A Walk Through the Early Days of Interventional Radiology

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Background

► 1964 – Charles Dotter does first angioplasty
► 1967 – First coronary artery saphenous vein bypass graft
► 1967 – Introduction of Judkins technique of coronary angiography
► 1974 – Andreas Gruentzig does first balloon angioplasty
► 1985 – Dotter, Sones, Judkins, and Gruentzig die
We have come a long way...

1929 Dr. Werner Forssmann
Early Uflacker Work

Ye Olde Room
Ye Olde Equipment
Film and Darkrooms
Film and Darkrooms

- You would use fluoroscopy to position a catheter
- The technologist would do a scout film of the area for positioning AND technique
- The catheter would be hooked to the injector, patient breathing instructions given, and the noise would start
- A serial film changer would slide large film cassettes in and out of the Image Intensifier part of the C-arm rapidly, up to 4/sec
Film and Darkrooms

- Then all cassettes would be collected by the technologist and slid into the passbox to the darkroom.
- The darkroom tech would develop the film and another technologist would wait for them to drop one at a time out of the darkroom film slot (average 90 sec/film).
- The resident/fellow/physician would flush the catheter every 90 seconds waiting for the films.
- All films would then be hung on a type of rollerscope and when ready, the physician would come out of the angio room and view them.
1985

- Most VIR “departments” were called Special Procedures
- SIR, then SCVIR, was a true “old boy’s club”
- Over half of VIR fellowships included dictating coronary angiograms
- Many still performed coronary angiograms
- Neuroangiography was separate from the rest of angiography
- Diagnostic Angiography was HUGE!
1985

► Where was CT?
  - Remember CT invented in 1972!
  - Head CT was routine, but skull films were still obtained in the ER for trauma!
  - Routine body CT was a slice every 2 cm.

► Where was Ultrasound?
  - In the heart with M-mode, B-mode
  - Real time ultrasound began in 80’s
  - VA hospital suggested hiring a full-time FTE that could be an ultrasound tech half time and work in the mail room half time.

► Where was MRI?
  - Nowhere
Name: Special Procedures

Procedures: Diagnostic Angiography (Arteries and Veins), Balloon Angioplasty, Embolization, PTC and Biliary Drainage, Nephrostomy, Arthrography, IVC Filters

Staff: 1 Attending, 2 fellows, 2 residents, 7 specials techs, 1 radiology nurse

Rooms: 1 Angio room, 1 RF room

Film: Serial Film Changer, Darkroom
1985

- **Interesting facts**
  - Attending was only around for big cases although always present for “read-out”
  - Attending did not come in at night unless needed
  - Flushing catheter every 90 seconds was primary resident responsibility (while films were being run through darkroom and hung on rollerscope)
  - Balloon dilatation catheters were 7 Fr
  - Sheaths were not often used
  - IVC filter delivery sheath was 30 Fr
Trying to replace Arthrograms with Ultrasound
The Log Cabin Days
Early Venous Access

1990

- Most VIR “departments” were still called Special Procedures
- SCVIR was opened up to general membership!
- Renal, Iliac, SFA angioplasty were routine ... if you were at a VIR center
- Many still performed coronary angiograms
- Interventional Neuroangiography was beginning
- Diagnostic Angiography was ... declining.
1990

► TIPS began
► Metal stents for palliation of biliary obstruction began
  ▪ Initial BIG push for metal stents in benign and malignant disease
  ▪ About 3 years later there was rapid unanimous agreement that metal should not be used in benign disease
► IVC filters got smaller
► People were looking to use IR ideas anywhere in the body
The Golden Age


The Golden Age


Liver Casts
A Great (Very Complicated) Idea: Treatment of Dialysis Graft Pseudoaneurysms by Detachable Balloon from a Femoral Approach
Balloon on a Wire
Balloon on a Wire

- 0.035 inch hollow guidewire with a balloon on the end
- Floppy tip guidewire distal to balloon to cross lesion
- Used with a guiding catheter

So, how about balloon-through-balloon technique?
Biliary Work circa 1989
Biliary Work circa 1989
Fallopian Tube Recannalization
IVC Filters - Greenfield

24 Fr
(30 Fr Outer Diameter)
1990

- **Name:** Interventional Radiology/Angiography
- **Procedures:** Diagnostic Angiography, Balloon Angioplasty, Embolization, PTC and Biliary Drainage, Nephrostomy, Arthrography, Fallopian Tube Dilatation, TIPS, Chemoembolization, IVC Filters
- **Staff:** 2 Attendings, 2 fellows, 2 residents, 7 specials techs, 4 radiology nurses
- **Rooms:** 3 Angio room, 1 RF room
- **Film:** Serial Film Changer, Some Digital Filming Capability, Darkroom
1990

Interesting Facts

- Average TIPS in USA took 4 hours (>12 hours not unheard of)
- If balloon ruptured an iliac artery, you inflated balloon to tamponade bleeding and then fellow walked beside stretcher to the OR where patient was opened up
- Thrombolytic therapy (Urokinase) was big
- Nurses started administering Versed for sedation on a regular basis
- Neuro IR started getting big
- Detachable balloons were newest embolic material
- Using boiling contrast to treat varicocele was published
Treatment of Carotid Trauma 1990’s
IVC Filter – Simon Nitinol, Bird’s Nest, Vena Tech

9 Fr Delivery System

12 Fr Delivery System

11 Fr Delivery System
Early Ports circa 1993
1995 (Private Practice)

- **Name:** Interventional Radiology
- **Procedures:** Diagnostic Angiography, Balloon Angioplasty, Stent Placement, Embolization, PTC and Biliary Drainage, Nephrostomy, Arthrography, Spine Procedures, TIPS, Chemoembolization, IVC Filters
- **Staff:** 4 Attendings, 5 specials techs, 5 radiology nurses
- **Rooms:** 2 Angio room, 1 RF room
- **Film:** Serial Film Changer, More Digital Filming Capability, Darkroom
1995

Interesting Facts

- Venous access was starting, but surgeons would not let radiologists place IJ tunneled catheters
- Arm ports were main venous procedure
- Live demonstrations became big at meetings
- HI-IQ entered phase III to become a national database
1st Stent-Grafts at MUSC
CT got a lot better
Name: Vascular/Interventional Radiology

Procedures: Diagnostic Angiography, Balloon Angioplasty, Stent Placement, Aortic Stent-Graft, Embolization, Uterine Artery Embolization, Endovenous Laser Ablation, PTC and Biliary Drainage, Nephrostomy, TIPS, Chemoembolization, RFA, Cryoablation, IVC Filters

Staff: 3 Attendings, 2 fellows, 2 residents, 5 specials techs, 5 radiology nurses

Rooms: 1 1/2 Angio room, 1 RF room

Film: Serial Film Changer, Digital Filming Capability, Darkroom
2000

Interesting Facts:

- The days of the darkroom were numbered
- Carotid stenting caught Medicare’s attention
- Microcatheters became commonplace
- VIR becomes more evolutionary rather than revolutionary
2015

- Name: Vascular/Interventional Radiology (for now)
- Procedures: Diagnostic Angiography, Balloon Angioplasty, Stent Placement, Aortic Stent-Graft, Embolization, Uterine Artery Embolization, Endovenous Laser Ablation, PTC and Biliary Drainage, Nephrostomy, TIPS, Chemoembolization, RFA, Cryoablation, IVC Filters, Radioembolization, Kyphoplasty, Venous Access
- Staff: 7 Attendings, 4 fellows, 2 residents, 8 specials techs, 8 radiology nurses
- Rooms: 6 Angio rooms, 2 CT rooms, 1 Hybrid OR
- Film: All Digital Filming Capability, Replacing Image Intensifiers with flat panels
2015

► All angio rooms capable of rotational angiography
► 2 angio rooms capable of reconstructing in CT format with quality equivalent to 1990 CT
► 1 angio room with X-ray C-arm capable of moving around floor of room using GPS
► Procedures on the horizon: Prostate Embolization, Gastric Embolization
Take Home Message

► Vascular/Interventional Radiology is number one among all medical specialties in its emphasis on innovation

► Over 1/3 of all procedures I learned as a resident are extinct!

► Over 1/3 of all procedures I do now did not exist when I was a resident

► Expect it to be the same for you!