

# The History of the First Kidney Transplantation

– a European Overview

Edited by:

**Robert Langer**





# **The History of the First Kidney Transplantation – a European Overview**

*Edited by:*  
Robert Langer



© *Semmelweis Press and Multimedia Studio Budapest, 2019*

**eISBN 978-963-331-473-9**

All rights reserved. No part of this work covered by the copyrights hereon may be reproduced or copied in any form or by any means – graphic, electronic or mechanical, including photocopying, recording, taping on information storage and retrieval systems – without written permission of the author and the publisher.



Editor in Chief: László Tancos, director

Layout: János Békésy

Cover: László Tancos

SKD: 622

# Contents

Lectori salutem .....	7
<i>The European Prelude</i>	
Ukraine .....	13
<i>The American Prelude – Message from the English Editor</i>	
United States of America .....	18
France .....	23
Norway .....	27
United Kingdom .....	30
Belgium .....	37
Spain .....	42
Czech Republic .....	46
Hungary .....	51
Germany .....	57
Ireland .....	60
Denmark .....	64
Finland .....	67
Sweden .....	69
Switzerland .....	72
Russia .....	76
Austria .....	81
Poland .....	86
Netherlands .....	91
Italy .....	97
Bulgaria .....	101
Estonia .....	106
Greece .....	110
Portugal .....	114
Lithuania .....	117
Slovenia .....	121
Belarus .....	125
Croatia .....	128
Azerbaijan .....	134
Serbia .....	136



Slovakia .....	140
Latvia .....	143
Bosnia and Herzegovina .....	148
Turkey .....	150
Georgia .....	158
Macedonia .....	160
Armenia .....	165
Luxembourg .....	170
Romania .....	173
Malta .....	175
Moldova .....	179
Cyprus .....	183
Iceland .....	187
Albania .....	191
Kosovo .....	195
Montenegro .....	200

When I was elected to be the Chair of EKITA, the European Kidney Transplantation Association, I raised the question, who do we represent? According to the official definitions, Europe is spread from Iceland to the Ural mountain; more than 40 members belong to the Council of Europe, the states called European. All of these countries have initiated renal transplantations. An idea was born to demonstrate our togetherness: each and every country has the opportunity to present its “very first” such operation. Finally, beside the pioneer Ukrainian and American contributions 44 European stories are recorded in this book. We have to mention that some citizens of European mini states where transplant programs are not present (because of the small number of potential patients) have the possibility to be transplanted in neighbouring countries: Andorra (Spain and France), San Marino and Vatican (Italy), Monaco (France) and Liechtenstein (Switzerland and Austria). But the remaining European countries are traditionally nationally organized, with organ exchanges rarely happening, except for Eurotransplant 8 Western and Middle European countries, Scandiatransplant (Scandinavian countries) and Balttransplant (Baltic states) where regular organ exchanges happen between the member states.

“Historia est magister vitae” – history is the teacher of life, stood every year in our exercise-book in the school. How wise this Latin wisdom is; shows this book which the honoured reader holds in his hands. It remembers the pioneers of organ transplantation, those extraordinary surgeons, who dared to step on unknown territories. We, the late successors go on the pathways trodden by them and we are lucky that Sir Peter Medawar’s (Nobel Prize, 1960) prophecy became true, he told in these heroic times, that one day transplantation would become a routine operation and will not be newsworthy anymore, because in the early time every attempt drew media attention.

To demonstrate the early challenges, let’s quote the lines written to me by the European transplant pioneer, Sir Roy Calne:

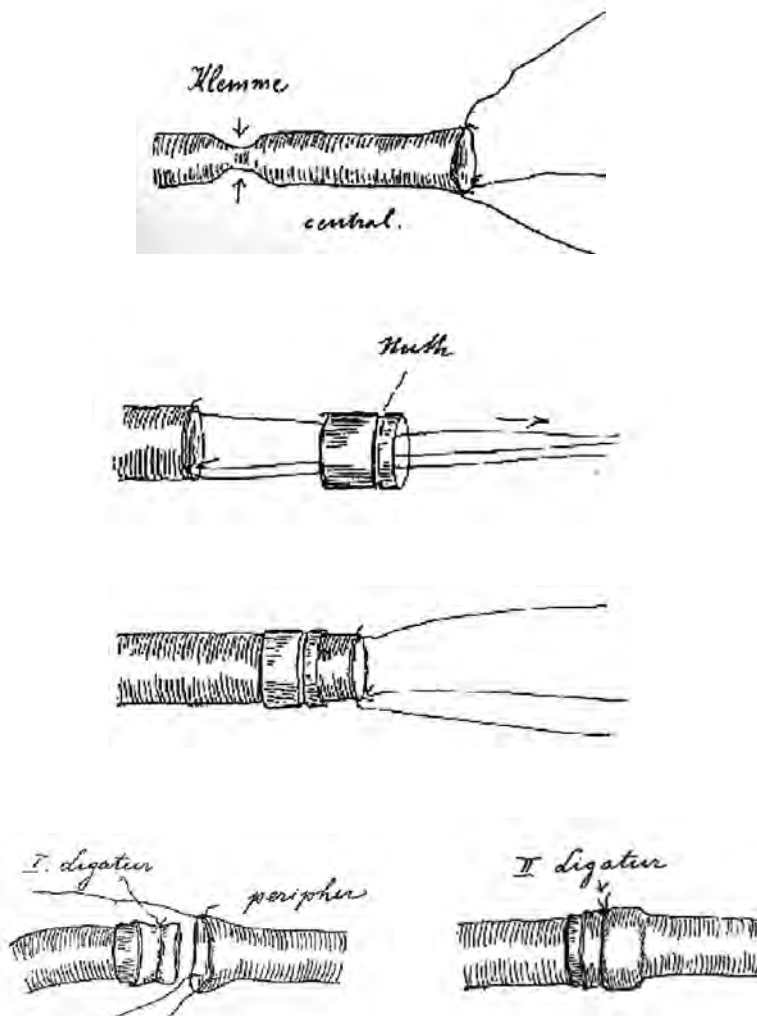
*„The first human kidney transplant that I attempted with John Hopewell at the Royal Free Hospital in Grays Inn Road is etched in my memory. I was in the process of experimental kidney transplants in dogs at the Buxton Brown Farm, Royal College of Surgeons Research Unit using 6MP in dogs with pelvic renal transplants leading to some prolongation of graft survival in most animals and a few fairly long survivors. I passed on the basis of these experiments John Hopewell and I planned to move to the clinic. The recipient was dying from uraemia due to polycystic renal disease. The donor had died from an intracranial haemorrhage. I had started the operation on the recipient but fortunately had not progressed very far when John Hopewell came to the operating theatre where I was working, carrying a basin with the donor kidney and his face was the same colour as his white coat. I realised something dreadful had occurred and was told the kidney he had removed was also polycystic, so we abandoned the procedure and then remembered that cerebral haemorrhage has a relatively high incidence in patients with polycystic kidneys. It seemed at the time that fate was against us. My next attempt at clinical kidney transplantation was after I had returned from Harvard Medical School in 1963 with a considerable amount of data on the immunosuppressive effects of 6MP and its close relative azathioprine. By this time azathioprine had reached clinical use in kidney transplantation, which was now a procedure with a high risk but stuttering towards success.”*

What was the specialty, which made these attempts interesting also for the media? An old dream of manhood became true in the middle of the twentieth century; that we can transplant organs. Usually a surgeon removes diseased parts or a whole organ from the body. Transplantation represents a fully different concept by replacing functions with an organ from another individual. To realize the technical feasibility, the first successful organ transplantation was demonstrated by the Hungarian-born Emerich (Imre) Ullmann (Fig. 1.) in 1902 in Vienna in dogs using the magnesium pipes technique of Erwin Payr (Fig. 2.). Alexis Carrel (Fig. 3.), the 1912 Nobel



**Fig. 1.**  
Emerich Ullmann (1861-1937)





**Fig. 2.**  
Vascular anastomosis according to Erwin Payr

Prize winner, further perfected the technical details: first of all, vascular suture anastomosis (*Fig. 4.*). But one had to wait another half a century for the evolution of immunology, until Joseph Murray (Nobel Prize 1990) achieved long-term renal graft survival in Boston.

However, there were several attempts to transplant animal kidneys into humans in Europe: first, the French Jaboulay (pig kidney 1906), then the German Unger (monkey kidney 1910), even Ullmann himself (goat kidney 1914),

and the American Neuhof (lamb kidney 1923). But the Ukrainian Voronoy was the first surgeon who tried a human-to-human renal transplant in 1933. The French attempts in the early 1950's were noteworthy for the so called heterotopic iliac technique of René Küss, still which is used today, leaving the native kidneys in place.

Were these pioneers carved from a special wood? Because they saw uremic patients, in whom the inchoate dialysis of the 1950-60's could not offer long term survival, as basically sentenced to death. The only solution was surgical: kidney transplantation. There were some who did not give up pushing the impossible despite the seemingly modest chance of a doubtful outcome. These surgeons required excellent dexterity, above-average endurance, obsessiveness and tolerance for failure. In Eastern Europe there was a further risk; if official politics judged the transplantation attempt unsuccessful, it could lead to professional or personal tragedies, so to try a renal transplant under these circumstances could become an existential question.

Even nowadays it is a huge responsibility for someone to launch a transplant program, despite the fact that ready-made recipes are at hand, including the technique and up-to-date knowledge from an experienced centre in the literature. But there are always sceptics who obstruct a promising project. This situation was increased among the heroes of this book. They not only had limited experience but also had to face and overcome great challenges. We know that the first step is always the hardest; we wonder with respect for passing that challenge. These first operations proceeded without exception by many years of preparation. Long hours of experimental operations, of failings and of hopes until Day 0 arrived, when everything became real; the stake was life or death. To take these ethical dilemmas which are beyond the technical questions on one's shoulders, required the special stuff of the pioneers.

In the 20<sup>th</sup> century another big dream of manhood was realized, when man reached space. Organ transplantation is often compared to space flight;



**Fig. 3.**

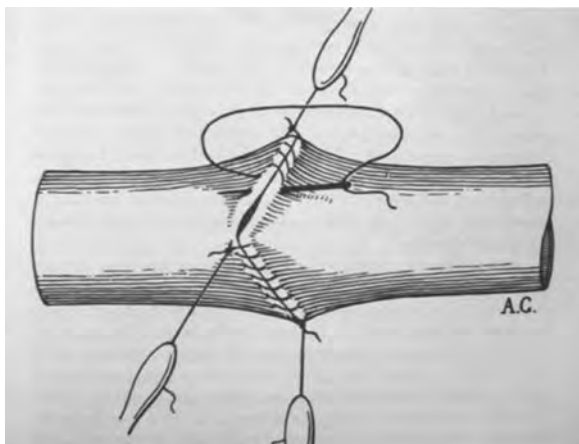
Alexis Carrel (1873-1944)

this rare branch of medicine is also a flagship, a drawing branch of its kind, because it has inspired further evolution of many specialties within medicine. "The Right Stuff" is the title of Tom Wolfe's famous 1979 book about the first seven astronauts; how they were chosen, what the risks and the dilemmas were, as well as which problem solving skills were needed for this special mission. I think the heroes of our book were also from this special "right stuff"; that is the reason why it is a special experience to learn their stories.

It has been an amazing one-and-a-half-year project to work on this book, to write the many e-mails to find the right people for the right task and to get to know these marvellous stories, which allow us to appreciate the unmatched work of our predecessors.

Here I want to thank Prof. Barry D. Kahan Ph.D., M.D. for the excellent English editing, I hope to read will be an affable, useful time travel also for the honoured reader.

Linz, Austria, Spring of 2019



**Fig. 4.**

The triangle anastomosis according to Carrel

*Robert Langer M.D., Ph.D.*

Professor of Surgery and Nephrology  
Chairman of EKITA





## Notes:

- The statistics in each chapter reflect the 2017 GDP data of the IMF: [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_GDP\\_\(nominal\)\\_per\\_capita](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal)_per_capita)
- The other 2017 figures were published in:
- Newsletter Transplant, International figures on donation and transplantation 2017. Editor: Beatriz Domínguez-Gil & Rafael Matesanz. EDQM Vol. 23. (2018)
- “pmp” means: per million population

## References:

- Langer RM, Kahan BD: 100 years ago. Ullmann’s pioneering operation – autotransplantation of the kidney. Transplant Proc 2002; 34: 429-433.
- Payr E: Beiträge zur Technik der Blutgefäß- und Nerven-naht nebst Mittheilungen über die Verwendung eines resorbirbaren Metalles in der Chirurgie. Archiv für klin. Chirurgie 1900, 62: 67-93.
- Langer RM, Kahan BD: Alexis Carrel’s legacy: visionary of vascular surgery and organ transplantation. Transplant Proc 2002; 34: 1061-1066.
- Carrel A: La technique opératoire des anastomoses vasculaires et la transplantation des viscères. Lyon Med 1902; 98: 859-864

# The European Prelude

## Ukraine



### 2017 European data

Inhabitants: 42.4 million
GDP per capita: \$8,712 (44 <sup>th</sup> )
Deceased donor pmp: N/A
All organ transplantations pmp: N/A
All kidney transplantations pmp: N/A
Deceased donor kidney transplantations pmp: N/A
Living donor kidney transplantations pmp: N/A


The first human allotransplantation worldwide – a kidney transplantation from man-to-man – was performed by Yuriy Voronoy, a Ukrainian surgeon in 1933 in the Ukrainian part of the Soviet Union.

Yuriy Yuriyevich Voronoy (*Fig. 1.*) was born in 1895 in the village of Zhuravka, in the district of Pyriatyn, in the Poltava Governorate of The Russian Empire, now Varva Raion, Chernihiv Oblast, Ukraine. His father, Georgy (Yurij) Feodosevich Voronoy was a famous mathematics professor, well-known for the Voronoi diagram (or tessellation) used in geoinformatics for distribution of rain as well as modeling crystal and cell growth. The Voronoi formula has long been a standard tool for studying analytic properties of automor-



**Fig. 1.**

Yuriy Y. Voronoy (1896-1961)



phic forms. The Voronoi iteration is used in computer science and electrical engineering to find evenly spaced sets of points. In 1891 he married Olha Krytska, a midwife. He left two sons and four daughters behind when he died as a mathematics professor at The University of Warsaw (at that time part of Russia) at the age of forty from the complications of gallstone disease. His son Alexander, who was a medical doctor experimenting with electricity for the treatment of tumour patients, died in a gulag camp after being arrested in 1938.

Yurij Voronoy started medical school in Kiev in 1913, but his studies were interrupted by World War I, when he volunteered at the Red Cross services as part of the Ukrainian corpsmen battalion. He also participated in the battle of Kruty, where in a five-hour battle on January 30, 1918, the Ukrainians delayed the Russian Red Army's conquest of Kiev allowing the Ukrainian Prime Minister to escape to international negotiations. So prior to the Treaty of Brest-Litovsk on February 9, 1918, the Central Powers signed an exclusive protectorate treaty with the Ukrainian People's Republic (German: *Brotfrieden*, "peace for bread"). It recognized the sovereignty of the Ukrainian republic which unfortunately did not last long.

Finally, Voronoy graduated in Kiev in 1921 remaining in the surgical department of the medical school. In 1926, he moved to Kharkiv, at that time the capital of the Ukrainian Soviet Socialist Republic working under Prof. Shamov in the Department of Surgery. The main scientific interest of Shamov's group was cadaveric blood transfusion and (an odd issue) testicular transplantation in man for the purpose of alleged rejuvenation and aging prevention. Yurij Voronoy performed his first experimental heterotopic renal transplant in 1930, presenting his observations at The Third Congress of Physiologists of the Soviet Union and at The 4<sup>th</sup> Ukrainian Congress for Surgeons. In 1931, he was promoted to a position as Head of The Surgical Department of The Medical School in Kherson. Here he lived in a flat on the clinic campus with his wife, his son (born 1918) and daughter (born 1926).

Kherson is the place where he performed the first human renal transplant in the world. The recipient was a mercury-poisoned 26-year-old married woman, who committed suicide after a family conflict. She was admitted to the hospital with abdominal spastic pain and emesis. She became anuric and somnolent with fibrillations of peripheral muscles. A 5% glucose infusion and rectal clyster therapy brought no improvement; she remained anuric for three days after her admission, so Voronoy decided to try renal transplantation with the intention of bridging kidney function.

A 60-year-old man died shortly after admission to the emergency room in the hospital due to a basal skull fracture. His AB0 blood group was type B; the recipient's was type O. Voronoy thought that this was not a hurdle; his theory

was that the reticuloendothelial system was a filter blocked by the mercury poisoning, the blood levels of which were continuously measured, so the poisoned person would be a universal recipient. According to his experiments and knowledge, allotransplantation in this case would have more chances than historic xenotransplant attempts where the “anaphylactic reaction”, (now known as hyperacute rejection) could lead to death. He also knew, that upon death the “sterility” and the viability of the kidney could be saved for a given time.

Voronoy performed the operation on March 3, 1933 under local anesthesia with Novocaine solution. He made skin incisions in the medial side of the mid-thigh as two tongue-shaped areas with the base of each skin tag pointing to each other. He prepared the femoral vein and artery, and covered the wound. Then he performed the operation in the non-heart beating donor. He explanted the right kidney by taking care of the anaerobic condition of the vessels by double ligating them and dissecting between the ligatures. The kidney was brought to the recipient without being perfused. Clamps were applied to the renal and femoral vessels for the anastomoses performed in the fashion described by Carrel. The ureter was canalized to the thigh and fixed to the skin (*Fig. 2.*). After releasing the clamps, the organ was reperfused as evidenced by capillary bleeding around the ureter and from the renal capsule. After a few drops of urine were observed, it stopped, but Voronoy was not concerned because he had observed this transient output previously in his animal exper-



**Fig. 2.**

The Voronoy technique of renal transplantation

iments. He drained the wound and closed the skin with the flaps. The patient remained stable during the operation, there was no “anaphylactic reaction”. The whole procedure lasted about 6 hours.

The postoperative phase was calm during the night, the patient did not vomit and had no muscular convulsions. The skin looked well without edema, the ureter had peristaltic movements and produced lucid urine from the transplanted kidney; however, the native kidneys remained anuric. According to the theory of Voronoy, to intensify the blockade of the reticuloendothelial system, he exsanguinated 700 ml blood and transfused the recipient with 400 ml of type 0 citrated blood. He was happy to detect that the mercury level in the blood had decreased from 4.0 mg% at admission to 1.5 mg% before the operation, and further to 0.15 mg% at 24 hours after transplantation. After the transfusion the urine became bloody, the patient vomited and experienced the reonset of muscular convulsions. Her condition became critical, she became oliguric, and on March 5, at 9.00 a.m., anuric, and she died at 9:40 a.m., 48 hours after transplantation.

The autopsy showed massive mercury intoxication of the parenchymatous organs, including signs of gastric and intestinal inflammation without necrosis. The transplant area looked unremarkable with minimal haematomas around the poles of the kidney. The anastomoses were leaky and the pelvis contained bloody secretions. The transplanted kidney was massively filled with fibrin and the vessels thrombosed. Voronoy interpreted the findings as a massive mercury intoxication with haemolysis following the blood transfusion, which he wished to abandon in future cases.

From the ethical point of view “not to harm”, he opposed living donor transplantation and was not encouraged by the first case. Therefore, he proceeded with another five cases of renal transplantations from non-heart beating donors. In 1950 he reported that these kidneys produced urine for 1 to 7 days, and in particular two successful cases, where he had used the transplantations as bridging therapy until the recovery of the recipients own organs. A 47-year-old woman with acute kidney failure saved by transplantation, had the graft removed on postoperative day 4, when she recovered renal function. In another case a 23-year-old woman became anuric after nephrectomy. While the graft lost its function on day 7 and was removed, the native kidney recovered such that she was discharged from the hospital.

Voronoy had an inventive mind: in 1940 he was the first to report a vascular stapling device for anastomoses. He participated in World War II, treating military personnel and civilians. He became Professor being promoted in 1953 to be The Head of the Institute for Blood Transfusion and Hematology in Kiev,



where he died of coronary disease in 1961. He is buried in Kiev at the Baikowo cemetery.

His legacy is unquestionable, he was a real pioneer, who dared to perform the first human kidney transplantation in an era without immunosuppression with the intention of bridging to allow treatment of acute renal failure. He published his results in 1936 in a Spanish journal, a decision that may reflect his complicated political situation as a Ukrainian in the Soviet Union. His work was known in the Soviet Union but then forgotten. When the next pioneer investigator, David Hume started his series in the 1940's in Boston, he applied the technique of Voronoy, using the thigh vessels for anastomoses. In addition to Ullmann succeeding in experimental animal models and Carrel inventing the technical details, Voronoy can be recognized as setting the third major milestone leading the way to clinical organ transplantation.

*Robert Langer M.D., Ph.D., FACS*  
Professor of Surgery and  
Nephrology Department of Surgery,  
Ordensklinikum, Krankenhaus der  
Elisabethinen, Linz, Austria

*Oleksiy Tsybrovskyy M.D.*  
Assistant Professor, Department of  
Pathology Ordensklinikum,  
Krankenhaus der Barmherzigen  
Schwestern, Linz, Austria

## References:

- Voronoy YY. Sobre el bloqueo del aparato reticulo-endothelial del hombre en algunas formas de intoxicacion por el sublimado y sobre la transplantacion del rinon cadaverico como metodo de tratamiento de la anuria con-secutive a aquella intoxicacion. *El Siglo Med* 1936; 97: 296.
- Hume DM, Merrill JP, Miller BF, Thorn GW. Experiences with renal homotransplantation in the human. *J Clin Invest* 1955; 34: 327.
- Hamilton DN, Reed WA, Path MC. Yu. Yu. Voronoy and the first human kidney allograft. *Surg Gynecol Obstet* 1984; 159: 289.
- Matevossian E, Kern H, Hüser N, et al: Surgeon Yurii Voronoy (1895-1961) – a pioneer in the history of clinical transplantation: in memoriam at the 75th anniversary of the first human kidney transplantation. *Transpl Int.* 2009; 1132. Wikipedia

# The American Prelude –

## Message from the English Editor

---

## United States of America



2017 data

Inhabitants: 324.5 million
GDP per capita: \$59,495
Deceased donor pmp: 31.7
All organ transplantations pmp: 103.3
All kidney transplantations pmp: 63.6
Deceased donor kidney transplantations pmp: 45.7
Living donor kidney transplantations pmp: 17.9

It was a great pleasure to edit these contributions and learn about the origins of transplantation in Europe. At the invitation of Dr. Langer, I have described these efforts in the United States of America.

In 1945, Dr. Charles Hufnagel, an eminent vascular surgeon at the Peter Bent Brigham Hospital, transplanted a kidney from a cadaver to the brachial artery and cephalic vein of a young woman in acute renal failure following multiple obstetrical complications. The kidney never functioned but fortunately the woman survived on her own. Similar cases were performed over the succeeding years. These cases have never been reported, but are described by Hume et al.

The first apparently successful renal transplantation was performed by Dr. Richard Lawler, a Senior Attending Surgeon at The Cook County Hospital with a faculty appointment at The Loyola University Medical School in Chicago, Illinois. The procedure was performed on June 17, 1950 at The Little Company of Mary Hospital, a community facility in Evergreen, Illinois. Lawler had reportedly done a few organ transplantations in dogs. He was assisted in this landmark procedure by Drs. James West and Raymond Murphy (*Fig. 1.*), nurse anesthetist Mary Lou Zidek and scrub nurse, Nora O' Malley. The recipient was a

44-year-old woman afflicted with familial polycystic kidney disease, who was hospitalized for five weeks awaiting a suitable cadaveric donor of the same gender and blood type as well as a similar age and physical size. These criteria were met by a woman with hepatic cirrhosis who suffered shock and coma following massive hematemesis. The total warm time from retrieval to orthotopic implantation was reportedly 45 minutes. The procedure included end-to-end anastomoses of the renal vessels and ureter in the former bed of the previously nephrectomized left kidney. She was hospitalized for a month; there was no treatment with immunosuppressants. The kidney appeared to

function for 53 days, as detected by the excretion of indigo carmines. However, at removal at ten months post-transplantation, it was reported to be 4×3×2 cm with absence of ureteral and pelvic structures. The recipient survived for nearly five years thereafter, before dying of heart disease and pneumonia. Lawler never performed another transplantation, but famously stated later "I just wanted to get it started".

Subsequently Hume (*Fig. 2.*) et al. performed nine cases of renal transplantations into the recipient's thigh with femoral vascular anastomoses and a cutaneous ureterostomy. They cited the advantages of this site to be less traumatic than the renal fossa, and less precarious than intra- or retroperitoneal locations following ureteral slough, as well as that it allowed direct collection of urine to evaluate function, ready assessment of graft blood flow by examination of the ureterostomy, easy access for biopsy and ready removal in case of infection or rejection. However, they acknowledged the need for careful hemostasis during the dissection to create the space and for a covering skin graft. They not only described the technique, but also provided a comprehensive report of the clin-

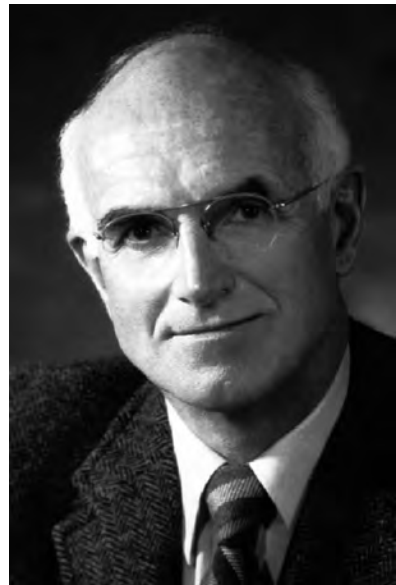


**Fig. 1.**

The first kidney transplant was performed by Dr. Richard Lawler, Dr. James West, and Dr. Raymond Murphy at Little Company of Mary Hospital, Evergreen Park, IL.



**Fig. 2.**  
David Hume (1917-1973)



**Fig. 3.**  
Joseph Murray (1919-2002)

ical events, metabolic profiles, renal function tests and histological features of the four allografts that developed measurable function for 37-180 days after delays of 8½ to 19 hours. However, based upon this experience, they concluded that “renal homotransplantations had no place in therapy of human patients at this time”.

After Hume had been drafted to serve in the Armed Forces during the Korean War, Dr. Joe Murray, a plastic surgeon (*Fig. 3.*) used steroids and whole body irradiation to blunt the immune response of renal failure patients to kidney allografts, he lead the team that performed the first successful transplantation on December 23, 1954. The success was due to the choice of the identical twins-donor Ronald to recipient Richard Herrick – as confirmed by fingerprint analyses by the Boston Police. Murray employed the retroperitoneal technique described by Küss. Before the operation, Richard was gaunt and white from severe anemia. His brain, affected by uremic toxins, made him disoriented and combative. After the operation, Richard’s mind cleared, his color improved, and he started to gain the weight he lost. He courted and married one of his nurses; they had two children. His brother, Ronald, suffered no ill effects from having just one kidney and lived another 56 years. The recipient lived for eight years before succumbing to recurrent nephritis. Murray was awarded the Nobel Prize in Medicine in 1990.

One of the first reported successful transplantations from a cadaveric

FOR FRANK  
DELMONICO

The Ad Hoc Committee includes Henry K. Beecher, MD, *chairman*; Raymond D. Adams, MD; A. Clifford Barger, MD; William J. Curran, LL.M., SMHyg; Derek Denny-Brown, MD; Dana L. Farnsworth, MD; Jordi Folch-Pi, MD; Everett L. Mendelssohn, PhD; John P. Merrill, MD; Joseph Murray, MD; Ralph Potter, PhD; Robert Schwab, MD; and William Sweet, MD.

Our primary purpose is to define irreversible coma as a new criterion for death. There are two reasons why there is need for a definition: (1) Improvements in resuscitative and supportive measures have led to increased efforts to save those who are desperately injured. Sometimes these efforts have only partial success so that the result is an individual whose heart continues to beat but whose brain is irreversibly damaged. The burden is great on patients who suffer permanent loss of intellect, on their families, on the hospitals, and on those in need of hospital beds already occupied by these comatose patients. (2) Obsolete criteria for the definition of death can lead to controversy in obtaining organs for transplantation.

JAMA, Aug 5, 1968 • Vol 205, No 6

## A Definition of Irreversible Coma

Report of the Ad Hoc Committee of the Harvard Medical School  
to Examine the Definition of Brain Death

Fig. 4.

The famous Harvard Committee report article, with Joseph Murray's handwriting on it

donor in The United States occurred in the early 1960's again in Boston. The organ was transplanted into a chronically uremic patient, who subsequently underwent bilateral nephrectomy. The graft sustained life for 15 months albeit with subnormal kidney function showing nitrogen retention and anemia. Several rejection episodes were reversed with immunosuppressive therapy.

After a committee charged to define death released their report defining the conditions of irreversible coma, retrieval of organs from "brain dead" donors expanded throughout America (Fig. 4.). The proliferation of organ retrieval organizations and transplant centers lead to the US Congress to pass the 1984 National Organ Transplant Act establishing the parameters of organ donation. The United Network for Organ Sharing (UNOS) a private nonprofit organization, was awarded the contract to establish an organ sharing system, to collect, store, analyze and publish data pertaining to the patient waiting list, organ matching and transplantations as well as to encourage organ donation. It presently employs 394 and has 500 volunteers with a 58-million-dollar revenue in 2016. Today, organ sharing is a robust effort within and between the 11 UNOS regions of the 50 states of the USA, which reported 33,000 transplantations performed in 2016, the last year formally reported by UNOS.

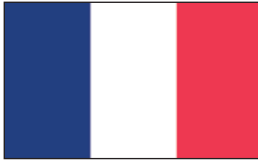
Barry D. Kahan, Ph.D., M.D.

Emeritus Professor, The University of Texas Medical School at Houston  
Houston, Texas USA



## References:

- Hume DM, Movill JP, Miller BF et al: Experiences with renal homotransplantations in the human: Report of nine cases. *J. Clin. Invest* 1955; 34: 327-382.
- Lawler RH, West JW, McNulty PH et al: Homotransplantation of the kidney in the human. *JAMA* 1950; 144, 844.
- Lawler RH, West JW, McNulty PH et al: Homotransplantation of the kidney in the human. Supplemental report of a case. *JAMA* 1951; 147, 45.
- Murray JE, Merrill JP, Harrison JH: Renal homotransplantations in identical twins. *Surg Forum* 1955; 6: 432-436.
- Küss R, Teinturiev J, Milliez P: Quelques essais de greffe de rein chez l'homme. *Mein Acad de Chir* 1951; 77: 755.
- Merrill JP, Murray JE, Takacs, FJ et al: Successful transplantation of a kidney from a human cadaver. *JAMA* 1963; 185: 347-353.
- Beecher HK: After the Definition of Irreversible Coma. *N Engl J Med* 1969; 281: 1070-1071.
- [http://optn.transplant.hrsa.gov/contentdocuments/OPTN\\_bylaws.pdf](http://optn.transplant.hrsa.gov/contentdocuments/OPTN_bylaws.pdf)



## 2017 European data

Inhabitants: 65.0 million
GDP per capita: \$43,760 (14 <sup>th</sup> )
Deceased donors pmp: 29.7 (6 <sup>th</sup> )
All organ transplantations pmp: 90.2 (3 <sup>rd</sup> )
All kidney transplantations pmp: 58.2 (2 <sup>nd</sup> )
Deceased donor kidney transplantations pmp: 48.8 (2 <sup>nd</sup> )
Living donor kidney transplantations pmp: 9.4 (12 <sup>th</sup> )

The first human-to-human kidney transplant attempt in France happened on January 12, 1951, at the Cochin Hospital, Paris. Under the guidance of Charles Dubost, René Küss (*Fig. 1.*) and Marceau Servelle transplanted a kidney in the extraperitoneal manner into the iliac fossa. This procedure became known as the “Küss operation”, it has been practiced ever since as the standard renal transplant operation. Unfortunately, without immunosuppression the kidney was rejected as were the other eight of this first series, wherein the donor organs were harvested from guillotined prisoners. One other kidney was obtained from a living donor, a so called “free kidney”, resulting from the Matson procedure for hydrocephalus, wherein the ureter was used and the healthy kidney would have otherwise been discarded. In 1966, Küss also attempted a cross-species renal transplantation – a pig-to-man xenotransplantation. However, both grafted kidneys suffered hyperacute rejection and the recipient died.



**Fig. 1.**  
Prof. René Küss (1913-2006)

René Küss was born into a family with medical traditions: his grandfather was a physician and mayor of Strasbourg, his father was Head of the Surgical Department of Hôpital de la Charité (later Broussais) and President of the French Academy of Surgery. René Küss participated in World War II in the army and

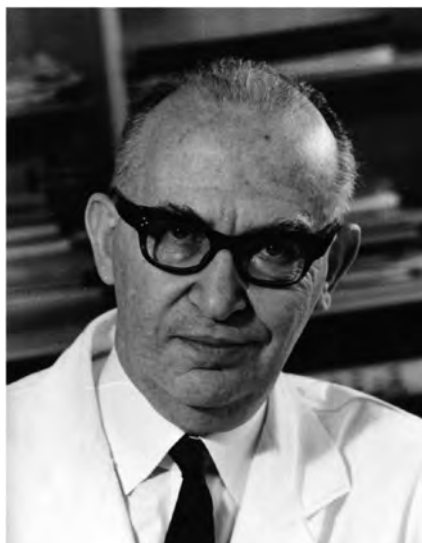


navy, helped the French Resistance and was honoured for his war efforts. The family were art-lovers; René Küss had a great collection of French impressionists. He also was a racecar driver competing in the Monte Carlo Rally.

A more promising effort in kidney transplantation was initiated by Jean Hamburger, one of the most outstanding pioneers in the field (*Fig. 2.*). Working at Hôpital Necker, he started the first dialysis in France in 1955, combining modern intensive care and nephrology, thereby founding a scientific environment for the study of nephrology, transplantation immunology and autoimmune diseases. He made major contributions to establish the French medical language. As a member and later President of the French Academy of Sciences he was honoured with many awards. His literary work regarding the medical-ethical-philosophical aspects was also significant.

Among his many contributions was the first “long-lasting” kidney transplantation in Paris on Christmas Eve 1952. A 16-year-old carpenter fell from a roof at work destroying what happened to be his solitary kidney. At that time, there was no dialysis available; he was destined to die of uraemia. His mother had heard of Jean Hamburger’s work on kidney transplantation and the young boy was therefore transferred to Necker Hospital. The mother was willing to donate a kidney to her son for him to survive (*Fig. 3.*). In a short period of time, doctors had to decide first, to remove one kidney to a healthy person and second, to organize the transplantation. The surgical technique pioneered by René Küss was key to successful right side transplantation of the mother’s right kidney during the night of December 25, 1952. The urinary anastomosis connected the ureter to the bladder.

Postoperatively, there was immediate diuresis with good function and few complications. The blood urea concentration was normal by day 5. Everything was stable until day 16, when the patient developed sudden anuria. An immediate second look operation verified that the artery, vein and ureter anastomoses were patent. A kidney biopsy revealed a mixed cellular and humoral rejection response, the first in kidney transplant history. The patient received sympto-



**Fig. 2.**

Prof. Jean Hamburger (1909-1992)






**Fig. 3.**

The recipient with the maternal donor, the participants of the first living donor kidney transplantation in the world

matic treatment with small doses of steroids but unfortunately succumbed from uraemia on day 22.

This case report needs some comments: It is almost unbelievable to have decided to perform this transplantation at this time. The surgical technique was perfect. The transplantation was performed without any immunosuppression; the doses of steroids administered at the time of anuria were low (and therefore not efficient). The mother who gave the kidney died at 83 years of age. From this time on, transplant teams knew that some kind of immunosuppression was required. Indeed, in 1959, both in Boston and at Necker, recipients of transplantation between non-identical brother were treated with total body irradiation. Perhaps the most striking of all were Jean Hamburger's observations of a normal complement but elevated gamma globulin level, leading to the hypothesis that the recipient developed antibodies against the donor, the current definition of donor-specific antibodies (DSA).

Jean Hamburger was the first physician to use steroid therapy; however, it took another 10 years until the effective dose was applied. In 1958 he participated in the care of six accidentally irradiated Yugoslavian researchers who were saved by bone marrow transplantations performed by Georges Mathé. Thereafter he developed the concept of total body irradiation for immunosuppression. A year later a series of patients were transplanted in Paris and in Boston. Although, most recipients unfortunately died, two cases were successful:



one French and one American patient, who survived more than 20 years. The concept of transplant biopsy and the development of the Euro-Collins preservation solution were both his contributions to the field. In 1962 he was the first to decide to remove the kidney of an individual who experienced brain destruction, thereby introducing the concept of organ retrieval after brain death, which has become routine practice in the Western World.

Although Joseph Murray who in 1954 performed the first successful kidney transplantation between identical twins, asserted in his Nobel Laureate presentation that the pioneering work of Hamburger and Küss which have “largely been forgotten” provided the important background deserving of “full credit for their work internationally”.

*Prof. Christophe Legendre*

*Prof. Henri Kreis*

Service de Néphrologie-Transplantation Adulte Hôpital Necker, Paris,  
France

## References:

- Küss R, Teinturier J, Milliez P. Quelques essais de greffe de rein chez l'homme. Mem Acad Chir (France) 1951; 77: 755-64.
- Michon L, Hamburger J, Oeconomos N et al. Une tentative de transplantation rénale chez l'homme: aspects médicaux et biologiques. Presse Med 1953; 61: 1419-23.
- Legendre Ch, Kreis H. A tribute to Jean Hamburger's contribution to organ transplantation. Am J Transplant 2010; 10: 2392-95.
- Wikipedia chapters of René Küss and Jean Hamburger <https://www.nobelprize.org/prizes/medicine/1990/murray/lecture/>

# Norway



## 2017 European data

Inhabitants: 5.3 million

GDP per capita: \$71,830 (3<sup>rd</sup>)

Deceased donors pmp: 21.9 (12<sup>th</sup>)

All organ transplantations pmp: 85.3 (5<sup>th</sup>)

All kidney transplantations pmp: 51.7 (6<sup>th</sup>)

Deceased donor kidney transplantations pmp: 37.2 (9<sup>th</sup>)

Living donor kidney transplantations pmp: 14.5 (7<sup>th</sup>)



**Fig. 1.**

Professor Leif Efskind (1904-1987)

The first renal transplant in Norway was performed in 1956 at The Surgical Department, University Hospital, Rikshospitalet, Oslo under the leadership of Professor Leif Efskind (*Fig. 1*). Life-saving haemodialysis for acute renal failure patients was established at Rikshospitalet in the same year. The patient, a 58-year-old man had cancer in his single functioning kidney. Without any waiting time, transplantation was performed after the nephrectomy using a kidney from a 57-year-old female deceased donor. The immunosuppressive regimen consisted of steroids and external irradiation directed to the graft. The immediate post-operative phase was uneventful; the patient displayed primary graft function. The graft continued to function for 4 weeks. At the end of week 4 post-engraftment, the serum creatinine increased; a post-renal obstruction was detected. This was possibly due to transplant-ureter necrosis. When the patient was reoperated, he died due to a cardiac arrest during the surgical intervention.

At the end of week 4 post-engraftment, the serum creatinine increased; a post-renal obstruction was detected. This was possibly due to transplant-ureter necrosis. When the patient was reoperated, he died due to a cardiac arrest during the surgical intervention.



**Fig. 2.**  
Professor Ole Jacob Malm (1910-2005)



**Fig. 3.**  
Third-man-test performed on the surgeon  
in charge

From 1956 to 1967, a total of 21 renal transplants were performed in The Surgical Department of Rikshospitalet. Sixteen recipients received grafts from deceased donors, while 5 from living donors. Fifteen grafts were lost or the patient died due to post-operative complications/infections within 2 months from engraftment. Three grafts functioned more than 12 months; the longest functioned 34 months.

The first renal transplantation in Norway with long term graft survival was performed at Ullevål University Hospital in Oslo in 1963. The patient was a 36-year-old man with end stage renal disease caused by tuberculosis. Both his mother and father were motivated for kidney donation. Based on the so called "third man test", Professor Ole Jacob Malm\* (Fig. 2.) first transplanted skin from the patient onto himself (Fig. 3.). After it started to reject at 8 days, skin transplantations were performed from the mother and from the father. Since the graft from the mother was rejected earlier and more vigorously, Professor Malm concluded that the mother and son shared tissue antigens and thus would be a better match than the father. The mother's graft allowed the recipient to

---

\* During the Occupation of Norway by Nazi Germany he assumed central positions in the resistance movement, and was decorated Knight, First Class of the Order of St. Olav in 1976.

eventually live with a functioning graft for 22 years. The transplantation was performed with the assistance of a surgeon from Peter Bent Brigham Hospital, Boston, Richard Wilson, who also brought azathioprine (Imurel®). Renal transplant activity for Oslo city continued at Ullevål Hospital until 1983. Thereafter all organ transplantations in Norway have been performed at The University Hospital, Rikshospitalet, Oslo.

*Karsten Midtvedt, M.D., Ph.D.*

*Per Fauchald, M.D., Ph.D.*

*Hallvard Holdaas, M.D., Ph.D.*

Oslo University Hospital, Rikshospitalet, Oslo, Norway

# United Kingdom



## 2017 European data

Inhabitants: 66.2 million
GDP per capita: \$44,117 (13 <sup>th</sup> )
Deceased donors pmp: 22.5 (11 <sup>th</sup> )
All organ transplantations pmp: 73.6 (11 <sup>th</sup> )
All kidney transplantations pmp: 52.1 (5 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 37.0 (11 <sup>th</sup> )
Living donor kidney transplantations pmp: 15.1 (5 <sup>th</sup> -6 <sup>th</sup> )



**Fig. 1.**

William James Dempster (1918-2008)

In the late 1950s, the attitude of the British medical community towards attempts at human renal transplantation was 'conservative' at best, with technical and ethical objections often vocally raised. William James "Jim" Dempster (*Fig. 1.*), who was a prolific surgical researcher in organ transplantation performed the first deceased donor renal transplant in 1956 which failed to function. This was followed by a number of unsuccessful transplants across the UK leading Dempster to conclude that further attempts at human renal transplantation would be 'premature'. Jim Dempster graduated from the University of Edinburgh and was an excellent rugby,

cricket and tennis player. He joined the Royal Air Force and served in India and Burma during WWII. In 1946 he started to work at the surgical unit of the Hammersmith Postgraduate Hospital in London, as a researcher in organ transplantation, investigating canine renal allografts. In 1956, Dempster joined Charles Rob's surgical team at St Mary's Hospital, in performing a renal transplant on a person with acute renal failure. Typically, frank and forthright, he described the procedure as an "unnecessary tragedy". In 1960 with Ralph Shackman, he carried out some of the earliest kidney transplants in the UK. Dempster became



**Fig. 2.**

Sir Michael Woodruff (1911-2001) photographed outside Holyrood Palace, Edinburgh on the day he was knighted in 1969.

one of the world's pioneers in organ transplantation by publishing more than a 100 reviews and papers on the subject between 1951 and 1957. His macro- and microscopic observations confirmed that rejection was an example of immune response, mediated by serum antibodies.

In July 1959 the urologist "Fred" Peter Raper performed a deceased donor kidney transplant with cyclophosphamide in Leeds. The patient died with functioning graft of a viral infection 8 months later.


The first long-term functioning successful renal transplant in the UK was performed in Edinburgh by Sir Michael Woodruff, on October 30, 1960 (*Fig. 2.*). The transplant was performed between two identical twin brothers and it continued to function for six years before the recipient died of unrelated causes. This success provided much needed momentum for

renal transplantation to grow in the UK.

Woodruff had an enduring research interest in transplant immunology that significantly pre-dated his seminal renal transplant in 1960. His significant personal professional investment aside, he was acutely aware that his first attempt at human renal transplantation needed to be a "resounding success" to "get renal transplantation off the ground" in the UK. Following the pivotal 1954 success of the live donor transplant between identical twins by Joseph Murray's team at the Peter Bent Brigham Hospital in Boston, he knew that long-term success was technically possible in the absence of immunological incompatibility and hence waited for similar circumstances to embark on his first attempt.

Woodruff was born in London, but undertook his medical and surgical training in Melbourne, Australia. His interest in transplantation began in unlikely circumstances, during his captivity in the notorious Japanese prisoner of war camp in Changi, Singapore. In this camp, he was intrigued to learn from a precious copy of Rodney Maingot's textbook 'Postgraduate Surgery' that skin allografts "often took for a time but did not survive permanently". This was





in contrast to corneal allografts, which somehow avoided rejection. Woodruff resolved then and there that “if I survived the war, I would investigate the matter”. This he did, and in doing so he became a pioneer of both transplant surgery and immunology.

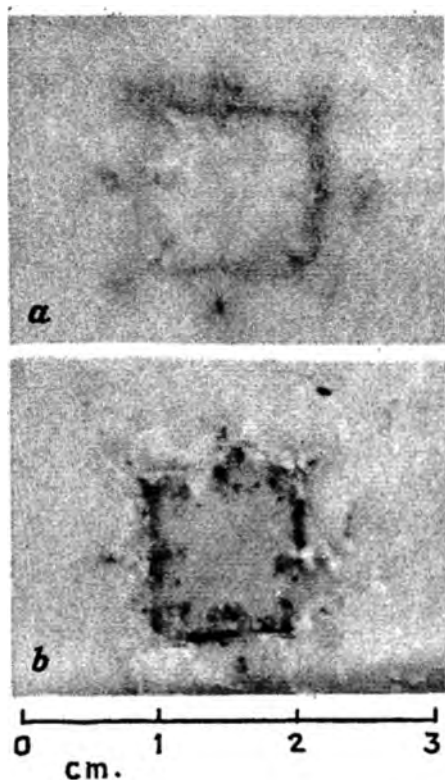
Following the end of the war and on the completion of his surgical training, Woodruff began his academic surgical career in Sheffield. There he studied the immunological privilege of thyroid allografts when placed in the anterior chamber of the eye before moving to Aberdeen in 1948. It was there, with his wife Hazel alongside him as his research assistant, that Woodruff began his important and enduring research into anti-lymphocytic serum (ALS) as a potential immunosuppressive agent, alongside studying various aspects relevant to transplant immunology.

At this time transplant surgery was yet to be either a widespread or a “respectable” specialism for an academic surgeon in the UK and as such, Woodruff had to travel far and wide to discuss his work with like-minded individuals. “As early as possible” in 1947, he arranged to meet with the eminent immunologist Sir Peter Medawar in what turned out to be a lasting collaboration and friendship. Woodruff’s international reputation as a transplant academic was established in 1950, when he secured a World Health Organisation (WHO) travelling fellowship to the USA. Here he developed relationships with many American surgical pioneers including Joseph Murray in Boston; a friendship which undoubtedly provided influential counsel for his own first transplant attempt. More practically, for his research, he obtained the first substantial supply of cortisone to come to the UK.

His reputation now firmly established in surgical academia, Woodruff was offered the appointment of Professor of Surgical Sciences in Edinburgh in 1954 without interview. This appointment offered “a favourable opportunity for a surgeon with some interest in fundamental biological problems to contribute to the progress of surgery and to help extend the frontiers of knowledge”. Here he established and chaired the UK’s first research group on transplantation funded by the Medical Research Council. Clinically, he performed a wide variety of surgery and developed vascular surgery within the unit. Woodruff expected his own high standards to be reflected in those who worked under him. His clinical ward rounds were “famous as a source of stress for those who unwisely came inadequately prepared, but, if the required high standards had been achieved, he was unstinting in his praise”.

Woodruff’s opportunity to perform a renal transplant finally came, when a 49-year-old steel warehouseman was admitted on the September 15, 1960 in renal failure and was noted by the referring doctor to have a healthy identical twin brother. He had become progressively more unwell over two months and





**Fig. 3.**

No evidence of rejection was seen on skin grafts (a) from recipient to healthy twin donor at 4 weeks and (b) from healthy donor to recipient after 6 weeks, supporting monozygosity of the twins.

had noted increasing breathlessness, swollen ankles and fatigue. On admission, his 24-hour creatinine clearance was 10-13 ml per minute and his metabolic acidosis was "considerable". The cause of renal failure was thought to be most likely chronic pyelonephritis, or possibly chronic glomerulonephritis.

The donor twin was found to be in good health. His creatinine-clearance was 88 ml per minute. Plain radiography confirmed the kidneys were of equal size, intravenous pyelography demonstrated good dye excretion and cystoscopy was normal. The team went to great lengths to prove the monozygosity of the twins – performing fingerprint tests, exchanging skin grafts (*Fig. 3.*) and utilising a contact with Dr. Goldsmith (London) to perform extensive red cell antigen testing. In combination, the probability that the twins were dizygotic was estimated to be 0.0026.

The operation, performed after six weeks of meticulous preparation, was more technically challenging than Woodruff could have hoped for in his

inaugural transplant. An associate surgeon, Mr. Ross performed the live donor nephrectomy synchronously in a separate theatre. The first challenge came when the transfemoral angiogram to establish the donor arterial anatomy was not possible due to tortuosity of the donor's iliac vessels. Only on opening was it realised that the donor had two renal arteries.

Following removal of the kidney, the arteries were flushed with heparin and the kidney placed in a basin of ice-cold saline and careful attention was paid to ensuring the kidney remained cool whilst *ex vivo*. In doing so, Woodruff had the opportunity to put into practice some of his own research in sheep demonstrating the protective effects of renal cooling against ischaemia.

The kidney was implanted into the right iliac fossa of the recipient. Woodruff had planned to anastomose the renal arteries onto two branches of the internal iliac artery; however extensive atheromatous plaque of the internal iliac

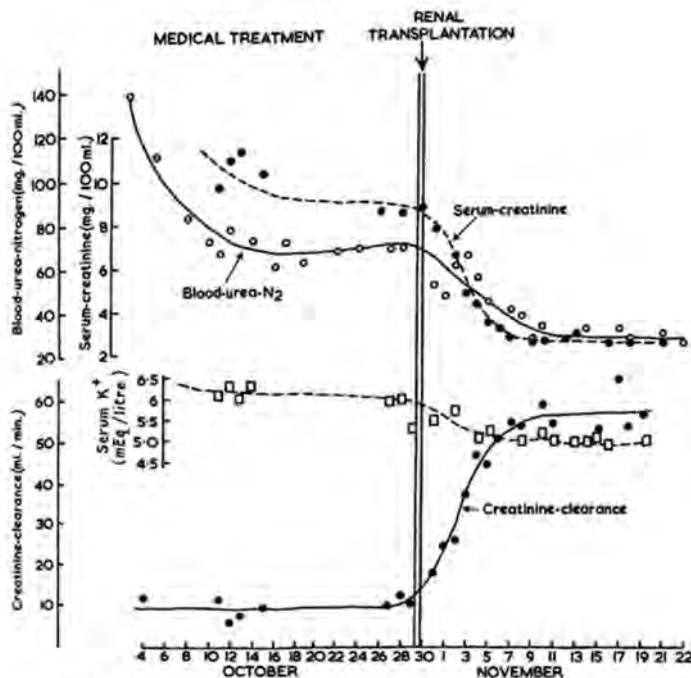


Fig. 4—Effect of medical treatment and of renal transplantation on the blood-urea-nitrogen, serum-potassium, and creatinine-clearance.

Fig. 4.

The perioperative course of the patient

artery thwarted this approach. Instead the renal arteries were sutured together to form a common channel and anastomosed end-to-side onto the external iliac artery. Total ischaemic time was 85 minutes – although the duration of warm vs. cold ischaemia is unclear.

For the ureteric anastomosis, the ureter was divided at the junction of its upper and middle third, before being tunnelled obliquely through the bladder wall and a mucosa to mucosal anastomosis performed in the fashion still employed by some today. The transplant ureter was cannulated with a 3 mm plastic tube (infant feeding tube) and brought out through the anterior wall of the bladder onto the anterior abdominal wall, thus allowing for the isolated measurement of graft urine output.

The initial post-operative recovery was described to be 'remarkably smooth'. Although no urine was produced intraoperatively, the kidney began producing urine in the first 24 hours (78 ml), which then worryingly declined in the following 48 hours. This was found to be a consequence of obstruction of the ureteric collecting tube. Once this was removed, urine output was excellent



**Fig. 5.**


The local newspaper headline

and the corresponding improvement in renal function (*Fig. 4.*) must have been a moment of great elation and relief for the team.

The excitement within the hospital was difficult to contain, and reports of the transplant featured the very next day on the front cover of the national newspaper, the Scotsman with the medical superintendent famously saying "I think the recipient has a sporting chance of getting away with it" (*Fig. 5.*).

The twins continued to make a smooth recovery. The donor made an uneventful recovery, returning to work five weeks after the operation. The recipient was discharged after seven weeks in hospital, at which point his 24h creatinine clearance was about 60 ml per min. The recipient returned to work 15 weeks after transplant. The graft continued to function well for 6 years until the recipient unfortunately collapsed. At autopsy the cause of death was thought to be coronary thrombosis, however a small gastric cancer was also identified. On finding this, the donor was investigated and found to have inoperable gastric cancer.

This transplant cemented Woodruff's reputation as a leading transplant surgeon in the UK with local and international support that promoted the development of clinical and academic transplantation. His next clinical breakthrough came when Joseph Murray visited Edinburgh and told Woodruff of the research by his Boston team (including Roy Calne) on a drug known as BW322 or, as it came to be known, azathioprine. Then at the Association of Surgeons of Great Britain and Ireland conference, Woodruff was given the serendipitously-numbered cloakroom tag '322', which Murray took to be such a good omen that he



gave Woodruff some BW322 to try. Woodruff tried this on his third transplant, between a father and son, making it the first renal transplant in Europe using azathioprine. It was also the most successful transplant of the era, continuing to function for 25 years.

With each success came gradual acceptance of the respectability of transplantation as a speciality in the UK. In 1968, the Nuffield Transplant Unit was built in Edinburgh; this was the world's first custom-built, dedicated transplant unit and was designed to minimize the risk of sepsis while allowing ready access to immunosuppression by radiotherapy and dialysis if required. It was a model adopted by many transplant units across the world.

Although his surgical achievements were undoubted, arguably Woodruff and his team's greatest contribution to transplantation was through his research into ALS. In 1963, following almost 15 years of research on the topic, Woodruff demonstrated that the administration of ALS prolonged the survival of skin allografts in rats. This research opened the pathway to further research into ALS and its derivatives, agents that have a lasting role in the management of kidney transplantation today.

*Katie Connor*

MRC/KRUK Research Fellow  
University of Edinburgh

*John Forsythe*

Medical Director, Organ Donation and Transplantation for NHS Blood and Transplant (UK)  
Honorary Professor University of Edinburgh

#### References:

- Brent L: Transplantation: some British pioneers. J R Coll Physicians Lond. 1997 Jul-Aug;31(4):434-41
- Hamilton D: A History of Organ Transplantation. Pittsburgh: University of Pittsburgh Press, 2012.
- Hopewell J: Royal College of Surgeons, biographical entry: Dempster, William James (1918–2008) <https://livesonline.rcseng.ac.uk/biogs/E000592b.htm>
- Woodruff MFA: Nothing Venture, Nothing Win. Edinburgh: Scottish Academic Press, 1997
- Jenkins S: 'Sir Michael Woodruff – Pioneering surgeon who performed Britain's first successful kidney transplant operation' The Guardian, 2001, March 16th, pg 20.
- Woodruff MFA et. al: Transplantation of a kidney from an identical twin. Lancet. Vol. I, 1961. Pp. 1245-1249.
- Mitchell RM., Woodruff MFA: The effects of local hypothermia in increasing tolerance of the kidney to ischemia. Transplant. Bull. 1958; 4, 15

# Belgium



## 2017 European data

Inhabitants: 11.4 million
GDP per capita: \$46,553 (11 <sup>th</sup> )
Deceased donors pmp: 30.5 (4 <sup>th</sup> )
All organ transplantations pmp: 92.1 (2 <sup>nd</sup> )
All kidney transplantations pmp: 48.1 (9 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 42.5 (4 <sup>th</sup> )
Living donor kidney transplantations pmp: 5.5 (21 <sup>st</sup> )

A first, unsuccessful attempt at living donor renal transplantation was performed in Brugmann Hospital at The Free University of Brussels on February 2, 1960 at the initiative of Professor PP. Lambert, Head of the Department of Medicine and Professor Jean Goovaerts, Head of the Surgical Department assisted by Professor P. Mingers, Head of the Department of Urology, and G. Primo, resident in surgery, who 11 years later performed the first heart transplantation in Belgium. This first attempt at living donor kidney transplantation recruited the recipient's father to salvage a young patient in end-stage renal disease. The immunosuppression consisted of whole body irradiation and corticosteroid therapy. Unfortunately, severe bone-marrow aplasia occurred during the second postoperative week, followed by general sepsis, and the patient rapidly succumbed. One year later, a second attempt was made on a middle-aged, chronically uremic man, using an unrelated young woman as the donor. The immunosuppressive regimen was similar to the one used for the first case, leading to similar complications and outcome.

On June 3, 1963 Professor GPJ Alexandre performed the first renal transplantation at Saint Pierre Hospital, at the University of Louvain, the French section of the "Université Catholique de Louvain", using a kidney procured from a heart-beating donor, for the first time ever in the world. The kidney was transplanted into a female recipient who survived for 87 days.

In 1962, GPJ Alexandre (*Fig. 1.*) obtained a fellowship for a year of surgical research in a laboratory at the Harvard Medical School in Boston, under the direction of Professor Joseph Murray, in The Department of Surgery at the Peter Bent Brigham Hospital, directed by Professor Francis D. Moore. His initial US con-

tact in Boston was with Professor Roy Calne who was packing to return to England. Roy Calne put his trust to Alexandre to look after the dogs surviving from his experiments. The dogs were receiving BW-57322, currently known as azathioprine, and actinomycin C. This drug combination was considered to be good enough to be used in clinical practice. Therefore, Dr. Alexandre returned to Belgium with both drugs in his luggage (and this good news) to complete his surgical training.

Since no chronic dialysis apparatus was available in the Department of Surgery at Saint Pierre Hospital in Louvain, the first candidates for renal transplantation were maintained on peritoneal dialysis, performed by medical students in 24-hour rotations on a voluntary basis. A first, 45-year-old uremic woman was admitted to the surgical department on April 2, 1963 to be maintained on chronic peritoneal dialysis. A few days after her admission, the first potential donor, a victim of a road accident was screened but eventually rejected due to an incompatible blood group for that unique recipient. Nevertheless, it was an excellent opportunity to prepare all teams and materials for a future challenge.

On June 3, 1963, a 12-year-old girl with a head injury and profound coma was brought to the Emergency Department after a traffic accident. The patient underwent bilateral carotid angiograms to exclude an intracranial haematoma. Despite active resuscitation and administration of vasopressive drugs, the patient presented all signs of what Mollaret and Goulon had previously described as “coma dépassé”. Since the patient was dead, Dr. Alexandre who was still an assistant and for that reason, could not make the decision himself, suggested to Professor Jean Morelle, Chief of the Department of Surgery and also experienced in neurosurgery, to remove the kidney while the heart was still beating. In doing so, Professor Morelle took the most important decision in his career, which was later accepted by all transplant teams all over the world.

As the blood group was compatible with the first uremic patient, donor and recipient were actively prepared in two contiguous operating rooms. Professor Morelle performed a left nephrectomy through a flank incision in the donor, while Dr. Alexandre prepared the recipient vessels in the right iliac fossa. Professor Morelle carried the kidney – one artery and one vein without a patch –



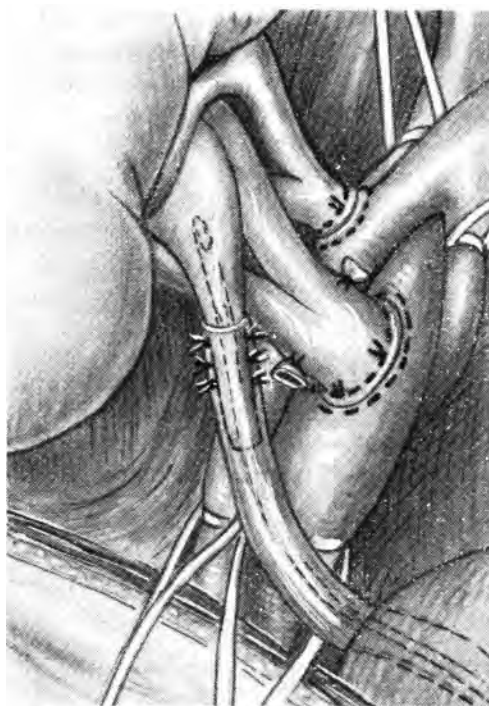
**Fig. 1.**  
Prof. Guy PJ Alexandre





**Fig. 2.**

The Küss technique: transplantation of a left kidney in the right iliac fossa



**Fig. 3.**

Scheme of the Vaysse and Economos technique: pelvic implantation of the kidney with the urinary tract reconstruction

from one room to the other, simply wrapped in a wet surgical sponge. No heparin, no preservation fluid were used; the blood contained in the transplant was not even washed away.

While Professor Morelle's assistants were suturing the donor's body, before carrying it to the mortuary, Professor Morelle joined Dr. Alexandre's team and helped him to suture the renal vessels using Küss's transplant technique for vascular anastomoses (*Fig. 2.*). After a total ischaemic time of 28 minutes, all clamps were released and the kidney regained immediately its pink color, dripping and jetting a lot of magic urine. With joy and satisfaction, the team proceeded with the ureteral suture using the Vaysse and Economos procedure, the one they had used for the famous 1952 living related case (*Fig. 3.*). Through the same recipient incision, they performed a nephrectomy of the right native kidney and sutured the distal native ureter to the proximal graft ureter, in end-to-end fashion without JJ tube stenting.

Using the same immunosuppressive drug combination as in the US animal experiments, the recipient received azathioprine, actinomycin C and steroids. The graft functioned immediately without any tubular necrosis. The recipient's serum creatinine normalized within a few days. Unfortunately, she experienced a rejection crisis at postop-

erative week 7, which was immediately treated; however, she died on postoperative day 87 due to sepsis.

At the time of her death, two other patients had been transplanted using that effective immunosuppressive drug combination, and a fourth one, the following November of the same year. The third patient had been transplanted with a living donor kidney from the patient's uncle, while the fourth with a cadaver kidney. These recipients experienced long term function for more than six years. In this way the kidney transplant program was launched at the University of Louvain, French section.

Guy Alexandre stated during the 1965 Ciba Symposium on Transplantation his practice of removing kidneys: *"In our nine cases we switched off the respirator immediately after the kidneys were removed. In all patients the heart beat ceased within two or three minutes. In my opinion, it is irrelevant whether a heart-lung preparation goes on for two days or even for weeks: it is still a heart-lung preparation and for us it is still a dead person"*. Furthermore, he claimed: *"Dr. Giertz spoke about taking organs from a dying person. I would like to make it clear, that, in my opinion, there has never been and there never will be any question of taking organs from a dying person who has a "non-reasonable chance of getting better or resuming consciousness". The question is of taking organs from a dead person. The point is that I do not accept the cessation of heart beat as the indication of death"*.

Five years earlier than the publication of the Harvard committee's report concerning irreversible coma, Guy Alexandre had not only adopted closely similar diagnostic criteria for brain death, but applied those criteria in performing his first kidney transplant from a brain dead donor. During the Ciba symposium, Alexandre proposed one precondition (severe cranio-cerebral injury), and five criteria for the diagnosis of brain death: complete bilateral mydriasis; complete absence of reflexes, both natural and irresponsive to profound pain; complete absence of spontaneous respiration 5 min after mechanical respiration has been stopped; falling blood pressure necessitating increased amounts of vasopressor drugs – adrenaline or phenylephrine hydrochloride and flat EEG. If all five conditions are met, the observation period does not need to exceed 6 hours.

It took several years and the Harvard Ad Hoc Committee Report to help other surgeons to "change their minds about brains".

Today with the development of organ procurement – even of the heart from a donor after cardiac death (DCD) – and of euthanasia, combined with the evolution of technologies and progress in the transplantation field and in preservation, the Harvard Ad Hoc Committee criteria have been stretched and adapted to improve organ quality.

By contrast, Alexandre's first concept and surgical approach to DBD are



still valid, and pertaining for all types of cadaver donors. They allow surgeons to have “clear minds of taking organs from a dead person”.

*Jean-Paul Squifflet M.D., Ph.D.,*  
Professor of Surgery  
Department of Abdominal Surgery and  
Transplantation, University of Liege

*Guy PJ Alexandre M.D., Ph.D.,*  
Professor emeritus  
Department of Surgery, Catholic  
University of Louvain

## References:

- De Pauw L: Organ Transplantation Pioneers at the «Université Libre de Bruxelles».
- Suppl Acta Chir Belg, 2003; 103: 25-27.
- Squifflet JP: The history of organ transplantation in Belgium 1963-2003. At the honor of the Belgian pioneers in transplantation surgery. Suppl Acta Chir Belg, 2003; 103:5-62.
- Machado C: The first organ transplant from a brain-dead donor. Neurology 2005; 64:1938-42.
- Alexandre GPJ: From the early days of human kidney allotransplantation to prospective xenotransplantation. In: Terasaki PJ: History of transplantation: thirty-five recollections
- UCL Tissue Typing Laboratory. Los Angeles, Ca, 1991: 337-348.
- Haxhe JJ: 50 ans de Médecine à l'UCL. 1950-2000. Editions Racine. Bruxelles 2002.
- Mollaret P and Goulon M: Le coma dépassé. Rev Neurol 1959; 101: 3-15.
- Küss R, Teinturier J, Milliez P: Some attempts at kidney transplantation in man. Mem Acad Chir (Paris) 1951; 77: 755-764.
- Wolstenholme GEW, O'Connor M: Ethics in Medical Progress: With Special Reference to Transplantation. Boston, MA: Little, Brown and Company; 1966.
- Friedman Ross L, Thistlethwaite JR: The 1966 Ciba symposium on transplantation Ethics: 50 years later. Transplantation 2016; 100: 1191-1197.
- A definition of irreversible coma. Report of the Ad Hoc Committee of the Harvard Medical School to examine the definition of brain death. JAMA 1968; 205: 337-340.
- Moore FD: Changing minds about brains. N Eng J Med 1970; 282: 48.
- Boucek MM, Mashburn C, Dunn SM, et al: Pediatric Heart Transplantation after declaration of cardiocirculatory death. N Eng J Med 2008; 359: 669-675; 709-714.
- Detry O, Laureys S, Faymonville ME, et al: Organ donation after physician-assisted death. Transplant Int 2008; 21: 915.
- Wijdevicks EFM: Brain death worldwide: accepted fact but no global consensus in diagnostic criteria. Neurology 2002; 58: 20-25.
- Bernat JL: Life or death for the dead donor rule? N Eng J Med 2013; 369: 1289-1291.



## 2017 European data

Inhabitants: 46.4 million
GDP per capita: \$38,285 (16 <sup>th</sup> )
Deceased donors pmp: 47.0 (1 <sup>st</sup> )
All organ transplantations pmp: 111.0 (1 <sup>st</sup> )
All kidney transplantations pmp: 70.5 (1 <sup>st</sup> )
Deceased donor kidney transplantations pmp: 63.3 (1 <sup>st</sup> )
Living donor kidney transplantations pmp: 7.2 (17 <sup>th</sup> )



**Fig. 1.**

Dr. José-Antonio Martínez-Piñero  
(born 1927)

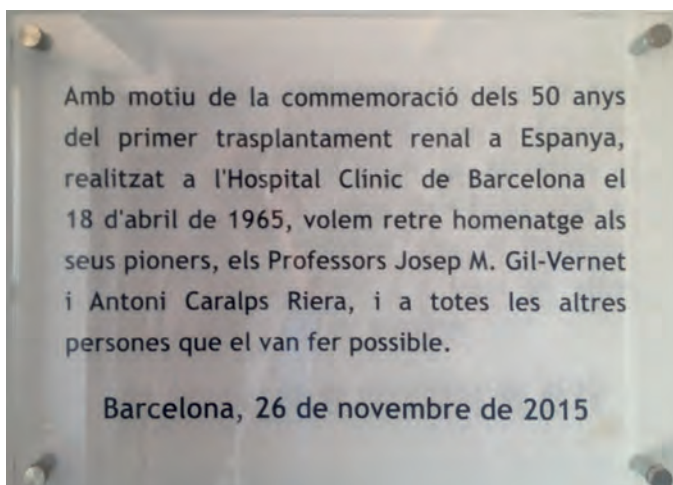
The first two attempts of kidney transplantation in Spain were performed in Madrid in 1960 and 1961: the first at The Provincial Hospital of Madrid by Dr. José-Antonio Martínez-Piñero (*Fig. 1.*) and the second at The Nuestra Señora de la Paloma Clinic by Dr. Carlos Younger de la Peña (*Fig. 2.*). These living donor transplantations both failed because of the recipients' deaths within the first week.

In April 1965, at The Hospital Clínic in Barcelona, Dr. Josep M. Gil-Vernet performed a cadaveric donor kidney transplantation to a 19-year-old boy who succumbed four days later due to haemorrhage, compounding several other postoperative complications (*Fig. 3.*).

The first successful kidney transplantation in Spain was also performed at The Hospital Clínic of Barcelona by Dr. Josep M. Gil-Vernet on July 23, 1965. The 35-year-old woman who received a kidney from a cadaveric donor survived a little over two years. The nephrological consultation by Dr. Antoni Caralps, included two young doctors – Jeroni Alsina and Albert Brulles. That same year, another six transplantations were performed at



**Fig. 2.**  
Dr. Carlos Younger de la Peña (1920-1996)



**Fig. 3.**  
Plaque honouring the first renal transplantation in Barcelona at the  
Hospital Clínic



**Fig. 4.**

The pioneers celebrating the 50<sup>th</sup> anniversary of the first successful renal transplantation: Drs. Josep M. Gil-Vernet, Jordi Vives and Antoni Caralps

The Hospital Clínic, one from a living donor (*Fig. 4.*). Both Dr. Antoni Caralps and Dr. Jeroni Alsina had undergone previous training with Dr. Hamburger at the Necker Hospital in Paris. Using greyhound dogs from a kennel in Barcelona Dr. Gil-Vernet had perfected the surgical technique in the operating rooms of the zoo in Barcelona, which were very close to the lion's cage.

At the beginning of 1966, the Clínica de la Concepción de Madrid also performed its first successful kidney transplant.

The political and social contexts in which Spain's first transplantations were performed were not easy. The country had suffered a three-year civil war (1936-1939) and a post-war dictatorship that lasted until 1975. Of course, no legislation at that time contemplated organ donation and transplantation. The details of how these pioneering experiences were recalled and a multitude of anecdotes that accompanied them collected in a book.

In 1979, the first law was published to regulate the extraction and implantation of living and cadaveric donor organs for transplantation. It established the criteria for the diagnosis of brain death and the technical requirements of hospitals to perform transplantations. The law was considered quite advanced at that time, since it was only a short time since the end of the dictatorship.

In 1984, the position of the hospital coordinator was created, based upon the experiences of the Catalan hospitals. Hospital coordination has been considered to be one of the keys to the remarkable growth of cadaveric donors in Spain. That same year, cyclosporine was introduced in Spain causing the results of kidney transplant survival to improve significantly. In 1989, the appointment of Dr. Rafael Matesanz to the National Transplant Organization, produced a sustained growth in donation rates, presently reaching 48 pmp.

*Federico Oppenheimer, M.D., Ph.D.*  
Director, Clinical Institute of Nephrology and Urology (ICNU)  
The Hospital Clínic de Barcelona, Spain

## Reference:

- Historia del trasplantament d'òrgans a Catalunya, published by the Fundació Catalana de Trasplantaments (Eulàlia Valls, Edicions 62, Barcelona 2009)

# Czech Republic



## 2017 European data

Inhabitants: 10.6 million
GDP per capita: \$35,512 (19 <sup>th</sup> )
Deceased donors pmp: 25.4 (8 <sup>th</sup> )
All organ transplantations pmp: 78.5 (8 <sup>th</sup> )
All kidney transplantations pmp: 44.2 (12 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 39.4 (7 <sup>th</sup> )
Living donor kidney transplantations pmp: 4.8 (25 <sup>th</sup> )

The first kidney transplantation attempt happened on November 23, 1961 in Hradec Králové. The recipient was a 16-year-old girl who had undergone a right-side nephrectomy due to lithiasis in Slovakia but remained anuric after the surgery. Therefore, the patient was moved to Hradec Králové, where haemodialysis for acute patients was available at that time. On November 7, 1961 in Hradec Králové the urologists found that the left kidney was small with chronic hydronephrotic changes. The brother and mother were evaluated as potential donors. For immunosuppression, whole body irradiation was used since the recipient did not tolerate 6-mercaptopurine (*Fig. 1*). The brother was intended to be a suitable donor but the nephrectomy on November 17, 1961 was not completed due to unanticipated complex anatomy. Therefore, a second attempt was made using the recipient's 52-year-old mother as the donor on November 23, 1961. Pavel Navrátil, a urologist, performed the transplant surgery; his nephrology counterpart was Josef Erben, father of the Czechoslovak dialysis program (*Fig. 2*). After transplantation, the kidney graft started to produce 150-250 mL/day of urine. On the 9<sup>th</sup> postoperative day, the patient developed fever and endogenous sepsis as well as radiation sickness succumbing on the 16<sup>th</sup> postoperative day.

The first successful kidney transplantation beginning the program in Czechoslovakia was performed on March 21, 1966, in Prague, Krc, in The Department of Clinical and Experimental Surgery. The "father" of the transplant program was Prokop Malek, surgeon, who had two years previously initiated a working group of surgeons (Malek, Hejnal, Kocandrlé), nephrologists (Jirka, Reneltova) (*Fig. 3., Fig. 4.*), immunologists (Ivanyi) and pathologists (Rossmann)



**Fig. 1.**

Sterile bed of the patients after total body irradiation



**Fig. 2.**

Pavel Navratil (second left) and Josef Erben (second right) celebrating the anniversary of the first transplantation attempt in Hradec Kralove.



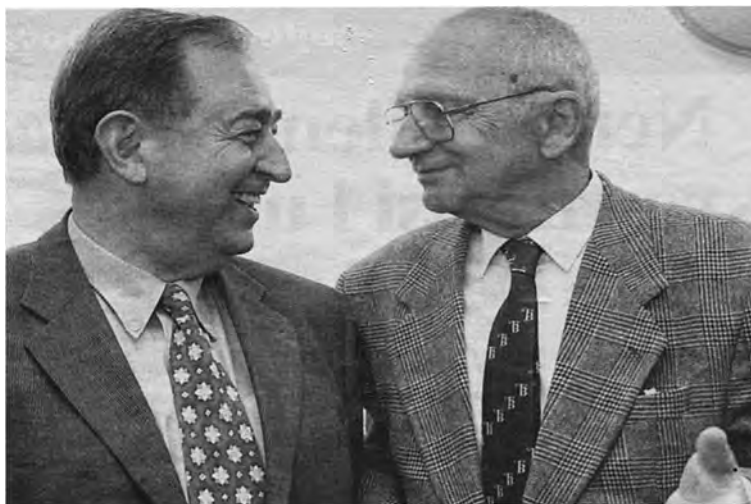
having them visit several hospitals in the “West”. A young surgeon, Vladimir Kocandrl, later director of the hospital, visited Chicago to observe their first living donor kidney transplantation, while the nephrologist and pathologist visited Paris to learn about transplant management and pathology. Prague immunologists, mainly fellows of famous Milan Hasek, who contributed to transplantation tolerance research in the beginning of the 1950’s, were at that time visiting pioneering European immunogenetic schools and were organizing several European immunological meetings in Czechoslovakia.

Their first patient was a 24-year-old man suffering from end-stage polycystic kidney disease. He had initiated haemodialysis on February 23, 1966. Before the transplant surgery he had undergone 7 dialysis sessions. His mother (aged 49) agreed to be a living donor (*Fig. 5*). Both patient’s and donor’s blood group



**Fig. 3.**

Jaroslav Hejnal who performed the first successful living donor kidney transplantation in Czechoslovakia



**Fig. 4.**

Vladimir Kocandrl (left) and Jiri Jirka (right) some 40 years after the first transplantation





**Fig. 5.**

The first kidney transplant recipient with his mother – the first living donor

were AB, Rh+. Transplantation was scheduled for March 21, 1966. A urologist (Jiri Kubat) performed a left-sided nephrectomy via a lumbotomy. The kidney graft was cooled to 4° Celsius by perfusion with low molecular weight dextran containing procaine and heparin. Transplant surgery was led by Jaroslav Hejnal assisted by Prokop Malek and Vladimir Kocandrlle. Interestingly, both polycystic kidneys were removed before the kidney transplantation. The left kidney was removed via a left lumbotomy, while the right kidney was excised via the same incision that was used for kidney transplantation. The renal vein was anastomosed end-to-side to the external iliac vein and the renal artery was anastomosed end-to-end to the internal iliac artery. Urine production was noticed just 3 minutes after

**Operační vložka**

12-11-1966

Jméno operovaného **Pavlík K.** Číslo prot. **21.3.1966**  
 Míst a den **21.3.1966**  
 Počet let. měs.

**Všedoperační záznam**

U nemocného je jedné o terminální stav renální insuf. Je indikována transplantace ledviny se současnou oboustr. nefrektomií. Děrcem je matka.

**Postup a popis operace**

**Dg. operací**  
 Polycystosis renis bilat.  
 Glomerulonefritida chron.  
 Afunctio ren. bilat.  
 Uremia terminalis.


**Operační výkon**  
 Nephrectomia bilateralis.  
 Allotranspl. renis.

**Operátor**  
 Dr. Hejnal  
 Asistenti  
 Doc. Malek  
 Dr. Kubat, Dr. Kocandrlle  
 Instrument  
 s. Mindřová  
 Anestezista  
 Doc. Kozler

V celk. znecitnění provedena nejprve z levost. lumbotomie nefrektomie levé ledviny ( Doc. Malek ) a poté z obloukovitého řezu nad pravým tříselem proniknuto do pravé poloviny retroperit. prostoru. Z tohoto řezu provedena nejprve nefrektomie pravé ledviny. Obě odstraněné ledviny jsou značně zvětšené, hrboľaté, s makroskop. vzhledem polycystosy. Po vypreparování vnitřní ilické tepny a zevní ilické žíly připravena situace k přenosu ledviny, odebrané z matky. Ta je nejprve perfundována nízkomolekulárním dextranem, ke kterému je přidáno 2 ml heparinu a 50 ml 1% prokainu na 500 ml perfusní tekutiny. Při tom je byl roztok zchlazen na 4°C a perfuse se dělá za tlaku asi 100 mmHg, použito bylo 150 ml. Po této přípravě byla ledvina transplantována do pravé jámy kyčelní a tím, že nejprve byla našita ledvinná žíla nasevní ilickou žílou a to způsobem end to side a, potom ledvinná tepna na vnitřní ilickou tepnu a to end to end. Asi za 3 minuty ~~xxkxxjxixix~~ po obnovení cirkulace v ledvině se již obnovila sekrece moči. Celková doba ischemie trvala 25 min. Po skončení cévních sutur byl našit ureter do měchýře a sice ve formě Benninghausovy implantace ( Dr. Kubat ). Po revizi krvácení a zavedení drénů byl výkon ukončen stahem oper. rány ve vrstvách.

**Fig. 6.**

Description of the 1966 living donor transplantation procedure



removal of the clamps. Total ischemic time was 25 minutes. The ureter was placed in the urinary bladder by Jiri Kubat using a Beninghaus implantation (*Fig. 6.*). Azathioprine (5mg/kg/daily) and prednison (200 mg) initiated preoperatively were tapered to 1-2mg/kg/daily and 10-20mg daily respectively. The kidney graft was locally irradiated 3-times with 150R and actinomycin was given thrice. There were several infectious complications post-transplantation with subsequent deterioration of kidney graft function. The kidney graft functioned for 3 years until March 12, 1969, when graftectomy was performed by Jaroslav Hejnal.

*Ondřej Viklický M.D., Ph.D.,*

Professor of Nephrology

Dept. of Nephrology, Transplant Centre,

Institute for Clinical and Experimental Medicine

Prague, Czech Republic

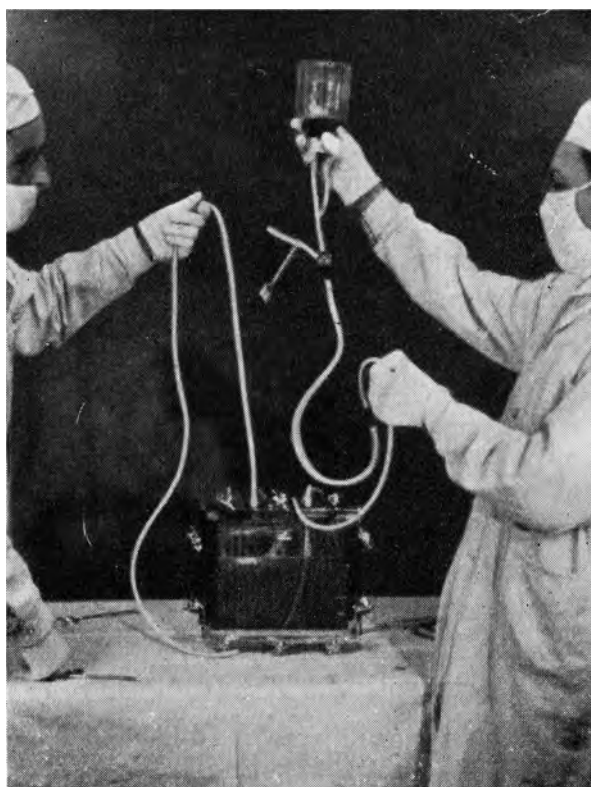
## References:

- Pavel Navrátil: Praktická urologie u nemocných v dialyzační léčbě, před a po transplantaci ledviny. Olga Čermáková, Hradec Králové 2005.
- Ondřej Viklický et al: Kaleidoskop vzpomínek na 50 let program transplantací ledvin v Krči. Stanislav Juhaňák -TRITON, Praha, 2016.



## 2017 European data

Inhabitants: 9.7 million
GDP per capita: \$29,473 (26 <sup>th</sup> )
Deceased donors pmp: 16.4 (20 <sup>th</sup> )
All organ transplantations pmp: 45.5 (20 <sup>th</sup> )
All kidney transplantations pmp: 30.6 (20 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 26.5 (19 <sup>th</sup> )
Living donor kidney transplantations pmp: 4.1 (26 <sup>th</sup> )



**Fig. 1.**

First dialysis equipment in Hungary designed by András Németh and György Gál in 1954

Behind the Iron Curtain in Szeged, Hungary the first haemodialysis was performed to treat acute uraemia in 1954 using a home-made equipment (*Fig. 1.*) designed by András Németh and György Gál. Even in the much more fortunate Western Europe, dialysis treatments started much later. The surgeon András Németh was a versatile, creative and innovative person who became the pioneer of Hungarian transplantation by performing the first kidney transplant on December 21, 1962 in Szeged. Unfortunately, the recipient experienced just 79 days of prolonged life, but this was according to András Németh the 39<sup>th</sup> operation



**Fig. 2.**  
Prof. András Németh (1924-1999)

of its kind. Prof. Gábor Petri, the visionary Chairman of the Department of Surgery in Szeged, unselfishly supported his co-workers by sending them abroad, mainly to Western Europe to learn the most advanced surgical techniques. This was a noticeable accomplishment, considering the political circumstances in the middle of the cold war.

András Németh (*Fig. 2.*) spent 6 months in England visiting Prof. Dempster, where he assisted in two human transplantations, but performed many experimental operations, thereby acquiring the techniques of renal transplantation. He was a renaissance man with accomplishments in literature as a language purist, in athletics, amateur filmmaking, as well as a great inventor in surgery and

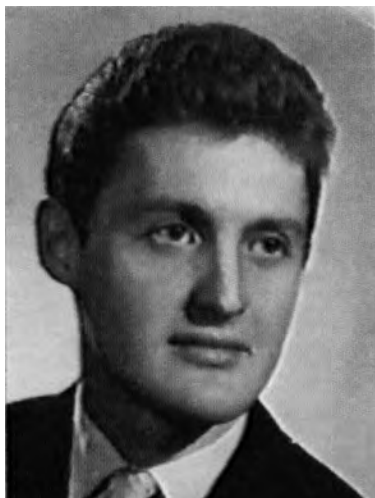
medicine. But fortune was not gracious to him: because of his role in the 1956 revolution after the “failed” renal transplantation his recognition did not come until just after the political changes in 1990, when he finally became professor and was honoured by a high state award for his life-long achievements.



**Fig. 3.**  
The first Hungarian kidney recipient

In preparing for the kidney transplantation in Szeged an isolated locker room, the so called “sterile room” was built at the department. The operating room was also modernized. One did not have to wait long for the first patient, a just-married 26-year-old young man (*Fig. 3.*) was diagnosed with end stage renal disease and was undergoing 24-hour dialysis treatments, a surely eventual fatal outcome. This man belonged to a deeply religious, Catholic family, where the widowed mother raised 8 children, who had all grown-up in the meantime. One sister received information that András Németh was preparing for kidney transplantation. The family contacted him; despite the uncertain prospects all the siblings offered immediately

to become donors. The choice fell for immunological reasons to his 21-year-old brother (*Fig. 4.*).



**Fig. 4.**

The first living donor in Hungary



**Fig. 5.**

The thoraco-abdominal incision 50 years after kidney donation

According to contemporary reports, on the day of the operation the surgical department grew silent, everybody waited strained for the outcome. The donor operation was performed by Prof. Petri via an abdomino-thoracic incision, which measured about 40 cm (*Fig. 5.*) The kidney was transplanted without perfusion in the neighbouring operating theatre, where András Németh sewed the arterial anastomosis twice for technical reasons. The pre-perfusion time



**Fig. 6.**

The Daily Worker article from January 1st 1963





**Fig. 7.**

The first Hungarian living donor,  
50 years after donation

became 66 minutes. The kidney started urine production after two hours; the joy was huge. Prof. Petri ordered a news-ban, but two weeks later the outcome already appeared in England (*Fig. 6.*).

The donor returned home after three weeks; more than 50 years later, he is completely healthy (*Fig. 7.*). There was no surgical complication in the recipient; however, rejection was unavoidable according to our present knowledge because of the insufficient immunosuppression, which included donor kidney irradiation and high dose steroids. In the meantime, a pack of azathioprine arrived from England, but because the drug was unregistered, the team did not dare to prescribe it. So the kidney function gradually decreased, dialysis was reintroduced and finally the patient expired after 79 days.

In Szeged another five kidney transplants were performed secretly in the coming decade, but all patients died in the postoperative period. Using his political influence Antal Babits, the omnipotent Urology Professor in Budapest forbade the procedure calling it a human experiment. In 1972 a law was promulgated in Hungary, the fifth in Europe, which regulated transplantation and donation according to the opting out principle. In 1973 in Miskolc, József Pintér attempted renal transplantation with no success. The media called this the first, until they recognized the Szeged operations. Finally, the first long-term successful kidney transplantation was performed by Ferenc Perner (*Fig. 8.*) in Budapest on November 16, 1973.

Characteristic of the time and the political situation, these first attempts were surrounded secrecy; only limited information was available behind the Iron Curtain. Prof. Perner writes:



**Fig. 8.**


Prof. Ferenc Perner, who in 1973  
performed the first long-term functioning  
renal transplantation in Hungary

*The first human kidney transplantation was done between a mother and her son in Paris in 1952. They didn't know the leukocyte groups (HLA), no immunosuppressive medicine was known back then, but René Küss had already developed the technique of transplantation. The kidney worked for 21 days. In 1954 in Boston a successful transplantation was done between identical twins. I was a student of the Medical University of Budapest between 1956-62. It was never mentioned in any subject that kidney transplantation exists, or that this is a therapeutic alternative to treat chronic renal failure. And it is also as sad that while our institution was planning to prepare for kidney transplantation (in 1971/72), we did not hear about it that in the University Hospital of Szeged, led by Gábor Petri, in 1962, András Németh, after a half-year long scholarship in Britain, carried out the first successful kidney transplantation from living donor between siblings."* It is also typical of the socialistic information exchange, that Prof. Perner learned from Robert Langer in the mid-2000's, that in 1965 in Moscow Boris Petrovskij, who worked for years in Hungary in the 1940s, had already performed a successful kidney transplantation.

In the 1<sup>st</sup> Department of Semmelweis University, an "on purpose" programme was prepared: including "sterile rooms" and a modernized intensive care unit. Via a state grant Ferenc Perner spent a year in Paris at The Hôpital Necker (Univ. René Descartes). He assisted in 47 transplantations, participated in many experimental operations and played an active role in organ procurements. At that time, the HLA lab was already initiated by Győző Petrányi, an immunologist. A house-made Collins solution was ready in use. At that time a waiting list of 36 registrants was begun including patients from all five dialysis units in Hungary. Since patients noted their own situation to be hopeless, almost all of them volunteered to be part of the project.

Curiously, the first deceased donor was a medical student, who was declared brain-dead after a slap in the face when he stole a bicycle as a joke following celebration of a successful exam. The recipient was a 35-year-old lady who underwent simultaneous ipsilateral nephrectomy and transplantation. The kidney immediately produced urine. The technique included a uretero-ureteral anastomosis, which became the standard procedure in the Budapest centre. The patient went home three weeks later; the transplanted kidney worked for 23 years, whereafter she recovered from two different cancers and lived for another 5 years on dialysis.

The Budapest centre continuously expanded; in 1994 transplantation became a distinct department in a separate building. Ferenc Perner was its first chairman. In Szeged kidney transplantation restarted in 1979 led by Ernő Csajbók, but András Németh never performed any further transplantations. Despite the fact that he was the first urologist, he could not be the head of the Depart-



ment of Urology at Szeged University, for political reasons. He stayed in the surgical department until retirement. In 1991 the third programme was started in Debrecen (László Asztalos); in 1993 the fourth programme was launched in Pécs (Károly Kalmár Nagy).

*Robert Langer M.D., Ph.D., FACS*  
Professor of Surgery and Nephrology  
Ordensklinikum, Krankenhaus der Elisabethinen, Linz, Austria

## References:

- Németh A, Petri G, Gál G, et al. Kidney homotransplantation in 2 brothers. [Vese-homotransplantatio két testvér között.] Orv Hetil. 1963; 104: 2017–2023. [Hungarian]
- Csajbók E: First steps of the national organ transplant program (In memoriam András Németh). [A hazai szervátültetések kezdeteiről – In memoriam Németh András]. Orvosképzés 2011; 86: 45–48. [Hungarian]
- Perner F, Megyaszai S, Járay J, et al. Successful kidney transplantation in Hungary. [Sikeres veseátültetés hazánkban.] Orv Hetil. 1974; 115: 2067–2068. [Hungarian]
- Perner F: The first successful kidney transplantation and the start of the organ transplant program. In: Langer R: History of the Surgical Department in the Baross Street. Budapest, Semmelweis Kiadó, 2011: 105–115.



# Germany



## 2017 European data

Inhabitants: 82.1 million
GDP per capita: \$50,425 (8 <sup>th</sup> )
Deceased donors pmp: 9.7 (28 <sup>th</sup> )
All organ transplantations pmp: 40.0 (23 <sup>rd</sup> )
All kidney transplantations pmp: 23.4 (28 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 16.6 (26 <sup>th</sup> )
Living donor kidney transplantations pmp: 6.8 (18 <sup>th</sup> -19 <sup>th</sup> )

The first kidney transplantation in the Federal Republic of Germany (Bundesrepublik Deutschland; BRD) and the whole of Germany was performed at the Klinikum Charlottenburg in Berlin. On November 27, 1963, the urologic surgeons Wilhelm Brosig (*Fig. 1.*) Director of the Clinic, and his associate and future successor, Reinhard Nagel (*Fig. 2.*), in cooperation with the vascular surgeon Emil Sebastian Bücherl, successfully transplanted a so-called “free kidney” to a uremic lady. The transplanted organ had to be removed due to a uretero-vaginal fistula in the donor, a 39-year-old patient. Unfortunately, after initial good function, the organ failed due to rejection; the patient died due to rupture of



**Fig. 1.**

Prof. Wilhelm Brosig (1913-2003)



**Fig. 2.**

Prof. Reinhold Nagel (1927-2009)

the transplanted kidney. But in the following years the results improved: already in 1964, a lady receiving a kidney allograft lived with a functioning organ for more than 25 years. Brosig became professor emeritus in 1983, Nagel in 1995.

The first kidney transplantation in the German Democratic Republic (Deutsche Demokratische Republik; DDR) was performed in Halle in 1966 by

the general and urologic surgeon Heinz Rockstroh (*Fig. 3.*). A 24-year-old son received his mother's kidney. As in West-Berlin previously, the course of this first transplantation was not successful due to rejection. The recipient died on postoperative day 14. The donor died when she was 91 years old. But the results improved; years later, Rockstroh finally performed the 100th kidney transplantation.

He suffered immensely from the loss of his wife due to an accident in 1975, and became even more unhappy after his three sons left the DDR to settle in the BRD. Despite his clinical pioneering work, he had difficulties to receive lasting recognition, most likely because – in the opinion of the Communist regime – he

did not support the political system in the DDR sufficiently. For obvious political reasons, he was removed from office and became emeritus in 1982. He left the DDR in 1985 and died in West Germany two years later.

The first successful kidney transplantation in East Germany was in Berlin-Friedrichshain performed by Moritz Mebel (*Fig. 4.*) on February 13,



**Fig. 3.**

Prof. Heinz Rockstroh (1920-1987)



**Fig. 4.**

Prof. Moritz Mebel (born in 1923)

1967. He was also the first to transplant a child, a 16-year-old girl in 1971. Mebel had fled with his family to the Soviet Union in 1932, finishing medical school in Moscow and returning to East Germany in 1958. He became a urology professor at Berlin-Charité and established a successful renal transplant programme. He also had high political positions in his country.

*Prof. emeritus Dr. med. Dr. h. c. Norbert Senninger, FACS, FRCS*  
Previous Head of The Department of General and Visceral Surgery  
University of Münster, Germany

## References:

- Wilhelm Brosig, Reinhard Nagel: Nierentransplantation. Walter de Gruyter & Co. Berlin 1965
- Moritz Mebel, Gottfried May, Peter Althaus: Der komplette Nierenersatz!? Aufbau und Entwicklung der Nierentransplantation in der DDR. Pabst Science Publishers Lengerich, Berlin, Bremen, Miami, Riga, Viernheim, Wien, Zagreb (2003)

# Ireland



## 2017 European data

Inhabitants: 4.8 million
GDP per capita: \$75,538 (2 <sup>nd</sup> )
Deceased donors pmp: 20.6 (14 <sup>th</sup> )
All organ transplantations pmp: 64.8 (14 <sup>th</sup> )
All kidney transplantations pmp: 40.0 (16 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 29.4 (15 <sup>th</sup> )
Living donor kidney transplantations pmp: 10.6 (11 <sup>th</sup> )

Until the late 1950's virtually all patients presenting with acute or chronic renal failure were destined for early death apart from the fortunate few in whom acute renal failure recovered spontaneously. To address this dismal situation, Dr. Willem Kolff working in occupied Holland, experimented with cellophane membranes to develop a primitive but effective dialysis machine. In 1958, Dr. Arthur Barry, an Obstetrician at the Charitable Infirmary in Dublin (Jervis Street Hospital) was appalled by the deaths of young women with severe renal failure caused by catastrophic peri-partum haemorrhage. He purchased a Kolff Dialyser for the Charitable Infirmary using his own money together with contributions from colleagues: Prof. William O'Dwyer (Renal Physician), Mr. Tony Walsh (Urologist), Prof. Gerry Doyle (Pathologist) and Dr. Joe Woodcock (Anaesthetist). The contributors attended a training course under the direction of Dr. Frank Parsons at the Leeds Infirmary in the United Kingdom. Thus was born the first Renal Unit in Ireland. For the first time, patients with otherwise fatal acute renal failure were successfully haemodialysed.

Although dialysis treatment was gradually extended to a few patients with chronic renal failure, the day when large-scale haemodialysis facilities would be widely available was far off. In light of this, significant decision was made to try to provide kidney transplantation for this otherwise hopeless group. Following the seminal work of Joseph Murray and others at the Peter Bent Brigham (now Brigham and Women's Hospital) in Boston, where an identical twin transplant was performed with excellent long term patient and graft survival, a small number of kidney transplantations had been performed at various centres around the world. It was clear from an early stage that the surgical challenges were



Prof Billy McGowan



Mr Peter McClean



Mr Tony Walshe



Mr Sean Hanson



Prof Gerry Doyle



Dr Michael Carmody



Prof William O'Dwyer




Prof Denis Gill

1. Prof. Bill MacGowan, together with Peter McLean, performed the first series of renal transplants in Ireland. 2. Although Mr. Peter McLean did not perform the very first kidney transplant in Ireland, he was responsible for the subsequent launch of the National Renal Transplantation programme. 3. Tony Walshe was the leader and guiding light of the team which formulated the National Transplantation programme for Ireland. The guidelines and structures that he proposed then continue to be relevant to this day. 4. Mr. Sean Hanson was Ireland's first wholly dedicated Transplant surgeon. 5. Prof. Gerry Doyle was the country's first Pathologist with special expertise in renal histology. In the area of transplantation, his knowledge of the pathology of renal rejection was a pivotal component of our transplantation efforts. 6. Dr. Michael Carmody (Renal physician) worked alongside Billy O'Dwyer and oversaw the continuing expansion of the fledgeling haemodialysis programme. He pioneered Home haemodialysis in Ireland, and was instrumental in the structured deployment of haemodialysis centres countrywide. 7. Prof. Billy O'Dwyer was effectively Ireland's first Renal physician. Trained as a general physician, he developed an early and abiding interest in renal medicine and oversaw the entire development of Ireland's Renal, Dialysis and Transplantation programmes. 8. Prof. Denis Gill supervised Ireland's first ever paediatric renal transplant.

not the greatest obstacles to progress, but rather the need for safe, effective strategies to deal with immunological rejection of transplanted foreign tissue.

The first kidney transplant in Ireland took place in December 1963 at St Vincent's Hospital, Dublin. The chosen recipient was a young man dying from terminal renal failure. The surgery was performed by Mr. Joe McMullin (General Surgeon) and Mr. Frank Duff (Urologist). Dr. Frank Muldowney was the supervising Renal Physician. The graft functioned well, allowing the patient to be discharged home where he survived for 60 days.

With expanded capacity and advanced dialysis expertise at the Charitable Infirmary, further efforts were directed towards renal transplantation. A team led by Mr. Tony Walsh, Peter McLean (Urologist), Prof. Billy O'Dwyer (Renal Phy-



sician) and Prof. WAL MacGowan was organized to launch the programme. Arrangements were made with a sister hospital (St. Laurence's, also known as the Richmond), which had substantial neurosurgical and vascular surgery departments. At the Richmond, Peter McLean (then the Urology registrar) practiced the technique of organ harvest and perfusion. An isolation room was provided to allow the postoperative patient to be nursed in sterile surroundings.

The first donor was a middle-aged male, a patient in the Richmond neurosurgical unit, who was terminally ill due a malignant brain tumour. The procurement surgeon was Peter McLean who established a vigil at the bedside of the dying man who died four days later. At the time, brain death criteria had not yet been universally formulated; ventilators were not used in such circumstances. On the morning of January 31, 1964 when the donor ceased breathing, he was rushed to the operating theatre where the kidney was removed as quickly as possible. A gynaecologist was asked to vacate the operating theatre on that morning to facilitate the donor nephrectomy (some things never change!). The kidney was packed in ice and transported to the nearby Jervis Street Hospital.

The transplant recipient was a 43-year-old man who had experienced chronic renal failure for two years. He was brought to the operating room after having been undergone haemodialysis. The vascular anastomoses were performed by Prof. WAL McGowan end-to-side to the internal iliac artery and to the external iliac vein. The uretero-vesical implantation was performed by Mr. Tony Walsh. To everybody's great relief and delight, the kidney successfully perfused with blood and urine output began immediately. Sadly, the jubilation was short lived as the recipient died suddenly the following morning. Over the ensuing months, three further transplant operations took place with only short term success. One of these was given to a then prominent actress at the National Abbey Theatre which continued to function for a period of 9 months.

Because of these decidedly poor early outcomes, the programme was suspended to allow Peter McLean to travel for training to the Mayo Clinic. He returned in 1968 and the programme was relaunched in earnest. Five years later, Ireland's first full-time transplant surgeon, Mr. Sean Hanson was appointed which provided great impetus to the programme. In 1972 we commenced the living donor transplant programme.

Over the 54 years since the start of the kidney transplant programme in Dublin, we have performed more than 5100 procedures. Graft and patient survivals reflected steady improvements in surgical technique, patient selection, immunosuppressive agents, histocompatibility matching and infection control over the intervening years. The results equalled or exceeded those of the best centres in the world. In 2018, patients can expect greater than 97% 1-year graft success and a median graft survival of more than 20 years.

Who can tell how renal transplantation will evolve over the next 50 years?  
If the progress achieved over the past half century can be maintained, a bright  
future beckons!

*Prof. Peter J Conlon FRCPI*

*Prof. John Donohoe FRCPI*

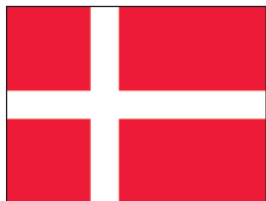
*Prof. WAL MacGowan FRCSI*

Department of Nephrology and Transplantation, Beaumont Hospital,  
Dublin, Ireland

## Reference

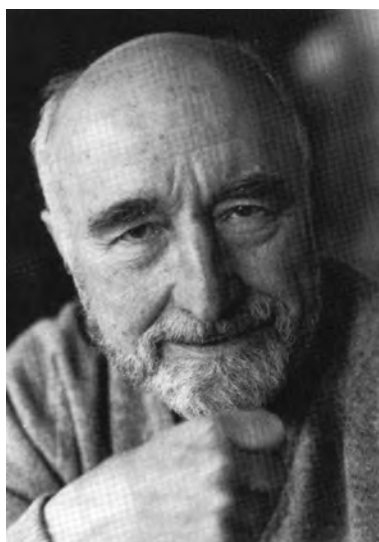
- Peter A McLean "Kidney Transplantation at the Charitable Infirmary" In: O'Brien E: The Charitable Infirmary Jervis Street 1718-1987. A Farewell Tribute. Anniversary Press, Dublin 1987. pp: 183-188.

# Denmark



## 2017 European data

Inhabitants: 5.7 million
GDP per capita: \$49,883 (9 <sup>th</sup> )
Deceased donors pmp: 18.1 (18 <sup>th</sup> )
All organ transplantations pmp: 65.3 (15 <sup>th</sup> )
All kidney transplantations pmp: 45.1 (11 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 28.9 (16 <sup>th</sup> )
Living donor kidney transplantations pmp: 16.1 (4 <sup>th</sup> )



**Fig. 1.**

Ole Fjeldborg (1923-2009). Danish surgeon who performed the first clinical organ transplantation in Denmark

The first clinical organ transplantation in Denmark was performed by Ole Fjeldborg (*Fig. 1.*) and his team at Aarhus Kommunehospital in Aarhus on April 18, 1964. The operation lasted from 20.10 to 24.00. The artery anastomosis was opened at 22.30. The recipient was a 32-year-old woman suffering terminal renal failure. She had been in uremic coma with severe cramps and neurological manifestations. She had been stabilized by a short term of peritoneal dialysis. The donor was a 19-year-old man, who had been in a serious traffic accident. He was admitted to the Department of Neurosurgery with severe damage to the skull and the brain. He died in the operation theatre, where severe delaceration of the brain was found after loose fragments of skull had been removed. Autopsy revealed severe brain oedema and incarceration.

Postoperative the recipient had neurological symptoms and cramps requiring small doses of barbiturates. The immunosuppression was azathioprine and prednisolone. There was some graft function initially and the neurological state improved by the second postoperative day. One week later the





**Fig. 2.**


The 4 pioneers of renal transplantation in Denmark. From left to right: Villy Posborg, Flemming Kissmeyer-Nielsen, Steen Olsen and Ole Fjeldborg

function declined; the patient experienced fever and graft tenderness. Steroid and azathioprine therapy was intensified since the most likely diagnosis was an acute rejection episode, but antibiotics were also administered. The patient's condition stabilized for a few days, but she then developed severe leukopenia and bilateral pneumonia. Despite intensified antibiotic treatment she died 16 days after transplantation.

On May 7, 1964, three days after the first patient died, Ole Fjeldborg and his team performed a second renal transplantation. The recipient was a woman in her thirties with terminal renal failure due to phenacetin. This transplanted kidney functioned for 11 years and 9 months.

Ole Fjeldborg was a real pioneer in transplantation. He had been practiced on dogs in the cellar of the hospital, studied the literature, especially articles in "Scientific American" and taken his team to England to learn the surgical and medical aspects. Through all his years as Chief Physician at Aarhus Kommune-hospital until his retirement in 1991, he was dedicated to improve the results of renal transplantation and to increase organ donation.

The pioneering team at Aarhus also consisted of the nephrologist Villy Posborg, the pathologist Steen Olsen and the immunologist Flemming Kissmeyer-Nielsen. The team had learned about renal transplantation at interna-



tional meetings. The second hospital to perform transplantation in Denmark was Rigshospitalet in Copenhagen in 1968.

The legal aspects of the treatment were quite unclear, leading to public debate. For a short period only living donation transplantations were performed until the law was passed in 1967, whereafter deceased donor transplantation was realized again.

Flemming Kissmeyer-Nielsen was among the pioneers, who formed Scandiatransplant in 1969. His laboratory became the centre of this cooperative. Today the office of Scandiatransplant is still located in Aarhus University Hospital.

*Kaj Anker Jørgensen M.D., D.MSc.*  
Medical Director, Scandiatransplant  
Århus, Denmark

## Reference:

- Bundgaard E: Danske Nyretransplantationer – om pionerer og idealister. Published by the Danish Society of Nephrology January 1979. ISBN 87-987318-0-7



## 2017 European data

Inhabitants: 5.5 million
GDP per capita: \$44,332 (12 <sup>th</sup> )
Deceased donors pmp: 21.5 (13 <sup>th</sup> )
All organ transplantations pmp: 63.8 (16 <sup>th</sup> )
All kidney transplantations pmp: 43.6 (13 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 38.4 (8 <sup>th</sup> )
Living donor kidney transplantations pmp: 5.3 (22 <sup>nd</sup> -23 <sup>rd</sup> )



**Fig. 1.**

Börje Kuhlback (1924-2012) pioneer nephrologist in Finland

The progress of transplantation had been followed with interest in Finland in the early 1960's. The question of kidney transplantation arose when chronic dialysis treatment was started in Finland in the spring of 1964. Because of the growing number of chronic dialysis patients and encouraged by our Scandinavian neighbours who had already performed their first kidney transplantations, Börje Kuhlback, a pioneer of nephrology in Finland (*Fig. 1.*), visited Stockholm, Sweden to observe kidney transplant patients. These events led to the first kidney transplantation in Helsinki on December 18, 1964. The transplant team was led by vascular surgeon Björn Lindström who performed the operation (*Fig. 2.*). The first patient was a 31-year-old fire-

fighter with chronic glomerulonephritis; the donor was his 52-year-old mother. There was blood group compatibility but no tissue typing. The immunosuppression consisted of azathioprine and steroids. The kidney functioned immediately and continued for a few days before he experienced rejection and died about two weeks thereafter. At autopsy, the kidney showed rejection and septic myocarditis spreading from the external shunt was probable the cause of death. The second kidney transplantation in Helsinki was performed, April 26, 1965.



**Fig. 2.**

Vascular surgeon Björn Lindström (1917-2002) leader of the transplant team performing the first kidney transplantation in Finland

The recipient was a 25-year-old woman and the donor her brother. The second patient also died shortly after the operation.

However, the third patient, a 22-year-old man with chronic glomerulonephritis who received a kidney from his 52-year-old father in 1966, was a success. He underwent a second cadaveric kidney transplantation in 1975, succumbing with a functioning graft 21 years after the first transplantation. The longest surviving kidney in Helsinki is one transplanted in 1967, which is still functioning in 2018.

As in the rest of the world, kidney transplantation in Finland has been a success story, with almost 7500 procedures performed to date, thanks to the pioneering work of Björn Lindström and Börje Kuhlback.

*Marko Lempinen, M.D., Ph.D.*

*Björn Eklund, M.D., Ph.D.*

Transplantation and Liver Surgery, Abdominal Centre, University of Helsinki, Finland

# Sweden



## 2017 European data

Inhabitants: 9.9 million
GDP per capita: \$51,474 (7 <sup>th</sup> )
Deceased donors pmp: 19.4 (17 <sup>th</sup> )
All organ transplantations pmp: 79.1 (7 <sup>th</sup> )
All kidney transplantations pmp: 47.9 (10 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 35.3 (13 <sup>th</sup> )
Living donor kidney transplantations pmp: 12.6 (8 <sup>th</sup> )

In Sweden, the first kidney transplantation was performed on April 6, 1964 at the Serafimer Hospital in Stockholm (Fig. 1. and Fig. 2.). The recipient was a 17-year-old man with end-stage renal failure due to renal aplasia/hypoplasia; the donor was his 50-year-old father (Fig. 3.). The immunosuppressive therapy consisted of azathioprine and prednisolone. Pre-operatively, 5.1 liters of lymph was drained through a thoracic duct catheter. Post-transplant, renal function improved rapidly and the kidney graft functioned well for approximately 3 years. Later the same year (July 1964), the first Swedish kidney transplant from a deceased donor was performed at the Serafimer Hospital as well.

Dr. Curt Franksson (M.D., Ph.D., RNO), (Fig. 4.) Professor of Surgery at the Karolinska Institute and Head of the Department of Surgery at the Serafimer Hospital, lead the team that performed these first Swedish kidney transplanta-



**Fig. 1.**

The plaque honoring the opening of the Serafimer Hospital in 1752, Sweden's first hospital. The Serafimer Hospital closed in 1980 with many of its clinical activities transferred to the recently opened Huddinge Hospital



**Fig. 2.**

Plaque at the Serafimer Hospital in Stockholm, the first hospital in Sweden (1752-1970), in memory of the first Swedish kidney transplantation in 1964



**Fig. 3.**

This picture shows the recipient of the first Swedish kidney transplant together with his father, the first Swedish living kidney donor and his mother. Even today, the memorial fund established in their honour grants yearly award for research related to living donor kidney transplantation



**Fig. 4.**

Professor Curt Franksson (1916-2007)





**Fig. 5.**

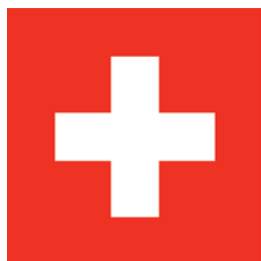
The Serafimer Hospital football team in the 1960's  
(Carl-Gustaf Groth second from left in bottom row)

tions. Other members of this pioneering team were Sven Bellman (vascular surgery and vascular anastomosis); Sten Wallensten (donor nephrectomy); Bertil Löfström (anesthesiology); Gösta Magnusson (nephrology); Härje Bucht, Jonas Bergström and Bertil Wehle (nephrology and dialysis at St. Erik Hospital); Göran Möller (transplantation immunology) and Göran Lundgren (surgery). Another participant was Carl-Gustaf Groth, who was later appointed Professor of Transplantation Surgery at the Karolinska Institute. (*Fig. 5.*) This first Swedish kidney transplant procedure was filmed but, unfortunately, the unique recording has been lost.

*Lars Wennberg, M.D., Ph.D.*  
Royal Court Physician  
Associate Professor, Director, Renal  
and Pancreas Transplantation  
Department of Transplantation Sur-  
gery, Karolinska University Hospital  
Stockholm, Sweden

*Göran Lundgren, M.D., Ph.D.*  
Associate Professor  
Former Head of the Department of  
Transplantation Surgery at Huddinge  
Hospital  
Stockholm, Sweden

# Switzerland



## 2017 European data

Inhabitants: 8.5 million
GDP per capita: \$61,421 (4 <sup>th</sup> )
Deceased donors pmp: 17.1 (19 <sup>th</sup> )
All organ transplantations pmp: 67.9 (12 <sup>th</sup> )
All kidney transplantations pmp: 42.4 (14 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 27.3 (17 <sup>th</sup> )
Living donor kidney transplantations pmp: 15.1 (5 <sup>th</sup> -6 <sup>th</sup> )

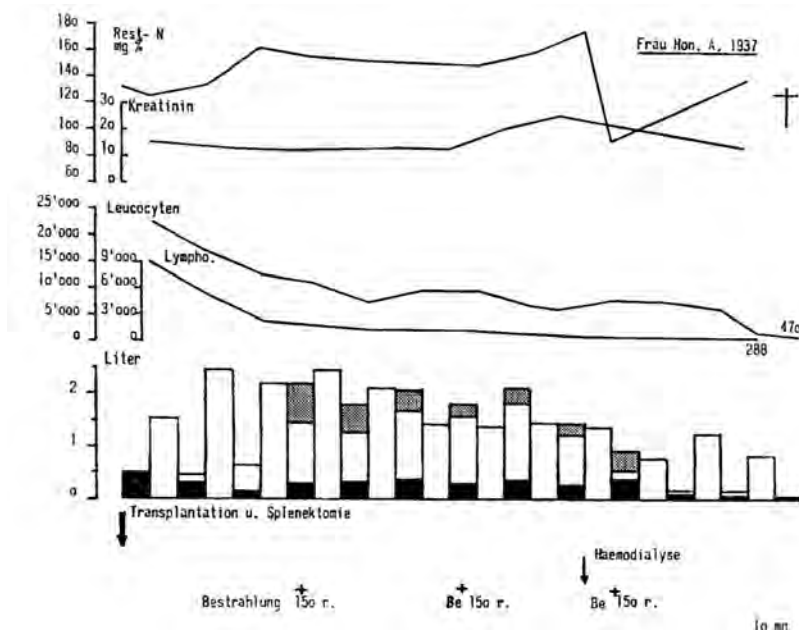
Pioneer activities in solid organ transplantation were ongoing in several hospitals in Switzerland in the mid 1960's. The first documented kidney transplantation was performed on March 11, 1964 in Bern. The recipient was a 27-year-old woman with dialysis-dependent chronic glomerulonephritis who had been treated for 4 months with dialysis. Since there was no living donor available, the team decided to perform a cadaveric donor transplantation using an organ from a young woman with intracranial bleeding. The transplantation was performed to the iliac fossa according to the technique of Küss with concomitant splenectomy. Anastomoses were performed by the vascular surgeon Dr. Albert Senn (*Fig. 1.*): end-to-end to the internal iliac artery and end-to-side to the external iliac vein. The kidney was perfused with an isotonic electrolyte solution containing heparin. The total cold ischaemia time was 70 minutes. In addition to the splenectomy, immunosuppression was induced with thymic irradiation, followed by a combination of azathioprine and azaserine. The nephrologist in charge was Dr. André Montandon. The diuresis which was quickly established peaked at 4 liters daily over the first postoperative week (*Fig. 2.*). Thereafter, the patient developed gram negative sepsis and required return to dialysis on the 9<sup>th</sup> postoperative day. Despite rescue therapy with prednisone, actinomycin C and methotrexate due to suspected rejection the allograft was lost. The patient died two days later due to multiorgan failure with pancytopenia. An autopsy showed no signs of rejection in the transplanted kidney.

A second, similar case followed soon thereafter on June 27, 1964. A 25-year-old woman affected with chronic glomerulonephritis was treated for about 4 months with peritoneal and haemodialysis before transplantation. The ABO





**Fig. 1.**  
Prof. Albert Senn



**Fig. 2.**  
Clinical course of the 27-year-old first transplant patient

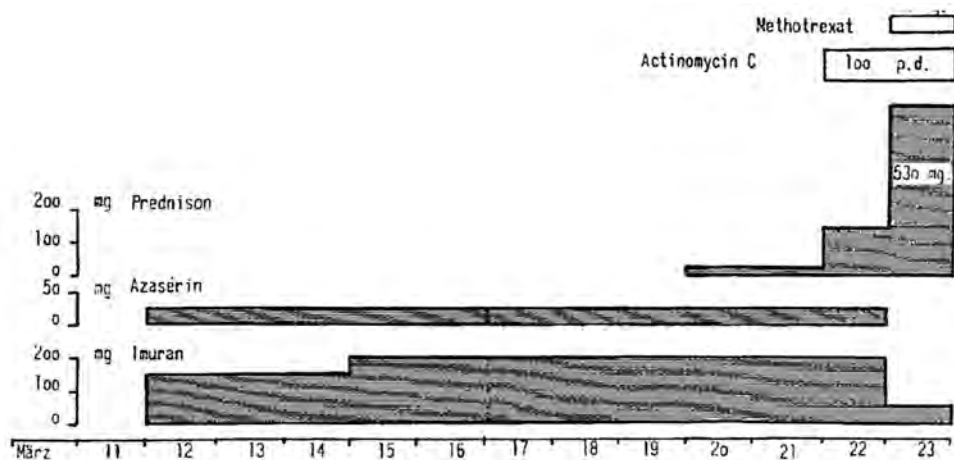


Abbildung 2

Klinischer und biologischer Verlauf nach Transplantation einer Kadaverniere bei einer 27jährigen Patientin mit chronischer Glomerulonephritis. Senkrechte schwarze Kolonnen = tägliche Diurese; weisse und punktierte Kolonnen = weitere Flüssigkeitsverluste durch Abdominaldrain und Erbrechen. Exitus am 13. Tag an einer Kolisepsis

Fig. 3.

Clinical course of the 25-year-old second patient

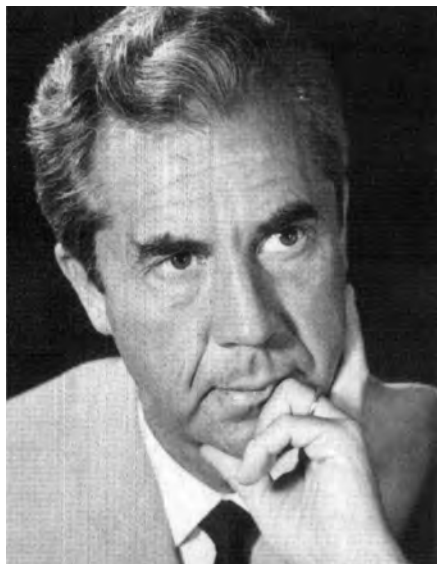


Fig. 4.

Prof. Åke Senning (1915-2000)

incompatible donor was a victim of a motor-vehicle accident with an irreversible cranial injury. At that time there was no unanimous opinion whether ABO compatibility was necessary for solid organ transplantations. The cold ischaemia time was 53 minutes, the same surgical technique and immunosuppression were employed as in the first case. After an initial 48-hour period of 4½ liter diuresis, the kidney suddenly ceased to function on postoperative day 3. The patient succumbed due to a cerebral lesion a week after the transplantation (Fig. 3.). The histology showed a huge infarct in the cranial pole of the transplanted kidney with multiple thrombi in the arteries

and veins. These signs of early rejection were most likely related to the blood group incompatibility.

On December 17, 1964 the second Swiss kidney transplant programme headed by Prof. Åke Senning (*Fig. 4.*) was launched at the Zurich University Hospital using a living donor. Unfortunately, the patient died five weeks later because of a bleeding in the stomach.

*Dr. Daniel Sidler*

Institute for History of Medicine, University Bern, Switzerland

## References:

- Montandon A: Immunologische Probleme bei der Nierentransplantation. *Ther Umsch.* 1965; 22: 9-15.
- Felix Largiadèr: Transplantation von Organen. EMH Verlag 2010.
- Candinas D, Schlumpf R, Röthlin MA, Binswanger U, Largiadèr F: Thirty-two years of renal transplantation in Zurich. *Clin Transpl.* 1996:241-7.



## 2017 European data

Inhabitants: 144 million
GDP per capita: \$27,834 (27 <sup>th</sup> )
Deceased donors pmp: 4.0 (34 <sup>th</sup> )
All organ transplantations pmp: 13.1 (32 <sup>nd</sup> )
All kidney transplantations pmp: 8.2 (32 <sup>nd</sup> )
Deceased donor kidney transplantations pmp: 1.1 (35 <sup>th</sup> )
Living donor kidney transplantations pmp: 1.4 (36 <sup>th</sup> )

According to the official version, the first successful kidney transplantation in the country was performed on April 15, 1965 by B. V. Petrovsky and his colleagues: V. S. Krylov, V. I. Shumakov, I. Yarmolinsky, V. V. Vorozhyshev.

Nevertheless, it must be said that the first kidney transplantation in this country was performed three decades earlier, which was the first-in-human attempt to transplant a kidney. Time makes history; time changes things. In the 20<sup>th</sup> century, Russia was a part of the Soviet Union, which also included 14 republics, many of which are now independent. In 1933, in the city of Khereson, which is now part of sovereign Ukraine, the Soviet surgeon Yuriy Voronoy attempted to save the life of a desperate patient; a 26-year-old woman admitted to the city hospital with symptoms of poisoning in a semi-conscious condition. It turned out that she had taken hydrargyrum chloride as a suicidal gesture. Meanwhile, a 60-year-old man with a fatal skull trauma expired in the admissions department of the same hospital. As a temporary measure for the period of the oliguric-anuric phase of acute renal failure, chief surgeon Voronoy decided to use the kidney of the deceased man to save the young woman.

He refused to take an organ from a living donor, believing that "it is impossible to apply a known disability to a healthy person, cutting out the organ needed for a transplant for the problematic rescue of the patient." Later, he reported in the article published in the Italian journal "Vinerva Chirurgis" in 1934, that the kidney was joined in the circulation and began to function. However, the patient died two days later. Nevertheless, this operation is considered to be the first in the world to attempt kidney transplantation.



**Fig 1.**  
Boris Petrovsky (1908-2004)

Academician Boris Petrovsky (*Fig. 1.*) was born on June 14, 1908 in a family of doctors. In 1963 he established and became the director of the Scientific Centre of Surgery for 25 years. This was a prominent Soviet clinic. From September 1965 to December 1980 (16 years), he was the Minister of Health of the country.

Petrovsky and his colleagues performed the first successful living donor kidney transplantation in the Soviet Union. Mother donated to a son who was suffering from an end stage chronic renal failure on April 15, 1965 (*Fig. 2.*). In 1966, they performed the first-in-the-country deceased donor kidney transplantation. Soon afterwards kidney transplantation became a routine clinical practice. In 2011, a postage stamp dedicated to Petrovsky was issued in Russia (*Fig. 3.*). The street of Boris Petrovsky appeared in Moscow in February 2017.

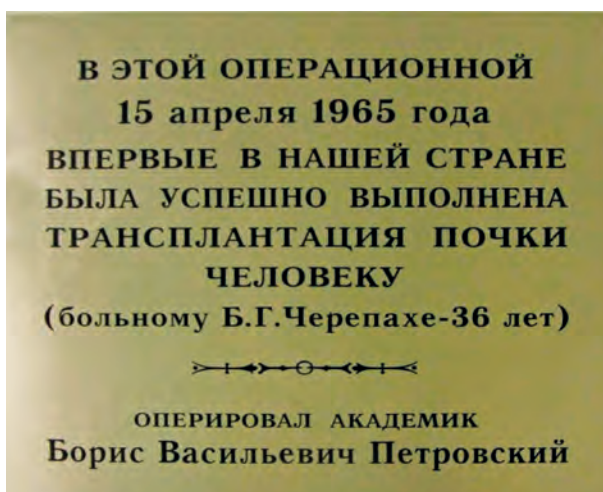
The book “Man, Medicine, Life”, was written in memoir style by Academician Boris Petrovsky (*Fig. 4.*). The author was not just a bystander, but an active participant in historical events: outstanding surgeon, teacher, organizer and creator of the first multi-disciplinary surgical institution in Russia.

One of the chapters is devoted to the first kidney transplantation: “A mother brought a 17-year-old son for a consultation. Leaving the boy in the waiting room, she stood in front of the table, pale and excited: I ask you, Professor, to take my kid-

ney and give it to my son. It turned out that the young man has been suffering from glomerulonephritis for more than two years and was on dialysis. After studying the medical history and laboratory results, I did not have any doubt about the seriousness of his condition: the pathological process irreversibly progresses, the kidneys lose their function, the prognosis is poor" – wrote Petrovsky. He honestly told this suffering from anxiety, sorrow, and

pain telling the woman that he had never performed a kidney transplantation, and that the operation is dangerous. *"I did not conceal that the operation, even if successful, will give only a temporary extension of life, before kidney rejection. The mother insisted: If he lives at least another month, I will be happy. What could I say to her? Of course, by that time we were almost ready to perform a transplantation. We have performed it in animal experiments many times, and thoroughly studied the international experience."*

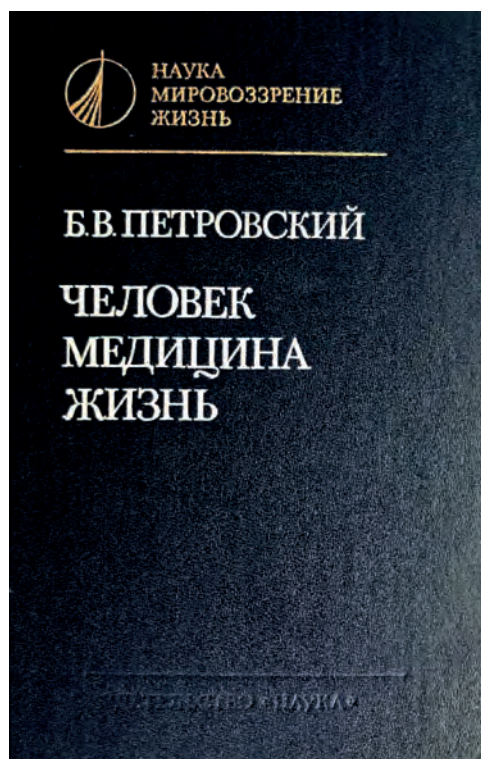
In 1964 Boris Petrovsky visited The Centre for Kidney Transplantation in Paris. Shortly thereafter one of the French transplantologists, D. Over, came to Moscow to share their experience. *"Colleagues were surprised by the precautions we made to start the kidney transplantation program. At that time again and again, I asked myself the tough question: Do I have the moral right to perform such a dangerous operation? I made this decision only after I was sure about success. The most crucial stage of the operation was kidney removal from the donor in the first operating room. We used open nephrectomy technique. The organ was carefully separated along with the necessary length of artery, vein and ureter. The kidney was washed, perfused with cold saline, and placed in a tray with crushed ice. At the same time in the second operating room the assistant, doctor Krylov, made a right-sided incision in the lower segment of the recipient's abdomen, isolating the iliac vessels and the anterior surface of the bladder to provide a place for the transplant. Now, I go to the second operating room, carefully carrying the cooled donor kidney in my hands... fit it onto a new bed and connect the renal artery with the end-to-end anastomosis and an end-to-side vascular suture for the external iliac vein. The kidney is stitched*



**Fig. 2.**

Plaque remembering the first successful renal transplantation in the Soviet Union





**Fig. 3.**

The book by B. Petrovsky "Man, Medicine, Life"  
(issued in 1985)

ney transplantations were provided by close relatives, mostly (almost always) by the mothers. In 1986, the first kidney transplantation was performed in the country, where the donor and recipient were homozygous twins – women, of 35 years old. By 1986, there were already 20 transplant centres in the USSR. In 1976, the Institute of Transplantation and Artificial Organs was organized.

Next years kidney transplantation rapidly developed in the country. However, transplant rejection remained an unresolved problem. Available immunosuppressants – azathioprine and

into the circulation of its new host. And finally, a miracle happens in front of our very eyes: a cold, lifeless kidney warms, its vessels begin to pulsate, and pure, clear urine follows by drops from the ureter. The whole scene was observed through a glass window on the ceiling by multiple attendees of the XXVII-th Congress of Surgeons who applauded the event. After making sure that the kidney functioned well, we connected the ureter to the bladder and closed the wound. The operation was finished, the patient taken from the operating room. We concluded that this was the first scientifically grounded kidney transplantation operation in the country. A new chapter of Soviet clinical transplantology and immunology opened." – wrote Petrovsky.


At first, 90% of organs came from deceased donors. The kidneys were taken within 40 minutes after cardiac arrest. Nearly 10% of the kid-



**Fig. 4.**

Postage stamp "Boris Petrovsky" issued in 2011





prednisolone – provided survival for only 2-3 years. Transplant loss due to rejection dictated the need for second, third and fourth transplantations.

*Prof. Dr. Sergey Gautier*

Director of National Research Centre of Transplantology and Artificial  
Organs, Moscow, Russia

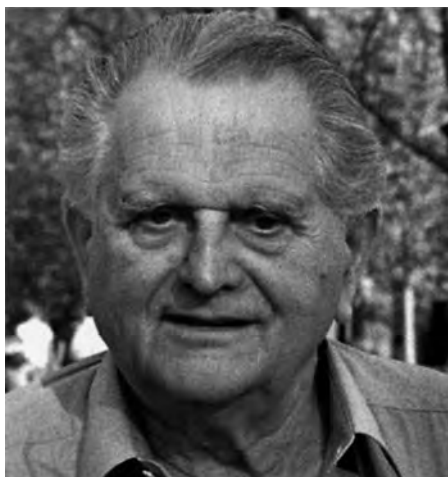
*Prof. Dr. Alex Shevchenko*

Head of Critical Heart Failure Department



## 2017 European data

Inhabitants: 8.7 million
GDP per capita: \$49,868 (10 <sup>th</sup> )
Deceased donors pmp: 24.5 (9 <sup>th</sup> )
All organ transplantations pmp: 87.5 (4 <sup>th</sup> )
All kidney transplantations pmp: 49.2 (8 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 41.3 (5 <sup>th</sup> )
Living donor kidney transplantations pmp: 7.9 (15 <sup>th</sup> )




**Fig. 1.**

Univ.-Prof. Dr. Franz Piza (1925-2016)

Prior to the first Austrian human transplantation, a series of large animal operations were performed in dogs and pigs by Franz Piza (*Fig. 1.*) and Peter Brücke. The first kidney transplantation at The Vienna General Hospital (AKH), Department of Surgery was performed on June 17, 1965. A 21-years-old male patient who was on chronic dialysis for 2 months due to chronic glomerulonephritis received a kidney from an 18-year-old female, who suffered from a malignant untreatable intracranial tumour. Following cardiac arrest, she was successfully resuscitated but was unconscious with wide mydriasis, pupils

unresponsive to light and no peripheral reflexes but with spontaneous breathing. After two days in the ICU, she stopped breathing, which was interpreted as the progression of brain death. She was then intubated and declared dead. Preoperative aortography was performed to demonstrate the vascular anatomy. Under controlled circulation the left kidney was removed via a transperitoneal approach, followed by ex vivo flush and cooling, with a dextran-electrolyte-buffered solution. Today this would be considered a DBD (Donor after Brain Death); however, the diagnosis of brain death did not quite meet present



day standards. The doctors involved in the brain death diagnosis were neurosurgeons, anaesthetists, surgeons and nephrologists. The removal of an organ from a dead body was legal already at that time, because it was considered to be an autopsy, regulated by a more than two hundred years of legislation.

The recipient operation was started simultaneously with the donor operation in order to minimize cold ischemia time. In the right iliac fossa, the vein was connected end-to-side to the external iliac vein and the renal artery end-to-end to the internal iliac artery. The anastomosis time was 25 minutes, and the total cold ischemia time was 50 minutes counted from ex vivo perfusion to recirculation in the recipient. Kidney reperfusion was excellent. The ureter showed venous bleeding; by a team of urologists it was connected to the bladder using a Boari flap. A second oblique incision was made to remove the spleen and both shrunken kidneys. The laparotomy was closed with a drain in the splenic fossa. Thereafter the transplanted kidney was again exposed and decapsulated to prevent a compartment syndrome. The iliac fossa was closed without a drain after careful haemostasis. The patient recovered from the operation and was extubated on day 3, experiencing bowel movements on that day with evidence of normal wound healing.

The transplantation was AB0 identical, but due to lack of knowledge there was no cross match or antigen typing done. The immunosuppressive regimen consisted of steroids and azathioprine. Unfortunately, the kidney never functioned, the patient required dialysis from day 4 onwards. He experienced episodes of hypertension above 200 mmHg that were refractory to treatment. His general condition deteriorated. He developed pneumonia and succumbed on day 10 after transplantation. Autopsy confirmed the pneumonia. The kidney was not perfused, for the arterial anastomosis showed a dissection with consecutive thrombosis of the whole organ. Although this first kidney transplantation was unsuccessful, it was the beginning of a subsequently successful effort to become one of the largest programs in Western Europe.


The second kidney transplantation in Vienna was performed almost one year later on May 19, 1966. The 31-year-old recipient was diagnosed with chronic glomerulonephritis and had undergone 6 months of dialysis. The donor was a 16-year-old man who was postoperative from a neurosurgical operation for a brain tumour. Brain death was awaited and diagnosed similar to case 1. The operative procedure was the same as outlined previously; however, there was no additional laparotomy due to low blood pressure. The kidney displayed immediate function, freeing the patient from dialysis. On day 2, a decrease in urine volume demanded a second look operation which revealed a purple kidney. The organ was again decapsulated; an open biopsy revealed cellular rejection. High doses of steroids were administered and the kidney continued to

function. On day 8, urine volume fell again. During another operation a leak in the urinary bladder was closed with a single suture. The patient was discharged home after several weeks, requiring no further dialysis. Six months later the patient died after suffering a pulmonary embolism.

A few weeks later on June 7, 1966, the next transplantation was performed: the recipient, 26-year old experienced chronic glomerulonephritis as the cause for kidney failure. The donor was a 24-year-old male victim of cerebral trauma. The two donor renal arteries were connected end-to-side to the common iliac artery using an aortic patch. The urologist performed a Leadbetter-Politano ureteral implantation. Again, splenectomy and nephrectomy were performed on the recipient. During this operation, surgical bleeding occurred, with immediate cessations of urine output that gradually improved during the operation. Although the kidney function was good, the patient developed pancreatitis, a likely rejection episode was treated with high dose methylprednisolone and a duodenal ulcer perforated, requiring relaparotomy. Ten weeks after transplantation, another operation was necessary because of prolonged septic temperatures and upper GI pain. During this operation a Billroth II gastric resection was performed to avoid further ulcer development. The patient did not recover from the sepsis and died 100 days after the transplantation due to fungal peritonitis.

On June 16, 1966 a 28-year-old female underwent renal transplantation after one month of dialysis. The donor was a cerebral trauma victim. The surgical techniques of vascular anastomosis and Leadbetter-Politano ureter implantation were similar to the previous case. There were no additional surgical procedures. The patient experienced three rejection episodes none of which were proven by biopsy. Otherwise there were no complications. This patient had a remarkable course: she underwent bilateral hip replacements 25 years after the transplantation. The first kidney functioned until 1989, when she received a second kidney preemptively. She furthermore survived a myocardial infarction in 1992. The first kidney was removed in 1993 because of recurrent urinary tract infections. In 2007 she underwent deep anterior resection for rectal cancer and she died in September 2009 from metastatic rectal disease. In summary, she lived with functional transplanted kidney grafts for 43 years only on azathioprine and steroid therapy for long term immunosuppression.

On December 2, 1966, the fifth kidney transplantation was performed on a 44-year-old recipient who suffered polycystic kidney disease and was on peritoneal dialysis. The donor was a 5-year-old boy with a brain stem tumour. For the first time an electroencephalography (EEG) was used to document brain death by a flat line in addition to the clinical symptoms. Because of the donor's young age the en-bloc transplantation utilized stents in each ureter and a urinary catheter. A bladder fistula that developed, thereafter was treated conservatively.



atively. However, the patient developed sepsis due to various bacteria. Seven weeks after transplantation, a laparotomy was performed to evacuate cloudy liquid. Despite these infections a splenectomy was performed apparently due to anxiety about allograft rejection. A little more than a week later, the patient died from generalized sepsis.

These first 5 cases were described in detail herein in order to understand the trial and error approaches during the pioneer phase of kidney transplantation. Despite all the successes and drawbacks at the initiation of kidney transplantation, a systematic approach was required to develop a robust programme in the Vienna General Hospital. The driving force was Prof. Dr. Franz Piza, who simultaneously initiated vascular surgery in The Department of Surgery. His friend and collaborator, the urologist Georg Gasser unfortunately left the institution quite early, a major loss which subsequently excluded urology from the kidney transplant program. Walfried Fritzer, the nephrologist at this time was personally involved in organ preservation and patient follow up. All chairmen of the respective departments supported the transplant programme. Karl Steinbereitner and Rudolf Kucher were the anaesthetists responsible for donor management and postoperative care in the intensive care unit (ICU). They acted as a “brain death centre” yielding 20 to 30 potential donors per year until 1984 when the system was decentralized by each admitting hospital becoming temporarily a donor unit with support from the central ICU. In addition, at that time basically all anaesthetists in our region spent most of their training at this ICU, where they were exposed to and “contaminated” with the idea of organ donation.

From this series of kidney transplantation onwards, organs were removed from brain dead donors, who were diagnosed using the best available standards, with clinical evidence of brain stem death producing apnoea as the final proof. From the fifth transplantation onward, electroencephalogram (EEG) investigations were performed to complement the clinical diagnosis but by independent neurologists who made the brain death diagnosis. Since 1970, two neurologists were available 24/7 for brain death diagnosis; one for clinical diagnosis, the second for EEG. This system was expanded in 1984 to include also outside hospitals in the context of decentralized donor procurement. Organ removal from brain dead donors was considered to be an autopsy being legal since 200 years. In 1982 the presumed consent regulation was passed unanimously by parliament and subsequently confirmed in 2012, with no dissent.

Until kidney transplantation case 18, all transplantations included ABO identical subjects, but no cross-match or tissue typing. All of the following transplantations underwent tissue typing and excluded positive cross-matches. Our centre joined Eurotransplant in 1971, which resulted in increased organ exchange and fruitful learning on all levels of organ transplantation.

In 1973, eight years after the first transplantation, Franz Piza and colleagues published a series of 88 cases in 85 patients. The complication and mortality rates, initially 75% and 50% decreased to 44% and 14% respectively. Advantages of HLA matching were not substantiated by the statistics. Upper GI bleeding episodes were abolished by routine truncal vagotomy and pyloroplasty. A new era started with the availability of cyclosporine in 1982, yielding an 80% graft survival. Decentralized procurement was introduced with a rapid increase in donor availability. Currently, this centre performs 150 renal transplant procedures annually, including 15% from living donors.

*Ferdinand Mühlbacher M.D.*

Emeritus Professor

Department of Surgery, Division of Transplantation, Medical University  
Vienna

## References:

- Fritzer W: Internistische Probleme der Nierentransplantation. [Experience with homologous kidney transplantation in man. I. Internal medicine problems]. Wien Med Wochenschr. 1968; 118: 187-91. [German]
- Piza F: Chirurgische Probleme der Nierentransplantation. [Experience with homologous kidney transplantation in man. IV. Surgical problems]. Wien Med Wochenschr. 1968; 118: 195-7. [German].
- Fritzer W, Lücking C, Gerstenbrand F: The clinical picture of brain death after serious brain injuries: Electroencephlogr Clin Neurophysiol 1971; 30: 272.
- Gerstenbrand F, Lackner F, Lücking C: Neurologic checklist for monitoring acute traumatic brain injuries. Z Prakt Anaest 1971; 6: 437- 447.
- Piza F, Böhmig HJ, Brücke P, Wagner O: Chirurgische Erfahrung mit der Nierentransplantation. [Surgical experience with renal transplantation]. Wiener Med Wochenschrift 1973; 123: 127-134. [German]
- Hansjörg Böhmig, and Peter Brücke personal communications



## 2017 European data

Inhabitants: 38,2 million
GDP per capita: \$29 521 (25 <sup>th</sup> )
Deceased donors pmp: 14,7 (24 <sup>th</sup> )
All organ transplantations pmp: 42,2 (22 <sup>nd</sup> )
All kidney transplantations pmp: 28,6 (21 <sup>st</sup> )
Deceased donor kidney transplantations pmp: 27,1 (18 <sup>th</sup> )
Living donor kidney transplantations pmp: 1,5 (35 <sup>th</sup> )



**Fig. 1.**

Prof. Wiktor Bross (1903–1994)

The first deceased donor transplantation in Poland was performed in September 1965 by Prof. Wiktor Bross (*Fig. 1.*) and his team in Wrocław. Unfortunately, the recipient died after the surgery.

Wiktor Bross was a specialist in heart disease and transplantation. He was the late successor of Jan Mikulicz-Radecki, continuing the local surgical traditions of his predecessor. In 1958, he performed the first open heart surgery in Poland. In 1961, he obtained a heart-lung machine from the United States for cardiac operations with extracorporeal support. In 1966, Professor Bross transplanted a kidney from a living donor, the first such case in his country. In 1967, he excised a heart aneurysm. These pioneer operations were milestones in Polish medicine.

The surgical team in Warsaw had been preparing to start a clinical transplantation program for over two years. The Surgical Research Laboratory



was headed by Prof. Jan Nielubowicz (*Fig. 2.*), who was born in Warsaw into a medical family. His grandfather, Dr. Władysław Nielubowicz, was a surgeon and manager of a hospital in Kremieńczug in Ukraine. His father, Dr. Kazimierz Nielubowicz, was a surgeon and a urologist at the Infant Jesus Hospital in Warsaw, where his son later spent much of his career. He attended The Stefan Batory Gymnasium in Warsaw. In 1929 Jan's father died, and his mother Wanda decided to move to Vilnius. In Vilnius, he graduated from high school and began studying at The Stefan Batory

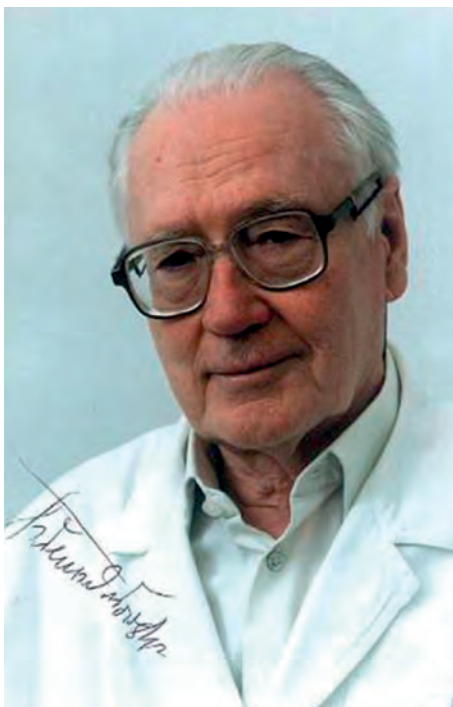


**Fig. 2.**

Prof. Jan Nielubowicz (1915-2000)

University. In 1936, he returned to Warsaw and continued his studies at the Faculty of Medicine at The University of Warsaw, graduating in 1939. After the outbreak of war, he stayed in the territory occupied by the USSR. In 1940, on the orders of Lithuanian and Soviet occupation authorities, he began his medical practice in Vilnius and Kaunas. From 1943, he was medical director and the only doctor in the small hospital of Wołożyn. In 1945, he returned to Warsaw working here until 1986, when he retired. In 1958, thanks to The Rockefeller Foundation, he completed a one-year internship at The Surgical Clinic of Harvard University, Boston, USA. There he had the opportunity to learn about surgical achievements. After returning from Boston, as the head of the 1st Surgical Clinic of Warsaw Medical Academy, he created a school of modern surgery based on scientific research. He received many awards and honorary titles, including The British and American Societies of Surgeons. He was the creator (or reformer) of many areas in Polish surgery.

His pupil and later successor Wojciech Rowiński learned transplantation medicine as a Research Fellow at The Peter Bent Brigham Hospital in Boston in 1965. The Warsaw Transplant Centre produced anti-dog, anti-rat and anti-hu-



**Fig. 3.**

Prof. Tadeusz Orłowski (1917-2008)

man anti-lymphocytic sera (ALS) as well as purified globulins in horses, goats, pigs and rabbits, evaluating the effects of administration of ALS on renal graft survival in dogs. The team was one of the first in the world to prepare a clinical rabbit-anti-thymocyte serum.

The first successful cadaveric kidney transplantation in Poland was performed at The Medical University in Warsaw on January 26, 1966 by professor Jan Nielubowicz and his team: Waldemar Olszewski, Jerzy Szczerbań and Wojciech Rowiński. The recipient, an 18 year-old nursing school student, had been prepared and taken care afterwards by the nephrologists Professor Tadeusz Orłowski (*Fig. 3.*) and his team. The operation went well; the patient was discharged home at 3 weeks after transplantation (*Fig. 4.*). Unfortunately, the recipient died 6 months later with

a well-functioning graft due to acute pancreatitis.

At the time when the first cadaveric kidney transplantation was performed in Poland, the World Registry was organized by the late Nobel Prize winner Joseph Murray, who recorded only 600 such procedures in the world.

Soon thereafter, Wiktor Bross in Wrocław performed the first Polish living related donor kidney transplantation on March 31, 1966. Although this procedure was followed by attempts at other centres, these efforts were abandoned soon; until the 1980's, transplantation was continued only in Warsaw.

Tadeusz Orłowski the son of one of the greatest Polish internist Witold Orłowski was born in Kazań at the Volga river. In 1943 he graduated from The Secret Medical Department of the University of Józef Piłsudski in Warsaw. From 1945 he was on the faculty of Internal Medicine of the Medical Academy in Warsaw and headed it from 1963. In 1957, after an internship in Sweden under the supervision of Professor Alvala, he learned about dialysis. Then, as a Rockefeller scholar, he went to Saint Louis, a world centre of renal pathophysiology lead by Professor Bricker. In the 1960's, he gained further experience by internships in London and Pisa. In Warsaw in the 1950's, he conducted pioneering attempts to treat chronic uraemia with peritoneal, intestinal dialysis and low-protein diets.



**Fig. 4.**

The first successful Polish recipient and the news in the newspaper

In 1959, he opened a dialysis centre. In 1964, he became a member of the Polish Academy of Sciences. In 1975, he established the Institute of Transplantology at The Medical Academy, which became the leading institution in the field of kidney transplantation in Poland. The fruit of his team's activities was the development, patenting and production of a Polish artificial kidney, a coil dialyzer. Professor Orłowski was also a mountaineer. He marked numerous new routes in the Tatra mountains: in particular, the first crossing of the Drège's Gully, the Świerz chimney and the north-western wall of the Gankowa Gallery considered the most difficult route at the time. He climbed routes in the Alps and the mountains of Vietnam. He was awarded The Order of Polonia Restituta in recognition of his outstanding achievements in science and in health protection.

*Prof. Dr. Magdalena Durlik*

Department of Transplantation Medicine, Nephrology and Internal Diseases Transplantation Institute, Medical University of Warsaw, Poland



## References:

- Orlowski T, Nielubowicz J, Gradowska L, Rowiński W, Kłopotowska E: Function of a transplanted kidney. *Pol Arch Med Wewn* 1966; 37: 47-54.
- Nielubowicz J, Orlowski T, Rowiński W, Szczurbań J, Szostek M, Kamiński B, Olszewski W, Ladygin J, Lao M, Gradowska L: Transplantation of kidney from cadaver. *Pol Przegl Chir* 1966; 38: 1030-4.
- Rowiński W, Szmidt J, Rosnowska M, Baraniewski H, Grupińska E, Tupalska B, Brühl A, Krawczyński K, Madaliński K, Nowoslawski A: Effect of long-term administration of horse antilymphocyte serum to healthy dogs. *Pol Arch Med Wewn*. 1970; 45: 281-9.
- Rowiński W, Szmidt J, Brühl A, Dziedziul S, Tupalska B, Baraniewski H, Grupińska E, Operowski A, Nielubowicz J: Production and titration of antilymphocyte serum for use in dogs. *Pol Arch Med Wewn* 1970; 45: 275-80.

# Netherlands



## 2017 European data

Inhabitants: 17 million
GDP per capita: \$61,421 (5 <sup>th</sup> )
Deceased donors pmp: 15.2 (22 <sup>nd</sup> )
All organ transplantations pmp: 74.2 (10 <sup>th</sup> )
All kidney transplantations pmp: 57.6 (3 <sup>rd</sup> )
Deceased donor kidney transplantations pmp: 25.2 (21 <sup>st</sup> )
Living donor kidney transplantations pmp: 32.4 (2 <sup>nd</sup> )



**Fig. 1.**

Surgeon Professor Maarten Vink

The first renal transplantation in the Netherlands took place in 1966 at The University Hospital in Leiden. The responsible surgeon was Dr. Maarten Vink, who was appointed Professor of Surgery at The Leiden University in 1957 (*Fig. 1.*). Already at the end of the 1950's, he had been travelling through the United States in order to get familiar with the newest developments in vascular

surgery. During that trip he became aware of the first successful renal transplantations in man.

Back in Leiden, he started a working group to explore the possibilities to start clinical kidney transplantation in Leiden. Together with his assistant, Dr. Hans Terpstra (*Fig. 2.*), he initiated preclinical renal transplantation studies in dogs, mainly aiming at optimizing his team's abilities to perform the vascular surgery necessary for clinical implementation of a renal transplant programme. All transplanted kidneys were rejected early after transplantation and Dr. Peter



**Fig. 2.**

Professor Maarten Vink and his assistant Dr. Hans Terpstra



**Fig. 3.**

Dr. Peter van Breda Vriesman during his Ph.D ceremony



**Fig. 4.**

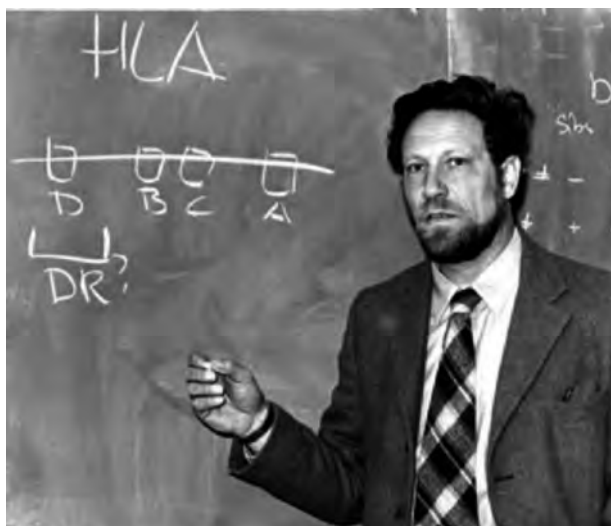
Dr. Tineke Lameyer

van Breda Vriesman (*Fig. 3.*) was asked to perform research to identify the mechanism leading to graft rejection, which became the topic of his Ph.D. thesis. Dr. Tineke Lameyer (*Fig. 4.*) who specialized in internal medicine, was asked to oversee the immunosuppressive treatment of transplanted patients. She was available day and night for her patients having a close collaboration with Dr. James Mowbray at St. Mary's Hospital in London. The focus of the renal working group led by Dr. Jaap de Graeff (*Fig. 5.*), who was later appointed Professor in Internal Medicine at The Leiden University, changed from hypertension, haemodialysis and renal disease toward renal transplantation and immunology. The latter line of research was successfully continued by his co-worker Dr. Bob van Es. In the meantime, Dr. Jon van Rood (*Fig. 6.*), who was a pioneer in the HLA field, had performed skin graft experiments using his colleagues as donors and recipients, demonstrating that HLA matching was beneficial for graft survival. He was responsible for tissue typing all patients and donors transplanted in Leiden. He





**Fig. 5.**  
Professor Jaap de Graeff and renal immunologist  
Dr. Bob van Es



**Fig. 6.**  
Dr. Jon van Rood, pioneer in tissue typing

was also the founder of the international organ exchange organization Euro-transplant in 1967. In the meantime, all preparations for a kidney transplantation in man had been made; it was decided to start the clinical programme.

The first patient, eligible for transplantation, was a 26-year-old man, who at the age of 4 had experienced acute glomerulonephritis. In 1954 he was hospitalized at the Community Hospital "Zuidwal" in The Hague because of polyneuropathy due to severe chronic kidney failure. The patient was no longer



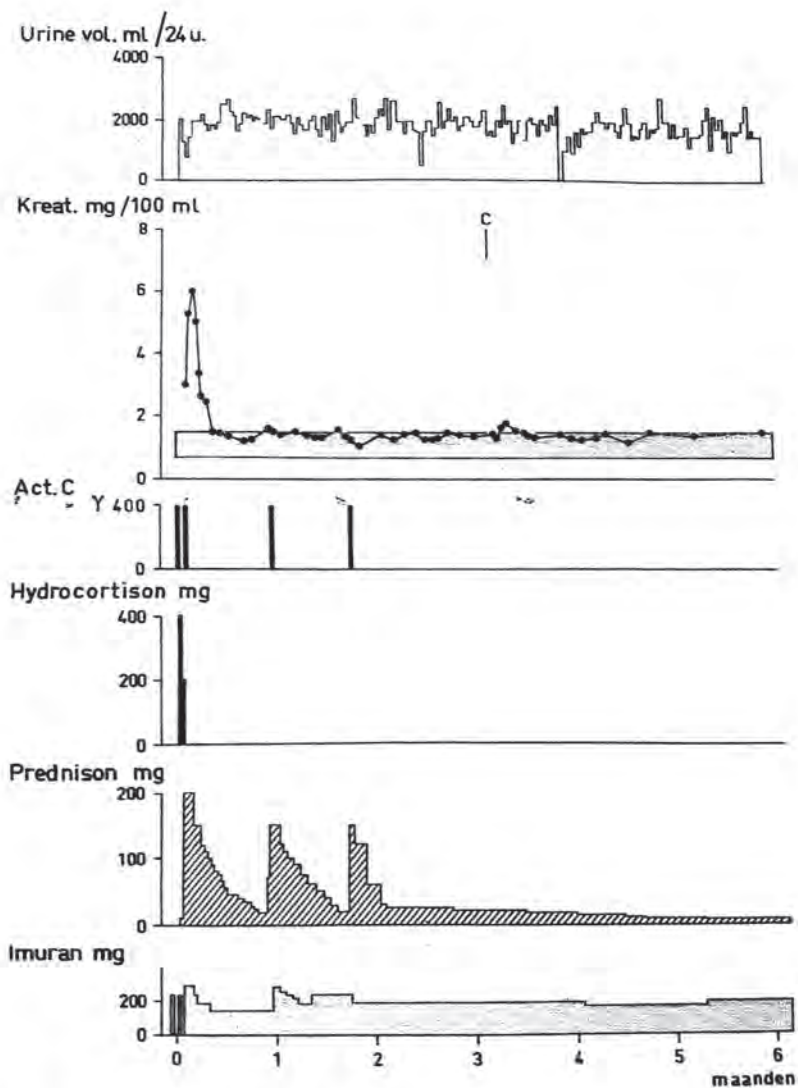
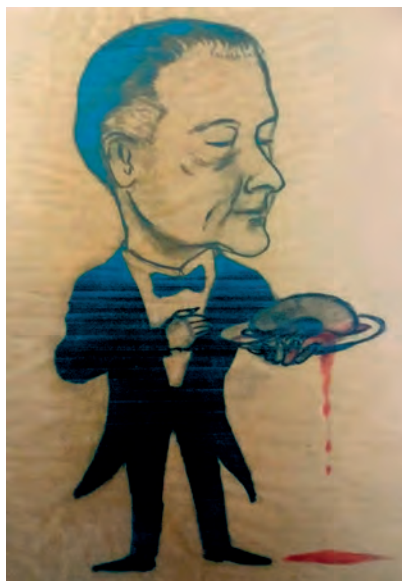


Fig. 18. Patiënt nr 1, Ve, 26 jaar, man  
C: subtotale parathyreoïdectomie drie maanden na de transplantatie.

Fig. 7.

Clinical information on the first Dutch renal transplant.



**Fig. 8.**

Cartoon of Professor Vink and the first donor kidney

able to handle life, having so many restrictions due to poor kidney function, although haemodialysis was available. His physician in The Hague approached the Leiden group whether the patient could become a candidate for renal transplantation. His 46-year-old mother was willing to donate a kidney.

On March 2, 1966, the transplantation was performed by a team consisting of Maarten Vink, Hans Terpstra and Hans Dicke. The donor nephrectomy was performed by Dr. Herman van Houten. Fortunately, as was to be expected in case of a living donor transplantation, the diuresis started immediately (*Fig. 7*). This first renal transplantation in the Netherlands was announced in almost all national newspapers; a cartoon showed Professor Vink with the donor kidney (*Fig. 8*). The immunosuppressive treatment combined steroids and

Imuran. When a rejection occurred the doses of these drugs were increased with added actinomycin. Complications after transplantation included a urinary tract infection and two respiratory tract infections caused by *Streptococcus pneumoniae* and *Haemophilus influenzae*, which were successfully treated. Three months after the transplantation, a parathyroidectomy was performed because of persistent hyperparathyroidism.

Thanks to this transplantation, the patient was able to enjoy a normal life. In 1970, he moved to Austria, where he worked for many years as a mechanic. He died at an old age. The donor did not experience any major complications as well; she reached the age of 93.

This pioneer work leading to the first transplantation in the Netherlands was the start of successful Dutch transplantation programs, not only in Leiden but in all university hospitals in the Netherlands.

*Dr. Ton A.H. Hintzen  
Marijke E.G. van Gurp  
Prof. dr. Bob L.A. van Es  
Prof. Frans H.J. Claas*

Leiden University Medical Centre, The Netherlands



## References:

- van Breda Vriesman PJ, Vink M, Willighagen RG. Histochemical studies of canine renal homotransplants with special reference to alkaline phosphatase and its isoenzymes. *Transplantation*, 5(3), 420-434 (1967).
- Van Rood JJ, Van Leeuwen A, Eernisse JG, Frederiks E, Bosch LJ. Relationship of Leukocyte Groups to Tissue Transplantation Compatibility. *Ann N Y Acad Sci*, 120, 285-298 (1964).
- de Graeff J, Lameijer LD, van Rood JJ, Struyvenberg A, Terpstra JL, Vink M. [Kidney transplantation (experiences from Leiden)]. *Ned Tijdschr Geneesk*, 112(41), 1818-1823 (1968).
- Lameijer LD, de Graeff J, Struyvenberg A, Vink M. Autonomy of parathyroid function in a patient with a renal homograft. *Folia Med Neerl*, 10(2), 45-48 (1967).



## 2017 European data

Inhabitants: 59.4 million
GDP per capita: \$38,140 (17 <sup>th</sup> )
Deceased donors pmp: 28.9 (7 <sup>th</sup> )
All organ transplantations pmp: 66.5 (13 <sup>th</sup> )
All kidney transplantations pmp: 37.8 (19 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 32.5 (14 <sup>th</sup> )
Living donor kidney transplantations pmp: 5.3 (23 <sup>rd</sup> -24 <sup>th</sup> )



**Fig. 1.**

Prof. De Bakey with Prof. Stefanini

The first kidney transplant programme in Italy was created in 1961 in The Second Surgery Clinic of Sapienza University of Rome, Polyclinic Umberto I of Rome. The Director of the Clinic was Prof. Paride Stefanini (*Fig. 1.*), assisted by Prof. Cortesini, Baroni, Arullani, Boffo, Casciani, and Cucchiara. After intense five-year preparation to develop an organ preservation solution composed of magnesium, bicarbonates and other salts by Prof. Casciani, the group was ready to implement the first dialysis in chronic uremic patients in October 1961 and in early 1966, to improve the surgical technique by Prof. Stefanini performing kidney transplants on corpses in The San Giovanni Hospital paying particular attention to vascular abnormalities.

On April 30, 1966, Prof. Ste-



**Fig. 2.**

From left to right: Prof. Casciani, Prof. Barnard, Prof. Cortesini and Prof. Stefanini

fanini performed the first clinical transplant in Italy. His first assistant was Prof. Raffaello Cortesini, the second assistant Prof. Carlo Umberto Casciani (*Fig. 2*). The recipient was a 17-year-old Roman girl, who survived a year with the functioning graft. The kidney was procured in The San Salvatore Hospital of L'Aquila, approximately 100 kilometres from Rome. The ectopic kidney at the level of the right iliac fossa, both vessels originating from the iliac axis was removed from a 29-year-old female patient for clinical reasons. The nephrectomy was performed by Prof. Giorgio Ribotta, assisted by Drs. Arullani and Casciani. The graft was rapidly transported to Rome after washing and cooling in a picnic container. In 1966, no highways existed between Rome and L'Aquila, so the organ was carried using a police car across the Apennines and the Via Salaria. The trip required only two and a half hours instead of the typical minimum of three hours and 40 minutes. The experimental work performed on cadavers in The San Giovanni Hospital was extremely useful, considering that the first graft bore a vascular anomaly. The transplant procedure was successfully concluded in the late afternoon.

Ten days later, on May 10, 1966, the first xenotransplantation was performed in Italy (*Fig. 3*). It was the second clinical xenotransplantation performed in the world. The donor was a 20-year-old chimpanzee called Peppone. The recipient was a 20-year-old Sardinian boy, who unfortunately lived for only 40

**PER LA PRIMA VOLTA IN EUROPA**

# ***Trapiantato su un uomo il rene di uno scimpanzè al Policlinico di Roma***

**L'ardita operazione è stata condotta a termine dal professor Stefanini, assistito dal prof. Cortesini - Le condizioni del paziente, un giovane sardo, appaiono soddisfacenti - Anche il primate «donatore» sembra godere buona salute**




Paride Stefanini, titolare della cattedra di patologia chirurgica dell'Università di Roma e Raffaele Cortesini, suo primo assistente, sono questi i due chirurghi che — primi in Europa e secondi nel mondo — hanno effettuato in un corpo umano un trapianto renale con organi prelevati da uno scimpanzè. Lo straordinario intervento chirurgico è stato compiuto una settimana fa nell'Istituto di patologia chirurgica: ne ha beneficiato un giovane sardo, Antonio Farina di 23 anni, che fu ricoverato l'11 marzo scorso per grave insufficienza renale. Per diverso tempo il paziente era stato mantenuto in vita con due applicazioni settimanali di rene artificiale, poiché i suoi reni erano stati completamente distrutti dalla malattia, ma poi — essendosi le sue condizioni aggravate — i medici decisero che non era più il caso di attendere. Il prof. Stefanini ed i suoi assistenti (oltre al prof. Cortesini hanno collaborato al trapianto i dottori Casciani, Arullani, Speranza e Ribotta) si misero all'opera.

Poiché non disponevano dell'organo di un cadavere e non potendo ricorrere a una donazione di vivente (non essendo ancora approvato il relativo disegno di legge) i chirurghi decisero di trapiantare sul malato il rene di uno scimpanzè e scelsero quale «donatore» un esemplare di *pan troglodytes* della clinica. L'operazione è riuscita: le funzioni renali sono riprese dopo l'intervento ed attualmente il paziente può alimentarsi e perfino alzarsi dal letto. Naturalmente, i medici si riservano ogni previsione sull'esito finale dell'intervento e si trincerano dietro una più che giustificata prudenza. Si è appreso, comunque, che mercoledì prossimo essi terranno una conferenza stampa sull'argomento al Consiglio Nazionale delle Ricerche.

**Fig. 3.**

Front page of an Italian newspaper with the first case of xenotransplantation in Italy and Europe



days, succumbing due to the adverse effects of the immunosuppressive drugs. Peppone was not sacrificed, but survived after the nephrectomy, coming back to the zoo of Rome. The programme was immediately interrupted due to the high costs of maintaining the animals.

Finally, the first living donation procedure was performed between two sisters in 1967, following the approval of a law that allowed this type of intervention in Italy.

*Quirino Lai, M.D., Ph.D.*

*Fabio Melandro, M.D.*

*Prof. Pasquale Bartolomeo Berloco M.D., Ph.D.*

Department of General Surgery and Organ Transplantation

"Paride Stefanini"

Sapienza University of Rome, Polyclinic Umberto I of Rome.



# Bulgaria



## 2017 European data

Inhabitants: 7.1 million
GDP per capita: \$21,686 (32 <sup>nd</sup> )
Deceased donors pmp: 6.1 (30 <sup>th</sup> )
All organ transplantations pmp: 8.2 (34 <sup>th</sup> )
All kidney transplantations pmp: 5.6 (36 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 4.5 (31 <sup>st</sup> )
Living donor kidney transplantations pmp: 1.1 (37 <sup>th</sup> )

The history of renal transplantation in Bulgaria began in 1964, when The Clinical Board of the Urology Clinic at the Military Medical Institute – Sofia, decided to prepare for the first renal transplantation in our country. This decision consisted of two parts.

In October 1964, during the clinical rounds at the Urology Clinic of the Military Medical Institute, Sofia, Assoc. Prof. Nikola Atanasov enthusiastically announced that a new era in medicine had begun with renal transplantation. The Head of the Clinic Assoc. Prof. Stoyan Lambrev, answered literally “We should put a great effort into this also”. They decided that a preliminary preparation on cadavers and on dogs was needed to learn the techniques of vascular suture. The team, which undertook this on its own, included Assoc. Prof. Atanasov, Dr. K. Nikolov and Dr. Hristo Kumanov. From March 15, 1964 until December 17, 1965, they performed 25 canine kidney transplantations in breeds, weighing more than 20 kg.

The first kidney transplant in a child in Bulgaria was performed at the Institute for Urgent Medical Service “Pirogov” in Sofia on December 3, 1968 by Prof. Nikolay Minkov and surgical assistants Dr. Ivan Ivanchev, Dr. Marian Hristov and Dr. Angel Boyanov; anaesthesiologists Dr. Nicola Noev and Dr. Anna-Maria Boycheva; nurses Eleanora Kalaydjieva and Emilya Assenova. The two cadaver kidneys obtained from another child were transplanted simultaneously to a 7-year-old boy.

This 7-year-old boy from the town of Petrich was brought in complicated condition two months prior to the Institute “Pirogov”. He had a high fever and a urea of 432 mg% (reference range 20-40 mg%). The boy was diagnosed with

congenital kidney defects resulting in inflammatory processes and gradually decreasing renal function. All clinical, X-ray and laboratory tests indicated irreversible damage; the child could expect imminent death. From his admission until the time of the operation, his life was supported with medications and continuous peritoneal dialysis.

Four days before December 3, 1968, a three-month-old baby to the Institute "Pirogov" had been brought from the town of Vratsa. The boy was born with hydrocephalus, cerebral hernia and severe nervous system damage leading to paralysis. Although doctors did everything possible to save it, the baby died. After the death diagnosis, preparations began for explantation of his kidneys, which was performed by the surgeons Rashko Dorosiev, Hristo Hristov and Maria Georgieva and the anaesthesiologists Gencho Tatarliev and Rositsa Vassileva. At 1 p.m. exactly they began the procedure. It was difficult due to the thin veins and arteries of the three-month-old baby. The abdominal aorta was connected to the left internal iliac artery end-to-end, the inferior vena cava of the donor to the left external iliac vein end-to-side. After the anastomoses the two kidneys became pink with pulsations in their arteries and urine flow from the two ureters. The operation had ended at 4:30 p.m. The recipient was transported to a special sterile room. He woke up from the anaesthesia and smiled at the people in white overalls. The first day and the first night after the operation passed well. The child's heart rate was normal; the breathing correct and



**Fig. 1.**

After the first renal transplantation: A. Boyanov, N. Minkov, I. Ivanchev, R. Dorosiev



Prof. N. Minkov



Prof. I. Ivancsev



Prof. A. Bojanov



Prof. Anna-Maria



Prof. P. Delyiszki  
Bojcseva

**Fig. 2.**



**Fig. 3.**

Urology team, celebration of Prof. N. Minkov

independent and the temperature 36.8°C. Two doctors and two nurses were standing by his bedside.

Renal transplantation was considered to be performed successfully without any complications to this moment but this does not mean that the newly grafted kidneys will be O.K. As it is known, the problem of the immuno-biological barrier of the recipient has not been fully solved in medicine. To suppress the immunological responses patients were given cortisone and Imuran. "After the seventh day we will be able to talk about results with greater security" – Prof. Minkov said to the journalist on the next day (*Fig. 1., 2., 3.*). Unfortunately, the child died two weeks after the transplantation.

After a long preparation, on February 1, 1969 the first kidney transplantation in an adult was performed in Bulgaria at the Department of Urology of the Medical Academy Sofia, now called University Hospital "Alexandrovsk".



Prof. Sztojan Lambrev



Prof. Nikola Atanasov



Prof. Hriszto Kumanov

**Fig. 4.**

The donor was a 42-year-old man from the town of Elena with a brain tumour leading to brain and biological death. His family gave consent for donation. A month earlier a 49-year-old woman from the village of Bistrec-Vratsa district was admitted to the clinic with endemic **nephritis** and end stage chronic renal failure treated by haemodialysis. She showed preserved vitality and a stable psychological condition. She displayed a perfect antigenic match for ABO, Rh and Kell systems. There were no antibodies toward platelet or leukocyte antigens. Immediately after death registration the left kidney was procured and perfused with Ringer's solution containing 5000 units of heparin.

The operation was performed by a team lead by the Head of the Department of Urology – Prof. Stoyan Lambrev – with his assistants Prof. Nikola Atanasov and Prof. Hristo Kumanov (*Fig. 4.*). The anaesthesiologist was Assoc. Prof. Georgi Tenev. The technique of Küss was used, anastomosing the renal artery anastomosing end-to-end to the hypogastric artery and renal vein end-to-side to the external iliac vein. The ureter was anastomosed directly into the bladder.

The immunosuppressive therapy utilized the available medicines – corticosteroid (Prednisolone F) and Imuran. Gradually all indicators became normal, including blood nitrogen products. Gamma renogram showed good perfusion of and excretion by the graft. Two months later, however, the transplanted patient developed bronchopneumonia, which she failed to overcome.

The first condition that inarguably contributes to the success of this activity is good organization and the development of chronic dialysis treatment. This success is due to the work of Prof. Zdravko Kyriakov, the Head of the Centre for Dialysis at "Alexandrovska" Hospital for many years. Another important link is the Immunological Laboratory established in 1971, most essentially due to its creation and development by Professor Gena Stefanova.

The first kidney transplantation of an adult from a living donor was performed in 1969 at the University Hospital for Multiprofile Treatment "ISUL" by

Dr. A. Cherveniyakov and collaborators. The transplanted kidney was taken from a maternal donor.

There was a lull in activity the 1970's, during which various working groups futilely addressed the problem "kidney transplant" due to lack of brain death criteria of laws regulating procurement from deceased donors, of organization for retrieval of technical expertise in the renal transplant procedure and immunological investigations, as well as of close collaboration between intensive care specialists, urologists, nephrologists, immunologists, etc.

Kidney transplantation in Bulgaria has more than five decade's history, showing that the physicians, who initiated this program sought to place our country among those with advanced medical therapy.

*Dr. Maryana Doitchinova-Simeonova*

Executive director

Bulgarian Executive Agency for Transplantation

Sofia, Bulgaria



## 2017 European data

Inhabitants: 1.3 million
GDP per capita: \$31,749 (23 <sup>rd</sup> )
Deceased donors pmp: 13.8 (25 <sup>th</sup> -26 <sup>th</sup> )
All organ transplantations pmp: 38.5 (24 <sup>th</sup> )
All kidney transplantations pmp: 26.9 (23 <sup>rd</sup> )
Deceased donor kidney transplantations pmp: 23.1 (23 <sup>th</sup> )
Living donor kidney transplantations pmp: 3.8 (27 <sup>th</sup> -28 <sup>th</sup> )

The first kidney transplantation in Estonia was performed on December 22, 1968 in a surgical clinic of Tartu University, which is situated in Domberg (a part of the capital Tallinn). This institution has a long, famous history. The building (*Fig. 1.*) was designed and constructed in 1875 by Ernst von Bergmann (1836-1907), who was well-known as a pioneer in surgical asepis.

The prerequisite for the first transplantation in Tartu was the introduction of haemodialysis in April 1966 by Harri Tihane (1933-2007), whose mentor was a forgotten Estonian Lembit Norvit (1913-1967) who moved to Sweden in 1944 and worked with Nils Alwall in Lund. It is believed that Lembit Norvit suggested the idea and contributed to the development of an artificial kidney, which not only reduced uraemia and regulated electrolytes, but most importantly could also be used for ultrafiltration.

There was a coincidence of a good collegial relationship with the surgical team lead by Artur Linkberg (1899-1970) and Professors of Forensic Medicine as well as Neurology and Neurosurgery. A Respiratory Centrum had been created within The Clinic of Neurology in 1962, to treat comatose patients. Methods to diagnose brain death in the Clinic were published in the Estonian medical journal "Eesti Arst" in 1968 which was well before the Harvard ad hoc committee document.

During the night of December 22, 1968, a 24-year-old woman was operated by Artur Linkberg and his colleagues (*Fig. 2.*), including vascular surgeons Endel Tünder (1929-2015) and Kaljo Pöder (1932-1984), who both later became Professors of Surgery.



**Fig. 1.**

The old surgical building of Tartu University, Estonia

The comatose patient had been admitted to the hospital a week prior due to chronic nephritis with uremic complications: anaemia, bleeding disorders and pericarditis. She was dialysed to regain consciousness. There was a degree of social pressure, because she was a prominent young journalist. Therefore, there was a decision to perform kidney transplantation.

The donor was a 40-year-old man with severe head trauma including a skull fracture, who had been admitted to the Respiratory Centrum two days prior. The donor was pronounced dead after the disappearance of blood pressure. The kidney removed quickly via a left thoracolumbotomy was flushed with a Collins-type fluid before being immersed in ice-water and transported to the operation theatre in Domberg.

The donor and recipient were blood group-compatible. Immunosuppression included intravenous prednisone and Imuran. The kidney was placed extra-peritoneally in the right iliac fossa with the renal vein anastomosed end-to-side to the external iliac vein, the artery, end-to-end to the internal iliac artery, and the ureter connected by the Leadbetter-Politano method. The operative site was





**Fig. 2.**  
The Estonian team of the first renal transplantation

drained using a small plastic tube via the bladder suprapubically. Total ischaemic time was about 6 hours; the operation lasted 7 hours. There were serious bleeding problems. At the end of the operation, the kidney looked “nice” with normal colour and turgor. The next morning the patient was extubated. She was anaemic, requiring dialysis. On the third postoperative day she expired due to cardiovascular insufficiency. Autopsy revealed a spectrum of uremic complications; however, the transplanted kidney displayed intact anastomoses with a histologically normal appearance save for moderate tubular necrosis.

Seven days later, a 40-year-old woman in nearly the same condition was transplanted from a 35-year-old cadaver donor. She also died 5 days later.

The reasons for the losses in these cases are obvious. The donors were close to non-heart-beating. Furthermore, it was impossible to improve the conditions of the recipients using the haemodialysis systems available at that time. The death of these two patients discouraged the team, causing them to stop clinical trials for three years. Success came in 1972, the third transplantation was performed on a 35-year-old man who received a kidney from his mother.

Unfortunately, the patient was lost to follow-up, succumbing one year later due to cessation of immunosuppression.

Now, 50 years since the beginning, there have been 1,200 renal transplantations including 130 from living donors. Since autumn 2017, Estonia has been an associated member of Scandiatransplant.

*Dr. Peeter Dmitriev*  
University of Tartu, Estonia



## 2017 European data

Inhabitants: 11.2 million
GDP per capita: \$27,737 (28 <sup>th</sup> )
Deceased donors pmp: 6.0 (32 <sup>nd</sup> )
All organ transplantations pmp: 18.9 (29 <sup>th</sup> )
All kidney transplantations pmp: 15.7 (30 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 9.6 (28 <sup>th</sup> )
Living donor kidney transplantations pmp: 6.1 (19 <sup>th</sup> )



**Fig. 1.**

The chimera, a creature from Greek mythology referenced in Homer's *Iliad*, which is amalgam of a lion, snake and goat and has become a recognized symbol of transplantation. Apulian plate, 350BC, Musée Louvre

The origins of organ transplantation start in ancient Greek mythology wherein there are countless examples of metamorphoses, symbolic incarnations, demons, sirens, tritons and centaurs (*Fig. 1.*). There is no reference to transplantation in the current sense in the written sources of ancient Greek medicine. In addition, the dissection of the dead human body was forbidden by religious and social beliefs; surgical instruments were rudimentary (*Fig. 2.*).

The first cadaver kidney transplantation in contemporary Greece was performed on July 9, 1968, at the AHEPA University Hospital in Thessaloniki (*Fig. 3.*). The donor was

a 63-year-old man who succumbed after head trauma in a traffic accident three days earlier. The recipient was a 22-year-old soldier with end stage renal failure. The patient who had been hospitalized for three months was undergoing haemodialysis and peritoneal dialysis at the 1<sup>st</sup> Department of Internal Medicine, Aristotle University Medical School, directed by Professor Dimitrios Valtis.



**Fig. 2.**

## Surgical instruments from the temple of Asclepius at Epidaurus

[illegible]

**Fig. 3.**

Newspaper clip reporting the first cadaver kidney transplant was performed in Greece, from the July 10, 1968 Macedonia newspaper



**Fig. 4.**

Professor Dimitrios Valtis, Professor Konstantinos Tountas and Associate Professor Aleandros Marsellos, AHEPA University Hospital, Aristotle University Medical School, Thessaloniki, Greece

The transplant operation was performed by Professor Konstantinos Tountas together with Associate Professor Aleandros Marsellos of the 1<sup>st</sup> Department of Surgery, Aristotle University Medical School (*Fig. 4.*). Postoperatively oliguria lasted for three weeks during which time the patient underwent haemodialysis through an arteriovenous silastic shunt. Subsequently, graft function became normal and the serum creatinine was 1.2 mg/dl. The recipient died 10 years later, in a motorcycle accident, having normal graft function.

The first living donor renal transplantation was performed at the AHEPA University Hospital in September 1970. Living donation was not allowed by Greek law at this time; special permit was obtained from the District Attorney of Thessaloniki. Professor Valtis and Menelaos Papadimitriou, together with the father of the recipient visited the District Attorney's office. The father claimed that if "I am not allowed to donate my kidney to my son, I will jump off the window to become a cadaveric donor". Finally, the special permit was given by the District Attorney. The transplantation performed by Professor Dimitios Lazaridis and Associate Professor Georgios Mplatzas. Renal transplantations were performed in the AHEPA University Hospital during the 1970's and 1980's, by Surgery Professors Dimitios Lazaridis and Panagiotis Spanos together with Internal Medicine Professor Achileas Tourkantonis.

The torch of transplantation was transferred to Agia Sophia – Hippokration General Hospital of Thessaloniki by members of the 1<sup>st</sup> Department of Internal Medicine. Professor Panagiotis Metaxas established the 2<sup>nd</sup> Propedaetic Department of Medicine, together with Dr. Zafeirios Polymenidis who established the Immunology and Histocompatibility Laboratory. Later, Professor Menelaos Padimitriou, established the Department of Nephrology at The Aristotle University Medical School. In 1986, The Division of Organ Transplantation was established by Professor Antonios Antoniadis. The Hippokration Hospital

became a leading transplant centre in Greece performing 1600 adult and 190 paediatric renal transplantations as well as 570 liver, pancreas and combined liver–kidney procedures. The Hippokration Hospital Transplant Centre continues today to perform renal and liver transplants, despite a low number of organ donors in Greece, due to the economic crisis of 2010–2018.

*Ioannis Fouzas, Maria Daoudaki*

Division of Transplantation, Department of Surgery, Aristotle University  
Medical School  
Hippokration General Hospital, Thessaloniki, Greece

## References:

- Nagy J: A Note on the Early History of Renal Transplantation: Emerich (Imre) Ullmann. *Am J Nephrol* 1999; 19: 346–349.
- Boletis JN: Renal transplantation in Greece. *Nephrol Dial Transplant* 2001; 16 (Suppl 6): 137-139.

# Portugal



## 2017 European data

Inhabitants: 10.3 million
GDP per capita: \$30,416 (24 <sup>th</sup> )
Deceased donors pmp: 34.1 (2 <sup>nd</sup> )
All organ transplantations pmp: 84.0 (6 <sup>th</sup> )
All kidney transplantations pmp: 51.4 (7 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 43.9 (3 <sup>rd</sup> )
Living donor kidney transplantations pmp: 7.5 (16 <sup>th</sup> )



**Fig. 1.**

Alexandre Linhares Furtado, M.D.,  
Ph.D.

The first footprint made by men on the moon was on July 20, 1969. At the same time, in a small country on the western tip of Europe, another important adventure was starting, that would become a history of success. At that time The University Hospital of Coimbra (HUC) had the first living donor renal transplant performed in Portugal by the prestigious general surgeon, Alexandre Linhares Furtado (*Fig. 1.*). The brother-to-sister transplantation occurred without any technical problems. Back then, there was not a tissue typing laboratory in Portugal, so it was necessary to have the collaboration of Professor Traeger in Lyon, to study the donor and recipient.

A few years passed before another kidney transplantation. In 1976 the first law of organ procurement and transplantation was published in Portugal. In that same year, three tissue typing laboratories were created: one in the north (Oporto), one in the centre (Coimbra) and one in the south (Lisbon).

At the same hospital department where, years before, the first living donor renal transplantation was performed, Linhares Furtado remained enthusiastic about the procedure.

By 1980, the protocol to begin renal transplantation from a deceased donor was waiting for an opportunity. Linhares Furtado and Alfredo Mota





**Fig. 2.**

Alfredo Mota, Henriqueta Breda, Linhares Furtado and Luis Borges


together with Luis Borges and Cândido Ferreira (nephrologists), Henriqueta Breda (tissue typing laboratory technician), Carrington da Costa, Richard Maul and Jorge Pimentel (anaesthesiologists) were part of the team to perform the transplantation (*Fig. 2.*).

On June 28, 1980, a 29-year-old man was admitted to the emergency department of the HUC due to a traffic accident; he had a severe traumatic injury leading to the diagnosis of brain death.



**Fig. 3.**

Dr. João Rodrigues Pena



Among a few patients on the waiting list was a 51-year-old woman. The nephrologist Cândido Ferreira went to her house to explain to her and the family the process and advantages of transplantation. She accepted and went to the HUC. The kidney harvest occurred on the night of 29 to 30 June, and the procedure was performed the following morning. The left kidney was implanted in this patient, the right kidney was sent to the Cruz Vermelha Hospital, in Lisbon. João Rodrigues Pena (*Fig. 3.*), a general surgeon, had also prepared to perform a renal transplantation from a deceased donor, was only awaiting a donor. The donor from Coimbra began the program in Lisbon; this kidney went to a young man.

There were no problems in these surgeries; both grafts showed good renal function. The woman from Coimbra experienced kidney transplant function for eleven years.

*Dr. Susana Sampaio*  
Portuguese Transplantation Society



## 2017 European data

Inhabitants: 2.9 million
GDP per capita: \$32,298 (22 <sup>nd</sup> )
Deceased donors pmp: 13.8 (25 <sup>th</sup> -26 <sup>th</sup> )
All organ transplantations pmp: 36.6 (26 <sup>th</sup> )
All kidney transplantations pmp: 26.2 (26 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 24.1 (22 <sup>nd</sup> )
Living donor kidney transplantations pmp: 2.1 (33 <sup>rd</sup> )

The first renal transplantation in a patient with chronic renal insufficiency in Lithuania was performed at the Clinic of General Surgery of Vilnius University, at the base of the contemporary Clinical Hospital of Vilnius City on February 18, 1970. The recipient was a 23-year-old patient, who had suffered with chronic glomerulonephritis for 7 years. After several treatments in outlying hospitals, he was finally admitted to the Department of Nephrology at Vilnius City Clinical Hospital on November 4, 1969. As the conservative treatments were ineffective, the renal failure had worsened requiring on December 2, 1969 haemodialysis via an exterior arteriovenous connection. Thereafter the patient underwent 1-2 haemodialysis sessions weekly for a total of 18 prior to the renal transplantation.

The deceased donor was a 48-year-old woman with an abrupt cardiac arrest and unsuccessful resuscitation for half an hour. The bilateral nephrectomy procedure began 20 minutes after the unsuccessful resuscitation. The organs were placed in a bath containing isotonic sodium chloride solution at 4°C. Simultaneously, renal perfusion was initiated using heparinized blood at 4°C. In order to minimize arterial spasm, novocaine was added to the perfusate.

Simultaneously, the recipient was opened in an adjacent operating room via a right ilioinguinal incision to access the iliac vessels retroperitoneally. The internal iliac artery was prepared to its root and the common iliac vein was isolated to facilitate transplantation of the left kidney. The arterial anastomosis was performed end-to-end and the venous connection end-to-side. After revascularization the kidney gained normal colour and turgor with ureteral peristalsis. The hypothermic anoxia, namely from the beginning of perfusion to the beginning of the blood vessel anastomosis lasted 1 hour and 40 minutes. Blood



**Fig. 1.**

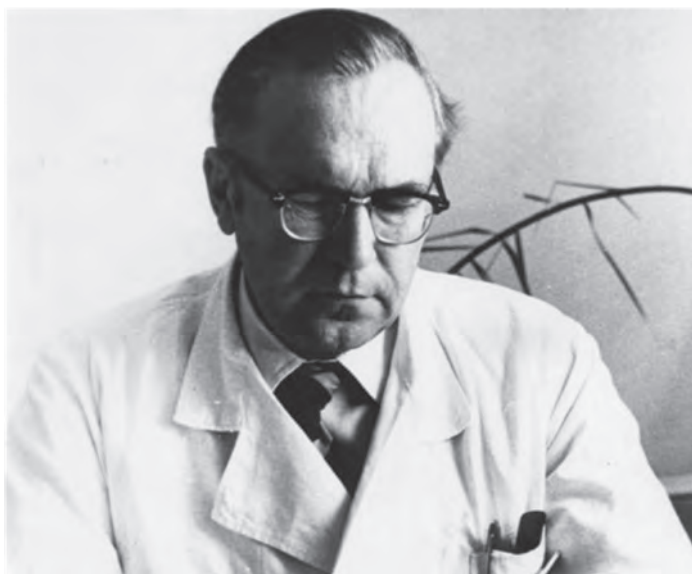
The first patient after renal transplantation in Lithuania

vessel anastomoses required 45 minutes. Thus the total anoxia time from the donor's cardiac arrest to the recovery of blood circulation was 2 hours and 45 minutes. Integrity of the urinary tract was achieved by transvesical implantation of the ureter. The overall procedure lasted 2 hours and 50 minutes. (*Fig. 1.*)

The first renal transplantation in Lithuania was performed by Prof. Algimantas J. Marcinkevičius (*Fig. 2.*). His assistants included: V. Kleiza, B. Dainys, V. Triponis, V. Sirvydis, D. Kavoliūnas, G. Uždavinsys, E. Kosinskas, G. Dirsė, D. Triponienė. The internal medicine caring for the recipient were: Prof. L. Laucevičius, I. Misevičius, V. Kirsnyš, N. Stanaitytė, N. Paliuščinskaja, L. Pinigytė; the anaesthesiologists: L. Zeldinas, G. Martinkėnas, V. Jakelevičius; the biochemists and immunologists J. Žemkauskaitė, J. Čepaitienė, K. Lukošūtė; the nurses: J. Martinkėnienė, O. Sventkauskienė, A. Padervinskienė, V. Bieliauskaitė, I. Motiejauskaitė; and the sanitary assistants: G. Zaleckytė and P. Ivanova.

At that time, the only available immunosuppressants were azathioprine and prednisolone (or triamcinolone). The patient received daily doses of azathioprine 50 to 150 mg and prednisolone 60 to 450 mg.

During the postoperative period there were no signs of transplant function, requiring 8 haemodialysis procedures within 1.5 months. At one month




**Fig. 2.**

Prof. Algimantas Jonas Marcinkevičius (1921-2014)

the patient experienced fever and decreased daily urine output. Due to the suspicion of an acute rejection the corticosteroid dose was increased and azathioprine was completely discontinued to reduce the danger of sepsis. Nevertheless, the daily urine output continued to decrease and the fever persisted. The transplanted kidney was removed on April 7, 1970, when it was obvious that it was irreversibly damaged. The patient died on April 12, 1970.

Microscopic study of the contralateral kidney of the donor showed chronic lesions, including thickening of basement membranes with increased cellular components suspected to be related to a rheumatoid process. The acute renal lesions included a cloudy swelling of some convoluted urinary ducts tubules with necrobiosis of their epithelia. A probable cause for these microscopic lesions was the cardiopulmonary bypass and resuscitative measures in the donor.

Macroscopic examination of the removed kidney showed it to be enlarged and dappled with numerous anaemic infarcts. Microscopic study revealed a total vessel wall cortical necrosis. Fresh and old clots were present in the blood vessels with lymphoid leukocyte infiltration in the walls and perivascular areas demonstrating an acute rejection response to the transplanted kidney. The patient's autopsy showed signs of septicaemia with an enlarged and soggy spleen, thyroid gland abscesses, phlegmonous mediastinitis and myocarditis with abscess formation.



Although the first kidney transplantation in Lithuania ended unsuccessfully due to a difficult medical situation, primitive immunosuppressants and poor dialysis technique, it was an important step towards the future era of clinical transplantation in our country.

*Prof. Dr. Marius Miglinas*

Institute of Biomedical Sciences, Department of Nephrology,  
Faculty of Medicine, Vilnius University, Vilnius, Lithuania

# Slovenia



## 2017 European data

Inhabitants: 2.1 million
GDP per capita: \$34,407 (20 <sup>th</sup> )
Deceased donors pmp: 20.5 (15 <sup>th</sup> )
All organ transplantations pmp: 42.9 (21 <sup>th</sup> )
All kidney transplantations pmp: 22.9 (29 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 21.9 (24 <sup>th</sup> )
Living donor kidney transplantations pmp: 1.0 (38 <sup>th</sup> )

On April 27, 1959, the first haemodialysis was performed in Slovenia (then part of Yugoslavia). During the first 10 years, nearly a thousand dialyses had been performed at the Department of Urology of the Surgery Clinic in Ljubljana. The dialysis therapy was started with the most difficult patients who were at death's door because of acute renal failure. About 50% of such patients could be saved. In 1969, the dialyzers were started to be used also for chronic patients who were potential candidates for transplantation. At that time, transplantation without haemodialysis was considered impossible: if you did not take the first step, you could not take the second one. In 1970, the nephrologists assumed leadership for dialysis and for transplantation preparations under Prof. Saša Luzar. Another important step prior to the launch of a transplant programme was the establishment of a national histocompatibility laboratory in 1969. From the onset of the effort the biochemical laboratory founded by Prof. Mateja Bohinjec was part of the Blood Transfusion Centre of Slovenia.

To learn about the organisation and technique of kidney transplantation, the urologist Ludvik Ravnik went to Heidelberg, Germany, which was one of the leading centres in Europe at the time. Some of the urologists also received training in Vienna. In those times the urologists removed kidneys every day and in other cases often attached ureters to bladders as well. The quite large, highly qualified team was well prepared for the first case.

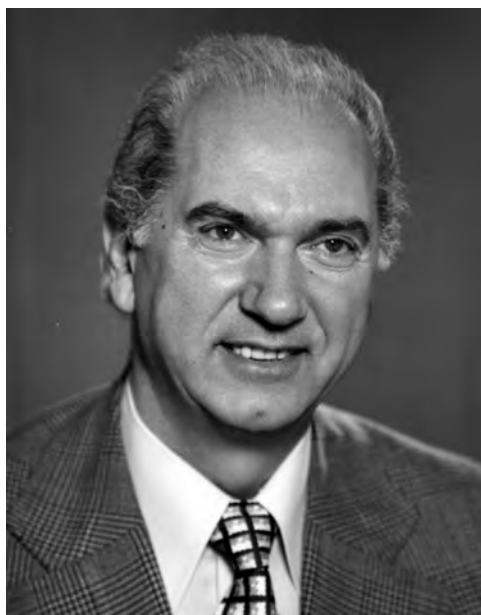
The first kidney transplantation in the former Yugoslavia was performed at the Medical Centre Ljubljana on April 16, 1970. The recipient was a 36-year-old man with end-stage renal disease secondary to chronic glomerulonephritis. The donor was his mother. The procedure itself was not technically complex.





**Fig. 1.**

Haemodialysis in Slovenia in the early days  
with Prof. Rakovec in the front



**Fig. 2.**

Prof. Ludvik Ravnik

Two teams worked concurrently in two rooms. The urologists, working under the leadership of Prof. Zdravko Rakovec (*Fig. 1.*) and his assistant Prof. Ludvik Ravnik (*Fig. 2.*), removed the donor's kidney in one room. The cardiovascular surgeons, led by Prof. Miro Košak (*Fig. 3.*), prepared a site for the graft in the recipient's pelvic area in the other room. The right kidney which was removed from the donor, cleaned and cooled was transplanted to the left iliac fossa of the recipient. First cardiovascular surgeons connected the renal vein to the common iliac vein end-to-side and the renal artery to the internal iliac artery end-to-end, then the urologists attached the ureter to the bladder. The immunosuppression consisted of azathioprine and prednisone. The kidney started excreting urine soon; its quantity increased every day. Unfortunately, the patient died on the 14<sup>th</sup> day after transplantation due to an uncontrollable infection that commenced during the immunosuppressive therapy.

The bad outcome of the first transplantation slowed down the work for another year. However, in those times the prevailing belief was that chronic dialysis represented a better way to treat end-stage renal disease. Patients who explicitly wanted transplantation went abroad to have the procedure performed in other centres, e.g. in Rijeka, Vienna or Paris. The living donor programme was restarted in 1972.



**Fig. 3.**  
Prof. Miro Košak

Via Yugotransplant in 1978, the first patient received a kidney from a deceased donor. Ljubljana received the kidney from the transplantation centre in Rijeka, after it had been classified as suitable for the recipient by tissue typing. Although the operation was performed optimally in technical terms, the kidney did not start to function. The non-function was attributed to the prolonged period from the donor's death to the kidney removal. Postoperatively it was learned that the other kidney from that donor which had been transplanted into a recipient in Rijeka, also displayed non-function.

In the first years of the Slovenian transplantation programme the protocol mainly relied upon living donors. The

urologists talked openly to potential kidney donors and recipients about donation options, including the risks. They presented the opinion, that for a patient with a relatively normal burden of daily life, transplanted kidneys would only function at 20% of their native potential. In contrast if one kidney was removed, the other one would assume its function, so the life of this person with one kidney would be completely normal. There was no major problem with donor acquisition. The society's attitude was much more in favour of transplantation from living donors. When relatives found out that treatment with transplantation was possible, their understanding and response were enthusiastic. Once they consented to the procedure, the first step was to check tissue compatibility by serologic cross-match, a precondition for transplantation.

A major obstacle to the implementation of deceased donation was the lack of legislation. Prof. Ludvik Ravnik together with Prof. Jože Drinovec, a nephrologist, Prim. Jasna Vončina and Prof. Mateja Bohinc anaesthesiologists advocated procedures to adopt relevant laws. However, the first transplantation law about brain death was adopted in 1985 in Yugoslavia. One year later, Ljubljana performed the first transplantation of a kidney from a deceased donor that was removed in Slovenia. After the Yugoslav era in 2000 Slovenia adopted a broader version of transplantation law including organizational aspects and other provisions to develop the entire transplant field. Shortly after mobile retrieval teams were established, who (with the participation of the local staff) could perform kidney removal in any hospital in Slovenia, but all transplantations are still per-



formed in Ljubljana. This working framework increased the opportunities for more procedures.

The establishment of a national transplant network in 1998 and the Institute for Transplantation of Organs and Tissues of the Republic of Slovenia in 2000 resulted in the full membership of Eurotransplant in 2000. Between 1970 and 2015, 1158 kidney transplantations were performed. From 1970 to 2009, 126 patients were transplanted from living related donors, only two in the ET period. From 1986 to 1999, 239 patients received kidney grafts from deceased donors, while three times more, 793 patients were transplanted from deceased donors after joining ET. In that period, 1- and 5-year patient survival rates were 98.1% and 93.8%, and graft survival rates were 94.3% and 87.5%, respectively. We are proud of the good results achieved under the more than 20-year leadership of nephrologists Prof. Aljoša Kandus and Prof. Andrej F. Bren and recently under Prof. Miha Arnol's team.

*Danica Avsec M.D.*  
Director, The Institute for Transplantation of Organs  
and Tissues of the Republic of Slovenia

## References:

- Kandus A, Buturović Ponikvar J, Mlinšek G, Oblak M, Arnol M: Kidney transplantation in Slovenia from 1970 to 2015. *Ther Apher Dial* 2016; 20:229-33.
- Interview with Prof. Ludvik Ravnik by Dr. Jana Šimenc in 2014. In: *Razvoj Transplantacijske medicine v Sloveniji: programi, smernice in perspektive* (Development of Transplant Medicine in Slovenia: programs, guidelines and perspectives), edited by Danica Avsec in Zvonka Zupanič Slavec; illustrations Radko Oketič. Ljubljana: Institute for Transplantation of Organs and Tissues of the Republic of Slovenia. *Slovenija-transplant*; 2016.

# Belarus



## 2017 European data

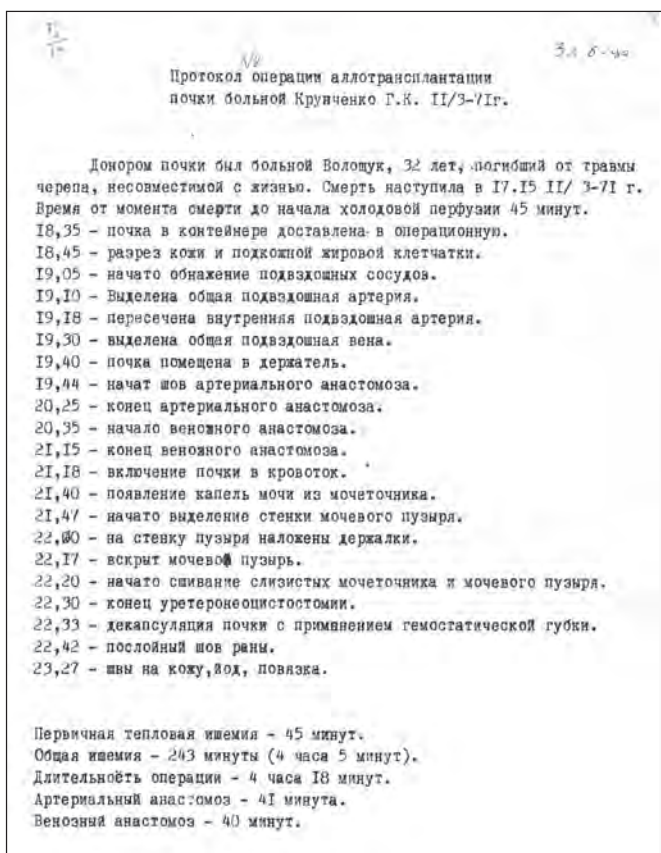
Inhabitants: 9.5 million
GDP per capita: \$18,930 (33 <sup>th</sup> )
Deceased donors pmp: 23.6 (10 <sup>th</sup> )
All organ transplantations pmp: 51.7 (19 <sup>th</sup> )
All kidney transplantations pmp: 38.1 (18 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 37.2 (9 <sup>th</sup> -10 <sup>th</sup> )
Living donor kidney transplantations pmp: 0.9 (39 <sup>th</sup> )

The first kidney transplantation was performed in Minsk by urology professors Nikolai E. Savchenko and V.A. Mochort on September 11, 1970. Previously the First Nephrology Department with a dialysis unit in The Fourth City Hospital, had prepared a group of 12–15 potential kidney recipients.



**Fig. 1.**

The flowchart of the kidney transplantation performed September 11, 1970



**Fig. 2.**

The procurement team (Dr. I. Scobeus, Dr. V. Saclakov, Dr. V. Pilotovich) leaving the Fourth City Hospital

The first recipient was a 28-year-old woman, who had suffered with chronic glomerulonephritis and had started dialysis on the eve of the transplantation (this centre had performed only 6 dialysis sessions at this time). On the day of the operation the patient's condition was not stable due to uncontrolled arterial hypertension with heart failure.

The donor was a 22-year-old lady who was involved in a car accident just near the hospital. She was admitted immediately with a clinical diagnosis of death after unsuccessful reanimation allowing specialists to decide to undertake kidney harvest. Left nephrectomy via a lumbar access was performed 90 minutes after donor death declaration. After the graft was flushed with physiologic solution and heparin, it was transplanted via an arterial end-to-end anastomosis between the renal and internal iliac arteries and an end-to-side anastomosis



**Fig. 3.**

The pioneers of renal transplantation in Belarus: academician Prof. Nikolai Savchenko (1922-2001) and Prof. V. Mochort

between the renal and external iliac veins. The ureter was implanted into the urine bladder by the Gregoir method. There were no technical complications during the operation; the graft became homogeneous with good turgor after blood flow restoration. At 15 minutes there was bloody urine.

At this time no immunologic investigation was performed; the recipient-donor matching was only by blood groups, namely both were A2 and Rh compatible.

The postoperative period was difficult due to progressive heart failure and anuria, despite frequent dialysis sessions and diuretic therapy. At 44 hours after transplantation the recipient expired due to cardiac decompensation and hyperkalaemia.

*Prof. Dr. Oleg Rummo*

Doctor of Medicine, Director of The State Institution:  
Minsk Scientific and Practical Centre of Surgery,  
Transplantology and Haematology  
Minsk, Belarus



# Croatia



## 2017 European data

Inhabitants: 4.2 million
GDP per capita: \$24,423 (31 <sup>st</sup> )
Deceased donors pmp: 33.3 (3 <sup>rd</sup> )
All organ transplantations pmp: 74.8 (9 <sup>th</sup> )
All kidney transplantations pmp: 39.3 (17 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 36.7 (12 <sup>th</sup> )
Living donor kidney transplantations pmp: 2.6 (31 <sup>st</sup> -32 <sup>nd</sup> )

In Croatia and former Yugoslavia, renal replacement therapy started with the treatment of acute renal failure by haemodialysis or peritoneal dialysis in 1962 and 1963, respectively. They were performed by the team of the late Prof. Jerko Zec and colleagues in Rijeka. These pioneers also introduced the treatment of patients with chronic renal failure using peritoneal dialysis in 1965 and regular haemodialysis in 1966, forming the basis for preparations for a kidney transplant programme. Experimental transplant surgery was performed on dogs. Members of the transplant team visited centres in Europe and the United States. After reading an article by Jean Hamburger about the experience with over fifty renal transplants at Necker Hospital in Paris, Prof. Frančišković sent a member of the team (P. O.) to this hospital for a 6-month internship. By the end of 1970, the new, enlarged dialysis centre had facilities for simultaneous dialysis of nine patients, and an isolation room for a kidney transplant recipient with the possibility of haemodialysis if needed. These facilities enabled the team in Rijeka to approach the first human kidney transplantation performed by Prof. Vinko Frančišković and colleagues on January 30, 1971 (*Fig. 1*). This was the first successful kidney transplantation in Croatia and former Yugoslavia. The patient, born in 1937 and a shoemaker by profession, was admitted on January 6, 1970 due to chronic glomerulonephritis diagnosed two years earlier. He complained of headache, fatigue and weakness. His blood pressure was 200/120 mmHg and he was uremic: haemoglobin 5.75 g%, urea 250 mg%, creatinine 10,5 mg%, and creatinine clearance 3 ml/min. As there was no free dialysis station in the centre, the patient was put on a low-protein diet. Over the following ten days, his condition worsened; the urea concentration increased to 400 mg%. On January





**Fig. 1.**

The multidisciplinary team that performed the first successful kidney transplantation in Croatia and former Yugoslavia in 1971, under the guidance of Prof. Vinko Frančišković and Prof. Šime Vlahović. *In front row left to right: Dr. Petar Orlić, Dr. Ksenija Vujaklija-Stipanović (Unit for Blood Transfusion, Tissue Typing Laboratory), Prof. Dr. Šime Vlahović (Department of Physiology, School of Medicine, Rijeka), Prof. Dr. Vinko Frančišković, Dr. Tomislav Tićac, and Dr. Jerko Zec. In the second row left to right: Dr. Giannpaolo Velčić, Dr. Miomir Zelić, Dr. Damir Dimec, Dr. Nikola Gržalja (Microbiologic section of the Central hospital laboratory), Dr. Sc. Daniel Rukavina (Department of Physiology, School of Medicine, Rijeka), Dr. Antun Šepić, Dr. Alemka Suzanić (Section for Anesthesiology of the Clinic of Surgery), Dr. Vjerislav Peterković, Dr. Duje Vukas, Dr. Marija Rakidžija (Section for Anesthesiology of the Clinic of Surgery), Dr. Branimir Budisavljević and Dr. Andrej Gudović. (On this picture the Head of the Biochemical laboratory Mr. Pharm. Davor Smokvina is missing.)*

17, 1970, peritoneal dialysis was initiated with one procedure of 36 hours per week. The patient's condition quickly improved with the blood pressure stabilized at 160/80 mmHg. A forearm arteriovenous fistula was formed on February 18, 1970, because a station for haemodialysis became available. Regular haemodialysis was started on February 25, 1970, twice weekly for 12 hours on Kiil dialyzers. The patient was dismissed in a good general condition at 2.5 months later. He continued to come 100 km by car for regular dialysis treatments two times weekly. Several months later, the patient's 49-year-old mother offered to donate a kidney to her son. Both were blood group 0; the mother, Rh positive,

the son Rh negative. HLA testing of donor and recipient was performed at the centre for blood transfusion in Beynost near Lyon, France (Dr. Hervé Bétuel). It showed identity for the first sublocus antigens 2 and 3, and a mismatch in the second sublocus for antigen 7, which was present only in the donor. Clinical examination showed the mother to be a healthy, slightly adipous woman with normal kidney function: creatinine clearance 112 ml/min. The cross-match was negative. Urologic investigations, including retrograde aortography via Seldinger technique, showed normal findings. Preparation of the patient was started seven days before the operation. Immunosuppression consisted of azathioprine (3 mg/kg) and deep intramuscular antilymphocyte serum (ALS; 5 ml daily), except on dialysis days to avoid haematoma formation. The last dialysis was three days before the operation. Anaemia was corrected with three units of washed erythrocytes. The PPD test, which was strongly positive, became negative six days after the onset of immunosuppression.

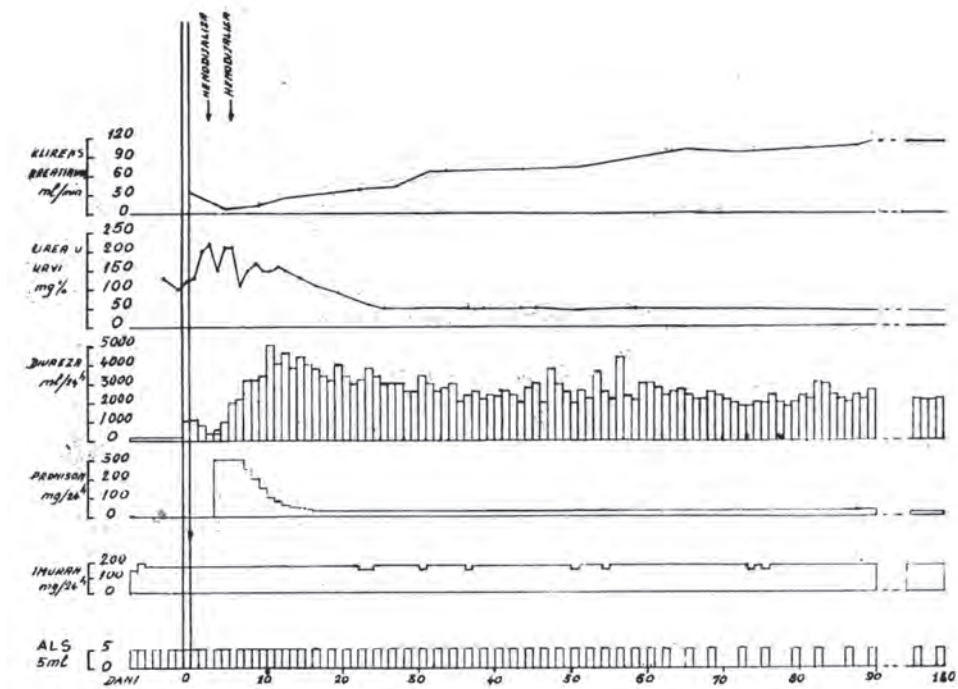
The transplantation was performed on January 30, 1971. The procedures were done simultaneously in two operating rooms. The donor underwent a typical lumbotomy. The renal artery, vein and ureter were dissected with special attention to the vascularization of the pelvis and ureter. The operation lasted four hours. In the recipient, a large incision was made from the tip of the 11<sup>th</sup> right rib to the symphysis thereby entering the retroperitoneal space. First the right nephrectomy was done, followed by isolating the iliac vessels and ureter. After the recipient preparation the donor ureter, artery and vein were ligated and transected. The removed kidney was perfused with Perfudex<sup>®</sup>, a modified Ringer's solution that contained 5% low-molecular dextran. The solution was cooled to 4 °C with addition immediately before usage of heparin and procaine. The perfused, cooled kidney was carried to the recipient's room. The renal vein was anastomosed terminolaterally to the common iliac vein, the renal artery terminoterminally to the internal iliac artery. After releasing the vascular clamps, the kidney immediately showed the typical pink colour. Total ischaemia, i.e. the time from the ligation of the renal artery in the donor until the release of the circulation in the recipient, was 43 minutes. Five minutes later, the first drops of urine appeared. Then, a ureteroureteral anastomosis was constructed at approximately 2 cm below the ureteropelvic junction with a Redon drain pulled out like a nephrostomy. The recipient's operation lasted 5 hours and 20 minutes. Both the donor and recipient tolerated the operation well (*Fig. 2*).

Postoperatively, immunosuppression was continued in the same dosage as before the operation. Vital signs and fluid balance were monitored hourly. In the first two days, the diuresis was over one liter per day, but on the second and third postoperative day the output dropped to 830 ml and 380 ml, and blood urea rose from 135 to 198 and 217 mg%, respectively. At that time the



**Fig. 2.**

The first press conference after the first kidney transplant in Rijeka in 1971.  
From left to right: Dr. Petar Orlić, nurse Zlata Špiler, the kidney transplant recipient, the transplant surgeon and Head of the Department of Surgery Prof. Vinko Frančišković, and hospital director Dr. Radoslav Peteh.



**Fig. 3.**

Data on diuresis, blood urea concentration, creatinine clearance and immunosuppressive therapy during the first six months after kidney transplantation. Horizontal axis: days, from 7 days before the operation to 6 months posttransplantation. Vertical axis (top to bottom): creatinine clearance in ml/min, urea in blood in mg%, diuresis in ml/24 h, prednisone dose in mg/24 h, azathioprine dose in mg/24 h, antilymphocyte serum administration (5 ml). Two haemodialysis procedures were performed, on the third and sixth postoperative days.

urinary sodium concentration dropped from 100 to 40 mEq/L with an increased number of lymphocytes in the urinary sediment. This early rejection crisis was treated with prednisone 5 mg/kg (300 mg) per day and haemodialysis. The treatment led to improved diuresis achieving more than two liters by the sixth day, but because of the high urea concentration (215 mg%) another haemodialysis was needed before the recovery of the kidney function. Pyelography, performed on the 11<sup>th</sup> postoperative day with contrast application through the Redon drain showed normal findings; the drain was then removed. The patient remained isolated for two weeks. The postoperative data on diuresis, blood urea, creatinine clearance and immunosuppressive therapy are documented graphically in *Fig. 3*. Two months after the operation, intravenous urography showed normal findings. The patient was dismissed in good general condition. At follow-up visits he underwent twice weekly ALS administration. The creatinine clearance gradually increased, stabilizing on the 50<sup>th</sup> postoperative day. The patient gained 10 kg and had a slight cushingoid appearance, but felt excellent. Antihypertensive therapy (reserpine) was reintroduced because of a gradually increasing blood pressure. Both the patient and his mother were satisfied with the transplant procedure and the postoperative course. ALS was continued once weekly during the first six months as the doses of prednisone and azathioprine were gradually reduced. The patient died 14.5 years later due to liver cancer with a functioning kidney transplant.

The quick recovery of this first kidney transplant recipient in our centre drove us to proceed with this intervention. In 1971, the tissue typing laboratory was founded in our institution; five additional kidney transplantations from living related donors were performed. On May 15, 1972, Prof. Frančišković and colleagues performed the first kidney transplantation from a deceased donor. In subsequent years this team helped to initiate transplant programs in other centres of the former Yugoslavia in Zagreb, Skopje, Sarajevo and Novi Sad.

*Petar Orlić, M.D., Ph.D.*  
Prof. emeritus, Department of Urology,  
Clinical Hospital Center Rijeka,  
Faculty of Medicine, University of  
Rijeka, Rijeka, Croatia

*Stela Živčić-Ćosić, Ass. Prof., M.D., Ph.D.*  
Department of Nephrology, Dialysis  
and Kidney Transplantation,  
Department of Internal Medicine,  
Clinical Hospital Center Rijeka,  
Faculty of Medicine, University of  
Rijeka, Rijeka, Croatia

## References:

- Prica M, Razmilić D, Smokvina D, Zgrablić M, Zec J: Our results with the clinical use of the artificial kidney in the therapy of renal insufficiency. *Liječ Vjesn* 1967; 89:743-50.
- Zec J: Peritoneal dialysis in the treatment of acute and chronic renal insufficiency. *Liječ Vjesn* 1967; 89:923-35.
- Zec J, Tićac T, Zgrablić M, Aničić M, Gudović A, Frančišković V: Two-and-a-half-year experience with continued haemodialysis in a patient with chronic renal insufficiency. *Liječ Vjesn* 1970; 92:641-53.
- Hamburger J, Crosnier J, Dormont J, Réveillaud R-J, Hors J-H, Alsina J: Homotransplantation rénale humaine, Résultats personnels chez 52 malades, Techniques et résultats d'ensemble. *Presse Med* 1965; 73:2793-8.
- Frančišković V, Vlahović Š, Zec J, Orlić P, Peterković V: Kidney transplantation – a case report. *Liječ Vjesn* 1971; 93:849-57.

# Azerbaijan



## 2017 European data

Inhabitants: 9.9 million
GDP per capita: \$17,433 (36 <sup>th</sup> )
Deceased donors pmp: 0.0
All organ transplantations pmp: N/A
All kidney transplantations pmp: N/A
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: N/A



**Fig. 1.**

Dr. Mirmammad Javadzadeh  
(1927-2008)

The history of transplantation in the Republic of Azerbaijan dates to 1971. At that time, the Republic of Azerbaijan, part of the USSR, witnessed a kidney transplant which was performed by Dr. Mirmammad Javadzadeh, the first time in the region including Iran and Turkey. Over 1971 and 1972, Dr. Mirmammad Javadzadeh, despite all the difficulties, did kidney transplantations not only from living donors but also from a few cadaveric sources. However, for unknown reasons this program was closed and subsequently no kidney transplant operations were carried out in Soviet Azerbaijan.

After the collapse of the Soviet Union in 1991, the Republic of Azerbaijan declared its independence. Thereafter, our republic began to integrate, in all areas, into a more developed country. In parallel, the health sector began to develop. In the early 2000's, Dr. Kamal Abdullayev and specialists from the Islamic Republic of Iran performed about 20 living donor transplantations. But this program was not organized professionally; there was no single Azerbaijani doctor who could

perform these operations. The patients again journeyed to foreign countries for surgery.

The history of professional activity in transplantation in the Republic of Azerbaijan started on December 12, 2008, when Dr. Mirjalal Kazimi performed a liver transplantation, not only for the first time in the Republic of Azerbaijan but also in the whole Caucasus region. Dr. Mirjalal Kazimi attracted a team of new doctors, who had acquired specialized training in Turkey, Japan and Europe. Dr. Elnur Farajov, who studied nephrology in Japan, joined the team in 2010. This group began kidney transplantation in 2011, showing that this service could be built in a country that relatively recently gained independence.

To date the team has performed 725 living donor organ transplantations (liver and kidney). In addition, other transplantation centres in our country – The Urology Centre of M. Cavadzade, The Republican Medical Diagnostic Centre and The Central Clinical Hospital – each perform 8-12 kidney transplantations per year.

Unfortunately, the cadaveric transplantation programme still does not function in our country; transplantations are performed only from living donors. However, in the near future, we seek to launch a cadaveric donor effort in the Republic of Azerbaijan which would be integrate into the European community, providing patients who have no living donors with an option of transplantation.



**Fig. 2.**  
Dr. Mirjalal Kazimi

*Mirjalal Kazimi, M.D., Ph.D.*  
Director of Surgery and Organ Transplantation Centre  
Central Customs Hospital Baku, Azerbaijan





## 2017 European data

Inhabitants: 7.0 million
GDP per capita: \$14,999 (35 <sup>th</sup> )
Deceased donors pmp: 5.7 (33 <sup>rd</sup> )
All organ transplantations pmp: 16.7 (30 <sup>th</sup> )
All kidney transplantations pmp: 12.4 (31 <sup>st</sup> )
Deceased donor kidney transplantations pmp: 8.8 (29 <sup>th</sup> )
Living donor kidney transplantations pmp: 3.6 (30 <sup>th</sup> )

The first transplant law was passed in 1981, when Serbia was part of the Socialist Federal Republic of Yugoslavia. The current Organ Transplant Law, which is based on an opt-out system, came into force on August 1, 2018.

The first organ transplant performed in Serbia was not a kidney transplant. In 1926 Pjotr Vasiljevic Kolesnikov, a Russian emigrant residing in Zajecar, a town in eastern Serbia, transplanted the testicle of a prisoner who gave consent for donation in exchange for a pardon. The recipient was his colleague, who was hoping for rejuvenation after the transplantation. In the period from 1926 to

1970, there were no data about solid organ transplantations in Serbia. However, in Denver in 1970 Thomas E. Starzl transplanted a liver to the Serbian king, Peter II Karadjordjevic, who unfortunately died in the immediate postoperative course.

The first kidney transplant to be done inside Serbia was performed in Belgrade in 1972. A year earlier Professor Vasilije Jovanovic (*Fig. 1.*), who worked at the Belgrade City Hospital, had established protocols to prepare patients for kidney transplantation and postoperative treatment. On January 13, 1972, Professor Jovanovic and his colleague, Dr. Milan Jovanovic, performed the first kidney transplant at the Surgical Department of the City Hospital in Belgrade. Unfortunately, a few days later, com-



**Fig. 1.**

Prof. Vasilije Jovanovic  
(1912-1979)

plications necessitated transplantectomy. After this failure, Professor Jovanovic did not continue these procedures at his home institution. However, two years later he accepted the invitation of Academician Sava Petkovic (*Fig. 2.*) and joined the team preparing for a kidney transplant program at the Urology Clinic of the Medical Faculty in Belgrade. At this place the first kidney transplant with long term success was performed on July 10, 1975 under the leadership of Academician Sava Petkovic. Team members also included biologists and immunologists from the Tissue Typing Centre of the Republic Blood Transfusion Institute in Belgrade, which was established in 1972. One of the founders was Dr. Aleksandar Dujic, an immunologist. He was an original member of the kidney transplant team. The donor and the recipient were prepared under the leadership of Professor Jovanovic. The recipient was a 23-year-old man of Caucasian ethnicity, blood group 0 and HLA phenotype was w3,32/w10,18 (corresponding to HLA-A 3,32; HLA-B 18,40). The donor was his mother, whose blood group was 0 and displayed HLA phenotype w9,32/w 10,5 (HLA-A 9,32; HLA-B 5,40). The patient's father displayed blood type A, which excluded him as a potential donor. At that time, the tissue typing centre performed HLA class I antigen typing, cytotoxic antibody screening and donor-recipient cross-matching. In Serbia determination of HLA class II antigens started in 1984 and molecular tissue typing techniques after 2005.



**Fig. 2.**  
Academician Sava Petkovic  
(1910-1992)

The surgical approach was a pararectal incision on the contralateral side from the original kidney position. Immunosuppressive therapy consisted of corticosteroids and azathioprine, the only available drugs. The patient was not administered antiviral prophylaxis, since these agents were not available. After transplantation, the patient experienced immediate diuresis, with renal function. Unfortunately, 13 years following transplantation he died due to acute pancreatitis.

Based upon this success, six kidney transplants were performed by the end of 1977. The first waiting list for deceased donor kidney transplantation was established in 1976 in the Republic Centre for Tissue Typing in Belgrade. At that time, there were forms for patient registration on and removal from the waiting list, as well as for reporting a waiting list death. In 1977 The Department of Transplantation nephrology was established at the Urology Hospital Medical Faculty in Belgrade. It was headed by Dr. Ivanka Krasojevic-Kostic, who

had completed three years of postgraduate training at The Necker Hospital in Paris (1972-1975). In 1980, the Department was transformed into the first Kidney Transplantation Centre which continuously expanded their staff, many of whom underwent training at leading European centres. Cyclosporine was introduced in the immunosuppressive protocols of the first Kidney Transplantation Centre in 1983, immediately after it became available worldwide. Other new immunosuppressive drugs, such as polyclonal and monoclonal antibodies, were added to the immunosuppressive protocols at the same time as they became available in European countries.

In Novi Sad, a city in northern Serbia, kidney transplantation was initiated in 1986. The first paediatric kidney transplant was performed in 1986 at the University Children's Hospital in Belgrade. A kidney from a living paternal donor was successfully transplanted to his four-year-old son. This transplant team was enjoined by the English surgeon Michael Bewick.

During the 1990's, due to economic sanctions, the number of transplantations decreased, but the kidney transplant team maintained its continuity despite the shortage of drugs. Thus mycophenolate mofetil, mycophenolate sodium, tacrolimus and sirolimus were not included in immunosuppressive protocols until 2005.

On November 29, 1973, Yugotransplant, the Yugoslav Dialysis and Transplantation Community was founded including The Urology Clinic, Medical Faculty in Belgrade, together with centres/clinics in Rijeka, Zagreb, Ljubljana, Sarajevo and Skopje. This organization arranged shipments of kidneys among member centres.

At present in Serbia there are five kidney transplant centres, one of which deals with paediatric cases. Before 2010, almost two thirds of kidney transplants were from living donors. The Clinical Centre in Novi Sad had performed the highest proportion of deceased donor kidney transplants. Intensified activity by continuous brain death monitoring at the Clinical Centre of Serbia in Belgrade increased the number of organs available for transplantation. Actual organ donors from this institution accounted for 81% of the overall donors in Serbia in 2010; the number of deceased donor organs was greater than the number of living related kidney transplantations.

*Lausevic M<sup>1,2</sup>, Kravljaca M<sup>1</sup>, Simonovic R<sup>3</sup>, Dukic T<sup>3</sup>,  
Brkovic V<sup>1,2</sup>, Milinkovic M<sup>1,2</sup>, Naumovic R<sup>1,2</sup>*

<sup>1</sup> Clinic of Nephrology, Clinical Center of Serbia, Belgrade, Serbia

<sup>2</sup> Medical Faculty, University of Belgrade, Belgrade, Serbia

<sup>3</sup> Tissue Typing Department, Blood Transfusion Institute of Serbia, Belgrade, Serbia.

## References:

- Milovanovic L. Podmlađivanjem hirurškim putem u Zaječaru 1926. godine. Timocki medicinski glasnik 2004; 29: 115–7.
- Stanivukovic V. Kralj bez zemlje i princeza bez miraza. Srpsko nasleđe 1998; 6. ([www.srpskonasledje.rs/sr-l/1998/06/article-20.html](http://www.srpskonasledje.rs/sr-l/1998/06/article-20.html))
- Vlaisavljevic Z, Jankovic S, Culafic Dj, Petrovic D. Transplantaton throughout the ages. Med J (Krag) 2015; 49(2): 49-53.
- Djukanovic Lj. Development of Nephrology in Serbia. U: Djukanovic Lj. Prilozi za istoriju nefrologije u Srbiji, Beograd, BIGZ, 2007, p 9-22
- Lezaic V. Centar za transplantaciju u Beogradu: U: Djukanovic Lj. Prilozi za istoriju nefrologije u Srbiji, Beograd, BIGZ, 2007, p125-143

# Slovakia



## 2017 European data

Inhabitants: 5.4 million
GDP per capita: \$33,025 (21 <sup>st</sup> )
Deceased donors pmp: 15.9 (21 <sup>st</sup> )
All organ transplantations pmp: 37.6 (25 <sup>th</sup> )
All kidney transplantations pmp: 28.3 (22 <sup>nd</sup> )
Deceased donor kidney transplantations pmp: 26.3 (20 <sup>th</sup> )
Living donor kidney transplantations pmp: 2.0 (34 <sup>th</sup> )

The history of kidney transplantation, although not long, is a period of hard, systematic and purposeful work by many scientists and clinical teams, full of successes and important discoveries, but also of failures and disappointments. It gives evidence of the joy of the results achieved and of the hope given to patients. The history of kidney transplantation is closely related to urology, they have many common historical and medical aspects. Urologists who participated in clinical renal transplantation programs used their experience with the surgical treatment of both congenital anomalies and acquired kidney and lower urinary tract diseases and applied their experience in open surgical, laparoscopic, endoscopic, percutaneous or transurethral surgical procedures to solve urological complications which belong to the most serious surgical complications after kidney transplantation. Some congenital or acquired diseases and urinary tract conditions (e.g. polycystic kidneys, urethral strictures, and neurogenic urinary tract disorders). as well as pathological conditions affecting the kidneys harvested for transplantation purposes, usually from dead donors (e.g. injured kidney, nephrolithiasis, significant renal vascular changes) can affect the result of kidney transplantation.

Renal transplantation in its evolution has gone through several stages until it has reached the stage of a successful method in the treatment of chronic renal insufficiency. After a certain decline in experimental and clinical work, research activity resumed after the end of World War II. The progress and development was enabled by technical and technological advances of dialysis devices, by the progress in transplantation immunology and especially by the introduction of the first, although non-specific immunosuppression into clinical

practice. Further aspects included scientific and legal recognition of brain death as a condition for harvesting kidneys from heart-beating cadaveric donors and improvement of harvesting and preservation techniques. In the early sixties, the technique of heterotopic and orthotopic kidney transplantation was described by the urologists René Küss and Jose Maria Gil-Vernet.

In Slovakia, Pavol Steiner and Emil Matejíček experimentally tackled the technical issues of kidney transplantation in the 1950's. In 1966, Professor Jean Auvert, one of the specialist who successfully transplanted a kidney between non-identical twins, lectured in Bratislava on his experience with kidney transplantation at Hôpital Necker in Paris. In the early 1970's, conditions for the launch of an integrated dialysis and transplantation programme were established in Bratislava. In 1970, a dialysis unit was opened at the Department of Urology in the Derer University Hospital. As part of preparation for kidney transplantation, the chairman of the Department of Urology and his colleagues undertook short internships in Prague, Paris and Switzerland.

Following the approval for kidney removal and transplantation, given by the Ministry of Health, the first kidney transplantation in Slovakia was performed at the Department of Urology in Bratislava on June 22, 1972. The kidney was removed from a dead donor at the Institute of Clinical and Experimental Medicine in Prague, where the central register was kept of Czech and Slovak patients awaiting transplantation. After 12 hours of simple hypothermic preservation, the kidney was transplanted to a 47-year-old patient whose own kidneys failed due to chronic glomerulonephritis. The operation was carried out by Professor Vladimír Zvara and his collaborators Josef Řezníček, Michal Horňák and Jozef Stojkovič (*Fig. 1.*). The technique of heterotopic kidney transplantation, described by René Küss in 1952, was used. The kidney was placed extraperitoneally into the iliac fossa. The renal artery and vein were attached to the external iliac vessels by a running suture. Reconstruction of the lower urinary tract consisted of implantation of the ureter into the urinary bladder. A combination of corticosteroids and azathioprine was used for immunosuppression. The function of the transplanted kidney normalized after a period of 3 weeks during which the patient underwent 8 dialysis treatments. No rejection reactions were noted in the postoperative period. The patient lived full quality life for 8 years and died of heart failure with functioning kidney.

With growing experience, paediatric kidney transplantations, transplantations from living donors and repeated procedures were performed at the Department of Urology in Bratislava. In the following years, the staff of the Department of Urology has performed kidney removal for transplantation purposes in other Slovak cities also.

The first kidney transplantation in Slovakia was the culmination of joint



**Fig. 1.**

Doctors participating at the first kidney transplantation in Slovakia

From the left side: Ass. Prof. Tomas Kadlic, Chairman of the Department of Anaesthesiology and Intensive Medicine, Prof. Rastislav Dzurik, nephrologist, Radko Menkyna, Director of the University Hospital in Bratislava, Prof. Vladimír Zvara, Chairman of the Department of Urology, Assoc. Prof. Jozef Řezníček, urologist

between the individual centres. For organ removal, the consent of relatives is not required in Slovakia. The system of presumed consent officially applies unless the patient has credibly declared during his/her life that he/she does not agree with the removal of his/her organs after death. Despite this fact, however, the staff of the transplantation centre communicates with the relatives of the potential donor for the sake of human dignity and ethics, hereby also avoiding aggressive confrontation and negative publicity by the media.

What are the future prospects and perspectives of kidney transplantation? While the number of potential kidney recipients increases, organ availability is relatively stable. Therefore, many patients die while waiting for a suitable organ. The problem of long-term survival of transplanted kidneys and rejection reactions can be solved by the induction of immune tolerance that will replace nonspecific and toxic immunosuppression. Great hope is being put into regenerative medicine. By using allogenic or autologous stem cells in the future, it might be possible to replace the damaged renal tissue. However, organogenesis leading to the formation of a three-dimensional organ is still the music of future. The future of xenotransplantation is also a question.

*Dr. h.c. Prof. MUDr. Ján Breza DrSc., MPH, MHA*  
Department of Urology, Comenius University, Bratislava, Slovakia





## 2017 European data

Inhabitants: 1.9 million
GDP per capita: \$27,644 (29 <sup>th</sup> )
Deceased donors pmp: 6.0 (31 <sup>st</sup> )
All organ transplantations pmp: 26.8 (27 <sup>th</sup> )
All kidney transplantations pmp: 26.3 (25 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 19.5 (25 <sup>th</sup> )
Living donor kidney transplantations pmp: 6.8 (18 <sup>th</sup> -19 <sup>th</sup> )

Since the first successful kidney transplantation in Boston, the Latvian medical society started discussing the possibility of introduction of this programme in our country. Irrespective of the positive attitude towards transplantation from the Health Ministry, there were no staff prepared for this operation, no chronic haemodialysis available (only sporadic acute dialysis since 1965) and therefore also no suitable patients. As a result of the Health Ministry initiative, in 1972 Prof. Josifs Jarmolinskis was invited to Riga to develop the kidney transplantation programme. He was one of the pioneers of kidney transplantation in the former Soviet Union, who had participated in the first kidney transplantations in Moscow in 1965. As the next step towards transplantation, a specialized nephrosurgical unit, including a group of enthusiasts from general surgery, started preparations to introduce chronic haemodialysis and transplantation. Chronic haemodialysis was initiated in 1973.

The staff worked to establish transplantation – treatment of chronic renal failure patients, development of contacts with intensive care units in Riga and regional hospitals, introduction and modelling of organ retrieval and transplantation procedures. From January 1973, new teams were trained in vascular surgery skills, constructing arteriovenous shunts and fistulas, experiences, that are useful in transplantation.

Being a part of the Soviet Union, Latvia had to follow the law, adopted there in 1938: each person is a part of society and his/her body belongs to society as well. A criminal expert had to participate in organ retrievals. In order to make the first kidney transplantation, our team had to obtain con-

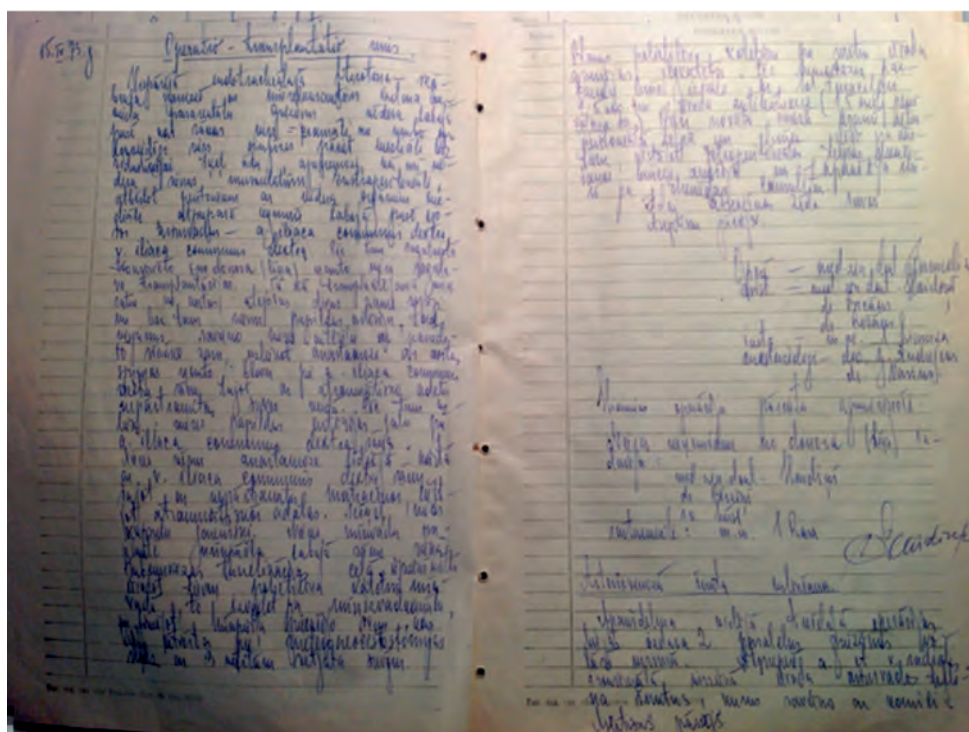


**Fig. 1.**  
First kidney transplantation in Latvia.

sent not only from the recipient, but also allowance from the Soviet Minister of Health.

The first attempt to retrieve kidneys from a deceased donor was performed on February 19, 1973. However, the lack of experience yielded a non-transplantable kidney. A second attempt on April 14, 1973 was performed after declaration of biological donor death by a team directed by Dr. Janis Slaidins with participation of Dr. Maris Berzins, Dr. Laima Luse (Salaka) and scrub nurse Inara Rasa. They retrieved a kidney displaying three arteries, one vein and a ureter; it was transplanted on April 15. The transplantation operation which started at 11.30 and continued till 17.30, was performed by Prof. Josifs Jarmolinskis, as well as Janis Slaidins, Janis Bicans and Ruta Berzina, scrub nurse Silvija Linnika, anaesthesiologist Ass. Prof. Georgs Andrejevs and Dr. Vjaceslavs Vasins (*Fig. 1.*, *Fig. 2.*). In the posttransplant period diuresis was 4000 ml/day; however, the serum creatinine improved only slowly, such that the patient required haemodialysis.

The second transplantation was performed using the left kidney from a 42-year-old fraternal living donor, to his 15-year-old daughter, who was already



**Fig. 2.**

Description of the operation in medical records.

under treatment with haemodialysis. In this case, function was immediate and the serum creatinine level reached the normal range by the third postoperative day.

The third kidney transplantation was performed from a deceased donor on April 26, of the same year; kidney function was immediate.

The initial donor – recipient allocations were based only on blood group compatibility; later matching was complemented by evaluation of cytotoxic activity in serum.

In 1974 the nephrosurgical unit – The Latvian Transplantation Centre – was organized as a separate hospital structure (Fig. 3.). During the first years the Centre was led by Prof. Josifs Jarmolinskis; thereafter from 1976, by Prof. Rafails Rozentals. At the beginning it consisted of a kidney transplantation unit, an operation theatre team, a haemodialysis unit, a serology/biochemistry transplant laboratory, as well as immunology and pathology groups, The Scientific Laboratory of Transplantology in The Riga Medical Institute and the tissue typ-



**Fig. 3.**  
Latvian Transplantation Centre staff in 1973

ing laboratory in The Latvian Blood Donor Centre. At this stage the Centre performed 15-20 kidney transplantations per year (5-7 pmp).

In 1993 the donor coordination system – Assembly of Baltic States “Balt-Transplant” was created and subsequently in 1996 was complemented by a Transplant Coordination Unit with a division in Latvia. The first head of the coordination department was Dr. Sergejs Truskovs, the first certified transplant surgeon in Latvia. At that time the numbers of kidney transplantations increased up to 40 pmp (38-39 pmp from deceased donors).

Like the other Baltic republics, full independence from Soviet Russia occurred on August 21, 1991, and on December 15, 1992 a new law regulating transplantation “Protection of the dead body, usage of human organs and tissues in medicine” was adopted; it still exists with some corrections. Nowadays in Latvia we perform deceased (mainly braindead), living (related and non-related), cross-match and ABO incompatible kidney transplantations.

Since 2017 the Centre suffered major restructuration, initiated by hospital administration. They removed the coordination from the Centre, introducing it

as a separate hospital structure, incorporating The Latvian Transplant Centre into The General Surgical Department with liquidation of the kidney transplantation unit, incorporation of the transplant laboratory into the hospital's central lab and of the haemodialysis unit into The Nephrology Centre.

During the last two years the number of transplantations decreased below 30 pmp, possibly due to these factors, as well as the decrease in the number and increase in the mean age of the population of Latvia, as well as the relatively high percent of refusals to donation among relatives.

*Jānis Bicāns, M.D., transplant surgeon*  
Head of the former Kidney Transplantation Unit  
Latvian Transplantation Centre

# Bosnia and Herzegovina



## 2017 European data

Inhabitants: 3.5 million
GDP per capita: \$12,723 (39 <sup>th</sup> )
Deceased donors pmp: 0.9 (37 <sup>th</sup> )
All organ transplantations pmp: 4.9 (39 <sup>th</sup> )
All kidney transplantations pmp: 4.9 (38 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 1.1 (34 <sup>th</sup> )
Living donor kidney transplantations pmp: 3.7 (29 <sup>th</sup> )



**Fig. 1.**

Prof. Sreten Bošković (1931-2002)

The first kidney transplantation in Bosnia and Herzegovina was performed in 1974 at The Transplantation Institute, Clinical Centre of The University of Sarajevo. This living related operation happened under the leadership of Prof. Sreten Bošković (*Fig. 1.*) with the help of Prof. Francisković from Rijeka, Croatia, who supervised the operation. The only available information is, that the recipient was a man.

From 1974 to 1990 an overall of 190 kidney living related kidney transplantations were performed in Sarajevo being the only transplant centre in Bosnia and Herzegovina. In that period there was no cadaveric transplantation.

In 1997, after the war in former Yugoslavia, the first transplantation was performed in Sarajevo again in The State Hospital by Dr. Enver Efendić, followed by another 13 procedures until 1999.

In 1999 Prof. Senaid Trnačević at The University Clinical Centre Tuzla initiated kidney transplantation with the support of Prof. Ferdinand Mühlbacher from Vienna, Austria (*Fig. 2.*). The programme completed 200 cases until now.

Prof. Aganović Damir and Prof. Senija Rašić in The Clinical Centre University of Sarajevo restarted the programme in 2004 with the support of Prof. Philip Morell from Geneva, Switzerland and completed 60 cases until now.





**Fig. 2.**

Prof. Senaid Trnačević and Prof. Ferdinand Mühlbacher in 1999

The Clinical Centre Banja Luka in Republica Srpska started 2010 also with a living related programme with the support of the transplant team from The Belgrade Military Academy. Ass. Prof. Milorad Grujičić completed 20 cases until now.

The first cadaveric transplantation was undertaken in 2006 in Tuzla, wherein until present there have been 40 procedures. According to our Renal Registry from 2017 there are 354 patients in Bosnia and Herzegovina who bear functional grafts.

*Prof. Dr. Halima Resić*

President of The Society of Nephrology,  
Dialysis and Transplantation of Bosnia and Herzegovina

Following books were published by Prof. Jasenko Karamahić:

- Transplantation of Kidney. Sarajevo- New Haven 2004
- Transplantation Immunology. Sarajevo 2010
- Transplantation of Kidney and Pancreas. Sarajevo 2012
- Publisher: Institut za naučnoistraživački razvoj Kliničkog centra Univerziteta u Sarajevu



# Turkey



## 2017 European data

Inhabitants: 80.7 million
GDP per capita: \$26,453 (30 <sup>th</sup> )
Deceased donors pmp: 6.9 (29 <sup>th</sup> )
All organ transplantations pmp: 60.1 (17 <sup>th</sup> )
All kidney transplantations pmp: 41.4 (15 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 1.5 (33 <sup>rd</sup> )
Living donor kidney transplantations pmp: 32.8 (1 <sup>st</sup> )

Solid-organ transplantation in Turkey began with two heart transplants in 1969, both of which, unfortunately, were unsuccessful. By the early 1970's, experimental studies on kidney and liver transplantation in dogs had already been initiated by our team. From January 1, 1974 until June 30, 1975, I trained with Thomas Starzl in Denver on kidney and liver transplantation. On my return to Turkey, the Founder and President of Hacettepe University, Prof. İhsan Doğramacı, appointed me Consultant of Paediatric Nephrology, which allowed me to make the necessary arrangements for organ transplantation to start at our hospital. My team was inexperienced, so I began by performing experimental kidney transplantation on dogs. Our first patient was a 12-year-old boy with chronic renal failure on haemodialysis under the care of paediatric nephrologists Prof. Ümit Saatçi and Prof. Ayfer Güven, and immunologist Prof. Fügen Ersoy. On November 3, 1975, we performed the first living-related renal transplantation in Turkey, using a kidney donated by our patient's mother (*Fig. 1*). The recipient survived for 6 years after the transplantation. However, following retransplantation in 1981, he died from a brain haemorrhage.

It is important to note that at the time there was no room to hospitalize a transplanted patient at our hospital. I arranged for 2 beds to be placed in a store room – one for the patient and one for me. No other person on the staff was trained to care for the patient, so I had to take care of his postoperative course personally. It was after this first successful transplant that we were finally able to establish our own transplantation and haemodialysis units (*Fig. 2*).

In those days, there was no law in Turkey governing organ transplantation or organ donation. Throughout the 1980's, the only alternatives for transplant



**Left to Right:** Prof. Gulnaz Arslan (anesthesiologist), Prof. Nevzat Bilgin (surgeon), Prof. Mehmet Haberal (surgeon), Prof. Mualla Karamelinoğlu (anesthesiologist), Prof. Nebil Büyükpamukçu (surgeon)



Murvet Çalışkan  
(Mother)



Bahtiyar Çalışkan  
(Son)



**Fig. 1.**

The surgical team of the first kidney transplant; Mother of the patient who was also the kidney donor; the recipient of the kidney; article that appeared in the Milliyet daily paper.



**Fig. 2.**

Our hemodialysis unit with Travenol monitor and coil dialyzer

diately after Lufthansa landed. Thankfully, after a personal request, the Minister of Transport at the time, Mr. Güneş Ögüt, intervened and the Turkish Airlines flight back to Ankara was delayed "due to technical reasons" long enough for me to catch the flight.

We were thus able to perform the first deceased donor kidney transplantation in Turkey on a patient, who had chronic kidney failure and was on haemodialysis under the care of nephrologists Prof. Ali Gürçay and Prof. Şali Çağlar. The surgery was carried out at Hacettepe University Hospital on October 10, 1978, using an organ supplied by the Eurotransplant Foundation (Fig. 3.). The patient was followed at our centre for 1 year posttransplant, after which time he stopped coming for check-ups and we lost contact with him.

In those years, kidneys were not preserved more than 12 hours and anything beyond that was considered unusable. However, the kidney I received on that occasion had already undergone more than 24 hours cold ischaemia time. Nevertheless, the surgery was successful; the kidney functioned. This was a great



**Fig. 3.**

Article that appeared in a daily paper; the recipient of the kidney; cannister containing the organ; packaging of the kidney received from Eurotransplant.

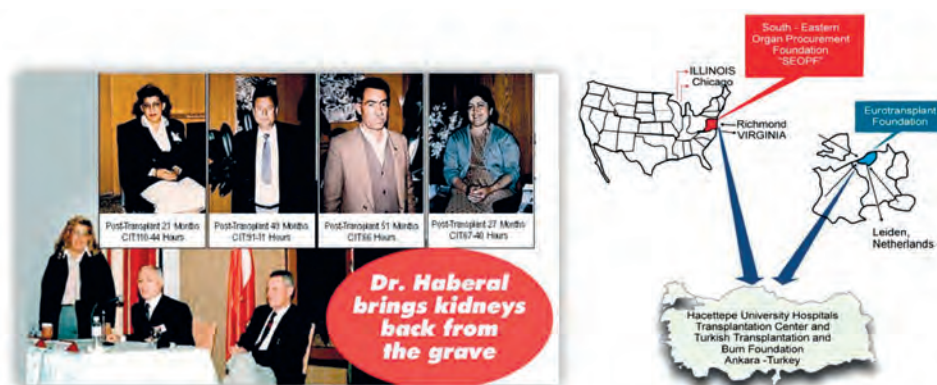
breakthrough for me. I decided to continue with this method so I proceeded to send a telex to Bernard Cohen and Guido Persijn at Eurotransplant and Gene Pierce at the South Eastern Organ Procurement Foundation to request that they send me any kidneys with longer than 12 hours cold ischemia time.

The organs received from these organ procurement foundations came to us often after having undergone more than 48 hours and up to 118 hours cold ischemia time and were also anatomically problematic. However, we found that deceased donor kidneys that are well preserved at 4°C and imported with a simple storage system and a warm ischemia time of less than 5 minutes were still viable and these kidneys were used with a high success rate. We performed more than 100 transplants with these kidneys. One of our patients survived 25 years with a kidney that had a cold ischaemia time of 110 hours 44 minutes. I remember that I was able to present our extraordinary results at the 1<sup>st</sup> Congress of ESOT that was held in Zurich November 23-25, 1983 (Fig. 4. and 5.).

During this early period, there was no legislation in Turkey governing



**Fig. 4.**  
Patients who received organs from Eurotransplant



**Fig. 5.**

Top left: The patient had chronic renal failure resulting in polycystic kidney disease. She received a kidney with 110 hrs 44 min coldischemia time. She survived 25 years. Bottom left: The patient with Prof. Mehmet Haberal and Prof. Thomas Starzl.

organ donation, a major hurdle. News about deceased donor kidney transplants was transmitted to the public by TV, radio, and print media. By these means, people were able to see our healthy recipients after transplantation. Highlighting these examples, I endeavoured to convince members of Parliament, officials in The Department of Religious Affairs and the Ministry of Health, and those in other governmental institutions that transplantation was a lifesaving procedure.

My efforts were successful yielding Law No. 2238 on organ procurement, preservation, and transplantation, which was enacted on June 3, 1979 (Fig. 6.). Article 3 of the law was particularly important, as it banned the sale of organs and tissues for money or any other interest. In fact, the law has been deemed progressive enough to be used as a model by many other countries.

Just one month later, on July 27, 1979, I performed the first local deceased donor kidney transplantation (Fig. 7.). The donor was a young male motorcycle victim. Once brain death was ascertained, the kidneys were donated by the family, but since one was cystic, we could make use of only one of the kidneys.





**Fig. 6.**

Excerpt from Law 2238 and copy of the official gazette announcing enactment of the law



**Fig. 7.**

Surgical team that performed the transplant; Hacettepe University Hospital;  
News article from a daily newspaper.

The recipient had end stage renal disease and was on haemodialysis. The surgery was successful, but 9 months after the transplant he died of a pulmonary infection.

We also worked with the Turkish public to provide education about the benefits and social responsibilities involved in organ donation. I founded The Turkish Organ Transplantation and Burn Treatment Foundation on September 4, 1980, to advance these interests. The burden of kidney disease on society was great, as there were insufficient haemodialysis opportunities for patients, many of whom could not afford treatment. The purpose of the foundation was to help provide treatment to poor patients, to promote organ donation, and to increase dialysis and transplant centres.

In our efforts to increase deceased donation, standardized "Organ Dona-

**TURKISH LAWS # 2594 - ADDENDUM TO LAW # 2238 (JANUARY 21, 1982)**

**Article 4: In the case of the aforesaid persons, where the next of kin do not exist or cannot be located, and the termination of life has taken place as a result of accident or natural death, provided that the reason for the death is not in any way related to the reason for harvesting and according to the conditions stated in Article 11, THE SUITABLE ORGANS AND TISSUES CAN BE TRANSPLANTED INTO PERSONS WHOSE LIVES DEPEND ON THIS PROCEDURE WITHOUT PERMISSION FROM THE NEXT OF KIN.**

**Fig. 8.**

Excerpt from Law No. 2594

tion Cards” were printed with the aim to promote donation and bring this concept to life in people’s minds. On January 21, 1982 some new articles were added to Law 2238, with the enactment of Law 2594, which stated that, in cases where the next-of-kin could not be reached, the organs of the deceased could be harvested without having to obtain permission (*Fig. 8*).

In 1985, I established the Turkish Organ Transplantation and Burn Foundation Hospital in Ankara, and we started to perform our transplantations. This was followed by many groundbreaking events; on December 8, 1988, I successfully performed the first deceased liver transplant in Turkey and the region, followed by the first paediatric segmental living-related liver transplantation in Turkey, the Middle East, and Europe on March 15, 1990, and just one month later, the first adult segmental living related left-lobe liver transplantation in the world, after grafting tissue from a father to his 22-year-old son. On May 16, 1992, I performed the first combined liver-kidney transplantation from a living-related donor (segmental left liver and right kidney from mother to daughter), which was the first operation of its kind anywhere in the world. The patient survived for 14 days, but unfortunately died from a brain haemorrhage. Her mother, the donor, is still alive and well today (*Fig. 9*).

The successful melding of legal, ethical, medical, social, psychological, technological, economic and religious aspects is mandatory for any transplantation organization. It is nearly impossible to create or run an effective system without regard for all these components. Like all similar programmes in the world, transplantation activities in Turkey began with operations that broke new ground. The long journey to an established system was made in baby steps, with the initiation of nationwide haemodialysis programs; access to and provision of immunosuppressive drugs; work on legislation; education of medical staff and the Turkish public; technological improvements in tissue typing; advancements in graft imaging and immunosuppressive drug monitoring; establishment of an



**Fig. 9.**

Surgical procedure and the donor with her daughter, the recipient

intercity organ sharing program; and organization of national and international scientific meetings and societies.

In 1993, I founded Baskent University in Ankara, which, in addition to providing a full range of educational opportunities, has established 10 hospitals (4 of which perform organ transplantation), 9 outpatient clinics, and more than 20 dialysis centres (mostly haemodialysis), throughout Turkey. As of the end of 2017, our team has performed 2,815 kidney and since 1988, 587 liver transplants. In over 40 years of solid organ transplantation history in Turkey, more than 33,000 kidney transplants have been performed nationwide in 72 different centres. Transplantation activities are accelerating day by day throughout the country, but deceased donors are still far below the desired rates. Efforts to increase awareness continue through the media, schools, and many public and private institutions. Improvements in legislation, education and coordination are key factors for increasing the quality and the quantity of transplantation activities in Turkey.

*Mehmet Haberal, M.D., FACS (Hon), FICS (Hon), FASA (Hon), FIMSA (Hon)*

Founder and Founder President, Başkent University

President of the Executive Supreme Board, Baskent University

Chair, Baskent University Division of Transplantation

President, The Transplantation Society

Distinguished Fellow, Royal Society of Medicine

Governor, American College of Surgeons

Founder and Past President, Middle East Society for Organ Transplantation

Founder and President, Turkish Transplantation Society

Founder and President, Turkic World Transplantation Society



## References:

- Haberal M. Development of Transplantation in Turkey. *Transplantation Proceedings*. 2001; 33:3027-3029.
- Haberal M, Oner Z, Karamehmetoglu M, Gulay H, Bilgin N. Cadaver kidney transplantation with cold ischemia time from 48 to 95 hours. *Transplant Proc*. 1984;16(5):1330-2.
- Haberal M, Aybasti N, Arslan G, Bilgin N. Cadaver kidney transplantation cases with a cold ischemia time of more than 100 hours. *ClinTranspl*. 1986:126-7.
- Haberal M, Karakayali H, Bilgin N, et al. Cadaver organs: limitations and results. *Transplant Proc*. 1996;28(1):266-8.
- Haberal M, Moray G, Bilgin N, Karakayali H, Arslan G, Büyükpamukçu N. Ten-year survival after a cold-ischemia time of 111 hours in the transplanted kidney. *Transplant Proc*. 1996;28(4):2333.
- <http://www.lawsturkey.com/law/2238-organ-transplantation-law>. Accessed January 22, 2018.
- Haberal M, Kaynaroglu V, Bilgin N. Ethics in organ procurement in Turkey. *Int J Artif Organs*. 1992;15(5):261-3.
- Haberal M, Moray G, Karakayali H, Bilgin N. Ethical and legal aspects, and the history of organ transplantation in Turkey. *Transplant Proc*. 1996;28(1):382-3.
- Haberal M, Moray G, Karakayali H, Bilgin N. Transplantation legislation and practice in Turkey: a brief history. *Transplant Proc*. 1998;30(7):3644-6.
- Haberal M, Demirağ A, Cohen B, et al. Cadaver kidney transplantation in Turkey. *Transplant Proc*. 1995 Oct;27(5):2768-9.
- <http://www.lawsturkey.com/law/2238-organ-transplantation-law?s=2594#>. Accessed January 22, 2018.
- Haberal M, Tokyay R, Telatar H, et al. Living related and cadaver donor liver transplantation. *Transplant Proc*. 1992;24(5):1967-9.
- Haberal M, Büyükpamukçu N, Bilgin N, et al. Segmental living related liver transplantation in pediatric patients. *Transplant Proc*. 1994;26(1):183-4.
- Haberal M, Buyukpamukcu N, Telatar H, et al. Segmental living liver transplantation in children and adults. *Transplant Proc*. 1992;24(6):2687-9.
- Haberal M, Abbasoğlu O, Büyükpamukçu N, et al. Combined liver-kidney transplantation from a living-related donor. *Transplant Proc*. 1993;25(3):2211-3.

# Georgia



## 2017 European data

Inhabitants: 3.9 million
GDP per capita: \$10,644 (42 <sup>nd</sup> )
Deceased donors pmp: 0.0
All organ transplantations pmp: 7.9 (37 <sup>th</sup> )
All kidney transplantations pmp: 5.4 (37 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 5.4 (22 <sup>nd</sup> )

The first six cases of organ transplantation in Georgia of a deceased donor kidney graft were performed in 1976 by a joint team of surgeons from The Institute of Surgery (Tbilisi) and The Institute of Organ Transplantation (Moscow) under the leadership of Prof. Laurent Managadze (*Fig. 1.*). The first cases of living kidney transplantation were done at The National Centre of Urology in 1995. A joint team of French-Georgian surgeons: George Karam from Nantes, France



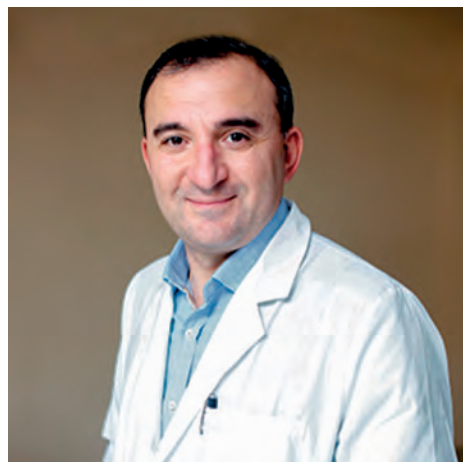
**Fig. 1.**  
Prof. Laurent Managadze



**Fig. 2.**  
Dr. Elguja Ghonghadze

and Elguja Ghonghadze from Tbilisi (Fig. 2.) performed 5 living-related kidney transplantations.

Important steps for the development of the transplant program in Georgia were in 1998 the state insurance coverage of the costs of kidney transplantation including immunosuppressive therapy. Two years later the Georgian parliament adopted regulations for both living as well as deceased donor organ transplantations with brain death criteria officially adopted by the Ministry of Health the following years.



**Fig. 3.**  
Prof. Archil Chkhotua

Dr. Archil Chkhotua (Fig. 3.) underwent training in organ transplantation in 1999. Two years in the department of organ transplantation at Rabin Medical Centre, Tel-Aviv, Israel and two years in the Transplantation Centre, The University of Ulm, Germany. After returning to Georgia, he together with a team of urologists and nephrologists initiated a kidney transplantation programme at The National Centre of Urology, Tbilisi. This effort continues to be the biggest programme in the country having introduced laparoscopic donor nephrectomy and paediatric kidney transplantation in our country. In addition, three other hospitals offer living donor kidney transplantation in our country: The National Centre of Urology, The National Centre of Surgery and The High Technology Medical Centre.

*Prof. Archil Chkhotua*  
Head of the kidney transplantation programme  
The National Centre of Urology, Tbilisi, Georgia

# Macedonia



## 2017 European data

Inhabitants: 2.1 million
GDP per capita: \$14,914 (38 <sup>th</sup> )
Deceased donors pmp: 0.0
All organ transplantations pmp: 8.1 (35 <sup>th</sup> )
All kidney transplantations pmp: 8.1 (33 <sup>rd</sup> )
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 8.1 (13 <sup>th</sup> )

Republic of Macedonia was part of the federal state of Yugoslavia for about 45 years (1945-1990) and part of its federal health system. The care of chronic kidney disease patients was developed in university centres at Belgrade, Zagreb, Ljubljana, Rijeka and Skopje etc. Our former country proposed many ideas about the care of kidney patients, including transplantation as a final, most successful treatment. However, despite the European legislation for living and deceased donation, the introduction of kidney transplantation was difficult due to the multicultural and multiconfessional nature of our country. Thus, only the Rijeka and Sarajevo centres started to perform kidney transplantations in the early 1970's. Only after the establishment of chronic haemodialysis in the Republic of Macedonia and the introduction of Nephrology and Urology as independent specialties in Skopje, did leading professionals in both clinics begin to plan kidney transplantations. The dramatic changes destroying the Yugoslavian federation (1991) had a negative impact on the recently established Macedonian kidney transplant programme. The development of kidney transplantation in the small and developing country of 2 million inhabitants faced the difficulties in the first years after independence (1991-1992).

The first living kidney transplantation in Skopje was performed in The Clinical Centre, Medical Faculty, University St. Cyril and Methodius on July 7, 1977. The two Kosovar pairs were from an HLA identical brother to his sister and from a haploidentical father to his daughter. The first case was successful with 10 years long term graft survival. The second graft was removed due to an early thrombosis. Both transplantations were performed in collaboration with the Croatian team of Professor Vinko Franciskovic and his colleagues Dr. Zeljic

and Dr. Uravic from The Clinical Centre of Rijeka. The Macedonian surgical team was led by Ass. Prof. Dr. Ivan Vlaski (*Fig. 1.*, educated in Newcastle University Hospital, England, with Prof. Sweeney) and his colleagues Dr. Blagoja Badiev and Dr. Ljubomir Vasilev from The Urology Clinic, the team of internal medicine of Professor Dimitar Hrisoho and his colleagues Professors Georgi Masin, M. Polenakovic and Dr. Katica Zafirovska from The Nephrology Clinic, the immunology team of Assoc. Prof. Perko Kolevski and the anaesthesiology team of Professor Vladimir Andonov.

Another living donor kidney transplantation was performed 7 years later from a haploidentical mother donor to her 24-year-old son. This procedure also involved collaboration and mentorship of the urology team from Rijeka. The graft was removed several months later due to graft failure from the recurrence of the primary disease, focal segmental glomerulosclerosis.

During the first 10 years of the kidney transplantations in Macedonia, two deceased donor procurements were performed. The first in 1985 yielded one kidney that was transplanted but to surgical complications was non-functional from the beginning and was removed after two weeks. In the same year a second kidney retrieval from a deceased donor at The University Clinical Centre, Urology and Surgery Department yielded two kidneys removed by Dr. Josip Pasini from The Clinical Centre Zagreb and transplanted in Croatia.

After the pioneer efforts newly established leadership in both The Urology and The Nephrology Clinics, decided to restart the kidney transplant programme with new young people in charge. Dr. Zivko Popov, a young urologist from The Urology Clinic was sent to The Henri Mondor University Hospital, Paris for training in kidney transplant surgery under the mentorship of Professor Jean Auvert, Professor Claude Clement Abbou and Professor Dominique Chopin. Almost simultaneously Dr. Ninoslav Ivanovski went to The Nephrology Clinic, Necker University Hospital in Paris and Dr. Perko Kolevski to The Saint Luis University Hospital in Paris under the auspice of Professor Henri Kreis and Nobel Prize Winner Professor Jean Dausset, respectively. In the coming years nephrologists Dr. Angel Oncevski and Dr. Koco Chakalaroski were sent to The Edouard



**Fig. 1.**

Associate Professor Dr. Ivan Vlaski,  
Director of The Urology Clinic (1965-1987)



**Fig. 2.**

Academician Prof. Zivko Popov Director of The Urology Clinic and Kidney Transplant Centre (1995-7, 1999-2002, 2006-2012)



**Fig. 3.**

Prof. Ninoslav Ivanovski nephrologist

Herriot Hospital in Lyon and The Henri Mondor Hospital in Paris to become specialists in transplant medicine.

After two years of education, the new local team was ready to restart kidney transplantation in The Republic of Macedonia. The key were Prof. Zivko Popov, the first certified transplant surgeon (*Fig. 2.*), Prof. Ninoslav Ivanovski, the immunosuppression specialist and head of the nephrology team (*Fig. 3.*), and Prof. Perko Kolevski, who established HLA typing and histocompatibility testing (*Fig. 4.*). At the same time special units were established in their institutions. They remained in head positions in their departments for the next 25 years. Also in this period colleagues from The Anaesthesiology and Reanimation Clinic included Dr. Jovan Janculev the head of the anaesthesiology transplant team, Prof. Dr. Trajanka Trajkovska, Prof. Zore Nikolova et al.

Shortly thereafter the first deceased donor kidney retrieval was performed obtaining permission on October 30, 1987 for organ yielding the two first Macedonian patients who successfully received new kidneys. One week later a third deceased donor transplantation had a successful outcome. All transplantations experienced long graft and patient survivals. In the next two years there were 22 successful deceased donor transplantations. During this period 5 harvested kidneys were sent to other centres in Yugoslavia – Belgrade, Zagreb and Rijeka. It was the first inter centre kidney exchange in the former federation. The kidney har-

vesting demanded collaboration with the neurosurgery and anaesthesiology departments in The Clinical Centre, Skopje. Of particular importance was the role of Prof. Jovica Ugrinovski, head of The Neurosurgery Clinic, who organized organ harvest procedures. Unfortunately, the further development of the deceased donor programme was interrupted by the terrible political and war crisis in the former Yugoslavia from 1989-1994.

Due to the lack of suitable legislation in the newly independent country, the recently established Macedonian kidney team was obliged to continue the programme with living donors and rare sporadic deceased donations, comprising over 250 transplantations the next twenty years.

During the last twenty years, due to the transplant activities of the team, Professors Zivko Popov and Ninoslav Ivanovski were promoted to Associate Professors of XII University of Paris "Val de Marne" and XI Paris Sud, and UEMS/FEBS presented them honorary diplomas for transplant surgery and medicine, respectively. Several scientific international and domestic projects were done with participation of the members of the transplant team, like the HOTT project about organ trafficking (coordinator Prof. N. Ivanovski). Many articles were published in the most prestigious journals as Transplantation, Urology and Nephrology and cited in Thomson Reuters Scientific Citation Index.

In the last 6 years the transplant programme continued following the already established basic principles of transplant surgery and medicine by the residents and successors of the above team. Dr. Saso Dohcev Ph.D. is the head of the actual surgical team, with Ass. Prof. Oliver Stankov and Ass. Prof. Sotir Stavridis from the urology part and Dr. Saso Josifovski from the vascular part. The actual nephrology team consists under the leadership of Prof. Goce Spasovski of Dr. Galina Severova Ph.D. and Dr. Igor Nikolov Ph.D. Prof. Koco Dimitrovski, Dr. Dejan Trajkov and Dr. Petlickovski are part of the immunology and histocompatibility team. The head of the anaesthesiology team is Dr. Maja Mojsova Ph.D.


This team performed about 130 kidney transplants predominantly from



**Fig. 4.**

Prof. Perko Kolevski transfusiologist





living donors, but also several from deceased donors. The total number of transplantations in our country is about 380.

*Prof. Zivko Popov, M.D., Ph.D., FEBS*  
Academician, Regular Member of The Macedonian Academy  
of Sciences and Arts  
Urological and transplant surgeon  
Head of The Urology Department, Special Hospital Filip II, Skopje  
Former Head of The Urology Clinic, Clinical Centre, Medical Faculty,  
Skopje Republic of Macedonia

## References:

- The number 4 in year 2000 of the French journal *Annales d'Urologie* was dedicated to the Macedonian kidney transplantation (editor Prof. Z. Popov)
- Book chapter of Prof. G. Spasovski in *Kidney transplantation, Bioengineering and Regeneration*. (London U.K, Elseviers, 2017)



## 2017 European data

Inhabitants: 2.9 million
GDP per capita: \$9,098 (43 <sup>th</sup> )
Deceased donors pmp: 0.0
All organ transplantations pmp: 3.8 (40 <sup>th</sup> )
All kidney transplantations pmp: 3.8 (40 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 3.8 (27 <sup>th</sup> -28 <sup>th</sup> )

In modern history Armenia has been part of the Soviet Union but declared its independence in 1991. 20-25% of its nearly 3 million population are children.

Presently there are 14 haemodialysis centres including 5 in Yerevan. In 2018 nine hundred patients are undergoing haemodialysis. There is no chronic peritoneal dialysis programme. Only one institution performs kidney transplantation, the Arabkir Medical Centre, which is the national referral hospital for patients with urinary tract and renal diseases.

Initially, haemodialysis was mainly performed for acute renal failure with a few chronic patients. The organ transplantation law was adopted by the Armenian Parliament in February 2002 and revised in 2009 has been to include presumed consent. Recently Armenia has signed the Council of Europe Convention against Trafficking in Human Organs.

The first three deceased donor transplantations in Soviet Armenia were performed in the late 1970's by the group of Prof. Alexander Mikaelyan, director of the Institute of Surgery in Yerevan (*Fig. 1.*). The exact dates and names of patients are not available. According to a recent personal conversation with the former personnel



**Fig. 1.**  
Prof. Alexander Mikaelyan



**Fig. 2.**

Transplant team in 1991 (discussion of the first regular transplantation)

two kidneys rapidly failed: primary non-function and the other to rupture. The third patient displayed preserved renal function at 1 year after operation.

In the 1980's, a small series of kidney transplantations were performed by the group of Professor Ivan Aghajanyan under the supervision of Russian specialists. Unfortunately, the data are not available.

The interventions done in the 1970-80's should be considered to be pioneering attempts in Soviet Armenia, but they do not represent the real start of the Armenian transplant programme.

In fact, the history of renal replacement therapy in Armenia can be split into two main periods – before and after the earthquake of December 1988, a catastrophic event that initiated a worldwide disaster relief response. Dozens of dialysis machines reached Armenia allowing establishment of haemodialysis units. It became obvious that the inevitably growing dialysis population demanded restoration of the kidney transplant programme which had ceased in 1988.

In 1991 a regular transplant programme was initiated of Prof. Ara Babloyan. (Fig. 2.) The first successful operation was performed on May 16, 1991. A kidney from a deceased donor was transported from Saint Petersburg (Leningrad) for transplantation to a 15-year-old recipient, with end stage renal disease due to membranoproliferative glomerulonephritis (Fig. 3.). Thereafter a few kidney transplantations were performed on a regular basis.

Until 1997 all procedures utilized deceased donors from St. Petersburg (Leningrad), which was not an optimal solution. Sometimes the cold ischemia time exceeded 30 hours. With a few exceptions, the results were extremely unsatisfactory. Many kidneys showed primary non-function or rupture. Meanwhile, the independence of Armenia and the disintegration of the former Soviet Union produced a precarious political and catastrophic economic situation. Despite these unforeseen difficulties, the programme continued function for some time until the establishment of new customs regulations.

Although two living related donor transplantations were performed in 1999, the program gained strength only in 2002 with a series of procedures, performed as a twinning agreement between The Arabkir Medical Centre in Yerevan and The Antwerp University Hospital in Belgium. The success was also largely based on existing cooperation with Swiss institutions – The University Children's Hospital of Zurich (Prof. E. Leumann) and Hôpital Regional de Porrentruy (Dr. JP Bernhard) which created proper infrastructure and trained medical personnel from 1989.

The special medical issue for Armenia is a genetic disease – the familial Mediterranean fever (FMF). Renal amyloidosis is a serious complication if not prevented by colchicine. Since only a few patients with FMF received colchicine in the 1980's, patients with amyloid nephropathy constituted up to 10-15% of the entire dialysis population some 10 years ago. In order to not compromise the start of the transplant programme such patients as well as those with diabetes mellitus were not considered to be candidates for renal transplantation in 1990's due to the well-known associated posttransplant complications. Subsequently we have performed 16 kidney transplantations in FMF patients, achieving survival rates comparable to those among the general transplant population.

So far more than 170 primary and 4 retransplantations have been performed, including 11 children, the youngest being 7 years old. Tissue typing is done locally by the Armenian bone marrow registry. Immunosuppression con-



**Fig. 3.**

Surgeon Prof. Ara Babloyan with his first patient, 3 weeks after operation



**Fig. 4.**

Transplant team in 2018 (from left to right): S Babloyan (surgery), N Manoukyan (radiology), A Sarkissian (nephrology) A Babloyan (leader of the transplant program), S Arakelyan (surgery), H Nazaryan (nephrology), Kh Kyurkchyan (anesthesiology, ICU), M Hovsepyan (laboratory), M Voskanyan (nephrology)

sists of triple therapy including steroids, cyclosporine or tacrolimus, and azathioprine or mycophenolate mofetil, purchased from the governmental budget. In addition, high immunological risk patients receive induction with basiliximab. 1, 3-, 5- and 10-year graft survival rates for patients transplanted since 2002 are 96.1%, 93.4%, 92.4% and 88.5% respectively at inquiry in 2014.

The first transplant team in 1991 is shown on *Fig. 2*. There are completely different people nowadays (*Fig. 4.*), the only remaining person is the founder of the regular transplant programme in Armenia at The Medical Centre Arabkir, Prof. Ara Babloyan.

It is known that one of the most difficult problems that nephrology faces in countries with limited resources is the management of patients with renal failure. It is clearly necessary to set priorities. Renal replacement therapy obviously still ranks far behind other concerns. Kidney transplant activity in Armenia at present is far from meeting the existing demand. It should be expanded and complemented by a deceased donor programme. The transplant programme in Armenia is a good example of fruitful international cooperation. It would not have been possible to do such this work without this assistance.

*Ashot Sarkissian M.D.*

Arabkir Medical Centre, Yerevan State Medical University, Yerevan, Armenia

## References:

- Voskanyan M, Nazaryan H, Babloyan S, Geyikyan P et al: Fifteen years of living donor kidney transplantation programme in Armenia. *Nephrol Dial Transpl* 2017; 32(Suppl 3):iii723-iii724.
- Voskanyan M, Nazaryan H, Arakelyan S, Kyurkchyan K, Babloyan S, Babloyan A, Sanamyan A, Sarkissian A: Are patients with familial Mediterranean fever (FMF) good candidates for renal transplantation? *Nephrol Dial Transpl* 2015; 30 (Suppl 3): iii634–iii661.

# Luxembourg



## 2017 European data

Inhabitants: 0.6 million
GDP per capita: \$106,373 (1 <sup>st</sup> )
Deceased donors pmp: 15.0 (23 <sup>rd</sup> )
All organ transplantations pmp: 0.0
All kidney transplantations pmp: 0.0
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 0.0

At the end of 1976, the brand-new hospital building Centre Hospitalier de Luxembourg opened its doors with newly recruited staff. The following year Henry Küntziger, internist and nephrologist (*Fig. 1.*) formerly at Hôpital Necker in Paris; Stanislas Lamy surgeon and urologist (*Fig. 2.*) with transplantation training at Tulane University, and François Hentges (*Fig. 3.*) internist with laboratory training in immunology at the Inselspital Bern, drove via Brussels to Leiden with the plan to integrate a programme into the Eurotransplant community. Up to that point, Luxembourg kidney patients had been transplanted abroad, often in Belgium with kidneys donated via ET centres. One motivating idea for the project

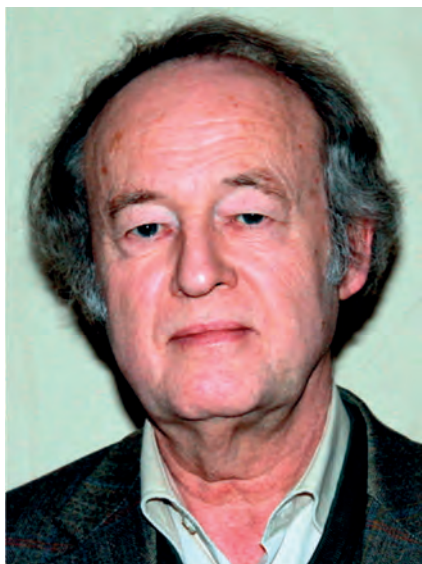


**Fig. 1.**  
Dr. Henry Küntziger



**Fig. 2.**  
Dr. Stanislas Lamy






**Fig. 3.**  
Dr. François Hentges

was to reverse the debt, that Luxembourg had in matters of organ donation. After a stop to see Prof. Alexandre at St. Luc, the team continued to Leiden where they were welcomed by Guido Persijn, who delivered a private lecture on the positive effects of blood transfusion on kidney graft survival in rhesus monkeys. After discussing the project with Bernard Cohen, the administrative director of Eurotransplant, it was agreed that Luxembourg should start with organ procurement before progressing to transplantation. With the promise that we would receive within the next days a shipment of the "Eurotransplant serum set" a condition sine qua non to obtain comparable tissue typing data for donors and recipients, the

team drove home using the old national route via Marche and Bastogne as the highway was still to come. It did not take the anaesthetists and intensive care colleagues much time to detail organ retrieval protocols. Neurologists, neurosurgeons, and the legislators from the Ministry of Health agreed on brain death criteria. The first kidney procurement and shipment took place uneventfully in Luxembourg on March, 30, 1977 and on April 4, we performed successfully two kidney donor procedures the same day.

In 1980 the first intrafamilial kidney transplantation and in 1982, the first allotransplantation were performed in Luxembourg. The cold ischemia time was 40 hours as the kidney was from New York. It had three arteries on a long patch. Thanks to a politically and administratively active Ministry of Health, the necessary legal framework was rapidly put into place. In November 1982, the Assembly Chamber passed a law defining the retrieval of substances of human origin, and in August 1983, a Grand ducal rule fixed the criteria for brain death. In the meantime, Luxembourg Transplant Society was formed to include all of the main national actors in organ transplantation. During the following years, we experienced the availability of cyclosporine in 1985, the implementation of multi-organ donation in 1987-88, as well as serial adaptations of organ donation practice, of allocation criteria and of transplantation procedures. On the immunogenetic side major changes and improvements led to evolution of acceptable mismatches, DNA typing (1991), as well as European Federation for Immunogenetics (EFI) accreditation (1999). The recruitment of transplant coor-



dinators in 1993 provided major logistical support during multi-organ donation procedures. In 1988 Henry Küntziger, a major driving force in matters of transplantation in our country, left for Paris, where he died unexpectedly in 1989.

Subsequently, hospital management priorities, and surgeons/physician professional priorities evolved, leading to the decision to close the programme in 2008 when the transplantation urologist left and was not replaced by another transplantation surgeon. Patients were again enrolled on foreign transplantation lists and organ retrieval relied on the transplantation team from Brussels. EFI accreditation was not renewed in 2016 and tissue typing is now performed at St Luc's. Considering the number of residents in Luxembourg, organ donation and transplantation were always a matter of dedication and personal investment rather than a necessity. However, since the early days of organ transplantation in Luxembourg, the number of residents has almost doubled and population statistics foresee an even faster increase in residents over the coming decades. Luxembourg Transplant with a dedicated core of nephrologists, intensive care physicians, transplant coordinators and interested surgeons is still operational, fostering organ donation, patient logistics and management. Optimists may draw hope from the famous national jumping procession of Echternach (inscribed since 2010 in the UNESCO list of Intangible Cultural Heritage of Humanity) where the dancing pilgrims advance by jumping two steps backward and three steps forward. We all hope that the steps forward will come in the near future.

*François Hentges, M.D.*

former Director of The Tissue Typing Laboratory and  
Head of the Clinical Unit of Immunology Allergology  
Centre Hospitalier de Luxembourg

## Reference:

- Together on a Life-saving Mission. The World of Eurotransplant. Eurotransplant International Foundation, Leiden, 2017 (50 years jubilee edition by Eurotransplant)

# Romania



## 2017 European data

Inhabitants: 19.7 million
GDP per capita: \$24,508 (31 <sup>st</sup> )
Deceased donors pmp: 3.3 (36 <sup>th</sup> )
All organ transplantations pmp: 10.9 (33 <sup>rd</sup> )
All kidney transplantations pmp: 7.6 (35 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 5.0 (30 <sup>th</sup> )
Living donor kidney transplantations pmp: 2.6 (31 <sup>st</sup> -32 <sup>nd</sup> )



**Fig. 1.**

Prof. Eugeniu Proca (1929-2004)

The first attempt to perform organ transplantation in Romania occurred at the beginning of the 20<sup>th</sup> century in 1905. Nicolae Florescu performed successful experimental kidney transplantations in dogs whilst working in the Laboratory of Experimental Surgery in the Bucharest Faculty of Medicine. Further experimental attempts took place in Iasi and Timisoara as part of the wider expansion of experimental surgery. In 1953, Prof. Nicolae Hortolomei and Dr. Tiberiu Ghițescu published a manuscript „Urinary conditioned reflex in experimental kidney transplantation” establishing the first academic group to investigate renal transplantation.

The first successful human kidney transplant in Romania was undertaken by Prof. Eugeniu Proca (*Fig. 1.*) on February 13, 1980 in Fundeni Hospital, using a kidney from the mother of the recipient. Shortly afterwards, the first deceased donor kidney transplant was performed in Timisoara by a team lead by Prof. Petru Dragan (*Fig. 2.*).

Up to 1997, when legislation established the infrastructure to allow the



**Fig. 2.**  
Prof. Petru Dragan (1932-2007)

first multi-organ procurement from a brain dead donor, there has been 45 living donor transplants.

At the Fundeni Hospital in Bucharest Prof. Ionel Sinescu expanded the renal transplant programme to 1200 renal grafts including 80% from living donors between 1997-2011.

At the Urology Clinic of Cluj-Napoca County Hospital (later to become the Clinical Institute of Urology and Kidney Transplantation Cluj-Napoca), Prof. Mihai Lucan established the second renal programme in Romania in 1992. He also performed the first simultaneous pancreas-kidney transplantation and established a large paediatric programme with over 110 cases by 2017. In

2000, a third renal transplantation programme was accredited in Iasi, establishing the core of the current renal transplant network. Up to 2017, over 4000 renal transplants had been performed in the three accredited Romanian centres.

Beginning in 1995, efforts to organise a national transplant network were intensified, including a protocol for the diagnosis and declaration of brain death (Prof. Dan Tulbure) and defining the medico-legal conditions to retrieve organs from deceased donors (Prof. Vladimir Belis), an effort accompanied by a strong mass-media campaign to explain the concept of brain death and to promote organ donation.

In 1997 the professional transplant association Romtransplant was founded to support the development of clinical and research activities. A year later the first transplant law was passed by the Parliament. Romania joined the Transplant Commission of the European Council in 1999, a move that facilitated the adoption of a new transplant law, which included cells and tissues. This legislation is in content with the European act of 2006. With the rapid expansion of programmes to transplant livers, islet cells and hearts, the Romanian National Transplant Agency was founded in 2004 to enable organ allocation and sharing. This body has been led by Dr. Victor Zota as Executive Director and Prof. Irinel Popescu as President of the Scientific Council.

*Cristian Lupascu, M.D., Ph.D.*  
*Eugen Tircoveanu, M.D., Ph.D.*  
*Gabriel C. Oniscu M.D., FRCS*



## 2017 European data

Inhabitants: 0.4 million
GDP per capita: \$41,944 (15 <sup>th</sup> )
Deceased donors pmp: 30.0 (5 <sup>th</sup> )
All organ transplantations pmp: 52.5 (18 <sup>th</sup> )
All kidney transplantations pmp: 52.5 (4 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 40.0 (6 <sup>th</sup> )
Living donor kidney transplantations pmp: 12.5 (9 <sup>th</sup> )



**Fig. 1.**

Dr. Victor Parsons (1929-1995)

Maltese renal transplantation started with the person of Dr. Victor Parsons (*Fig. 1.*). His initial association with Malta was during his time as a surgeon in the Royal Navy when stationed on the island. He was instrumental in helping the health department in Malta begin the renal programme including transplantation. Following training at Dulwich and King's College Hospital in London I (*Fig. 2.*) initiated the renal haemodialysis programme in Malta in 1982. Dr. Parsons paid several visits to Malta bringing Mr. Michael Bewick (*Fig. 3.*) to accompany him during one of his visits. He was a renal transplant surgeon who at that time worked at Dulwich, Guy's and King's College Hospitals.

In 1982 I presented a renal patient to Dr. Parsons and Mr. Bewick who suffered from focal segmental glomerulosclerosis, worked in the post office and was doing well on dialysis. It emerged that this patient's sister had confided to him that she was ready to give her brother a kidney. To my amazement Mr. Bewick immediately volunteered to perform the transplantation during that particular visit which had been planned to last only



**Fig. 2.**  
Dr. Louis Buhagiar

one or two days. He ascertained that the hospital had the right equipment and professional expertise. Blood was sent to Guy's Hospital for tissue typing and cross matching. He then arranged for Mr. Geoff Kiffmann who later became head of the transplant team at Guy's Hospital to come to Malta immediately to perform the harvest. All was ready within twenty-four hours. The operation was a success as reported on the front page of the next morning's papers. Mr. Bewick and Dr. Parsons left Malta the next day after the operation. I followed and managed the patient thereafter. His immunosuppressive regimen consisted only of azathioprine and prednisolone. His

postoperative course was complicated by two episodes of acute rejection which were managed with three daily doses of methylprednisolone. Subsequently he did well living in good health for nearly thirty years thereafter.

At that particular period there was a long standing dispute between the local medical profession and the government in Malta. The news was trumpeted by the government as a novelty and a remarkable achievement.

Beginning from this time we sent cadaver kidneys to the United Kingdom for British recipients when no local recipients were available or compatible. Mr. Bewick would take a quick flight to the island, harvest the kidneys and take them with him on his flight back to London for transplantation the next morning into British patients. Cooperation was close and beneficial to both parties. Mr. Bewick continued to oblige by coming to Malta each time we had couples for live renal transplantation. There was no reluctance, he always amazed me personally with his energy and commitment. He never required remuneration despite this energy and dedication. Therefore, it was an unpleasant surprise when he was prohibited from practicing renal transplantation by the General Medical Council in 1989. In my opinion he was a victim of his own selfless commitment; his urgent need was to make a patient better regardless of other considerations. Fortunately, he was allowed to resume his practice several years later. His dedication and abilities are to be commended and documented. We remember him with affection for his energy and sterling work.

By this time a Maltese surgeon Mr. Alexander Attard had returned to Malta

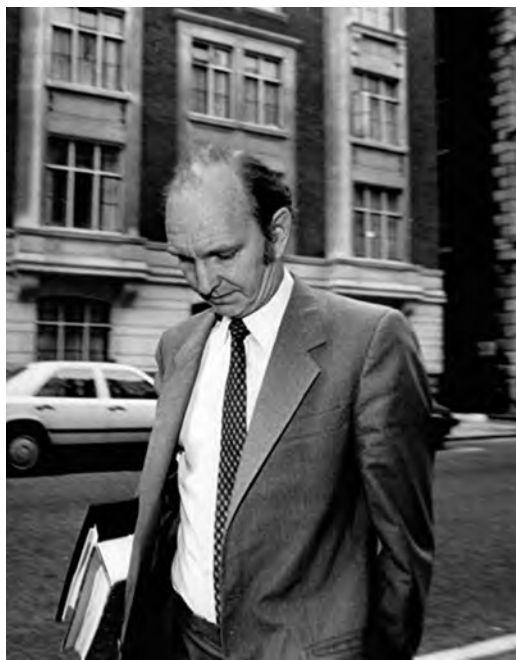


after training in Leeds, Leicester and for some time with Professor Peter Bell of the Royal Infirmary. He had sufficient experience with renal transplantation. On his return to Malta he performed renal transplantation operations with gusto and competence. Over the years he trained his assistant, Mr. Mark Schembri, who in his turn was turned a capable surgeon. To this day these are the two Maltese renal transplant surgeons. Medical follow up of the patients remained with myself as the only Maltese nephrologist for many years at that time.

The main problems with patients were infrequent immediate surgical complications, allograft rejection, as well as acute and opportunistic infections. Even at this stage we continued to depend on London Hospitals for tissue typing, cross matching and cyclosporine assays, when the latter agent started to replace or complement azathioprine for immunosuppressive treatment. In the intervening years the demand for haemodialysis and transplantation increased enormously and with herculean effort of renal nurses most of whom were trained locally on the job we could overcome this hurdle. Peritoneal dialysis came later at around 1988.

The introduction of cyclosporine in the early 1980's enabled the first cadaver donor transplantation in Malta in 1984. Since in the early days the local recipient pool was small it was not practical to HLA-match patients with cadaver donors. Despite this we would proceed with the transplantation regardless — thanks to the advent of cyclosporine. Although nowadays this practice may not be accepted in most centres, it was the only way we could proceed, to do cadaver transplantation and remove patients from dialysis. The results were satisfactory although obviously not as good as elsewhere where strict matching was required for transplantation.


We also collaborated with Italian teams from Rome and Palermo coming to harvest organs which they procured for their own use when they were not needed in Malta. So in effect most cadaver hearts, livers and pancreata went



**Fig. 3.**

Dr. Michael Bewick, transplant surgeon





to Italian recipients since these operations are not performed in Malta despite patients needing these interventions. On their part the Italian teams help with tissue typing and cross matching of patients and donors.

*Dr. Louis Buhagiar FRCP*  
Consultant Nephrologist, Mater Dei Hospital, Malta

## Reference:

- Walls J: Appreciation Rev. Dr Victor Parsons, DM, FRCP 1929-1995. Nephrol Dial Transplant (1996) 11: 904



## 2017 European data

Inhabitants: 4.1 million
GDP per capita: \$5,660 (45 <sup>th</sup> )
Deceased donors pmp: 3.9 (33 <sup>rd</sup> )
All organ transplantations pmp: 7.6 (38 <sup>th</sup> )
All kidney transplantations pmp: 4.6 (39 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 4.1 (32 <sup>nd</sup> )
Living donor kidney transplantations pmp: 0.5 (40 <sup>th</sup> )

Preparations for renal transplantation activities in the Republic of Moldova began in 1980, after the opening of the first haemodialysis unit in the Republican Clinical Hospital in Chisinau. The coordination of activities related to transplantation was performed by the Head of The Urology and Surgical Nephrology Department of The State Institute of Medicine from Chisinau, Prof. Mihai Bîrsan (Fig. 1-2.)



**Fig. 1.**

Prof. Mihai Bîrsan (right) The Chair of the Urology Department and Dr. Victor Sagatovici (left) performing a haemodialysis session on one of the first URSS dialysis machines Diahron-80 (in 1979)



**Fig. 2.**

Prof. Mihai Bîrsan (left) and Dr. Adrian Tănase, The Head of the Haemodialysis and Kidney Transplant Department discussing the patient for the first kidney transplant (1982)

Several teams of specialists had been selected to serve internships in different specialized centres in the former Soviet Union, including urologists trained in kidney retrieval from donors after cardiac arrest; urologists and nephrologists trained in the postoperative management of transplanted patients (Institute for Scientific Research in Transplantology and Artificial Organs, Moscow); medical *laboratory* scientists and immunologists qualified for *donor–recipient HLA matching* and laboratory monitoring (Institute for Scientific Research in Transplantology and Artificial Organs, Moscow; Kidney Transplant Centre, Riga, Latvia; Kidney Transplant Centre, Minsk, Belarus; Kidney Transplant Centre, Kiev, Ukraine).

According to the activity model of the Renal Transplant Centres within the former Soviet Union, several conditions

were required to open a new transplant centre: qualified specialists, including immunologists; accreditation of the transplant centre by specialists from the Institute of Scientific Research in Transplantology and Artificial Organs, Moscow; issuance of special orders and decisions by the Ministry of Health of the former Soviet Union to allow kidney retrieval from donors after cardiac arrest and renal transplant surgical expertise.

Thus, on February 22, 1982, a special order was issued by The Ministry of Health of the former Soviet Union, allowing kidney transplantation in two medical institutions in Chisinau, Moldova. On June 29, 1982, The Medical Science Council of The Ministry of Health of the former Soviet Union (Moscow) authorized the Republican Clinical Hospital in Chisinau to perform renal transplantation surgeries. Based on these documents, on August 13, 1982, the Ministry of Health of Moldova issued an order for the creation of the Renal Transplantation Centre in the Republic of Moldova. This centre was established on the basis of the haemodialysis unit of the Republican Clinical Hospital, the Organ and Tissue Typing Laboratory and the Department of Urology and Surgical Nephrology of the State Institute of Medicine in Chisinau. All transplant activities were regulated by special instructions (today guidelines), stipulating all of the steps related to the assessment of biological death, acceptance for sampling



**Fig. 3.**

Doctors who participated in the first kidney transplant and first kidney retrieval in the Republic of Moldova, from left to right – Ian Moisiuk (Moscow), Victor Sagatovici, Adrian Tănase (Chișinău)


and subsequent transplantation based on the results of HLA typing and matching. Initially, to start renal transplant surgeries in Chisinau, blood samples of the patients on the waiting list were sent to Moscow for HLA-typing and matching tests.

When all these conditions were met, on September 25, 1982 two specialists from the Moscow Transplant Institute – Pavel Filiptev and Ian Moisiuk – came urgently to Chisinau bringing two kidneys compatible for our patients (*Fig. 3-4.*). Two renal transplant interventions were performed consecutively. Together with the Moscow specialists, surgeons from Chisinau – Mihai Bîrsan, Adrian Tănase and Victor Sagatovici – performed the procedures (*Fig. 1-4.*). The recipients were a 21-year-old woman and a 23-year-old man, with only one match in the class B antigens. Both interventions were successful, showing a diuresis of 4-5 liters during the first 24 hours.



**Fig. 4.**

Pavel Filiptev (Moscow) and Adrian Tănase participants at the first kidney transplant, European Congress of Urology (1996)



After two days, on September 27, 1982, the first potential donor was selected in one of the intensive care units in Chisinau. After the signed agreement of the specialists, including the *forensic medical* physician, the first kidney retrieval was performed from a donor after cardiac arrest. The surgery was performed by Ian Moisiuk, (Moscow) and Victor Sagatovici, (Chisinau) (*Fig. 4.*). Because the first two kidneys transplanted in Chisinau were offered by colleagues from Moscow, the kidneys retrieved in Chisinau were offered to be transplanted in Moscow, as a collegial, ethical act. The kidneys were urgently sent to The Transplant Institute in Moscow by air, where they were successfully transplanted.

At the beginning of this millennium the activities in the field of transplantation ceased due to a scandal related to the trafficking in human beings for the purpose of the removal of organs involving Turkey. The evaluation of the Moldovan system for transplantation of organs, tissues and cells of human origin, became a joint programme between The European Commission and The Council of Europe during the years 2004-2006. It confirmed the actuality of the problem and the need for immediate interventions, so to overcome this situation various workshops and round tables were organized. The experts recommended to adopt a new Law on Transplantation of Human Organs, Tissues and Cells, referring to the Directive 2004/23/EC of The European Parliament and of The Council of March 31, 2004, setting standards of quality and safety for donation, procurement, testing, processing, preservation, storage and distribution of human tissues and cells. Authorities of the Republic of Moldova have carried out a series of legislative and regulatory actions and after these modifications the transplant activities for kidney (2011) and liver (2013) were successfully restarted.

*Dr. Adrian Tănase*

Department of Urology and Surgical  
Nephrology of The State University of  
Medicine and Pharmacy in Chisinau

*Dr. Igor Codreanu Ph.D, FISN*

Director, Transplant Agency,  
Chisinau Moldova

## References:

- Law on Transplantation of Human Organs, Tissues and Cells No 42-XVI of 06.03.2008 (Official Gazette No 81/273 of 25.04.2008)
- Government Decision No 386 of 14.05.2010 establishing the Transplant Agency;
- Government Decision No 1207 of 27.12.2010 approving the Regulation on the Organization and Modus Operandi of the Independent Approval Commission under the Ministry of Health and authorization criteria for the performance of procurement and transplantation activities.



2017 European data (corrected for the areas under the control of the Republic of Cyprus)

Inhabitants: 0.8 million
GDP per capita: \$37,023 (18 <sup>th</sup> )
Deceased donors pmp: 13.0 (27 <sup>th</sup> )
All organ transplantations pmp: 24.7 (28 <sup>th</sup> )
All kidney transplantations pmp: 24.7 (27 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 13.0 (27 <sup>th</sup> )
Living donor kidney transplantations pmp: 11.7 (10 <sup>th</sup> )

In response to public demand the President of the Republic of Cyprus Archbishop Makarios decided to start a small haemodialysis unit within the Department of Internal Medicine at The Nicosia General Hospital in March 1973. In 1979 another small haemodialysis unit began to operate at the Limassol General Hospital which helped to treat some Cypriot patients with end stage renal failure (ESRF).

An independent, complete Department of Nephrology was created at the Nicosia General Hospital in September 1983, after the return to Cyprus of Dr. Alkis Pierides, a Nephrologist and Associate Professor of Medicine/Nephrology at the Mayo Clinic USA. In May 1984, a benevolent association, known as the Cyprus Kidney Association (CKA) was created by renal failure patients, their families and sensitised members of the public. Its first president was the great national benefactor in Cyprus, the late Mr. Georgios Paraskevaides. With the efforts of the CKA and its president as well as Dr. Alkis Pierides, the first Kidney Transplant Centre was opened in 1986 – the Paraskevaideion. This private charitable institution supported by a histocompatibility centre whose director was Ms. Dia Papaioannou in 1986, followed by Dr. Agathi Varnavidou-Nicolaidou from 1987 to date. It was funded by donations from the Bank of Cyprus. These events enabled the return to Cyprus of the late Dr. George Kyriakides, a well-known transplant surgeon from Miami, Florida, USA, who was the first graduate of the distinguished transplant fellowship at The University of Minnesota.

On October 30, 1986 Dr. Kyriakides and his team performed the first kidney transplant, a graft from the 49-year-old mother to her daughter, a 22-year-





**Fig. 1.**

From left to right: President of the Republic of Cyprus Mr. S. Kyprianou, Minister of Health Mr. T. Pelekanos, Mr. G. Paraskevaides benefactor, Dr. A. Pierides nephrologist, Dr. G. Kyriakides transplant surgeon



**Fig. 2.**

Professor V.G. Hadjianastassiou transplant surgeon (centre), Dr. P. Loizou general surgeon (left) and Dr. N. Michael general surgeon (right)



# Ο Αντρέας Παναγιώτου μιλά στη «Σ» για τη μεταμόσχευση παγκρέατος στην οποία υποβλήθηκε

## Ξαναγεννήθηκε στα 29 του χρόνια

Είναι ο πρώτος ασθενής που δέχθηκε μόσχευμα παγκρέατος και η κατάσταση της υγείας του κρίνεται ως πολύ ικανοποιητική

ΤΗΣ ΝΑΤΑΣΙΑΣ ΕΥΡΥΛΩΟΥ

**Ο** 39χρονος Αντρέας Παναγιώτου απο-  
τελεί από προχθές την ενδοκρινική  
ενός ιατρικού επιτελείου της  
Μεταμοσχευτικής Κλινικής του Γεν-  
ικού Νοσοκομείου Λεωκωίας. Είναι ο πρώτος  
ασθενής που δέχθηκε μόσχευμα παγκρέατος  
και η κατάσταση της υγείας του είναι πολύ  
ικανοποιητική. Η «Σ» επικοινωνήσε με τον  
39χρονο Αντρέα, ο οποίος, όπως μας ανέφερε,  
είναι πολύ ενεργητικός και χαρούμενος· από  
την βόλη της καρδιάς του την οικογένειά του  
δίνει τον του χάρμα· ζωή και αισιοδοξία, για  
να προχωρήσει στη ζωή του με φυσιογνωμία,  
πάλιν, ροβώτης. Ο Αντρέας Παναγιώτου  
διαγνώστηκε λίγα μέτρα τη γέννησή του με  
διαβήτη. Από μικρός ήταν άρρωστος, μας

“  
“  
“Ανοίξα τα μάτια μου και ήρουν  
στη μοναξιά εντατικής θεραπείας.  
Δεν θυμάμαι πολλά, αλλά  
θυμάμαι τους γιατρούς και  
τους νοσηλεύτες από πάνω  
μου συνέχεια”  
”

είπε χαρακτηριστικά. Η ζωή του δεν ήταν  
φυσιογνωμική, αλλά τώρα όλα είναι διαφορετικά  
και χαίρεται να συνομιλήσει με τη «Σ».  
Πώς είναι η ζωή σου μετά τη μετα-  
μόσχευση;

Χίτες με εφίδνασαν οι γιατροί της Μεταμο-  
σχευτικής Κλινικής του Γενικού Νοσοκομείου  
και μου είχαν εστιάσει νέα, καθώς τα μα-  
θητήματα τόσο των νεφρών όσο και του παγκ-  
ρέατος λειτουργούν φυσιολογικά, όπως μου  
αναφέρθηκε. Δεν μπορώ ακόμη να πιστέψω  
ότι δεν θα χρειαστεί να περάσω στο νοσοκο-  
μείο να πάρω αμοιβαίο και ούτε μπορεί  
να φανταστώ ότι δεν θα κρατάει τις ενέσεις  
νοσηλεύτρια· «σαν φυλακισμένος».

Πώς ήταν η ζωή σου πριν από την  
επίχειρηση;  
Από τον καιρό που θυμάμαι τον παππού μου,



Ο 39ΧΡΟΝΟΣ Αντρέας Παναγιώτου δίνει στη «Σ» μαρτυρία εμπειρίας, πως οι δύσκολοι περάσαν και  
τώρα ζει από τον ίδιο με κανονική ζωή.

νόστιμα πάντα άρρωστος, διατηρήθηκα σε νη-  
πική ηλικία με διαβήτη και θυμάμαι πάντα  
τις ενέσεις ινσουλίνης· δεν προχώρησε με τη  
ζωή μου, καθώς η διαδικασία της αμοιβαίωσης  
ήταν και σκληρή και δύσκολη όλα αυτά τα  
χρόνια. Πριν από ενάμιση χρόνο οι γιατροί  
μολι ανακάλυψαν ότι οι νεφροί μου έχουν κα-  
ταποφθεί, όπως και το πάγκρεός μου. Ήμουν  
σπασμοειδής, κάποιες φορές αισιολογικός και  
συνεχίζονταν με όλα τα ενδοκρίματα. Μό-  
λις, στη ζωή μου, εκτός από τις ενέσεις ιν-  
σουλίνης, μπήκε και η διαδικασία της αμοι-  
βαίωσης, που ήταν για μένα μια δύσκολη  
διαδικασία. Τρεις φορές την εβδομάδα πήγαινα  
στο νοσοκομείο για την αμοιβαίωση, η οποία  
διαρκούσε τέσσερις ώρες. Επίσης, έλαβα δο-  
σολόγιο ινσουλίνης κάθε μέρα. Ήμουν συνήθως  
και πειναμένος να βρω δόση.

Πώς έμαθες ότι βρέθηκε δότης;

Στις 7 Ιανουάριος χρίστηκε το τηλεφώνό μου.  
Ήταν από τη μεταμοσχευτική κλινική του Γεν-  
ικού Νοσοκομείου Λεωκωίας. Μου ανέ-  
φεραν ότι βρέθηκε δότης και την ίδια μέρα,  
στις επτά το πρωί μπήκα στο χειρουργείο.

Ήμουν πολύ χαρούμενος  
φωτίζοντας την επέμβαση

Το σκέφτηκα για λίγο, αλλά ήμουν πολύ χα-  
ρούμενος. Ήξερα, ήμουν προσχεδιασμένος για  
την κατάσταση και την επέμβαση που έπρεπε  
να υποβληθώ. Μετά το τηλεφώνημα ανακάλυ-  
ψα την οικογένειά μου, τηλεφώνησα σε όλους να  
τους πω τα σχέδια. Επείγουσα τα αναγκαία  
προσωπικά αντικείμενα και πήγα στο Γενικό  
Νοσοκομείο Λεωκωίας, δεν φοβόμουν όταν  
έλπινα εκεί. Ήμυ ήμουν στους γιατρούς μου.

### Για 28 ώρες στο χειρουργείο

Ο ΕΠΙΧΕΙΡΗΜΑΤΗΣ της επέμ-  
βασης που διενεργήθηκε με μεταμόσχευ-  
ση στον Αντρέα, Δρ Βασίλειος  
Χατζηνικολαΐδης, σπερματί-  
στας η όλη διαδικασία διάρκεσε  
28 ώρες περίπου, καθώς, από  
περιλαμβανόμενης μεταμόσχευσης νε-  
φρών στον ίδιο ασθενή, όπως  
και μεταμόσχευσης του δεξιού  
νεφρού που δωρήθηκε  
από τον δότη σε άλλον ασθενή.  
«Εμείς της δωρεάς αφιέρωσαν  
από μεταμόσχευσης δότης, συ-  
μμετείχε, «δεν μπορούμε να  
έχουμε μεταμοσχευτικό πρό-  
γραμμα». Εκκαρπιαστές οπότε  
να και στην αναγέννηση του  
δότη για τον αλβανικό αν-  
δρα που πέθανε. Ο Δρ Χατζη-  
νικολαΐδης ανέφερε ότι όλες οι  
μεταμοσχεύσεις στέφθηκαν με  
επιτυχία και ότι από τη μέρα  
λειτουργίας της Κλινικής Μετα-  
μοσχεύσεων πραγματοποιή-  
σαν 38 συνολικά μεταμοσχεύ-  
σεις με 100% επιτυχία.

Πώς έζησες την επίσημη ημέρα;


Χάρω τα μάτια μου και ήμουν στη μοναξιά  
εντατικής θεραπείας. Δεν θυμάμαι πολλά,  
αλλά θυμάμαι τους γιατρούς και τους νοση-  
λεύτες από πάνω μου συνέχεια. Όταν συνήλθα  
μετά από δυο ημέρες με μετακίνησαν στη  
νεφρολογική κλινική, όπου ήδη έπαινε πολύ  
καλύτερα, σαν κανονικός. Είμαι ήδη στο  
σπίτι μου στη Λεωκωία, έχω πήγα στο Γενικό  
Νοσοκομείο Λεωκωίας για να με δουν οι  
γιατροί μου, οι οποίοι είναι πολύ ικανοποι-  
ημένοι για την κατάσταση των μοσχευμάτων  
και μου συνέστησαν να είμαι προσεκτικός  
και να λαμβάνω τη φαρμακευτική μου αγωγή,  
όπως προει-  
κό τη θεραπεία μου. Τα δόσολο-  
για μου, τώρα έχω μια κανονική ζωή  
που δεν είχα πριν γιατί ήμουν άρρωστος,  
δεν σπούδαζε, δεν έκανα πολλά...

Fig. .3.

Newspaper interview with the first SPK transplant recipient describing his experience 3 weeks  
after receiving the double transplant saying he was “Born again at 29!”

old recipient with systemic lupus erythematosus associated nephritis. This first patient died of sepsis 10 years after the transplantation. This operation was a milestone in the culture of surgery and medicine in general in Cyprus. For the next 25 years, Dr. Kyriakides and his team performed nearly 900 renal transplan-  
tations. In 2010 the Paraskevaideion closed because the Cyprus government  
decided to run the organ transplant system within the Government Hospitals.

New legislation was passed to conform to the European Union directives.  
Mr. Vassilis Georgiou Hadjianastassiou, a Consultant Surgeon at Guy's Hospital  
and Senior Lecturer (Hon) at King's College Medical School, was recruited to  
modernize the organization and delivery of the service.



Almost 25 years after the first kidney Transplant in Cyprus, a new era began at the Nicosia General Hospital with the introduction of laparoscopic live donor nephrectomies. The first procedure was performed on March 30, 2011 by Prof. Hadjianastassiou and his team. A 50-year-old woman donated to her 54-year-old husband whose end stage renal failure was due to type 1 diabetes, an HLA-A, B, DR 2-1-1 mismatch. The graft failed due to biopsy proven chronic humoral rejection after 6 years exacerbated by issues of immunosuppressive drug compliance.

Since 2011 Cyprus has witnessed an upgrade of the infrastructure of medicine; in 2011 the first medical school was inaugurated, The University of Nicosia, Medical School – followed in 2013 by the state-run University of Cyprus Medical School.

On June 8, 2012 Prof. Hadjianastassiou and his team performed the first simultaneous kidney-pancreas (SKP) transplant in Cyprus from a 22-year-old donor, whose cause of death was head injury. The HLA mismatch was 2-2-1 for the 29-year-old recipient who suffered from type 1 diabetes since the age of 1 year. The cold ischaemia times were for pancreas 10 hours and for kidney 11.5 hours. The first AB0 incompatible live donor kidney transplant was performed on September 25, 2013 by Prof. Hadjianastassiou and his team. The 58-year-old patient suffered from adult polycystic kidney disease, diabetes mellitus and a history of coronary artery bypass grafts. The donor was his 57-year-old wife whose “A” blood group was incompatible to the recipient’s blood group “O”. The HLA mismatch was 2-1-1. Both the SPK and AB0 incompatible recipients are in good health with functioning grafts free of graft rejection episodes. Nearly 200 kidney transplants have been performed in this new era since early 2011 with only 7 graft failures and 5 patient deaths (range of follow-up 8 years, median follow-up 4 years). All live donor nephrectomies have been performed laparoscopically since, without any need for open conversion to date.

In 2018, with a catchment population of 800,000 in the areas under the control of the Republic of Cyprus (excluding the Turkish occupied land in the North), there are dialysis units in all 5 major towns in Cyprus treating 700 haemodialysis and peritoneal dialysis patients, 800 kidney transplant recipients under follow-up and about 25 kidney transplants performed every year. Efforts are being made by the Ministry of Health in Cyprus to increase the deceased donation rate in the country which has been the biggest hurdle in recent years.

*Professor V.G. Hadjianastassiou*

*Dr. A. Pierides*

Department of Surgery, Medical School, The University of Nicosia

# Iceland



## 2017 European data

Inhabitants: 0.3 million
GDP per capita: \$51,841 (6 <sup>th</sup> )
Deceased donors pmp: 20.0 (16 <sup>th</sup> )
All organ transplantations pmp: 15.8 (31 <sup>st</sup> )
All kidney transplantations pmp: 26.7 (24 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 26.7 (3 <sup>rd</sup> )

Iceland is a country with only 350,000 inhabitants. Although advanced medical care is generally available, support from hospitals abroad is needed for complex, relatively infrequent surgical procedures, including organ transplantation. Icelandic patients have undergone kidney transplantation in several countries over the past decades, predominantly the Nordic countries. Organ donation in Iceland began in 1992, following passage of a legislation on the declaration of death and removal of organs for transplantation. Thereafter Icelandic healthcare authorities have had a formal collaborative agreement with a transplant centre in the Nordic region for organ procurement and transplantation, currently the Sahlgrenska University Hospital in Gothenburg, Sweden.

The first kidney transplantation on an Icelandic patient was a living donor procedure performed in the Hammersmith Hospital (London) on December 7, 1970. The 26-year-old woman (*Fig. 1.*) suffering end-stage renal disease due to glomerulonephritis, had two years earlier been the first patient to undergo dialysis in Iceland. The donor was her 29-year-old brother who shared 5 of 6 HLA antigens with his sister. The immunosuppressive therapy first comprised azathioprine and prednisolone for about a decade following by azathioprine monotherapy. Nearly half a century later the recipient is still alive with a well-functioning graft at the age of 74 years. The donor has developed chronic kidney disease stage 3b.

Approximately three years later, an Icelandic patient underwent kidney transplantation from a deceased donor at the Rigshospitalet in Copenhagen. The Rigshospitalet and the Sahlgrenska University Hospital in Gothen-



**Fig. 1.**  
The first Icelandic kidney transplant recipient

burg have since been the centres where most Icelandic patients have undergone kidney transplantation. However, the pretransplant evaluation and posttransplant management have been performed by nephrologists in Iceland. Although this collaboration has generally been successful, the travel has been a burden for the recipients, their living donors and their families.

A local living donor kidney transplantation resulted from the efforts of Johann Jonsson, an Icelandic Transplant Surgeon in the United States, in collaboration with Eirikur Jonsson, Chief of Urology, and Runolfur Palsson, Chief of Nephrology at the Landspítali – The National University Hospital of



**Fig. 2.**  
Surgeons Johann Jonsson (left) and Eirikur Jonsson (right) perform the first kidney transplant at Landspítali–The National University Hospital of Iceland.




**Fig. 3.**

Recipient (right) and donor (left) of the first kidney transplantation carried out in Iceland.

Iceland. Dr. Jonsson, who was in clinical practice at the INOVA Fairfax Hospital in Northern Virginia, was willing to visit Iceland to perform the transplant surgery in collaboration with local surgeons and nephrology staff experienced in kidney transplantation. The first procedure was carried out at the University Hospital on December 2, 2003. (*Fig. 2.*) The members of the team were Johann Jonsson, Transplant Surgeon; Eirikur Jonsson, Chief of Urology; Stefan E. Matthiasson, Chief of Vascular Surgery; Kari Hreinsson, Consultant Anesthesiologist; Runolfur Palsson, Chief of Nephrology; and Margret B. Andresdottir, Consultant Nephrologist. A 45-year-old woman with kidney failure caused by reflux nephropathy, received a kidney donated from her 54-year-old brother (*Fig. 3.*); the donor and recipient shared one HLA haplotype. This preemptive kidney transplantation followed a right-sided donor nephrectomy that was performed as an open procedure because the left kidney had two arteries. When the kidney allograft was placed in the recipient using a standard technique, it immediately began to function. The immunosuppressive therapy consisted of basiliximab induction followed by a tacrolimus-based regimen. Renal allograft function has remained stable; the patient, who recently celebrated her 60<sup>th</sup> birthday, is enjoying good health. The kidney donor remains healthy at 69 years of age.

The commencement of a living donor kidney transplant programme



has had a great impact on the provision of transplant services in Iceland, leading to a significantly increased number of living donor kidney transplants performed at The University Hospital in Reykjavik, which now totals more than 100 cases.

*Dr. Runolfur Palsson FRCP (Hon), FACP, FASN*  
Professor of Medicine, University of Iceland  
Chief, Division of Nephrology Director, Organ Transplantation Services  
Landspítali–The National University Hospital of Iceland





## 2017 European data

Inhabitants: 2.9 million
GDP per capita: \$12,506 (40 <sup>th</sup> )
Deceased donors pmp: 0.0
All organ transplantations pmp: 8.0 (36 <sup>th</sup> )
All kidney transplantations pmp: 8.0 (34 <sup>th</sup> )
Deceased donor kidney transplantations pmp: 0.0
Living donor kidney transplantations pmp: 8.0 (14 <sup>th</sup> )

The incidence of chronic kidney disease in Albania has been estimated to be 118 pmp per year, corresponding approximately to 330 new patients annually. Haemodialysis is the modality mostly used, namely a total of 880 patients undergoing this modality, including 270 treated in public and 610 in private hospitals which are paid by The Health Insurance Fund (MoH). The peritoneal dialysis program initiated in 2005 includes 50 patients.

The kidney transplant programme in Albania started in 2006. Before this, all renal transplantations were performed abroad. MoH oversees the implementation of high standards of quality and safety oversees the national law for "For organ, tissue and cell transplantation in Albania" that was approved by parliament in 2011. A deceased donor programme is not yet established in Albania. Only a living organ donor programme from family members exists; we do not have a national centre for organ donation and transplantation. The nephrology and urology services at The University Hospital Centre in Tirana are responsible for kidney transplantation: maintaining the waiting list, writing protocols for the removal of the organs from living donors in line with international protocols and designing treatment protocols after transplantation etc. with overall supervision by MoH. The number of patients on the waiting list for kidney transplantation from a potential living donor is about 30 by year. Albania has three transplant centres to perform transplantation: one public hospital in The Tirana University Hospital Centre "Mother Tereza" and two private hospitals, which are required to report to MoH yearly by the number and outcomes of transplantations, based on the decision of The Council of Ministers. Before May 21, 2014, the budget for transplantation came from the state or was supported by the Turkish





**Fig. 1.**  
Aspect during the transplantation

Government based on a bilateral agreement. Thereafter the costs have been reimbursed from The Health Insurance Fund.

The first successful kidney transplant in a public hospital in Albania was performed at The University Hospital Centre "Mother Tereza" in Tirana on March 26, 2009 with the assistance of Italian surgeons from the Pulia region as part of the INTERREG III project (Fig. 1.).

The patient was a 20-year-old woman from the Korça district, who had suffered from renal disease for less than 6 months and started dialysis treatment in October 2008. According to her mother, she had no familial history of renal diseases. The donor was her 48-year-old father.



**Fig. 2.**  
The surgical team




**Fig. 3.**  
The nephrology team

The team of doctors who performed the first transplantation was led by Prof. Mustafa Xhani and Prof. Batalia de Tono as well as Bilbil Hoxha, Aurel Janko and three anaesthetist professors: Ilir Ohri, Rudor Domi and Agim Dyrmishi (*Fig. 2.*). The five nephrologists were Prof. Nestor Tereska, Prof. Alma Idrizi, Prof. Myftar Barbullushi, Dr. Arjana Strakosha and Dr. Sulejman Kodra and immunologist Prof. Genc Sulçebe (*Fig. 3.*) completed the team. The event was reflected in the visual and written media. Prof. Xhani and the Minister of Health delivered a press conference.

Taking into account the Albanian population, the rate of kidney transplantations in Albania can be estimated about 8 per million population. From 2007, about 70 kidney transplantations were performed in Albania. Actually in Albania we follow about 240 patients who live with a functioning kidney transplantation. More than 68% of the patients are genetically related. The mean donor age is  $45.5 \pm 9.4$  years and the mean recipient age is  $32.4 \pm 18.5$  years. 88% of the kidneys are from living donors. 72.6% of the recipients are men. The posttransplant therapy is reimbursed by the state budget for all transplanted patients.

A deceased donor programme is not established in Albania. Our programme is lagging far behind international activities. In comparison with the successful regional models, the observed deficiency can be attributed to the



lack of proper organizational infrastructure for cadaveric organ retrieval as well as lack of regular public education, allocated funds for deceased donation, established registries, and highly trained transplant coordinators.

*Ass. Prof. Vjollca Durro M.D., Ph.D.*

NFP, Expert of blood transfusion and transplant  
Microbiology Department, Medical Faculty, University of Tirana



## 2017 European data

Inhabitants: 1.9 million
GDP per capita: \$12,003 (41 <sup>st</sup> )
Deceased donors pmp: N/A
All organ transplantations pmp: N/A
All kidney transplantations pmp: N/A
Deceased donor kidney transplantations pmp: N/A
Living donor kidney transplantations pmp: N/A

In 2007 the situation of medical care in Kosovo was critical given the fact that the war ended 8 years prior in 1999. The country was faced with great problems of a broken infrastructure, economic downturn and a completely destroyed health care system which had to be rebuild from scratch. In Kosovo even today there is no health insurance. The budget which the public sector can spend on medicine and free treatment of patients is limited. In daily prac-



**Fig. 1.**

The 15-year-old recipient before the operation



**Fig. 2.**

Prof. Jan Schmidt and his team during the transplantation

tice this budget – approximately 10 million Euro for 2 million inhabitants – is insufficient for even a very basic supply. The patients must buy their own medication by private means and bring it to the hospital.

Also for approximately 600 haemodialysis patients in Kosovo the situation was very problematic. There was a lack of dialysis machines, drugs, nephrologists and educated nursing staff. Terminal renal insufficiency and dialysis represent one of the greatest economic problems for medical care in Kosovo. Approximately 40% of the state budget (~ 3.5 million Euro) is spent for renal replacement therapy. In Kosovo there are 6 dialysis centres: Pristina (2), Peja, Gjilan, Prizren and Mitrovica. The university hospital and the local dialysis in the capital Pristina are the largest centres responsible for approximately 2 million inhabitants with approximately 500 000 residing in Pristina. A big difference from other Western countries: approximately 80% of dialysis patients are younger than 60 years. Their reasons for terminal renal insufficiency are frequently unclear due to the lack of diagnostic possibilities. The dialysis centre of the university clinic in Pristina has approximately 29 dialysis machines, if all of them are functioning. The Fresenius 4008 dialysis machines came to Kosovo thanks to a generous donation from the European Union. Due to the lack of replacement material,





**Fig. 3.**

The recipient three days after the transplantation at The University Pristina

technical personnel in Pristina frequently repair machines with parts of other non-functional dialyzers which further reduces the available resources. There is also a lack of disinfection material, gloves, clamps and partially even plaster and wound coverage material. The dialysis machines are hopelessly overused; dialysis usually runs 4 shifts. Because there is hepatitis serology only rarely available prior to the start of haemodialysis in the majority of patients, the number of patients becoming infected by Hepatitis B and C is high. Approximately 51% of dialysis patients are presently Hepatitis C positive. An active vaccination programme against Hepatitis B is lacking for patients and also for the nursing staff. Dialysis specific medication like erythropoietin are a pure luxury which

can be afforded only by a few patients. The life expectancy for dialysis patients in Kosovo is extremely low.

Due to an initiative of the International Society of Nephrology and the European Dialysis and Transplantation Association under Prof. Dr. Martin Zeier (Chairman of The Kidney Centre University of Heidelberg, Germany), there was a continuous support to rebuild dialysis centres in Pristina after the war. Since then there has been development of continuous contacts, visits and support between The University of Heidelberg and Pristina since 2005, including several international scientific meetings in Kosovo for the purpose to educate the local personnel and to improve the infrastructure.

In 2007, the parents of a dialyzed 15-year-old girl contacted Dr. Nexhat Miftari (at the time active Nephrologist at the Department of Nephrology, University of Heidelberg, Germany) who was born in Kosovo. Until this moment there had not been any kidney transplantation in Kosovo. The diagnostic procedures to prepare the maternal donor and recipient were performed at The University of Heidelberg in March 2007 by private sponsoring. The diagnosis was a terminal renal insufficiency of unclear aetiology, there was no renal biopsy, haemodialysis started October 20, 2006 at The University Hospital of Pristina. Diagnoses included renal anaemia and secondary hyperparathyroidism. According to the parents in October 2006 she developed a severe sore throat.



**Fig. 4.**

Follow-up at The University Heidelberg a year after the operation  
From left: Prof. Sascha Müller, Prof. Jan Schmidt, Dr. Jörg Beimler, the recipient and  
Dr. Nexhat Miftari

A local physician measured a creatinine level of 15 mg/dl and a haemoglobin of 5 g/L. Up to then she had been completely healthy. Upon questioning, the parents noticed progressive pallor over the last three years. It is noteworthy that never before had there been a blood examination of the patient. Of interest, her grandmother was receiving chronic haemodialysis for 8 years. There were no other reports of renal diseases in the family. According to the renal ultrasound at The University of Pristina, both kidneys were small, however, there were no exact measurements.

The 42-year-old mother had no previous history of disease or operations. Examinations at The University of Heidelberg showed no contraindication to the planned donation. She was completely healthy except for symptomatic cholelithiasis. Then the first living donation kidney transplantation in Kosovo in Pristina was organized with several visits by Dr. Nexhat Miftari.

All medical doctors were working on an honorary basis for five months. Dr. Miftari, Prof. Zeier and Prof. Jan Schmidt who was at that time Head of the Visceral Organ Transplantation of The University of Heidelberg and his team (Dr. Bruno Schmied, Prof. Sascha Müller and operating nurse Christine Lauterbach) travelled to Pristina to perform the first transplantation in Pristina May 23, 2007. Despite the difficult circumstances locally, the transplantation was performed



without any complications. In addition to the kidney donation the mother underwent simultaneous cholecystectomy.

The recipient is today in good shape 11 years posttransplantation. Her renal function is excellent with a creatinine value of 1.3 mg/dl. She has completed her studies to become a teacher at the local school and has married. Also her mother is doing fine with completely normal renal function. Continuous medical check-ups of the patient and her mother are performed by telemedicine and by personal visits in Pristina by Dr. Miftari. Everything continuous to be well up to the present day.

*Dr. Nexhat Miftari*

Department of Nephrology,  
The University of Heidelberg, Germany

*Professor Jan Schmidt MME*

General, Visceral and Vascular  
Surgery Hirslanden Clinics Zurich,  
Switzerland

# Montenegro

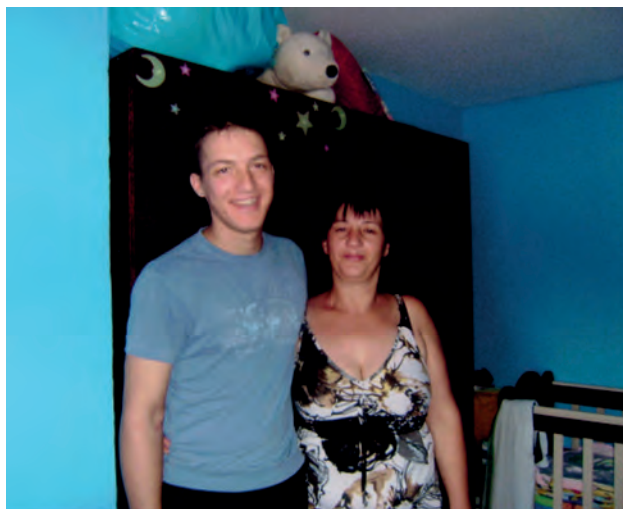


## 2017 European data

Inhabitants: 0.7 million
GDP per capita: \$17,735 (35 <sup>th</sup> )
Deceased donors pmp: N/A
All organ transplantations pmp: N/A
All kidney transplantations pmp: N/A
Deceased donor kidney transplantations pmp: N/A
Living donor kidney transplantations pmp: N/A

Montenegro which is situated in South-East Europe with a population of 680.000 citizens including 190 in 11 dialysis centres, became independent in 2006. If patients had a living related kidney donor their transplantation was performed in medical institutions in neighbouring countries – Croatia, Serbia, Bosnia and Herzegovina. However, many patients had no living related donors; their only alternative to peritoneal or haemodialysis was kidney transplantation from a deceased donor. Although Montenegro signed the Istanbul Declaration, which strictly prohibits trafficking in human organs, 15% patients underwent transplantation in countries with black markets (India, Pakistan, Russian Federation) and the others to countries where foreigners were placed on waiting lists if they could finance their transplantation. These patients returned to their homeland with various medical problems. There was no transplantation in Montenegro programme until 2012, but there were 93 patients bearing transplanted kidneys.

Preparation of all necessary conditions for the beginning of a transplantation programme in Montenegro started in 2006 with public, legal, medical, educational and international cooperation activities. In February 2011, Montenegro became a full member of the Regional Health Development Centre (RHDC) which is part of the South East European Health Network (SEEHN) based in Zagreb, Croatia. RHDC is supported by the Council of Europe, seeking to establish conditions for the development of transplantation in Southeastern Europe. Support from RHDC helped to establish collaboration between Montenegro and Croatia. The greatest role in this process belonged to Dr. Mirela Busic, the national coordinator for organ donation and transplantation in Croatia and



**Fig. 1.**

Male recipient and his maternal donor

Prof. Francis Delmonico from RHDC. They made several visits to Montenegro to organize aspects of the transplantation programme. In 2009, Montenegro adopted a law on transplantation of human body parts, organs and tissues for medical purposes, consistent with European and international guidelines. Criteria for the diagnosis and declaration of brain death were adopted in September 2012. In December 2013, the Ministry of Health drafted legislation on organ donation and transplantation including presumed consent for organ donation, which was adopted by parliament in 2016.

On September 25, 2012 the initial renal transplantations in Montenegro were performed with the support of a team from the University Hospital Centre in Zagreb, Croatia. One man (born in 1987) underwent kidney transplantation from his mother (born in 1969) (*Fig. 1.*) and one woman (born in 1989) from her mother (born in 1968) (*Fig. 2.*).

The transplant team from The Clinical Centre of Montenegro included: Marina Ratkovic M.D., Ph.D. and Branka Gledovic M.D., nephrologists; Danilo Radunovic M.D. and Vladimir Prelevic M.D., nephrology residents; Batric Babovic M.D., M.Sc., internal medicine specialist; Elvir Mucic M.D., internal medicine resident; Petar Kavaric M.D., Ph.D. and Vladimir Brajovic, M.D., urologists; Goran Marijanovic M.D. and Zoran Jovancevic M.D., anaesthesiologists; Ljubica Radunovic M.D., anaesthesiology resident; Vesna Sjekloca Ivanovic M.D., M.Sc., Srdja Ilic M.D. and Danica Raicevic M.D., radiologists. The team from The Clinical Centre Zagreb included: Zeljko Kastelan M.D., Ph.D., urologist, leader of the kidney transplant team; Nikolina Basic Jukic M.D., Ph.D., nephrologist, Josip Pasini M.D.,



**Fig. 2.**

Female recipient (left) and her donor. She also had a twin sister (right) who suffered from chronic kidney disease and was on chronic haemodialysis.

Ph.D., urologist; Marija Topalovic Grkovic M.D., anaesthesiologist; Jasna Brezak M.D., anaesthesiologist and coordinator of the cooperation between the two centres; Ivan Krhen M.D., Ph.D., Tvrtko Hudolin, M.D., Ph.D., Dinko Hauptam M.D., urologists, as well as Renata Zunec M.D., Ph.D., immunologist and Marijana Coric M.D., Ph.D., renal pathologist (*Fig. 3. and Fig. 4.*)



**Fig. 3.**

Members of the kidney transplant team




**Fig. 4.**  
Members of the kidney transplant team

Thereafter 34 kidney transplantations were successfully performed from living related donors without complications in The Clinical Centre of Montenegro by the same team.

A national waiting list of chronic haemodialysis patients suitable for kidney transplantation was derived from the 11 dialysis centres in Montenegro. A national waiting list for patients awaiting liver transplantation was also created by gastroenterohepatologists. The national waiting list for heart transplantation is in the process of establishment. The lists are maintained and updated in accordance with the recommendations of Eurotransplant.

A bilateral agreement on collaboration transplantation programmes was signed between Montenegro and Croatia on October 23, 2013. Montenegro patients who need an organ transplantation from a deceased donor, are placed on waiting lists in Croatia as well as Eurotransplant. The contract involves reciprocity, i.e. as much as Montenegro is involved in cadaveric donation to Croatia and to the Eurotransplant system, the same number of patients from Montenegro can be placed on waiting lists in Croatia to obtain a liver or a heart.

The first deceased donor for organ harvest was realized in The Clinical Centre of Montenegro on December 8, 2013, related to a cooperation with The Croatian Ministry of Health and its transplant team. A heart transplantation was successfully performed in The Clinical Centre Ljubljana, Slovenia after explanation in Podgorica, and a liver transplantation in The Clinical Hospital Centre Zagreb, Croatia. A cadaveric donor kidney transplantation was performed in



Podgorica, Montenegro for the best immunological matched patient on the kidney transplant list. Thanks to realization of deceased donors and the bilateral agreement with Croatia, two Montenegro patients subsequently underwent liver transplantation in The Clinical Hospital Centre Zagreb and another two for heart transplantation.

In conclusion, development of the national programme has significantly decreased the need for citizens of Montenegro to travel abroad for transplantation. Increased efforts of the government, other authorities and the media must be invested for physicians to improve the transplantation enterprise.

*Marina Ratkovic M.D., Ph.D.*  
nephrologist, National Coordinator  
for Organ Transplantation in Montenegro

*Danilo Radunovic M.D.*  
member of The National Committee  
for Organ Transplantation in Montenegro

*Vladimir Prelevic M.D.*  
member of The National Committee  
for Organ Transplantation in Montenegro

*"Service to society is the rent we pay for living on this planet"*

Joseph E. Murray, 1990 Nobel-laureate who performed  
the first long-term functioning kidney transplantation in the world

*"The pioneers sacrificed their scientific life to convince the medical society that this  
will become sooner or later a successful procedure... – ...it is a feeling – now I am  
going to overdo - like taking part in creation..."*

*András Németh, who performed the first  
Hungarian renal transplantation in 1962*

*"Professor Langer contributes an outstanding "service" to the field by a detailed  
recording of the history of kidney transplantation as developed throughout  
Europe. The authoritative information is assembled country by country by a  
generation of transplant professionals who knew the work of their pioneer  
predecessors. The accounting as compiled by Professor Langer becomes an  
essential and exceptional reference document that conveys the "service to society"  
that kidney transplantation has provided for all mankind and that Dr. Murray  
urged be done."*

Francis L. Delmonico, M.D.  
Professor of Surgery, Harvard Medical School,  
Massachusetts General Hospital  
Past President The Transplantation Society and the Organ Procurement  
Transplant Network (UNOS)  
Chair, WHO Task Force Organ and Tissue Donation and Transplantation

ISBN 978-963-331-476-0



9 789633 314760