Introduction to the Cardiac Catheterization Laboratory

April 16, 2010
History

- 65 yo male
- Hypertension and hyperlipidemia but no prior cardiac history
- Had sharp 7/10 back pain between his scapulae when he awoke. Took 3 ibuprofen, and then went for his regular walk with his wife. He denied any CP at the time, though he was somewhat more dyspneic on exertion than he typically would be.
- Later in the day, he experienced back pain while sitting which was now 10/10. This time pain was associated with substernal chest pressure as well as SOB and diaphoresis.
One Hour Later

- Was taken to Central Carolina Hospital in Sanford
- Had cardiac arrest while registering
- Successfully resuscitated (several teeth dislodged in process) and then given ASA, heparin, and nitro.
- Diagnosis – Acute Myocardial Infarction
- Transfer to UNC via Air Care
Coronary Angiography
Export Thrombus Extraction Catheter
Thrombus
History of Cardiac Catheterization

- 1711 – Hales conducts the first cardiac catheterization of a horse using brass pipes, a glass tube and the trachea of a goose.
- 1844 - French physiologist Bernard coins the term "cardiac catheterization" and uses catheters to record intracardiac pressures in animals.
Werner Forssmann performs first cardiac catheterization in a human - 1927

After these successful preliminary studies, I attempted the first experiment on a living human, performing the experiment on myself. … I proceeded with vena puncture in my left antebrachial vein and introduced the (ureteral) catheter to its full length of 65 cm. I only perceived some sensation of warmth similar to the sensation during intravenous ejection of calcium chloride. There was no pain. When I pushed on the catheter, I felt a warm sensation behind the clavicle and near the sternomastoid. There was also a minor stimulus to cough, probably due to irritation of a vagus branch.

I checked the catheter position radiologically, after having climbed stairs from the OR to the radiology department.
“When Schneider refused to give permission for experiments without prior research, Forssmann suggested that he would do the experiment on himself. Schneider strictly forbade any self-experiment, but Forssmann was set to go ahead with the self-experiment. He quite ingeniously deceived the scrub nurse. To get the instruments for the vena sectio, he made her an accomplice by sharing his dream with her. One day, he had successfully persuaded her to help with the vena sectio, just to see how it worked. She, however, became suspicious and insisted on being the subject. In a moment of inattentiveness, he tied the nurse to the operating table.”
History of Cardiac Catheterization

- **1940s** – Cournand and Richards study usefulness of right heart catheterization as diagnostic procedure.
Nobel Prize in Medicine or Physiology to Forssmann, Cournand and Richards - 1956

Nobel Prize Ceremony, Stockholm, December 1956.
Standing at center are (l. to r.): André Cournand, Werner Forssmann and Dickinson W. Richards.
Dr. Dehmer,

My name is Lloyd Wilson Betts. On April 7th, 1957 at the age of six, I had open heart surgery. I believe it was the first - 50 years ago.

Thanks to your catheterization Dept. finding my Pulmonary Stenosis.

My heart surgery was a success.

So also big thanks to all the staff - then & now & for the entire hospital. - Keep up the great work.

Thanks

Lloyd W. Betts
Hemodynamics

- Systolic pressure
- Dicrotic notch or incisura
- Pulse pressure
- Diastolic pressure
Hemodynamics
Left Ventricular Function
Left Ventriculogram
Coronary Angiography
Coronary Artery Disease
Lower Extremity Angiography
Renal Angiography
Aortogram
IVUS
Revascularization – Restoration of Blood Flow

- 1956 – Nobel prize
- 1959 – First coronary angiography
- 1964 – First concept of percutaneous revascularization (Charles Dotter)
- 1967 - Coronary artery bypass graft surgery (Rene Favaloro)
- 1974 - Percutaneous transluminal peripheral angioplasty (Andreas Gruentzig)
- 1977 - Percutaneous transluminal coronary angioplasty (Andreas Gruentzig).
Second Era of Cardiac Catheterization: Diagnostics + Treatment
Coronary Artery Disease
A. Gruenzig - first balloon angioplasty (1977)
Balloon Angioplasty

Deflated balloon in artery

Inflated balloon compresses plaque against artery walls
Intracoronary stents

1985 - Palmaz Stent
1986 - first intracoronary stent
1994 – FDA approval
2003 – First drug eluting stent
Peripheral Interventions
Renal Intervention
Catheter Based Therapeutics
Stations in The Cardiac Catheterization Laboratory

- Introduction to Angiograms
- Diagnostic Catheterization – Equipment and Technique
- Percutaneous Intervention – Equipment and Technique
- Electrophysiology
- Tour of the Cardiac Catheterization and Electrophysiology Laboratory
A ‘Typical’ Patient
Emergency Angiography