A Brief History of Congenital Heart Surgery

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Lillehei, Lewis, and Wangensteen: The Right Mix for Giant Achievements in Cardiac Surgery
Vincent L. Gott, MD

Cardiovascular Inventiveness Within the University of Minnesota Department of Surgery
Richard DeWall, MD

Congenital Heart Disease: A Surgical-Historical Perspective
Aldo Castañeda, MD, PhD

Ludwig Rehn: The First Successful Cardiorrhaphy
James W. Blatchford, III

Evolution of Cardiopulmonary Bypass
William S. Stoney

Fifty Years of Open-Heart Surgery
Lawrence H. Cohn
Origin of Surgery

Edwin Smith Papyrus

- Ancient Egyptian medical text (~1500 BCE)
- Oldest known surgical text
- Unique among four principal medical papyri in existence
  - Other papyri are medical texts based in magic
19th Century Views on the Heart

Early 1800s: treatment for cardiac wounds:

- “absolute quiet, the application of leeches, phlebotomy, and the passage of a catheter … into the wound for the evacuation of fluid from the pericardial cavity”

- Viennese surgeon Billroth, “The surgeon who should attempt to suture a wound of the heart would lose the respect of his colleagues.”

- The Surgery of the Chest (1896): “Surgery of the heart has probably reached the limits set by Nature to all surgery: no new method, and no new discovery, can overcome the natural difficulties that attend a wound of the heart.”
1896

- William McKinley (R) defeated William Jennings Bryan (D)
- Intensely heated contest
- Deep economic recession, high unemployment, violent strikes
- McKinley outspent Bryan 5:1
Origin of Cardiac Surgery

• September 9, 1896

• Ludwig Rehn, a *self-taught* surgeon (!), repaired a stab wound suffered by 22-year-old gardener Wilhelm Justus

  – Direct suture to the heart
Rehn’s Description (1897)

“A man, aged 22, was stabbed with a knife in the fourth interspace, 3 fingerbreaths to the left of the sternal margin. After a period of unconsciousness, which lasted 3 hours, the patient revived sufficiently to take about 300 paces, when he fell to the ground. He was later found almost lifeless and was taken to the hospital...

The pericardium was opened widely and the blood within it was removed. A wound 1.5 cm long was found in the right ventricle from which there was active bleeding. This was controlled by placing a finger over the wound, but difficulty was experienced and keeping the finger properly in place...

There was less bleeding during diastole then during systole. The wound was closed with 3 silk sutures placed during several diastolic phases. The pulse was immediately improved. ... an iodoform gauze drain was placed.

The patient recovered and was able to return to work.”
Groundwork for Cardiac Surgery

• Alexis Carrel, a French surgeon developed principles of vascular anastomosis

• Influenced Blalock-Taussig shunt, coarctation repair, virtually all modern cardiac and vascular procedures

• Nobel Prize for Medicine in 1912
Closed Heart Surgery: 20th Century

• Robert Gross (Boston Children’s Hospital) ligated a patent ductus arteriosus in a 7-year-old girl (Lorraine Sweeny) on August 26, 1938

• He was then Chief Resident in Surgery

• Waited until his boss William E. Ladd (Surgeon in Chief) was on summer vacation

Lesson: never take a vacation

• Ladd never forgave Gross
Helen Taussig (1898 – 1986)

• Realized Tetralogy kids had inadequate pulmonary blood flow

• Suggested to Dr. Blalock that babies could be helped by creating an artificial ductus

• Dr. Blalock performed first subclavian-to-pulmonary artery shunt operation in a baby
1945 – 1954

- 1952, Dr Gross described atrial well technique to close atrial septal defects

- Operation was done by *palpation* (!)

- Something better needed to be developed
Heart-Lung Bypass Machines
5 Medical Centers (1950-55)

1. **Toronto**: William Mustard used isolated monkey lungs as the oxygenator

2. **Philadelphia**: John Gibbon’s machine used DeBakey roller pumps and a film oxygenator. Engineering & financial assistance from the IBM Company

3. **Detroit**: Forest Dodrill and engineers from General Motors developed a heart pump, the Dodrill-GMR (General Motors Research) heart machine

4. **Minneapolis**: Clarence Dennis had developed a rotating disc oxygenator

5. **Rochester, MN**: John Kirklin and colleagues a vertical film oxygenator and roller pumps
Rhesus Monkey Lungs (Toronto)
C.R. Cowan and William Mustard
Heart-Lung Bypass: Initial Efforts

Gibbon-IBM heart-lung machine (Philadelphia)

Dodrill-GMR heart pump (resembles Cadillac V12 engine) (Detroit)
Heart-Lung Bypass: Initial Efforts

- First attempts were a series of disasters
  1951 – 1955, 18 patients had an operation using CPB (reported)
- 17 deaths, 1 survivor
Cross Circulation (1954-55)
Bubble Oxygenator (1955-1970s)

- Early DeWall bubble oxygenator and Sigmamotor pump
- Richard DeWall, Vincent Gott
- Travenol disposable bubble oxygenator
Open Heart Surgery

In 1955–1956, only 2 hospitals in the world where open heart surgery was being done on a daily basis:

- Minneapolis, MN
- Rochester, MN
Heart Block: A Big Problem

- Pacemakers: large, external, plugged into wall outlet
- Halloween 1957: Power outage, Lillehei patient died

Earl Bakken
Thank You