

History in Cardiology

The Great Pioneers of Coronary Artery Bypass Surgery: Is it Necessary to Ascertain Anybody the Fatherhood of CABG?

Md. Anisuzzaman¹, Nazmul Hosain¹, Md. Humayun Kabir²

¹Department of Cardiac Surgery, Chittagong Medical College, Chittagong, ²Department of Anesthesiology, Rangamati Medical College, Rangamati.

Abstract

Key Words :
Coronary artery
bypass surgery,
history, pioneer.

Coronary bypass operation is one of the greatest achievements of medical science in the 20th century. Alexis Carrel in 1910 and Arthur Vineberg in 1945 tried to perform surgical revascularization of the diseased coronary arteries. In the beginning of the 1950s many surgeons attempted experimentally to anastomose internal thoracic artery to the coronary arteries. Success was achieved simultaneously and independently by Vladimir Demikhov in Russia and Gordon Murray in Canada. Then the real success came of mammary-coronary bypass with tantalum ring by Robert H Goetz and with suture technique by Vasili I Kolesov. Then autogenous great saphenous vein used by Rene G Favaloro and others and made the procedure popular worldwide. Which contribution is greater, when medicine depends on evolution and big accomplishment reached by means of the contribution of many. There comes the interesting question who should be given the credit of introducing this major surgical procedure, and along comes the ethical issue whether any single individual should be ascertained the fatherhood of CABG or any historic event at all!

(*Cardiovasc j* 2023; 15(2): 185-188)

Background

Coronary artery bypass grafting (CABG) is the ultimate treatment of ischemic heart diseases in the modern era. It has revolutionized the management of coronary diseases saving millions of lives over the years. Introduction of the Coronary bypass operation is considered as one of the greatest achievements of medical science in the 20th century. A surgical solution for coronary ischemia was being explored by many for a long time. Among others, Alexis Carrel in 1910 and Arthur Vineberg in 1945 tried to perform surgical revascularization of the diseased coronary arteries. In the beginning of the 1950s many surgeons attempted experimentally to anastomose internal thoracic artery to the coronary arteries.

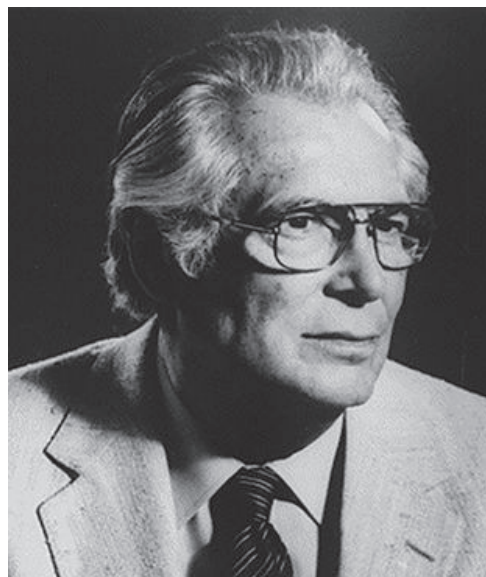


Fig.-1: Robert H. Goetz in 1989.

Address of Correspondence: Dr. Md. Anisuzzaman, Department of Cardiac Surgery, Chittagong Medical College, Chattogram, Bangladesh. E-mail: aniscts10@gmail.com.

© 2023 authors; licensed and published by International Society of Cardiovascular Ultrasound, Bangladesh Chapter and Bangladesh Society of Geriatric Cardiology. This is an Open Access article distributed under the terms of the CC BY NC 4.0 (<https://creativecommons.org/licenses/by-nc/4.0>)



Fig.-2: *Vasilii I. Kolesov in 1966.*

Goetz's Feat & Stories Behind the Iron Curtain

The first clinically successful documented CABG was performed by a German surgeon Dr Robert Hans Goetz on May 2, 1960 (Fig 1). He anastomosed the left internal mammary artery of a patient to his diseased coronary artery with the help of a tantalum ring.^{1,2} On April 4, 1962, Dr David Sabiston performed the first CABG procedure with the venous graft (unfortunately, the patient died 3 days later), but he did not report this until 1974.^{2,3} Meanwhile, significant progress was being achieved behind the iron curtain in the then Union of Soviet Socialist Republics (USSR). On February 25, 1964, Russian surgeon Dr Vasilii I Kolesov of USSR performed the first successful coronary bypass procedure by the suture technique, anastomosing the left internal thoracic artery to a coronary artery (Fig 2). He continued this practice and thus from February 26, 1964 until May 9, 1967, the department of surgery in Leningrad (Saint Petersburg) headed by Dr Kolesov was the only place in the world where CABG operations were performed. In those days of cold war, many success stories of the Soviet Union were not known to the people of the western world. Dr Kolesov's success was based on the experimental work of Dr Vladimir P. Demikhov. Dr Kolesov's seminal article, published in 1967, resembled the tip of the iceberg of the preceding experimental and clinical research done by Drs Demikhov and Kolesov in USSR.⁴ Another pioneer

CABG surgeon Dr George Green was aware of Dr Kolesov's article. On November 23, 1964, Drs Edward Garrett, Jimmy Howell and Michael DeBakey (Fig 3) performed successful CABG surgery with vein grafts as a bailout for a complicated endarterectomy, but they did not report this until 1973.⁵

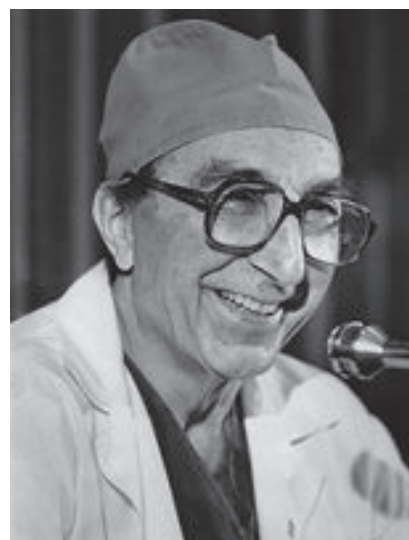


Fig.-3: *Michael DeBakey*



Fig.-4: *Rene G. Favaloro*

The Veinous Avenue

The saphenous veinous grafts has vastly outnumbered any other vascular conduit used in CABG till date. This technique was developed by Argentine surgeon Dr Rene G. Favaloro while working in Cleveland clinic. On May 9, 1967, Dr Favaloro performed the first successful coronary

artery bypass grafting surgery using saphenous vein conduits (Fig 4).⁶ On February 29, 1968, Dr Green performed his first successful CABG anastomosing the internal mammary artery to the coronary circulation. Like Dr Kolesov's famous work on the CABG procedure, Dr Goetz's pioneering effort was remarkable as it took place almost 4 years before Dr Kolesov performed a successful CABG operation in USSR, and 7 years before Dr Favaloro and 8 years before Dr Green did so in USA. Now the question arises, what then is the landmark from which the count for "the 60th anniversary of the coronary bypass operation" should begin.^{3,7}

The Moniker of CABG Fatherhood

From the Biography of Dr Favaloro, it may be mentioned, "he was always hesitant to carry the moniker 'father' of coronary artery bypass surgery." Dr Favaloro always stressed the importance of teamwork and express this remarkably well in his biographic book, "THE CHALLENGING DREAM OF HEART SURGERY, from the Pampas to Cleveland". Reading the personal account of Dr Favaloro of the events that led him to join the Cleveland Clinic team and to perform his first CABG there makes one feel the true humble greatness of his personality. Dr Favaloro always gave credit to the work of his predecessors. Would Dr Favaloro be happy to have bestowed upon him a somewhat pompous title of "the father of coronary artery bypass grafting"?⁸

What about Dr Goetz, Dr Kolesov, or other pioneers? Are they less fatherly figures to CABG? Do we need to establish the fatherhood of this surgical procedure? Dr Favaloro said, "Medicine depends on evolution, and big accomplishments in the field are reached by means of the work of many contributors. I could claim many 'firsts'. I never did, because to me 'we' is more important than 'I'. The merit of the team of the Cleveland clinic was our complete devotion to coronary revascularization since 1962. Perhaps the most important year, after our early experience in 1967, was 1968." Favaloro, Sones and their colleagues embodied one of the earliest examples of the heart team. Indeed, it was an explosive introduction of CABG with venous grafts in 1968 by the Cleveland Clinic team that finally convinced the world. The story of Rene Favaloro is almost unknown to the general public. Cristian Barnard, the cardiac surgeon who performed world's first human to human heart transplantation, is much more famous than him, although till date many more lives are saved thanks to Favaloro's work rather than to heart transplants. This paper wants to pay special tribute to a great doctor and an extraordinary man: Rene' Favaloro. It is much later that the Internal mammary arteries (IMA) were demonstrated to be the graft of choice in CABG, with a long-term patency rate unsurpassed by any other graft. Interestingly the research continues to demonstrate a histologic basis of the remarkable resistance of the IMA intima to atherosclerosis.⁹ Table-1 portrays the chronology of the clinical Coronary Artery Bypass Operations.¹⁰

Table-I
Chronology of the early days clinical CABG Operations

Date	Surgeon	Graft	Technique	Follow-Up
May 2, 1960	Goetz	RIMA	Tantalum ring	No angina at 01 year
April 4, 1962	Sabiston	Saphenous Vein	Suture	Pt diet 03 days latter
Feb 25, 1964	Kolesov	LIMA	Suture	No angina at 03 years follow-up
Nov 23, 1964	GarretDennis & DeBaKey	Saphenous Vein	Suture	No angina at 07 years follow-up
March 22, 1967	Kolesov	LIMA	Stapling	No angina at 03 years follow-up
May 9, 1967	Favaloro	Saphenous Vein	Suture	Successful
Feb 29, 1968	Green	LIMA	Suture	Successful

Conclusion:

Any major historic event usually results from the combined effort of many. No one is or was indispensable. It is highly likely that someone else would have taken the glorious role if that individual was not there. Ascertaining fatherhood to a single person is just an attempt to create a cult and doing injustice to the other contributors. These may be unnecessary political agenda, but not an essential truthful logical conclusion. These sorts of measures will be detrimental for all. It is also true for CABG procedures. Many surgeons contributed to the development of the clinical CABG procedure (Table-I). As it often happens in medicine, a personal success is, the result of teamwork and, as a rule, relies on the preceding pioneering work of the others. No one should be ascertained the fatherhood of CABG like petty politicians. It should be considered as the result of a series of efforts by many. The glorious roles of Carrel, Vinberg, Goetz, Kolessov, DeBakey, Favaloro and many others should be recognized. All have contributed their part and as a result CABG has been established as one of the highest practiced life-saving surgical procedures ever.

Conflict of Interest - None.**References:**

1. Anisuzzaman M. Heart Surgery: Past, Present and Future. LAP LAMBERT Academic Publishing, Chisinau, Moldova, 2021. ISBN: 978-620-3-92456-5.
2. Konstantinov IE. René Favaloro and the Fatherhood of the coronary bypass operation: Lest we forget. *The Journal of Thoracic and Cardiovascular Surgery*. 2019;157(1):196 -198. doi:10.1016/j.jtcvs.2018.07.051
3. Bakaeen FG, Blackstone EH, Pettersson GB, Gillinov AM, Svensson LG. The father of coronary artery bypass grafting: René Favaloro and the 50th anniversary of coronary artery bypass grafting. *The Journal of Thoracic and Cardiovascular Surgery*. 2018;155(6):2324-2328. doi:10.1016/j.jtcvs.2017.09.167
4. Konstantinov IE. Vasilii I. Kolesov: a surgeon to remember. *Tex Heart Inst J*. 2004; 31: 349-58.
5. Cooley DA. In memorium. Tribute to Rene Favaloro, Pioneer of coronary bypass. *Tex Heart Inst J*. 2000; 27: 231-232.
6. Konstantinov IE. Robert H. Goetz: The surgeon who performed the first successful clinical coronary artery bypass operation. *The Annals of Thoracic Surgery*. 2000; 69(6):1966-1972. doi:10.1016/s0003-4975(00)01264-9
7. Konstantinov IE. At the cutting edge of the impossible: a tribute to Vladimir P. Demikhov. *Tex Heart Inst J*. 2009; 36: 453-458.
8. Buratto E, Shi WY, Konstantinov IE. An Intima affair adds to the dominion of the internal thoracic artery in coronary artery bypass grafting. *The Journal of Thoracic and Cardiovascular Surgery*. 2016;151(6):1709-1710. doi:10.1016/j.jtcvs.2016.02.052
9. Konstantinov IE. The first coronary artery bypass operation and forgotten pioneers. *The Annals of Thoracic Surgery*. 1997; 64(5):1522-1523. doi:10.1016/s0003-4975(97)00928-4
10. Anisuzzaman M, Hosain N. Robert H. Goetz: A Heritage of Coronary Artery Bypass Surgery. *Bangladesh Heart J*. 2019; 34(2):132-136.