

HEART SURGEON MIRO KOŠAK (1919-2010) AND HIS CONTRIBUTION TO THE DEVELOPMENT OF CARDIOVASCULAR SURGERY IN SLOVENIA

KARDIOKIRURG MIRO KOŠAK (1919.–2010.) I NJEGOV DOPRINOS RAZVOJU KARDIOVASKULARNE KIRURGIJE U SLOVENIJI

Zvonka Zupanič Slavec*, Ksenija Slavec**

SUMMARY

Heart surgeon Miro Košak was a pioneer of modern cardiovascular surgery in Slovenia; in 1958, he performed the first open-heart surgery with extracorporeal circulation, in 1965, the first implantation of heart valve and pacemaker, and in 1971, the first bypass on coronary arteries. He also paved the way for heart transplantations that followed.

Keywords: History of medicine, 20th century cardiovascular surgery, Miro Košak, Ljubljana, Slovenia.

INTRODUCTION

Miro Košak passed away in August 2010. This article brings a short review of the life and work of this exceptional cardiac surgeon, founder of cardiovascular surgery in Slovenia and former Yugoslavia, head of the Cardiovascular Surgery at Ljubljana University Medical Centre from 1961 to 1987.

* Professor Zvonka Zupanič Slavec, MD, MSci, PhD, Institute for the History of Medicine Faculty of Medicine, University of Ljubljana, Zaloška 7a, SI - 1000 Ljubljana. E-mail: zvonka.slavec@gmail.com

** Ksenija Slavec, Faculty of Medicine, University of Ljubljana. E-mail: Ksenija.slavec@gmail.com



Figure 1 Professor Miro Košak
(1919–2010)

*Slika 1. Prof. dr. Miro Košak
(1919.–2010.)*

(Photo by Vlastja Simončič)

Košak was born in 1919. He studied medicine in Ljubljana, Belgrade, and Zagreb, where he completed his studies in 1942. He first volunteered at the Ljubljana Surgery Department, and then from 1945 continued as a paid physician. In 1949, he passed a specialist exam in surgery as a student of surgeon Božidar Lavrič. In 1967, he was appointed to a teaching position in surgery at the Ljubljana University School of Medicine and received an associate professorship two years later. In 1974, he received his doctorate in vascular microsurgery. In 1961, he became the first head of the Cardiovascular Surgery Section within the Surgery Department and continued to head it after 1975, when the section was upgraded to the Department of Cardiovascular Surgery of the University Medical Centre Ljubljana. He remained in this position until retirement in 1987 (Figure 1).

Košak's career was rich and fruitful. In 1947, he was introduced to endotracheal anaesthesia in Belgrade and he introduced this method in Ljubljana. Initially he focused on thoracic surgery, but gradually shifted to cardiovascular surgery, where he started introducing work in teams. He kept abreast with international developments, introducing new technologies to his institution and promoting interdisciplinary cooperation. Košak and his associates gradually developed invasive diagnostics at the clinical laboratory and in a small X-ray section, which was officially renamed to the Section of Invasive X-Ray Diagnostics for Cardiac Diseases in 1964.

Košak worked well with internists, cardiologists, and paediatricians. In 1957, he attended a specialist training in cardiovascular surgery in Lyon and Paris (France). After returning home, he helped to design a cardiopulmonary bypass machine, which was used during the first two open heart surgeries in Yugoslavia in 1958 (Figure 2). During these surgeries, Košak assisted Božidar Lavrič. In 1964/65, Košak developed a method for inducing cardiac arrest through electric fibrillation, based on his experimental work [1]. This was followed by pioneering achievements in cardiac surgery; in 1965, he was the first in Slovenia to implant an artificial heart valve and a pacemaker. In addition, he and his colleagues gradually introduced new congenital heart defect repair procedures. Following international examples, he started performing indirect revascularisation procedures as part of postoperative treatment of ischaemic heart disease, and in 1971 he performed a coronary artery bypass using a vein graft; this was achieved only four years after the first surgery of this sort in the world. In 1973, he was the first to use internal mammary artery to bypass the coronary artery [2].



Figure 2 Preliminary experimental team work on dogs in 1957 before the first open heart operation in Ljubljana

Slika 2. Preliminarni probni timski rad na psima izveden 1957., prije prve operacije na otvorenom srcu, izvedene u Ljubljani

(Photo Vlastja Simončič)

Košak was well aware of the importance of international cooperation, and along with his colleagues he established and maintained contacts with recognised cardiac surgery centres around the world, especially in the US (e.g. in Houston, Boston, and Cleveland) [3]. Ljubljana cardiac surgery team transferred new technology and surgical techniques from these centres to Slovenia [4] (Figure 3). Košak also made the technical and logistic preparations for heart transplantation. In 1986, he performed the world's first successful cardiac autotransplantation on a patient with a malignant heart tumour [5]. He was also involved in vascular surgery and introduced the implantation of artificial aortoiliac and femoral vascular prostheses.

Košak participated in many congresses in Slovenia and abroad, and wrote articles for Slovenian and international journals. He co-authored



Figure 3 Professor DeBakey's team of 10 specialists with their hosts, members of the Ljubljana Division of Surgery, in front of the aseptic unit of Surgical Department on August 17th 1967. The guests came from the Houston Heart Centre. First row, from left: Dušan Müller, Michael DeBakey, Miro Košak and others.

Slika 3. Tim profesora DeBakeya, u kojem je bilo deset stručnjaka, sa svojim domaćinima, članovima ljubljanskog Odjela za kirurgiju, ispred sterilne jedinice Hirurške klinike 17. kolovoza 1967. Gosti su došli iz Centra za srce u Houstonu. Prvi red, slijeva: Dušan Müller, Michael DeBakey, Miro Košak i ostali

(Photo by Vlastja Simončič)

the first Slovenian surgery textbook and was also on the team that treated the former president of Yugoslavia Josip Broz Tito. Košak was an excellent teacher and researcher and received many prominent Slovenian and international awards for his work. He was a member of several international associations. In 1988, he received the Boris Kidrič Award for lifetime achievement [6].

BEGINNINGS OF HEART SURGERY IN LJUBLJANA

On the occasion of the 50th anniversary of open-heart surgery in Slovenia in 2008, Professor Košak remembered the early days in a speech reproduced below, as we can not imagine a better account of events than his own.

Cardiac surgery proper began in the 20th century. Although a German surgeon Ludwig Rehn performed the first successful suture of a stab wound to the heart as early as 1896, it was only in 1925 that Henry Souttar performed the first closed mitral commissurotomy. In 1938, Robert E. Gross performed a ligation of a persistent ductus arteriosus, and in 1944 Alfred Blalock carried out the first palliative repair of tetralogy of Fallot by performing a systemic subclavian artery–pulmonary artery anastomosis. In the 1950s, all of these procedures, including surgeries on the great vessels, were also performed at the Ljubljana University School of Medicine Surgery Department. However, it was clear from the very beginning that it would be impossible to perform major procedures inside the heart without a machine to take the place of the heart and lungs during surgery. This problem was partially solved by Clarence W. Lillehei, who introduced the first finger pump. Because there were no oxygenators available at that time, he used the child's mother's lungs instead. He used cross-circulation to pump the arterialized blood from the mother and return the same amount of the child's venous blood to the mother. This procedure was only possible for children weighing up to 20 kg because the mother's cardiopulmonary system could not bear a greater strain. Fortunately, Lillehei's colleague Richard A. DeWall soon developed a bubble oxygenator, which successfully performed the function of the heart and lungs in combination with Lillehei's pump. This was then followed by other pumps and combined with protective hypothermia.

The world's first cardiopulmonary bypass surgery was performed in 1958. In the late fall of 1956, I received a scholarship (at the initiative of Professor Božidar Lavrič) for two months of training at Professor Paul

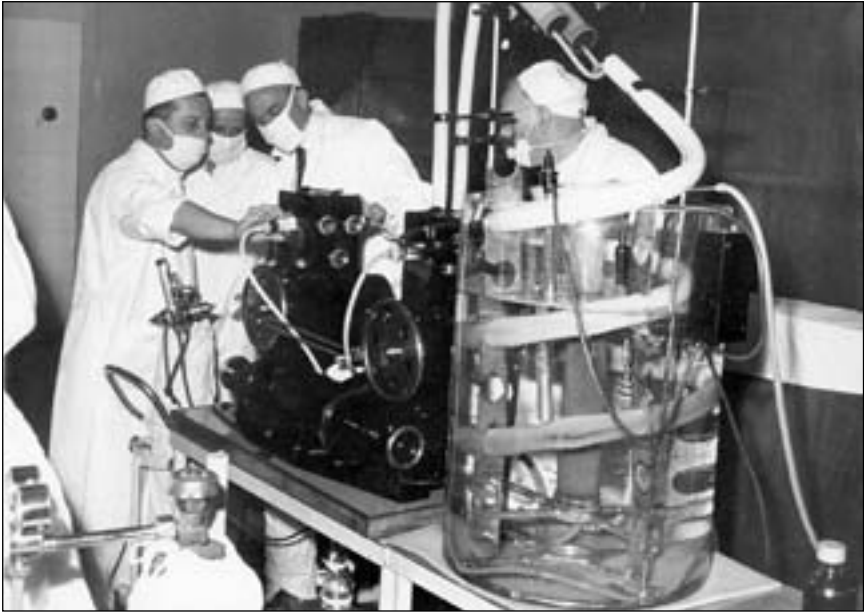


Figure 4 The 1957 Slovenian cardiopulmonary bypass machine, also known as the “heart-lung machine.” It was made at a time when purchase abroad was impossible, and was thus the result of Slovenian expertise and efforts.

Slika 4. Slovenski aparat za izvantjelesnu cirkulaciju iz 1957, poznat i pod nazivom "srce-pluća aparat". Aparat je simbol slovenske stručnosti i napora budući da je izrađen u vrijeme kada je nabava instrumenta u inozemstvu bila nemoguća.

(Photo by Vlastja Simončič)

Santy's cardiovascular clinic in Lyon, France. In the afternoons, Santy's colleague Pierre Marion had already been performing experimental procedures on dogs using Lillehei's pump. I attended these experiments regularly and diligently noted down various parameters of the machine and its tubes, and also drew sketches of it. After 6 weeks, equipped with this knowledge, I spent another 2 weeks in Paris with professors D'Allain and Dubost at Marie Lannelongue Hospital, where I was able to attend a human open-heart surgery using Lillehei's device for the first time. Unfortunately, the child did not survive due to insufficient use of anti-clotting agents. At that time, the purchase of an original device was impossible in Slovenia due to a lack of funds. Immediately after returning from France, I contacted a friend of mine, Lojze Murn, the director of Avtoobnova, a large company specializing in general overhauls of cargo vehicles. I gave him all of my documentation and sketches of the appara-

tus from Lyon and asked him for help. In a few months, a very good Lillehei-type apparatus was completed (Figure 4). In the meantime, we had already purchased all the required tubes for the pumps and the oxygenator and set up a room for animals on which experiments were to be performed. The device worked flawlessly and, after more than a year of experimenting on animals, we decided (in cooperation with Professor Lavrič) to perform a procedure using extracorporeal circulation (ECC). The procedure was performed on 23 September 1958, nearly 4 years after the first surgery of this sort. The patient, Miloš Jerlah, is still alive today.”[7].

CONCLUSION

Life and work of Professor Miro Košak was completely dedicated to heart surgery. He was among the pioneers of cardiovascular surgery in former Yugoslavia and especially in Slovenia. His collaborators Jolanda Jezernik Leskovšek, Borut Pirc, Tone Gabrijelčič, Borut Geršak, Tomislav Klokočovnik, and others continue his work, performing all kinds of heart surgery in Slovenia. The Ljubljana Department of Cardiovascular Surgery has also introduced heart surgery to the Maribor Cardiovascular Surgery Department, which has operated independently since 2001. The third Slovenian center for treating cardiovascular diseases, the Medicor Medical Centre, was established in 2003 at the Izola General Hospital on the Slovenian coast. These three centres together perform about 2,600 cardiovascular operations a year, of which 2,300 take place in Ljubljana. Slovene cardiac surgeons share own experiences with colleagues in the world all the time. They also cooperate with Croatian cardiac surgeons Željko Sutlić, Bojan Biočina, Ivan Jelić, and others from Dubrava Medical Centre (Klinični centar Dubrava) and Rebro Medical Centre (Klinični centar Rebro) in Zagreb, as though there were no border between the two countries [8].

REFERENCES

1. Soban D, Jagodic A, Gros M. Profesorju Miru Košaku ob osemdesetletnici. (To Honor Miro Košak on His 80th Birthday). *Zdrav Vestn* 2000;69:183-204.
2. Gabrijelčič T. Prof. dr. Miro Košak. *Zdrav Vestn* 1993;62:307.
3. Zupanič Slavec Z, Breclj A, Slavec K. The development of Slovenian Heart Surgery: celebrating 50 years (1958-2008). *The heart surgery forum*, 2010;13:2.

4. Šušteršič Z. Košak, Miro. In: Enciklopedija Slovenije, vol. 5. Ljubljana: Mladinska knjiga, 1991, p. 329.
5. Košak M., Gabrijelčič T., Breclj A., Eržen V., Kocbek B., Obrez I., Medvešček N., Bardorfer I., Rutar V., Ovčak Z. The first successful explantation and auto-transplantation of the heart for a recidivant cardiac tumor. In: D'Alessandro L.C. *Surgery* 1987. 2nd International Symposium on Cardiac Surgery. Casa edit, scient. Internat., Roma 345-53, 1987.
6. Breclj A. Prof. dr. Miro Košak. *Zdrav Vestn* 2005;74: (Supl. I):3-4.
7. Zupanič Slavec Z. Razvoj slovenske kirurgije srca: ob 50-letnici prve operacije na odprtem srcu (1958-2008) Development of Slovenian heart surgery: the 50th anniversary of the first open-heart surgery (1958-2008). Ljubljana: Klinični oddlek za kirurgijo srca in ožilja Univerzitetnega kliničnega centra: Department of Cardiovascular Surgery, University Medical Centre. Ljubljana, Slovenia, 2008:12-3.
8. Zupanič Slavec Z. Razvoj slovenske kirurgije srca : ob 50-letnici prve operacije na odprtem srcu (1958-2008) Development of Slovenian heart surgery: the 50th anniversary of the first open-heart surgery (1958-2008). Ljubljana: Klinični oddelek za kirurgijo srca in ožilja Univerzitetnega kliničnega centra: Department of Cardiovascular Surgery, University Medical Centre Ljubljana, Slovenia, 2008:200-1.

POVZETEK

Srčni kirurg Miro Košak je bil pionir srčno-žilne kirurgije pri Slovencih in tudi v nekdanji Jugoslaviji. Vpeljal je temeljne razvojne korake sodobne srčno-žilne kirurgije: od prve operacije na odprtem srcu 1958 z zunajtelesno cirkulacijo krvi, do prve vsaditve srčne zaklopk in srčnega spodbujevalnika 1965, nadalje uvedbe obvodnih (bypass) operacij na venčnem ožilju 1971 in tudi izvedbe priprav za transplantacijo srca.

Ključne besede: Zgodovina medicine, 20. stoletje, srčno-žilna kirurgija, Miro Košak, Ljubljana, Slovenija

SAŽETAK

Kardiokirurg Miro Košak bio je pionir slovenske kardiovaskularne kirurgije, zaslužen za uvođenje najznačajnijih dostignuća iz moderne kardiovaskularne kirurgije u operacijsku praksu: 1958. izveo je prvu operaciju na otvorenom srcu primjenom izvantjelesne cirkulacije, 1965. prvu implantaciju srčanog zaliska i srčanika, a 1971. prvi je postavio prenosnicu na koronarne arterije te otvorio put za prvu transplantaciju srca.

Ključne riječi: povijest medicine, XX. stoljeće, kardiovaskularna kirurgija, Miro Košak, Ljubljana, Slovenija