

History of Cardiology

War and the Development of Cardiac Surgery

M Kamruzzaman¹, F Amin², SN Hosain³

¹Combined Military Hospital, Dhaka. ²Department of Public health, Univ. KL Royal College of Medicine, Perak, Malaysia. ³Department of cardiac surgery, Chittagong Medical College, Chittagong.

Abstract

Despite all the devastating effects, wars have made some very significant positive impact in the development of cardiac surgery. Heart is an organ that cannot be stopped even for a minute, there by making it very difficult for the surgeons to operate. The wars of the Twentieth Century, particularly the two Great wars produced a significant number of patients with heart injury to reach surgeons' operating tables. This gave the surgeons a unique opportunity to study, operate, practice and research cardiac surgical patients. Notable names including Wilfred Bigelow, Walton Lillehei, John Gibbon, Christian Cabrol, Vasilii Kolessov and Alexander Vishnevsky all were world war veterans and utilized their wartime experience later on in the development of cardiac surgery. Had there not been the two great wars, the development of cardiac surgery would have been delayed probably by years.

(Cardiovasc. j. 2012; 4(2): 174-178)

Introduction:

'War' is the word hatred by the common people all over the world. Again war has remained the ultimate method of settling disputes between the communities and nations since the time ancient. Despite all the devastating effect of this man made disaster, war remains a reality as ever. No matter how worst the impact on mankind, wars have happened, are happening and will keep on happening in future. Ironically there are a few areas, where these detasted events had made some very significant positive contribution. One such area is the development of heart surgery. Had there not been the two great wars of Twentieth Century, probably the development of cardiac surgery would have been delayed by years.

Difficulties of Heart Surgery

Heart as an organ was always difficult territory for the surgeons and the ultimate frontier. Human heart has to pump blood every moment, 24 hours a day, 365 days a year, every year till death. If heart ever stops, the brain cells start to die with in 3 minutes. Secondly, the cavity of the heart is always filled with blood which makes it virtually impossible for the surgeons to see inside and operate, In addition, heart operation may result in inadvertent clotting of blood or entry of air in

the circulation resulting in very serious embolic problems in other organs. Moreover the position of the heart secured by the chest cage makes surgical approach very difficult. Considering all these facts, famous surgeon Stephen Paget¹ in 1895 wrote, "Surgery of the heart has probably reached the limits set by nature, no new methods and no new discovery can overcome the natural difficulties that attend a wound of the heart." But there were surgeons ready to challenge their pessimism. Ludwig Rehn² of Frankfurt, a former German hussar turned surgeon made the first successful repair of a partial depth stab wound on human heart in September 1896. This was literally the birth of cardiac surgery.

The Great Wars

Nineteenth Century was the century of inventions. A number of new inventions in Europe & America had changed the world forever. At the same time sheer competition & rivalry between the colonial forces reached the peak. The result was 2 all time worst man made catastrophes, namely the First & Second World Wars taking place in the Twentieth century. And at the end there was nothing at all, only ruins of civilization. It is estimated that more than a hundred million lives were lost in these 2 wars. The number of WW2

casualties in the then Soviet Union alone stood around 26.6 million.³ Ironically, these heavy casualties created a unique opportunity for the surgeons to operate patients otherwise never would have been possible. War front hospitals became mass center for treatment as well as research labs. As human tragedies, they were unsurpassable; but as for medicine, especially the new field of heart surgery, there was a boom. World War I began in 1914. With ill-informed commanders repeatedly relearning that bravery was no match for machine guns fired over open sites, there were unprecedented scenes of horror in the casualty-clearing stations. It is difficult to imagine the carnage. Men were driven insane by the sight and sound of it.⁴



Fig. 1: *Ludwig Rehn.*



Fig. 2: *Henry Souttar*

The War Wounds

Most soldiers with heart wounds usually die on the battlefield from the immediate trauma, from shock or blood loss. But, even though this phenomenon was a statistical rarity, the blood-

letting on the Great War's battlefields produced a substantial number of patients with bullets and metallic fragments in their hearts who survived their initial injury⁵. These wounded survivors demanded some attention because their prospects were still dismal. Although it was still thought by the medical establishment that nothing could be done, World War I would forever change the attitude of physicians towards heart surgery. Dedicated and resolute surgeons working under desperate circumstances bucked conventional medical wisdom and found innovative ways to work successfully on the heart.

But how did this shift in attitudes come about? Perhaps the story of English surgeon, Mr. George Grey Turner and his soldier patient is an ideal example⁴. Dr Turner made one of the earliest attempts to remove a bullet from a soldier's heart injured during the Battle of Cambrai at a British base hospital. Fired from 500 yards, a machine gun bullet went through the victim's left breast pocket into the heart. This was the time before the introduction of blood bank, pacemaker and antibiotics. With just primitive ether anesthesia and poor OT lighting, the lucky soldier of World War 1 operated in 1917 survived and subsequently lived through to participate also in the Second World War.

Another First World War veteran military surgeon was Dr Henry Souttar.⁶ At the outbreak of war in 1914 Souttar was appointed surgeon to the Belgian field hospital at Antwerp and for his performance, was awarded the Order of the Crown of Belgium. After the war he made an opening in the appendage of the left atrium while the heart continued beating and inserted a finger in order to explore and correct the damaged mitral valve (primitive CMC!). This was a pioneering operation. The patient survived for several years and the operation is regarded as a great landmark in cardiac surgery. Unfortunately he was only permitted to do the operation once. Souttar's physician colleagues at that time decided the procedure was not justified and he could not continue.

During the inter-war years (1918-1939) minor advances were made in France and the U.S.A. particularly in the field of valve surgery, but over all progress in heart surgery slowed down. Peace had reduced the numbers of the most challenging

kind of cardiac patients, those with bullets and splinters lodged in their hearts. Another war, however, was coming and, by greatly expanding the number of casualties with wounds to the heart, would challenge the practitioners of cardiac surgery to greater innovations. One of the greatest inventions of inter-war years was by thoracic surgeons at New York's Bellevue Hospital. They achieved scientific understanding of 'shock' & its management.⁷

The Second World War

The Second World War began on 1st September 1939 when Adolf Hitler's Germany invaded Poland. England and France immediately declared war against Germany and over the next six years all the mighty nations engaged in the worst war in human history. Just as in the First World War, the greatest breakthroughs came from dealing with the flood of casualties from the battlefields. Dr. Harken was the director of the Fifteenth Thoracic Center based at Cirencester in England. His team started to remove as many missiles as possible using a variety of the latest surgical techniques. To remove the missiles, the heart was often split wide open, with tremendous blood loss. Simultaneously rapid, massive, blood transfusions at rates up to one and one-half liters per minute were done to keep the patient alive. Penicillin, which was just beginning introduced, was often given in high dose injections. His wartime results inspired other surgeons to rethink surgical approaches to the heart.⁶

In this manner, military medicine played a major role in the successful launching of heart surgery by the late 1940s. The modern era of cardiac surgery actually began in the 50s. Many of the notable names related to this phase of development had military background and first hand experience of serving in the Second World War. It's worth mentioning the names of Canadian Dr. Wilfred Bigelow, American Dr. Walton Lillehei and Dr John Heysham Gibbon, French surgeon Dr Christian Cabrol, Russian surgeons Vasili I. Kolessov and Alexander Vishnevsky.

The Surgeons at War

Wilfred Gordon "Bill" Bigelow (June 18, 1913 – March 27, 2005) was a Canadian heart surgeon known for his role in developing the artificial

pacemaker and the use of hypothermia in open heart surgery.⁸ Bigelow served in the World War II as a Captain in the Royal Canadian Medical Army Corps, performing battle surgery on the frontlines. After the war, he was appointed to the surgical staff of Toronto General Hospital in 1947. This revolutionized the surgical approach to human heart and was an important step to make cardiac surgery possible.

Dr. Walton Lillehei completed the first successful surgical repair of a congenital heart defect on September 2, 1952. During almost four years in the Army during World War II, Lillehei served in Africa and Italy. He won several combat medals, including a Bronze Star for meritorious services and achieved the rank of lieutenant colonel. Lillehei commanded a mobile Army surgical hospital — an M.A.S.H unit. In 1945, he returned to the University of Minnesota and completed his residency. Then he was inspired to perform that historic operation, using hypothermia technique.⁹

Another mile stone in cardiac surgery was the invention of heart lung machine by Dr John Heysham Gibbon, a war veteran from the Second World War. In 1940, just before America entered World War II, he joined the U.S. Army Reserves as a Major in the medical corps. In 1942 he was sent on active duty to New Caledonia in the South Pacific. He was promoted to the rank of Lieutenant Colonel in 1944, and in 1945 after the war, acted as chief of surgical service at Mayo General Hospital in Galensburg, Illinois. On May 6, 1953, Gibbon performed the first successful open heart surgery, the repair of an atrial septal defect on an 18-year-old female, using his own heart-lung machine.¹⁰

Dr Alexander Alexandrovich Vishnevsky (*In Russian alphabet: Àëãëñàìüäð Àëãëñàìüäðîâ-Àëîíàìîñëèéñ*) a Soviet surgeon of Ukrainian descent is often credited with conducting the first heart surgery under local anesthesia. He studied the new methods on gunshot wound treatment on the Eastern Front of World War II. Later Vishnevsky was awarded several Soviet and foreign distinctions. Vasili I. Kolessov (1904–1992) is often referred to as the surgeon having performed the first successful coronary artery bypass operation. On 22nd June 1941, Germany invaded the Soviet Union. Kolessov was given the rank of Major in the Medical Corps of the Soviet Army. Within 2 months of the attack, Nazi

troops rapidly surrounded Leningrad, a city of 3 million people. The siege of the city began. In just January and February of 1942, the number of dead reached 200,000 in Leningrad due to cold and starvation. Kolessov was stranded in the besieged city and along with his team he had to perform surgery under desperate conditions. The people of Leningrad endured starvation, cold, and bombardments for 872 days, but never surrendered. After the war Kolessov left the military service in 1953 with the rank of Colonel and became the chairman of the Department of Surgery at the First Leningrad Medical Institute. He summarized his experience in treating combat injuries and wrote a few articles on the history of surgery. On 25 February 1964, Kolessov performed arguably the first successful clinical Coronary Bypass operation. The era of modern coronary surgery had begun.¹¹



Fig.-3: *Walton Lillehei*



Fig.-4: *Vasilii Kolessov*

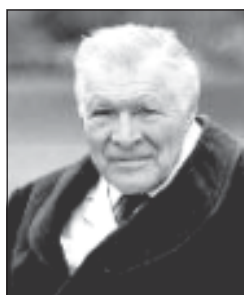


Fig.-5: *Christian Cabrol*

French surgeon Christian Cabrol played a pioneering role in the development of cardiac surgery in Europe. He took active participation as part of French resistance army in the Hitler occupied Paris. After the war he joined Hôpital la Pitié-Salpêtrière and pioneered many surgical

procedures in France and Europe including heart & heart-lung transplant. He was also elected a member of European parliament (MEP). The corresponding author of this article had the opportunity to work with him and use his library for study and research during his training at Paris. At the age of 81 Cabrol is still active.

The history of cardiac surgery in China also depicts the role of the war veteran surgeons. Cardiac surgery didn't exist in China before the Second World War. Several famous universities and hospitals were forced to move to wartime capital Chongqing, just before occupation of the city by Japan. Many Chinese physicians and surgeons were trained there during these years of turmoil. Dr Wu Ying-Kai performed the first cardiac surgery, repair of a Right Ventricular stab wound on October 1940.¹²

Conclusion:

Cardiac surgery had tremendous development in the last 6 decades. The two world wars had produced thousands of chest injury patients and created a unique opportunity for the cardiac surgeons to learn, practice, research and organize heart operations. It took fifty years for the surgeons to prove that Dr. Paget was wrong about operating on the heart and that the former soldier, Ludwig Rehn, had been on the right side of medical history. A large part of this was due to the pioneering efforts of wartime military surgeons working under desperate circumstances. They brought about revolutionary changes in the surgical approach to the heart. This was possibly one of the very few good things to come out of the suicidal conflicts that engulfed the world⁴. Had there not been the two great wars of the Twentieth Century, the development of Cardiac Surgery probably would have been delayed by years.

References:

1. Stephen Paget. *Surgery of The Chest*, E.B. Treat, 1896.
2. Blatchford JW. Ludwig Rehn: the first successful cardiography. *Ann Thorac Surg* 1985;39:492-495.
3. Michael Ellman and S. Maksudov, Soviet Deaths in the Great Patriotic War:a note-World War II- Europe Asia Studies, July 1994.

4. Alan S. Coulson, Michael E. Hanlon. War and the First Century of Heart Surgery. *Relevance* 1997 ;6 (1).
5. MacPherson, Maj. Gen. Sir W.G. et. al., History of The Great War – Medical Services of The War 1922; 1: 431.
6. Harken DE. The emergence of cardiac surgery. I. Personal recollections of the 1940s and 1950s. *J Thorac Cardiovasc Surg* 1989; 98:805–813
7. Johnson, Stephen L., The History of Cardiac Surgery, Johns Hopkins Press, 1970 : 132.
8. Bigelow WG, Callaghan JC, Hopps JA. General Hypothermia for experimental intracardiac surgery. *Ann Surg* 1950 ; 132 : 531-7.
9. Lillehei CW. A personalized history of extracorporeal circulation *Am Soc Artif Intern Organs (Transactions)* 1982; 28: 5-16.
10. Shumacker HB. A dream of the heart: the life of John H. Gibbon, Jr, father of the heart-lung machine. Santa Barbara (CA): Fithian Press; 1999.
11. AS Olearchyk, Vasilii I. Kolessov. A pioneer of coronary revascularization by internal mammary-coronary artery grafting. *Journal of Thoracic and Cardiovascular Surgery*; 96: 13-18.
12. Song Wan, MD Anthony P. C. Yim. The Evolution of Cardiovascular Surgery in China. *Ann Thorac Surg* 2003; 76 :2147– 2155.