

IR Team Concept: “Changing times, Redefining roles”

Jafar Golzarian

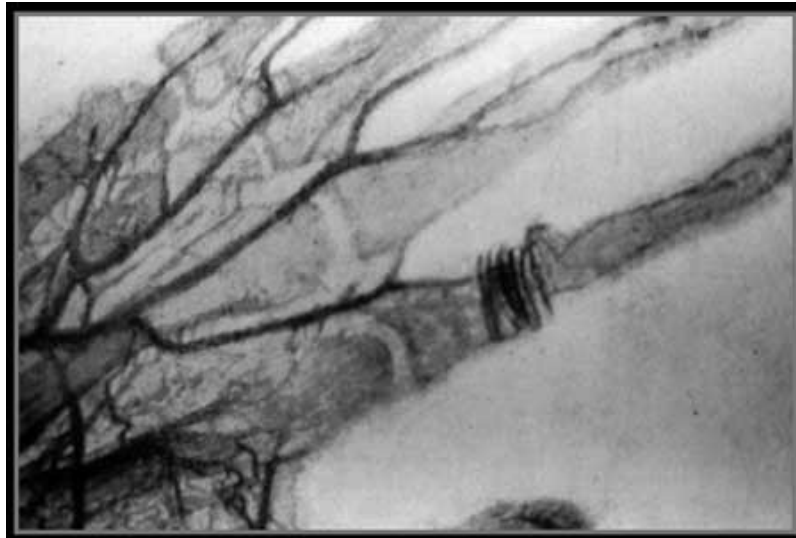
Professor of radiology and Surgery

University of Minnesota



1896

- The first angiogram was performed only months after Roentgen's discovery
- Two physicians injected chalk or mercury salts into an amputated hand and created an image of the arteries



- Post-mortem injection of mercury compounds, January 1896

Kassabian MK
Roentgenrays and electrotherapeutics
JB Lipincott 1907 Philadelphia

- Mihran Kassabian wrote:

I have studied the blood vessels of infants and adults by injecting them a substance opaque to the x-rays. The substance used is a concentrated emulsion of bismuth subnitrate, a strong solution of litharge or metallic mercury.

In order to demonstrate sharply the arterial tree, the injection must be done carefully and slowly.

Berberich J, Hirsh S

*Die Roentgenradiographische Darstellung der Arterien und
Venen am Lebenden*

Muenchen Klin Wsch 2:2226-2228, 1923

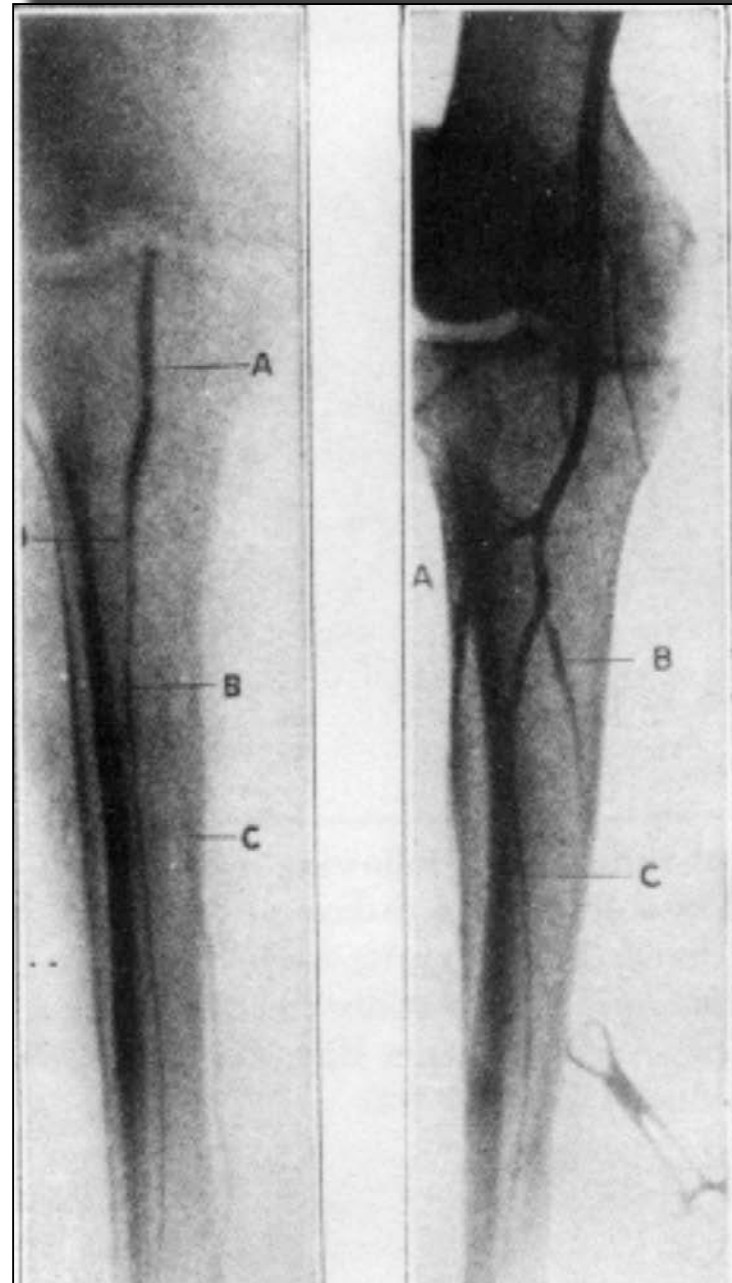


Sicard JA, Forestier G

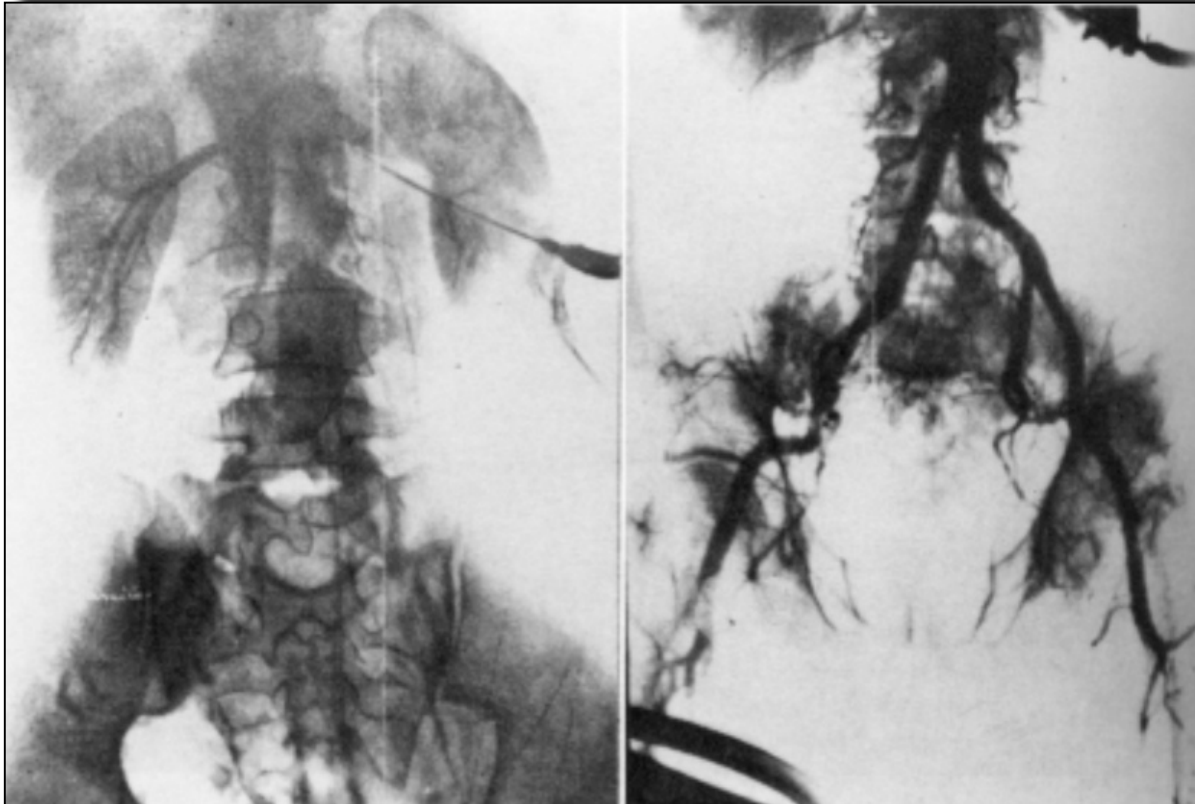
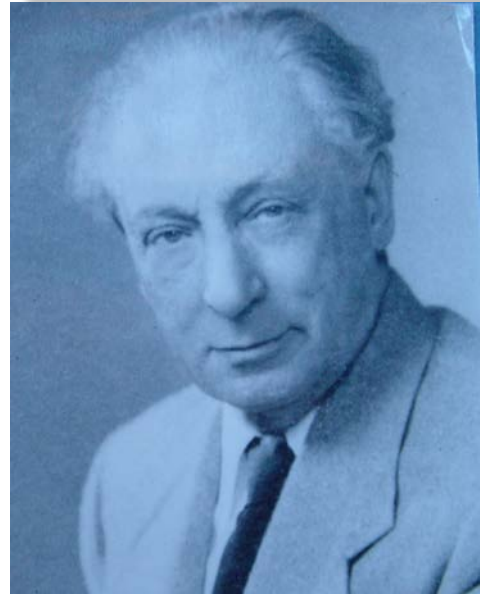
*Injection intravasculaire d 'huile iodée sous contrôle
radiologique*

CR Soc Biologie(Paris) 88:1200-1202, 1923

Brooks B
*Intra-arterial injection of
sodium iodid*
JAMA 82:1016-1019,
1924



Dos Santos R, Lamas, Peirera-Caldes J
Arteriographia da aorta e dos vasos abdominalis
Med contemp 47:93-97, 1929



Forssmann W

Die Sondierung des Rechten Herzens

Klin Wschr 8: 2085-2087, 1929

- In 1929 in a small hospital in Eberswald Germany Werner Forssmann, a young surgical resident, anesthetized **his own elbow**, inserted a catheter in his antecubital vein and, catheter dangling from his arm, proceeded to a basement x-ray room where he documented the **catheter's position in his right atrium** — proving that a catheter could be inserted safely into a human heart.
- Forssmann's goal was to find a safe way to **inject drugs for cardiac resuscitation**. He was determined that catheterization was the key, but it was believed at the time that any entry into the heart would be fatal. Forssmann **was immediately fired for his self-experimentation, despite the significance of his discovery**. The popular press acclaimed his work, but the medical establishment branded him as crazy, scorning him and ignoring his work for over a decade.

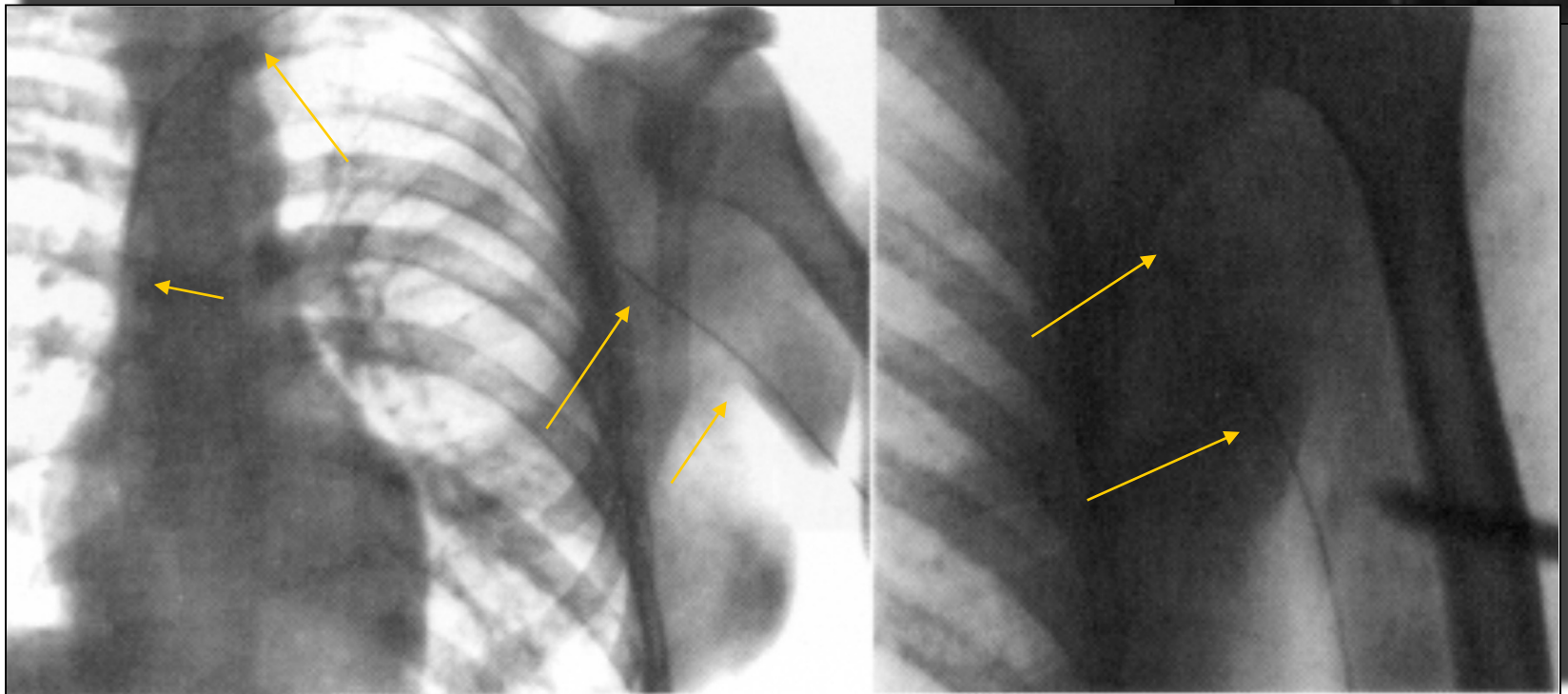
Forssmann

- He continued to experiment with catheterization in dogs and it is alleged that he stopped self-experimentation only when he had used all of his veins with 17 cut downs. Discouraged by his lack of acceptance in cardiology he switched to urology and eventually became a country doctor. He never returned to cardiology research but was awarded a Nobel Prize in 1956 (along with cardiology innovators Cournand and Richards) for his pioneering efforts.

Forssmann W

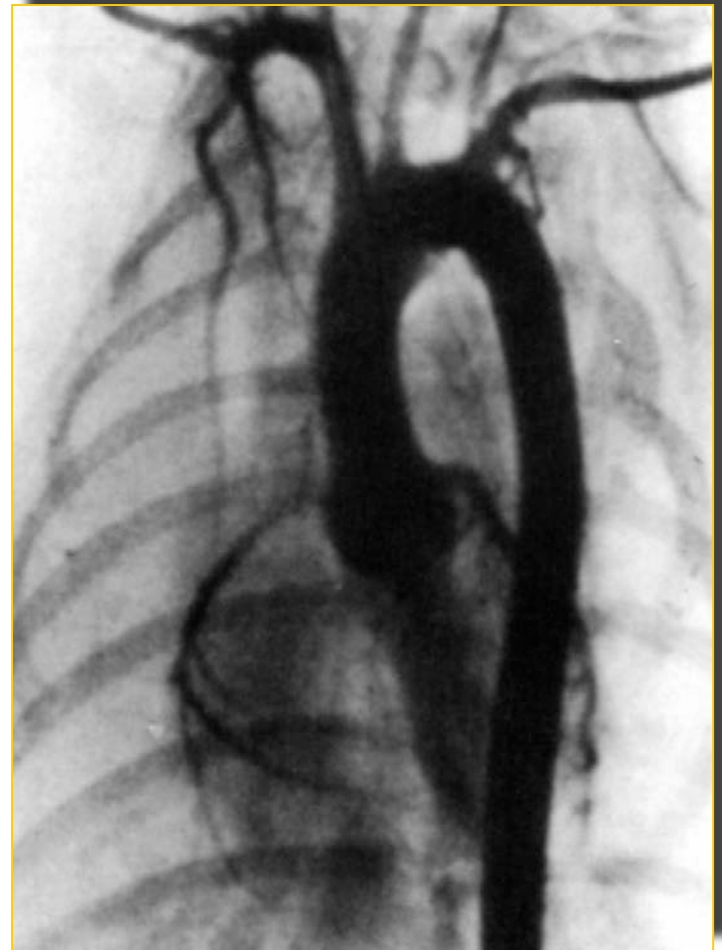
Die Sondierung des Rechten Herzens

Klin Wschr 8: 2085-2087, 1929



Rousthoi P

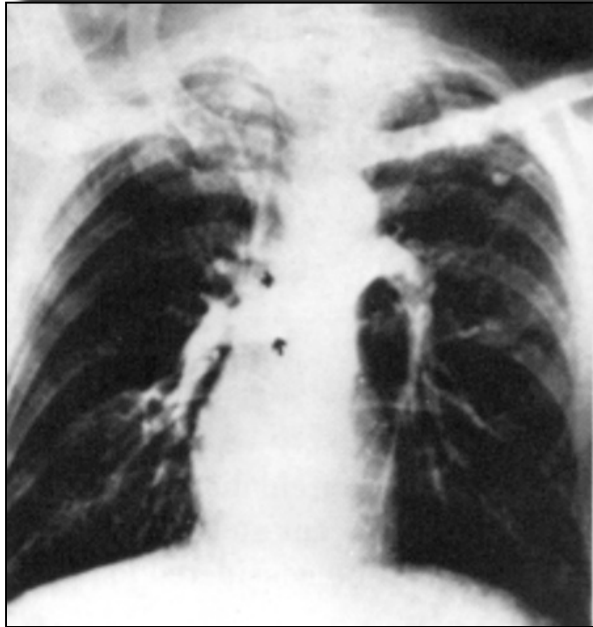
Über Angiokardiographie. Vorläufige Mitteilung
Acta Radiologica 14:421-423, 1933



Robb GP, Steinberg I

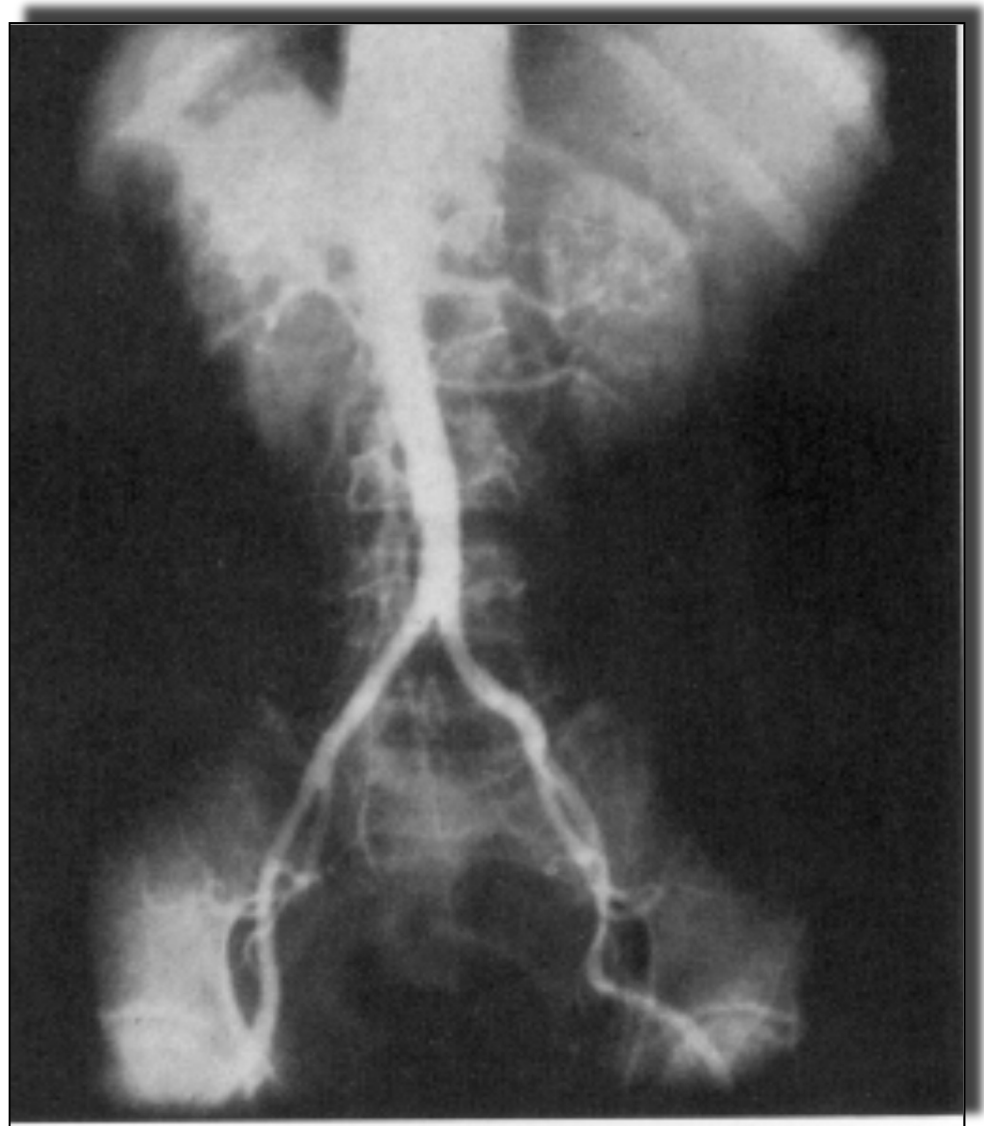
*Visualisation of the chambers of the heart, the
pulmonary circulation, and the great vessels in man*

AJR 41:1-17, 1939

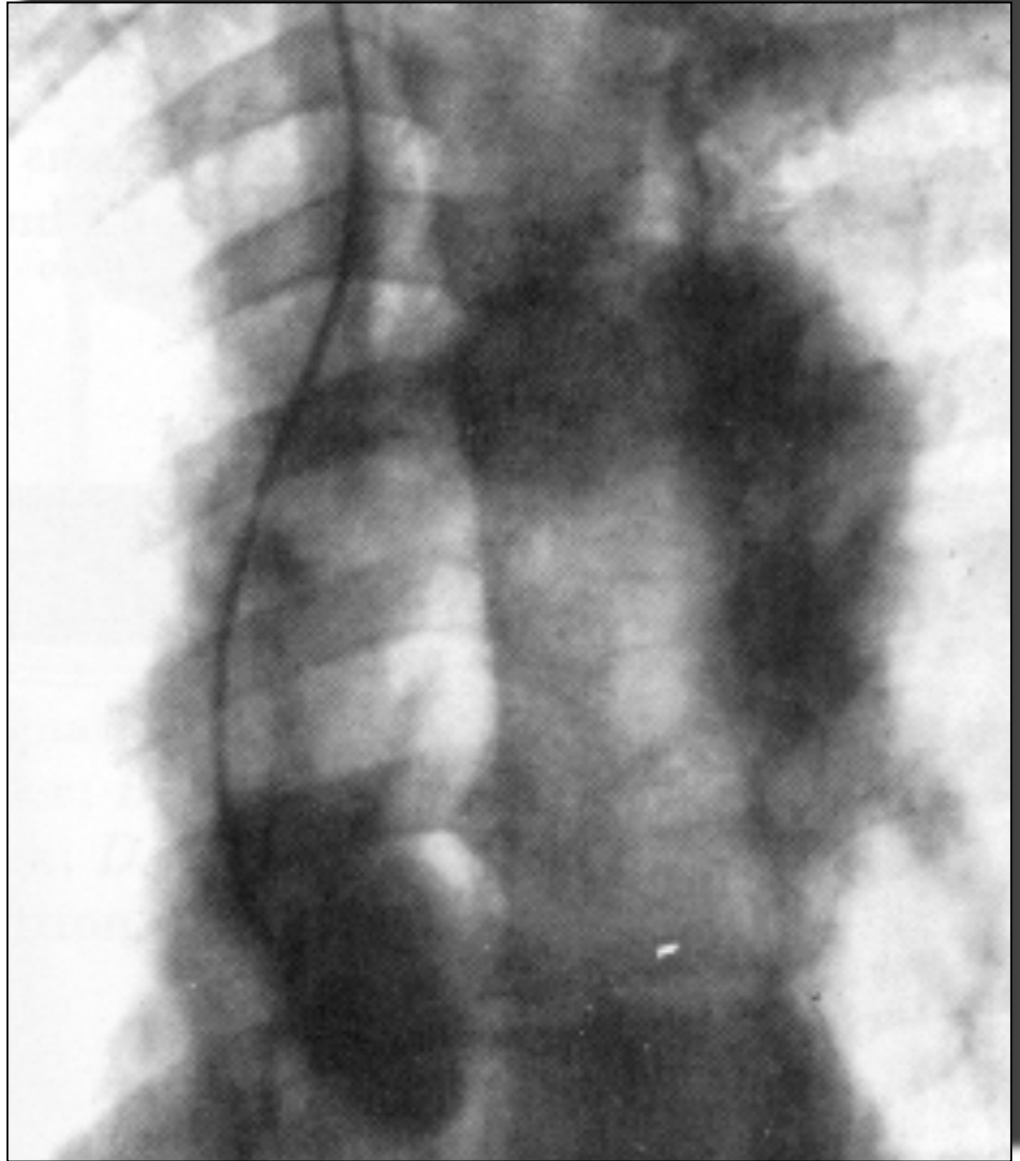


Farinas PL

*A new technique for the
arteriographic
examination of the
aorta and its branches
AJR 46:641-645, 1941*



Radner S
*Thoracal aortography
by catheterisation
from the radial artery*
Acta Radiol
1948:178-180, 1948



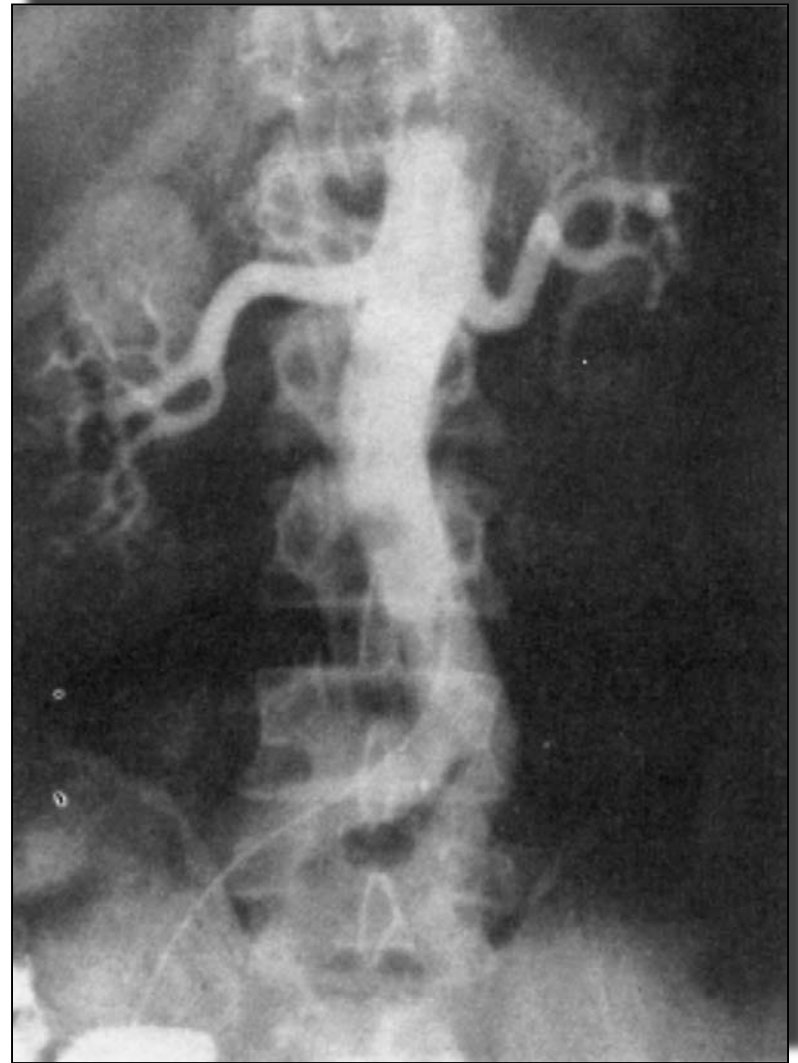
Jonsson G

Visualisation of the coronary arteries

Acta radiol 29:536-540, 1948



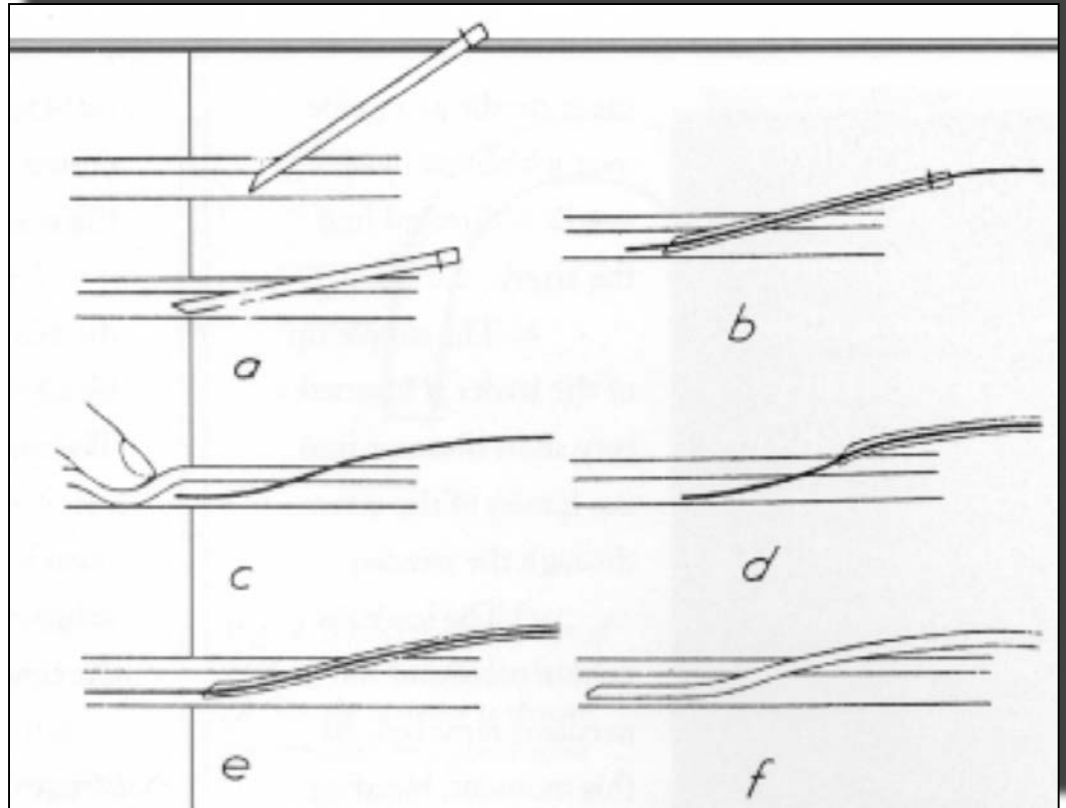
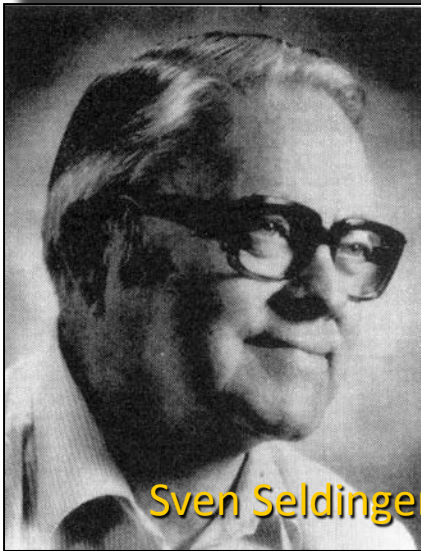
Peirce EC
*Percutaneous femoral artery
catheterisation in man with
special reference to
aortography*
*Surg Gynec Obst 93:56-74,
1951*



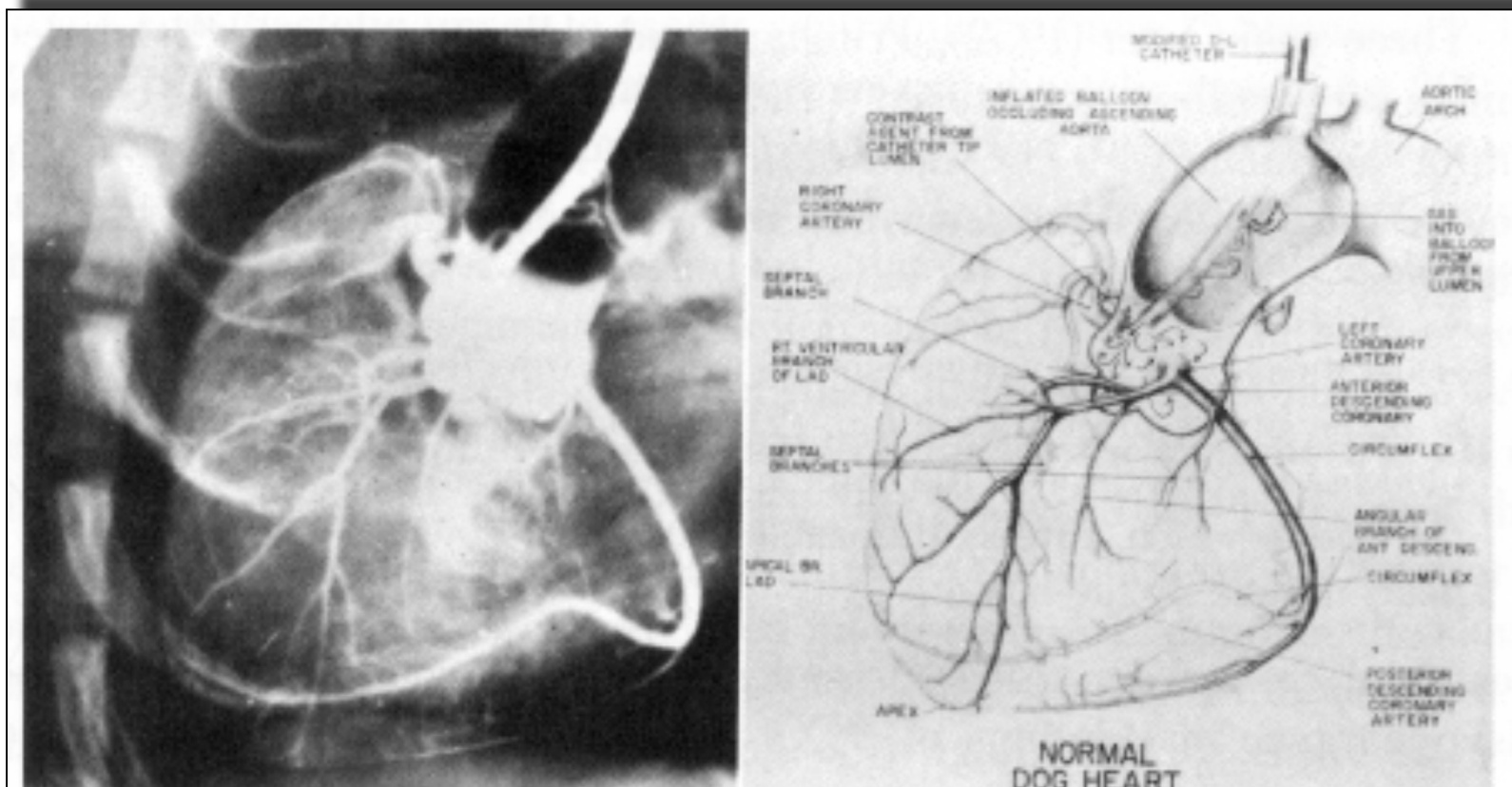
Seldinger SI

Catheter replacement of the needle in percutaneous angiography: A new technique.

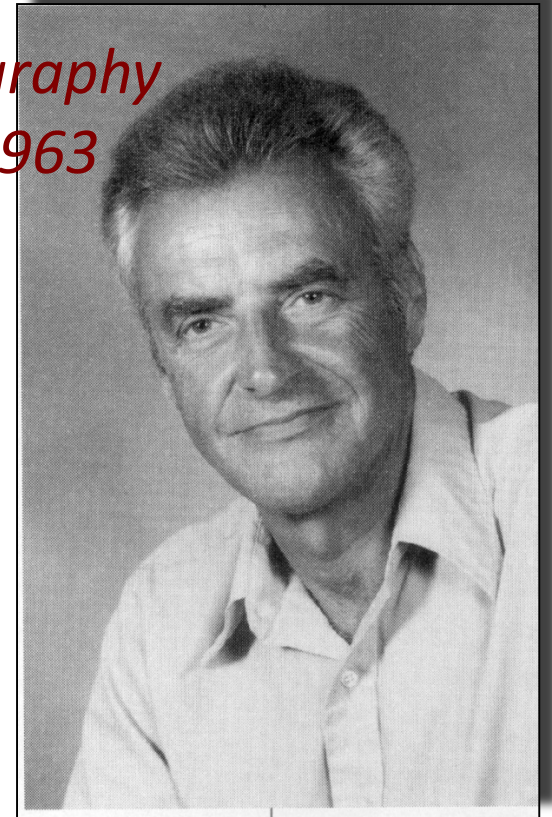
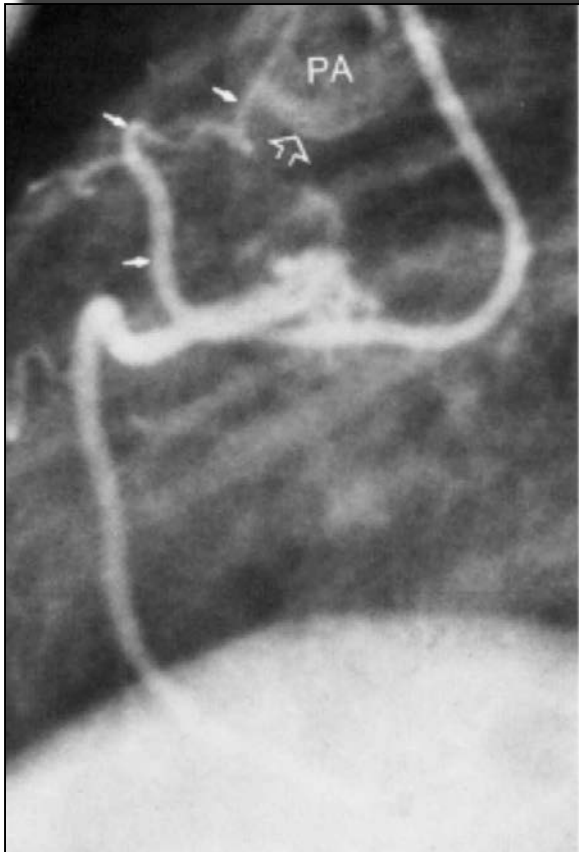
Acta radiologica 39: 369-376, 1953



Dotter CT, Friesche LH
*Visualisation of the coronary circulation by occlusion
arteriography*
Radiology 71:502-523, 1958



Amplatz K
Technique of Coronary angiography
Circulation 27-1:101-107, 1963



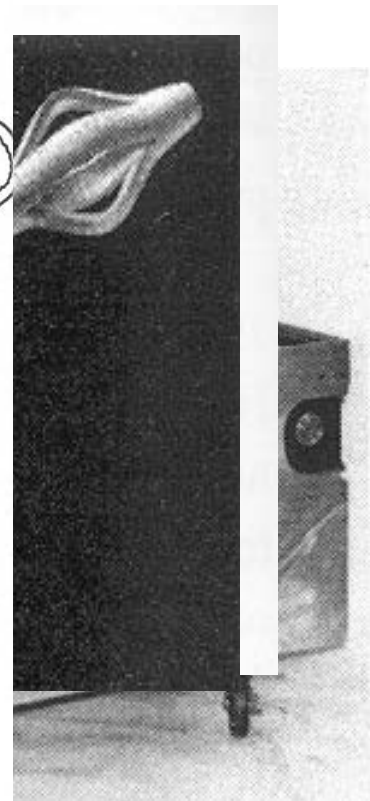
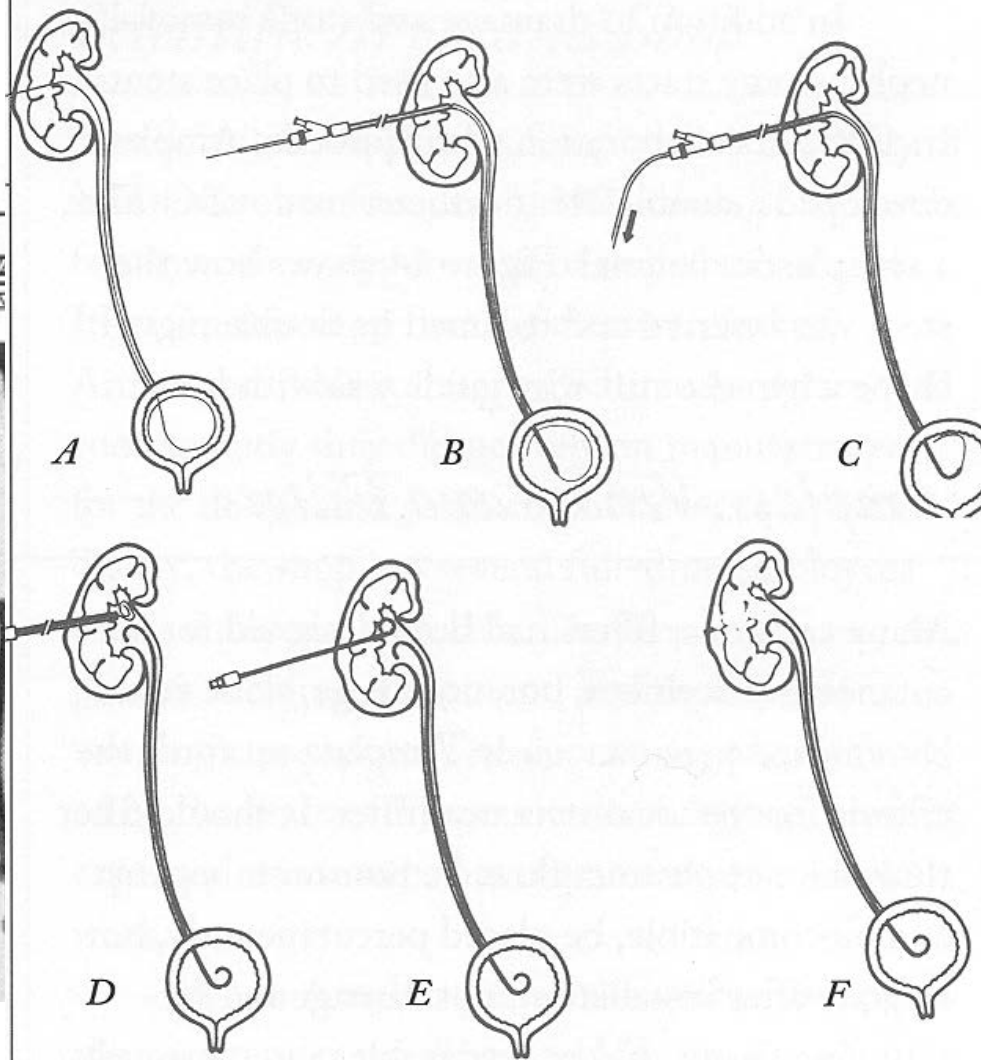
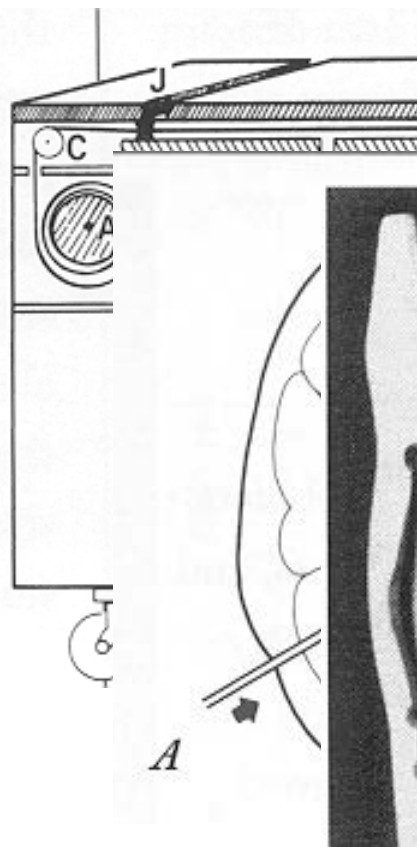


Fig. 14. To place the Amplatz ureteral stent, a guide wire was placed into the bladder percutaneously through a needle (A), the stent was advanced over the guide wire with the stent introducer (B), the guide wire was withdrawn (C, D), the introducer was withdrawn (E), and the double-J stent was in place (F).

- Special wire guides: stiff Amplatz wire guide
- Vena Cava filter
- Nitinol coil stent
- Clot lysers
- PTA mechanics

Paulin S

Coronary angiography. A technical, anatomic and clinical study

Acta Radiologica suppl 233:1-215, 1964



Odman P

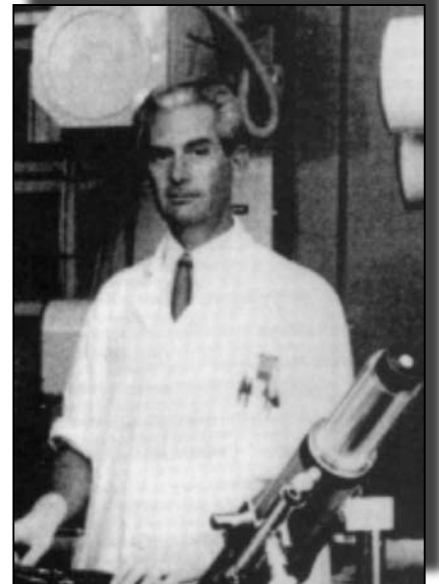
Percutaneous selective angiography of the
coeliac artery

Acta Radiol suppl 159 1958

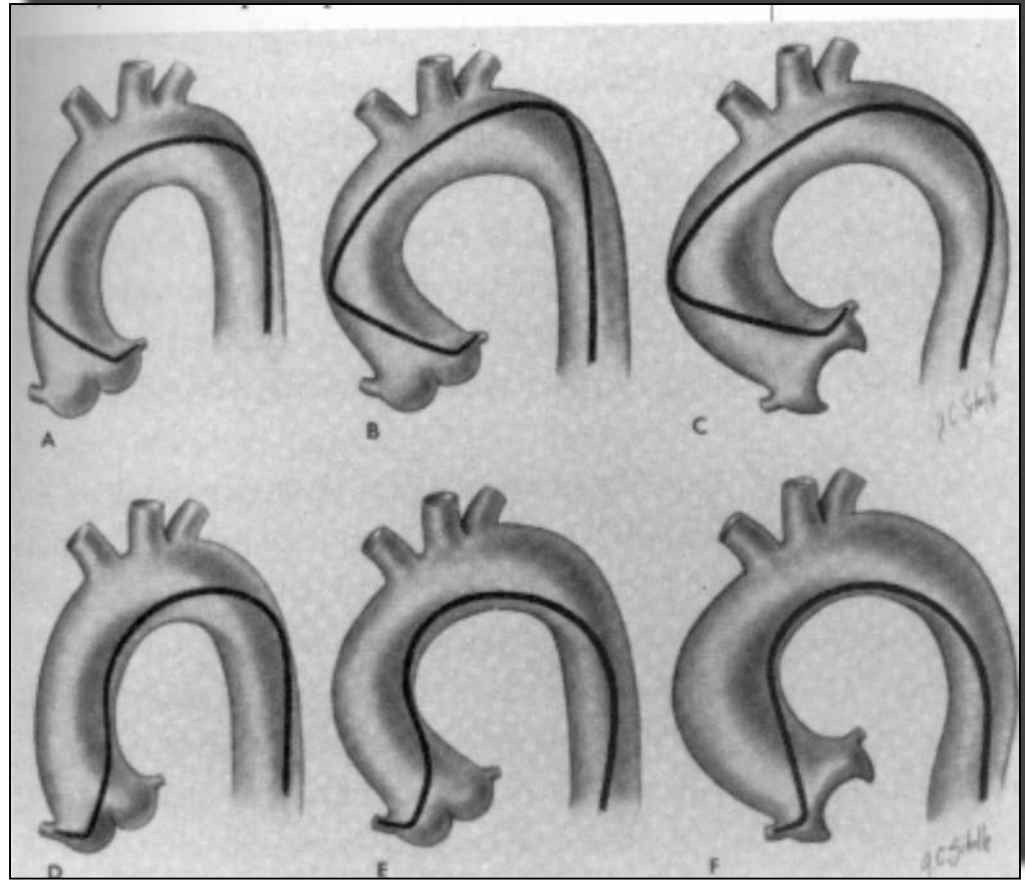
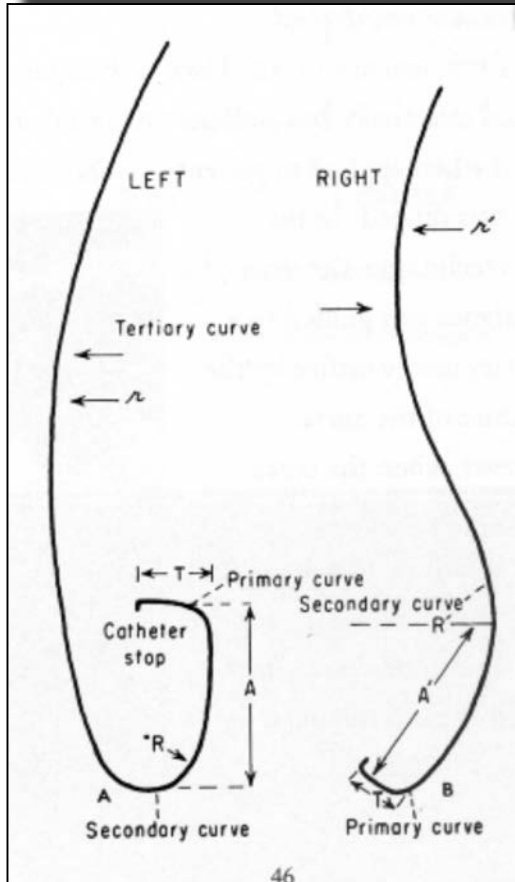
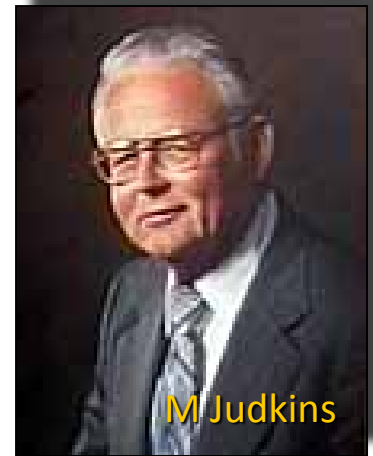
Boysen E, Eckman CA, Olin T

Coeliac and Superior mesenteric arteriography
in portal hypertention.

Acta Chir Scand 126:315-325, 1963

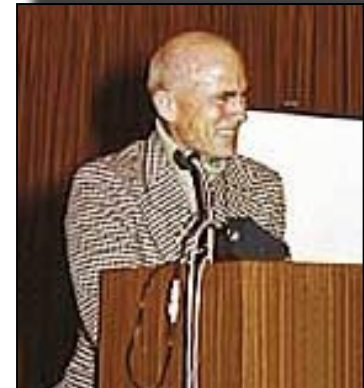


Judkins M
Selective coronary angiography
Radiology 89;-:815-824, 1967



Charles Dotter

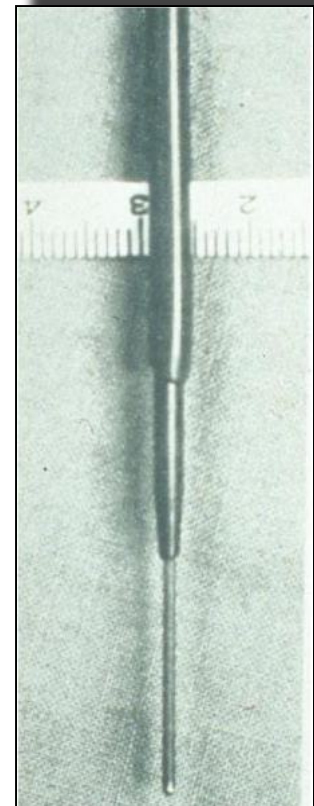
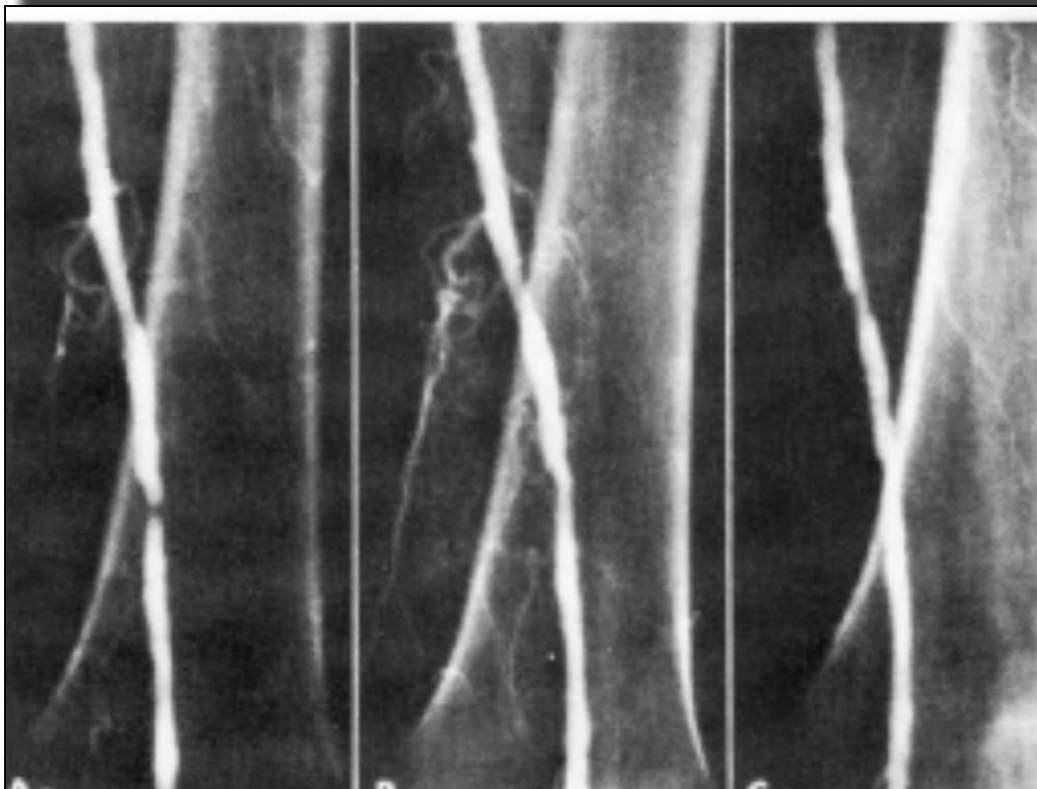
1920-1985

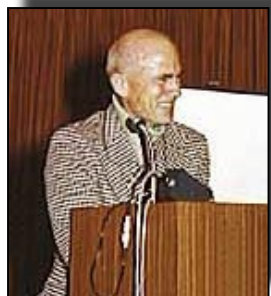


« ...it should be evident that the vascular catheter can be more than a tool for passive means for diagnostic observations: used with imagination it can become an important surgical instrument. »

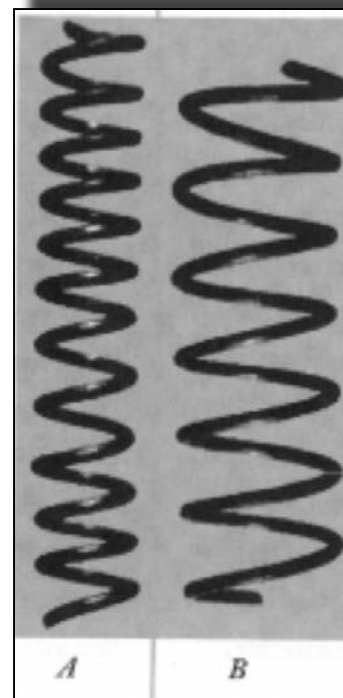
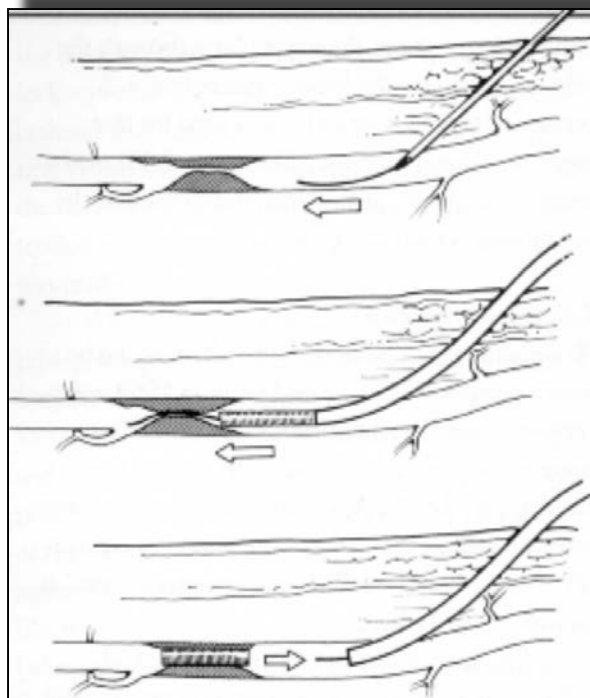
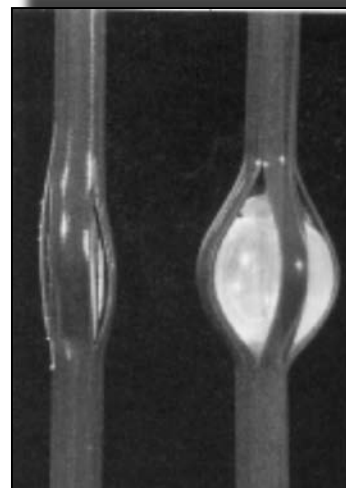
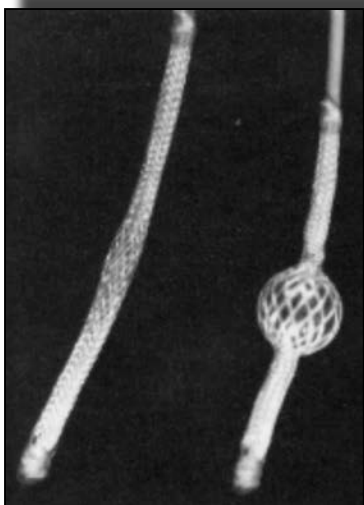
Charles T. Dotter 1963

Dotter CT, Judkins ML
Transluminal treatment of arteriosclerotic obstructions
Circulation 30:654-670, 1964





Balloons



Stent

January 16, 1964: First PTA

March 9, 1964

The image shows a medical form titled "ANGIO" with the following details:

- Header:** "ANGIO" in large bold letters.
- Form Fields:**
 - Location:** University of Oregon Medical Center, Med. Bldg. Rm. 324
 - Procedure:** SURGERY
 - Referring Physician:** [illegible]
 - Study:** 18-25-55
 - Name:** BOURNE, HARRY
 - Examiner:** 11/23/99
- Handwritten Notes:**
 - "Left femoral arteriogram"
 - "Adductor"
 - "Healed fracture, R."
- Diagnosis:** [illegible]
- Special Precautions:** [illegible]
- Bottom Section:** "VISUALIZE BUT DO NOT TRY TO FIX" with a red arrow pointing to it. Below this is a signature line with the name "G. Van Ert" and a date "11/23/99".

VISUALIZE BUT DO NOT
TRY TO FIX,

and the turf battle began!

Muller R, Zeitler E.

Experience with Dotter's catheter recanalization.

Verh Dtsch Ges Kreislaufforsch. 1969;35:461-4.

Schoop W, Martin M, Zeitler E.

The removal of old arterial occlusions by intravenous infusion of streptokinase.

Ger Med Mon. 1969 Mar;14(3):106-8.



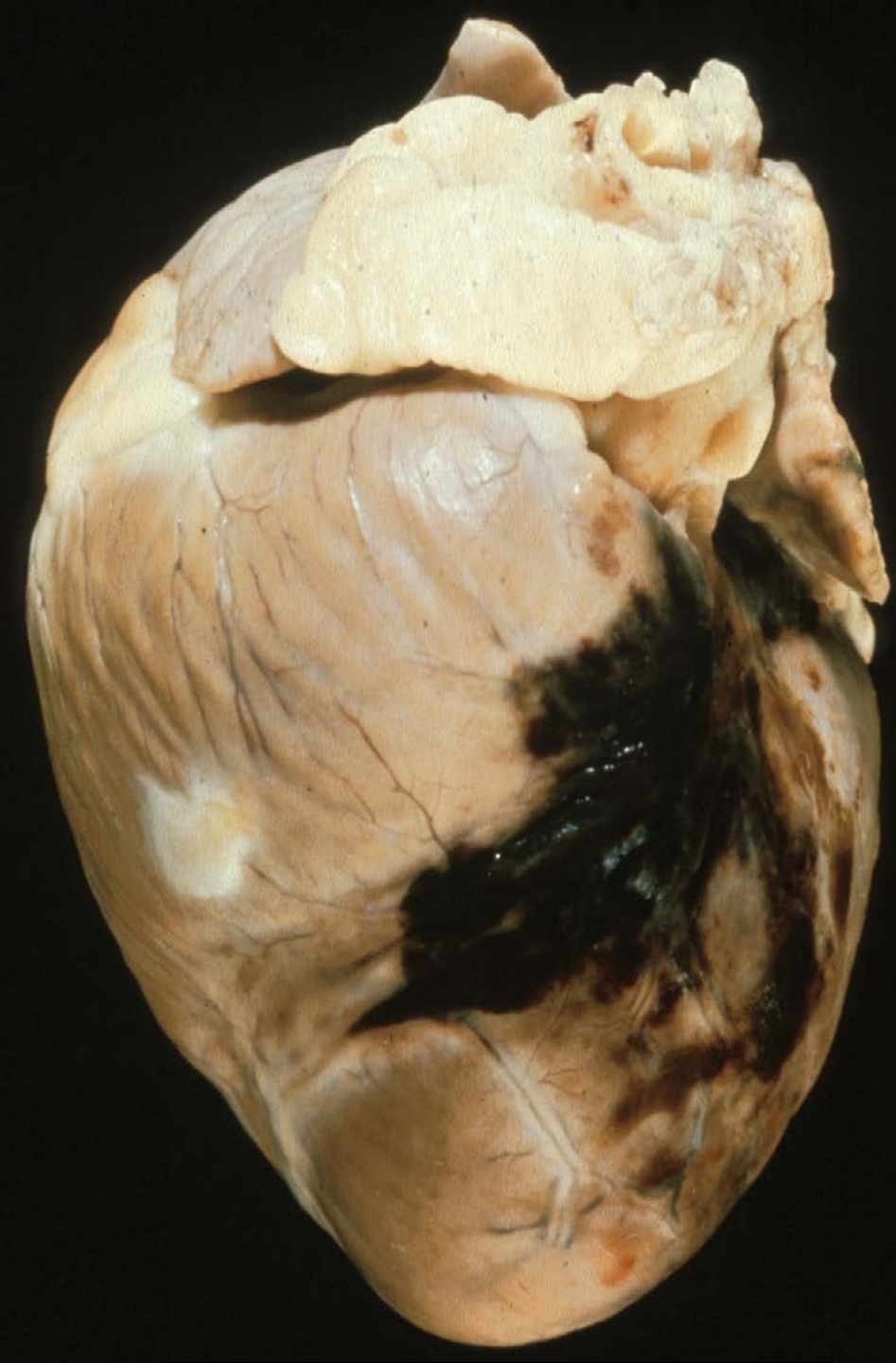
Gruntzig A, Hopff H

Perkutane Rekanalisation chronischer arterieller
Verschlüsse mit einem neuen Dilatations-Katheter.

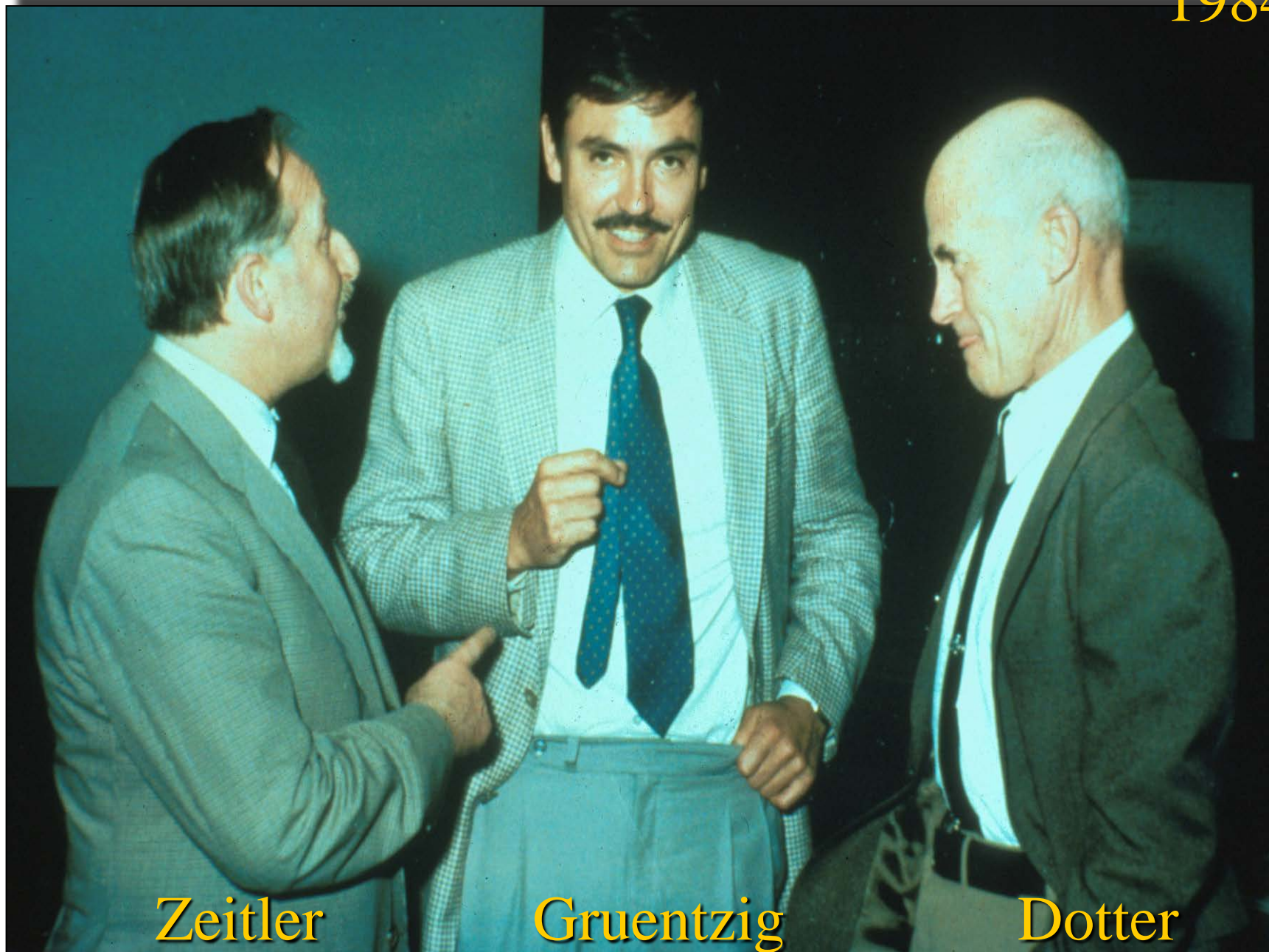
Deutch Med Wschr 99: 2502-2504, 1974



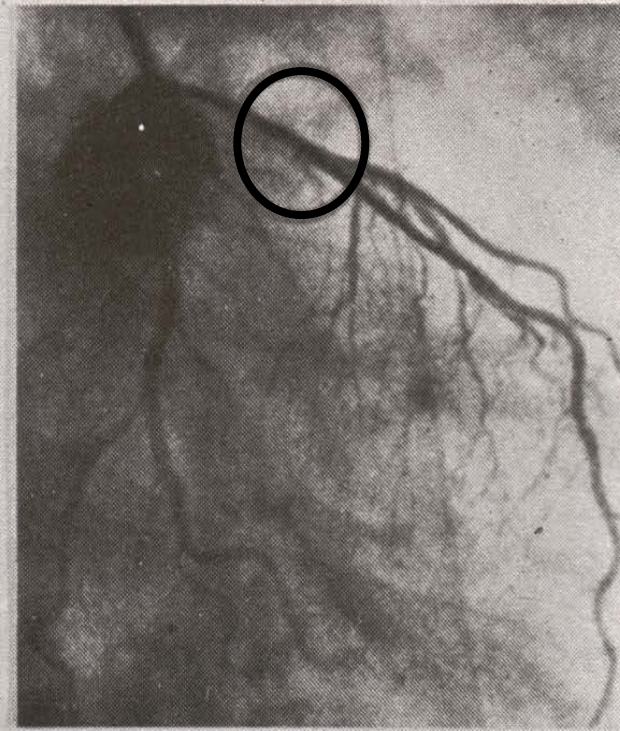
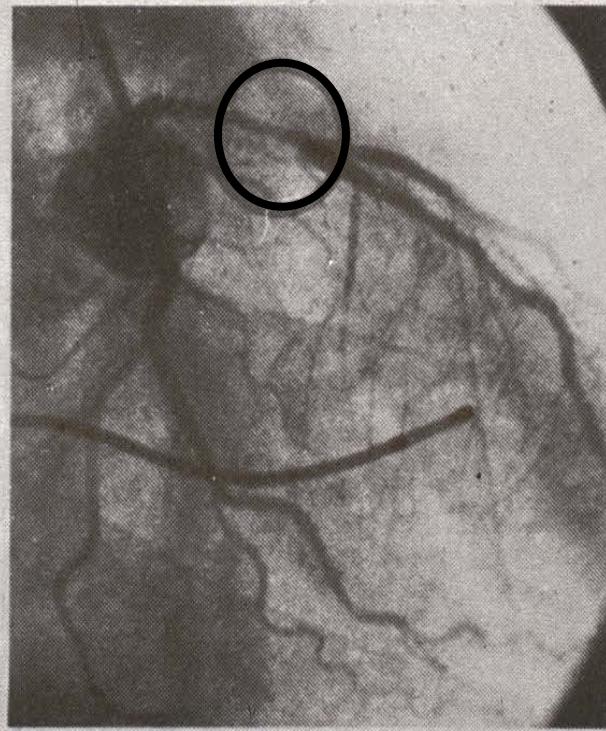
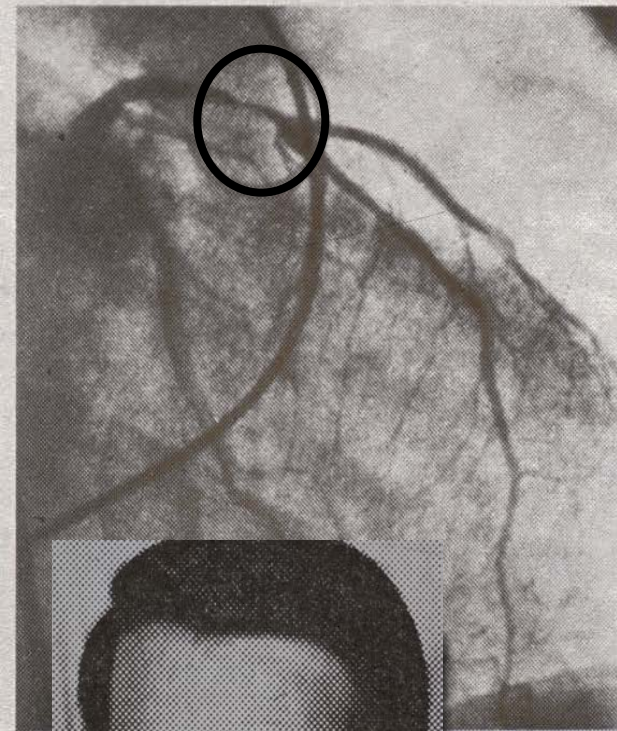
PTCA
First dog
October 22,
1975



1984



First PTCA 1977

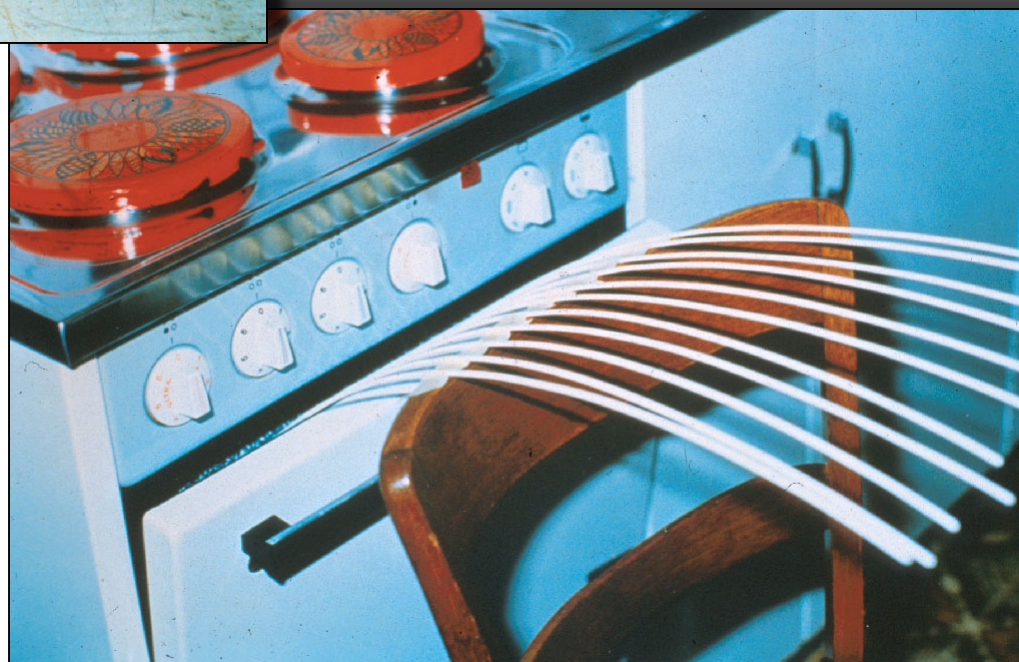


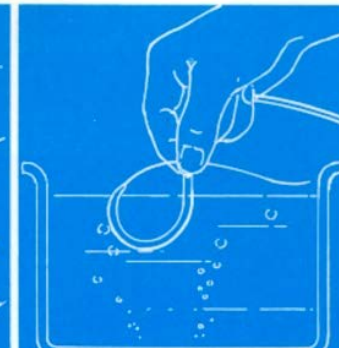
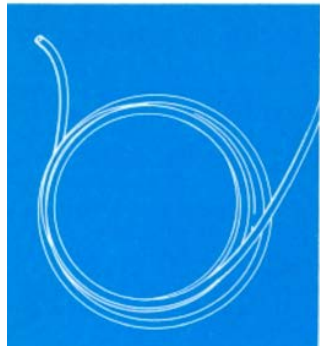
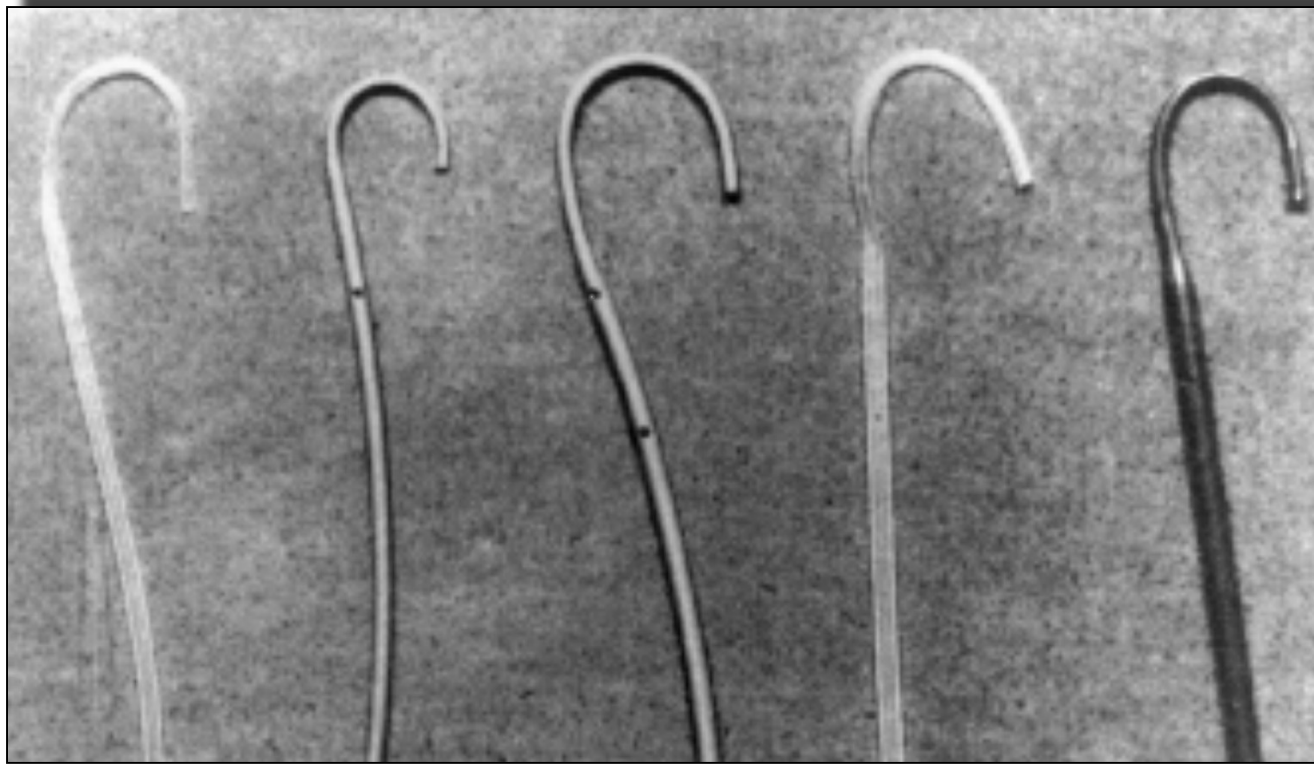
(B) 9-16-77

(C) 10-20-77

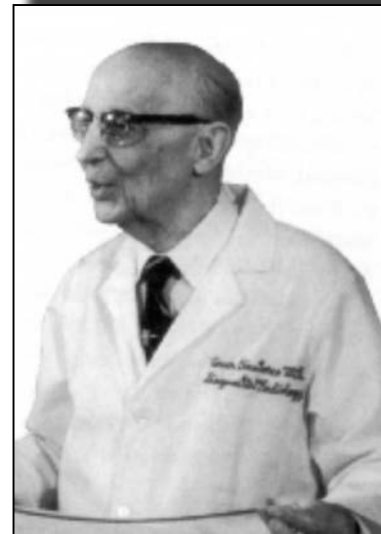
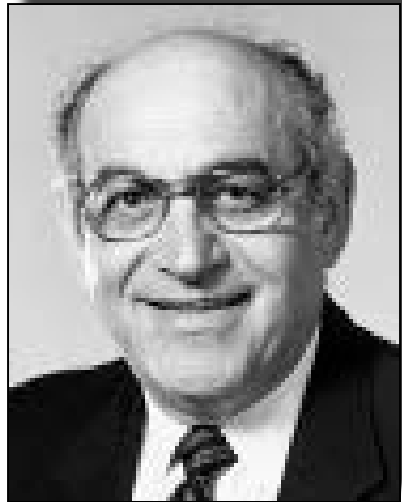
Am Heart J 103:779, 1982





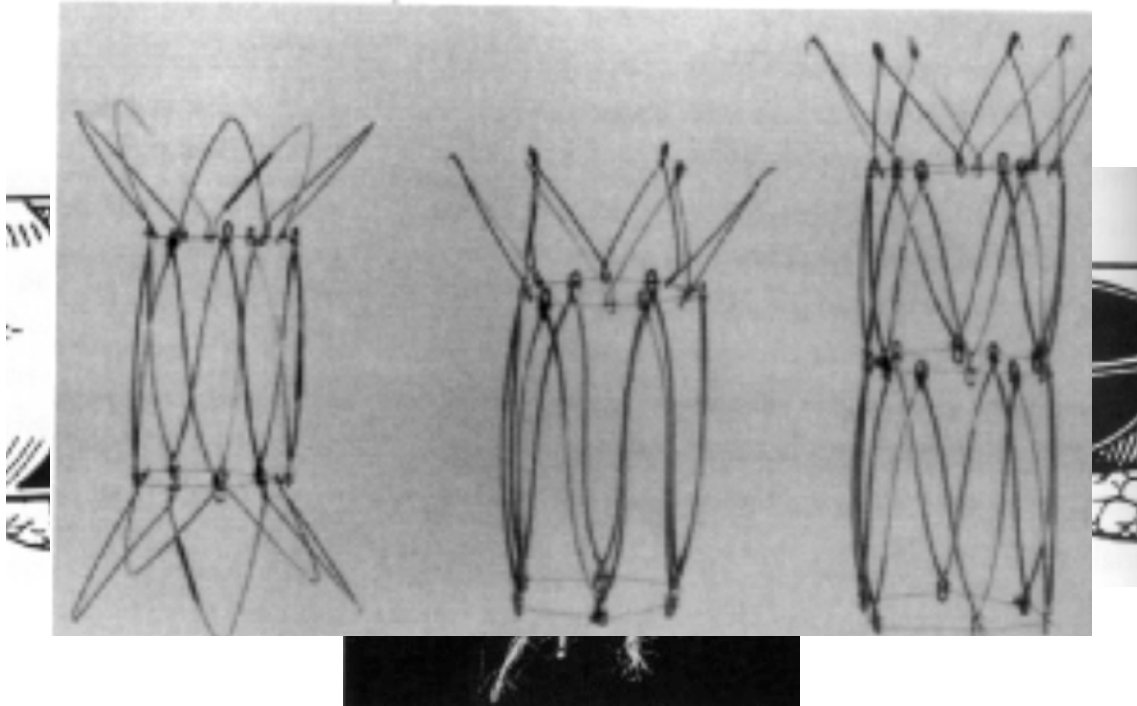


Gianturco C, Anderson JH, Wallace S
Mechanical devices for arterial occlusion
AJR 124:428-435, 1975



Coils,
Filters
Stents

...



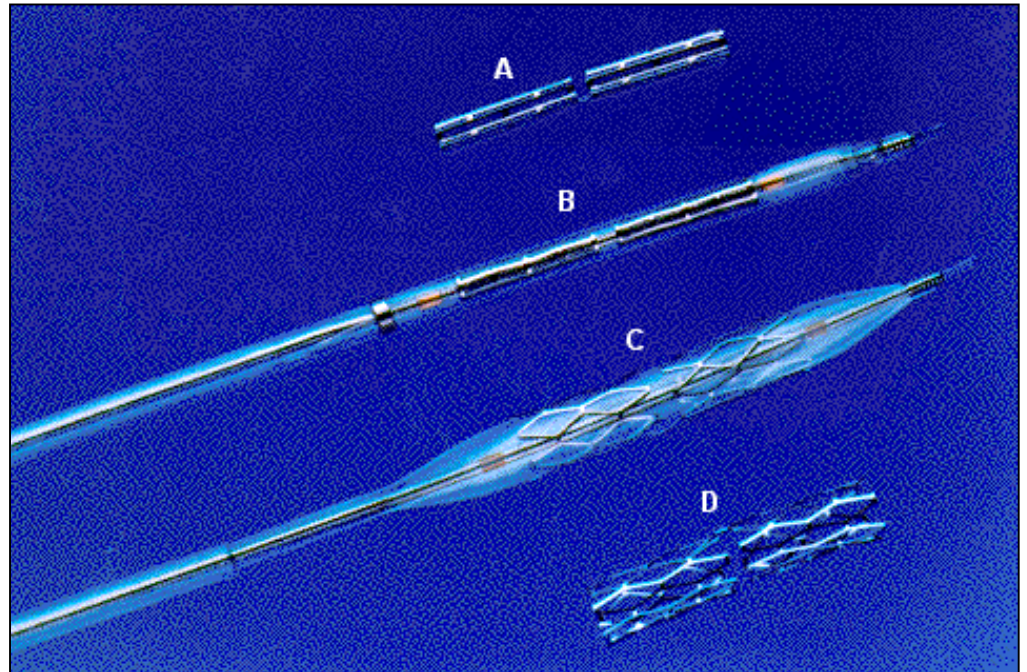
Palmaz JC, Sibbitt RR, Reuter SR, Tio FO, Rice WJ.
Expandable intraluminal graft: a preliminary study.
Work in progress.
Radiology. 1985 Jul;156(1):73-7.



Palmaz JC, Richter GM, Noldge G, Kauffmann GW, Wenz W

Intraluminal Palmaz stent implantation. The first clinical case report on a balloon-expanded vascular prosthesis.

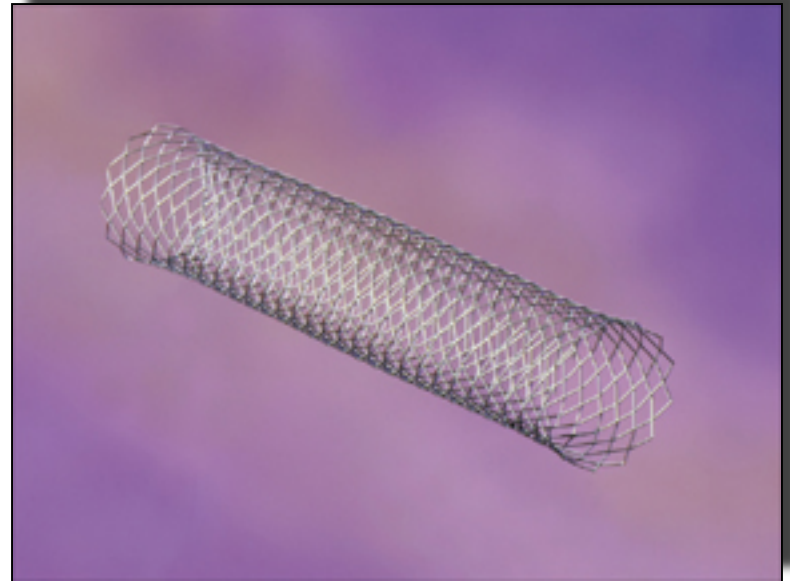
Radiologe 1987 Dec;27(12):560-3



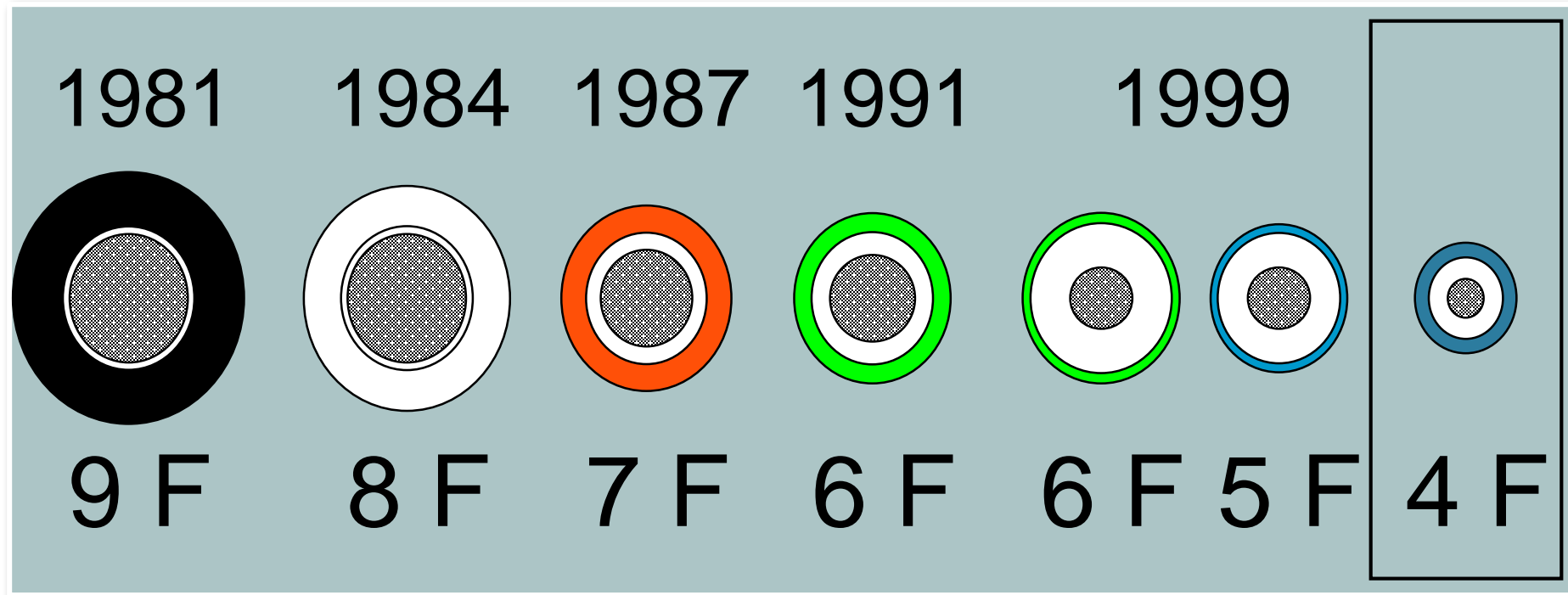
Rousseau H, Puel J, Joffre F, Sigwart U, Dubouchier C,
Imbert C, Knight C, Kropf L, Wallsten H

Self-expanding endovascular prosthesis: an
experimental study.

Radiology 1987 Sep;164(3):709-14



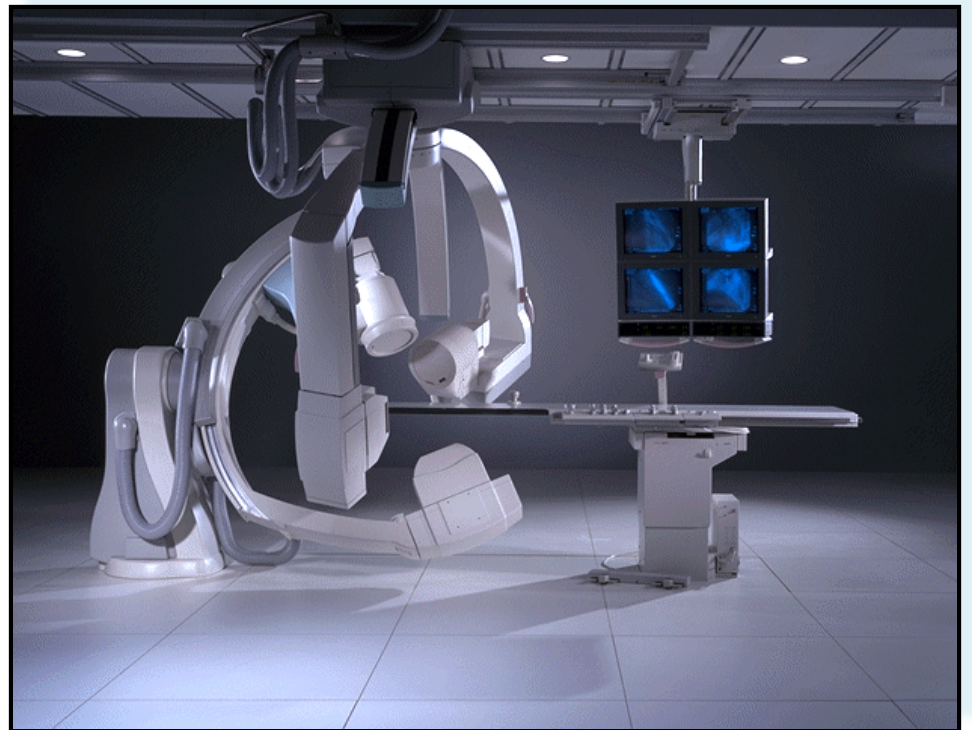
Introducers, Catheters and Balloons



And Microcatheters

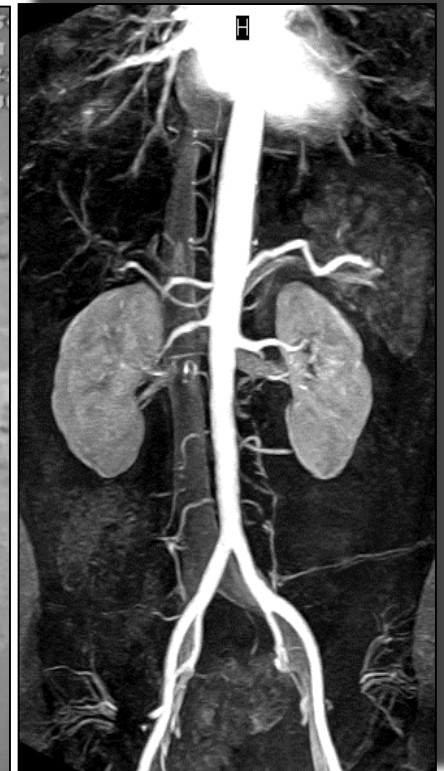
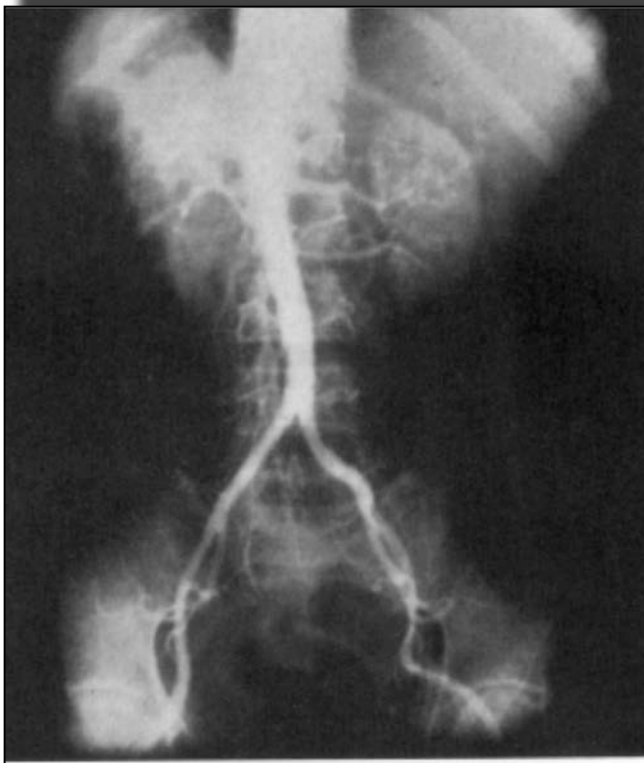
Dark rooms and Puck film changer





Imaging

- From non digital to DSA
- MRA and CTA
- From film to filmless



Evolution

- It took almost 80 years to get to the first stent and first Digital subtraction angiography (DSA)
- Additional 15 years to get to filmless Radiology and PACS
- In the last 10 years, there has been more inventions and evolution in Tools of trades both in imaging and IR than the last century

Tools

- CTA, MRA, CONE BEAM, Combined CT/MR and angio suites, Hybrides.....
- Microspheres
- Drug loading balloon, stents and microspheres
- Liquid embolic agents
- Resorbable materials
- Smaller and fancier thrombectomy, Atherectomy, laser, other ablation devices
- Etc.....

Procedures

- 20-30 years ago:
 - Mostly major arterial works and a few other stuff
- Then came:
 - TIPS
 - UFE
 - Vein Ablation
 - Tumor Ablation
 - Y 90
 - PAE
 - Many many more procedures

TEAM

- How all of these changes in evolution of IR and other factors such as new providers, Turf, etc will affect IR Team and members?

Team Members

- At the beginning
 - IR MD
 - IR Techs and/or nurses
 - Trainees

Team Members now

- MDs (IR and)
- Techs
- Nurses, NPAs, Coordinators, CNS
- PAs
- RPAs
- Scheduler (s)
- Transport
- Admin
- Trainees
- And many more

- : “if my fellow angiographers prove unwilling or unable to accept or secure for their patients the clinical responsibilities attendant on transluminal angioplasty, they will become high-priced plumbers facing forfeiture of territorial based solely on imaging equipment other can obtain and skills still other can learn”

Charles T Dotter 1968

IR MD

- Back then:
 - IR MDs where the lone wolf
 - Sitting in their chair waiting for patients
- With the improvement of technology and paradigm shift came TURF
- New procedures and great development
 - BUT not followed by Evidence
 - No clinical follow up

IR

- There is no debate on the fact that if IR is not changing to a clinical practice, it will die.
- We should move from treating a problem toward healing a condition and be recognized for it
 - Innovation alone is not enough
 - Research and evidence is essential
 - Immediate outcome is important but
 - Who cares and how to measure???

IR Team

- Not different from all other surgical units, the outcome of interventions are not only due to physician skill and experience
- But above and overall the outcome is related to the quality of **pre, per and post** procedure team members (and by the way the majority are not MDs)

IR Team

- ALL IR TEAM MEMBER work and commitment matter and affect patient QOL
 - You save lives
 - You know it but you need to believe on it

Examples

- Pre:
 - From clinic to the pre-procedure area
 - -Karen (Journey to transplant)
- Procedure:
 - From the first contact to the transfer out of the room
 - Speed
 - Mike (Cone beam CT)
- Post
 - From immediate post procedure to follow-up
 - Mary (abdominal pain post TACE)
 - Sharon (UFE expulsion)

Other IR Providers

- A great addition to the team
- New perspective and greater opportunity to improve our patient care
- Very new and needs to pass the test of time
- Immediate issues:
 - Very disperse and vague job description
 - Still under a general name that goes from general practice to neurosurgery dealing with all aspects of medicine

Other IR Providers

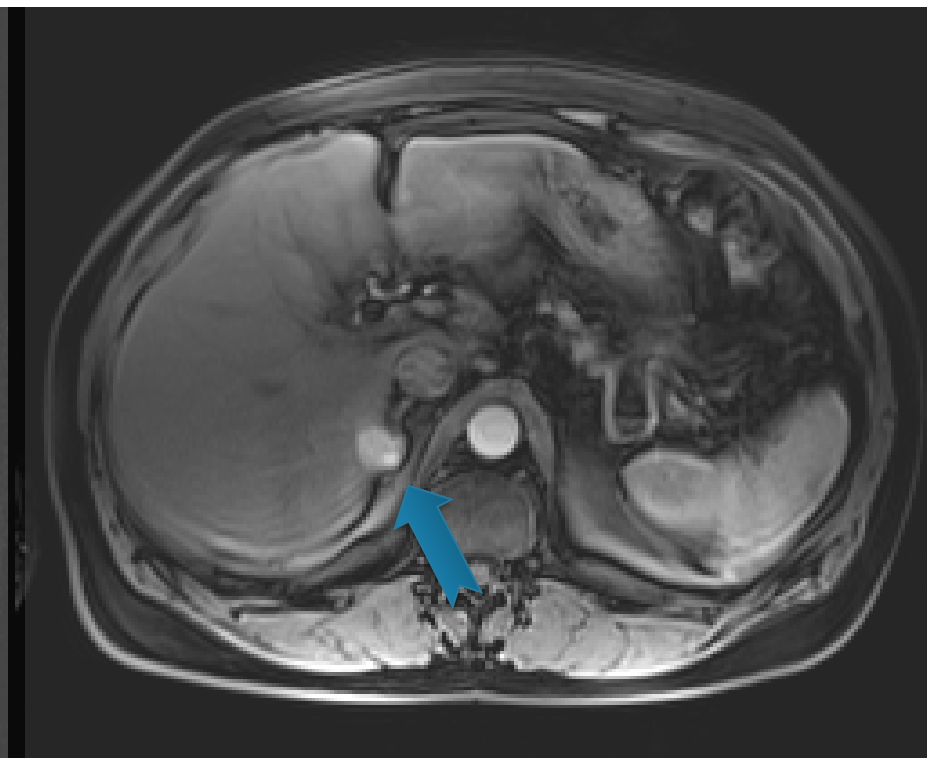
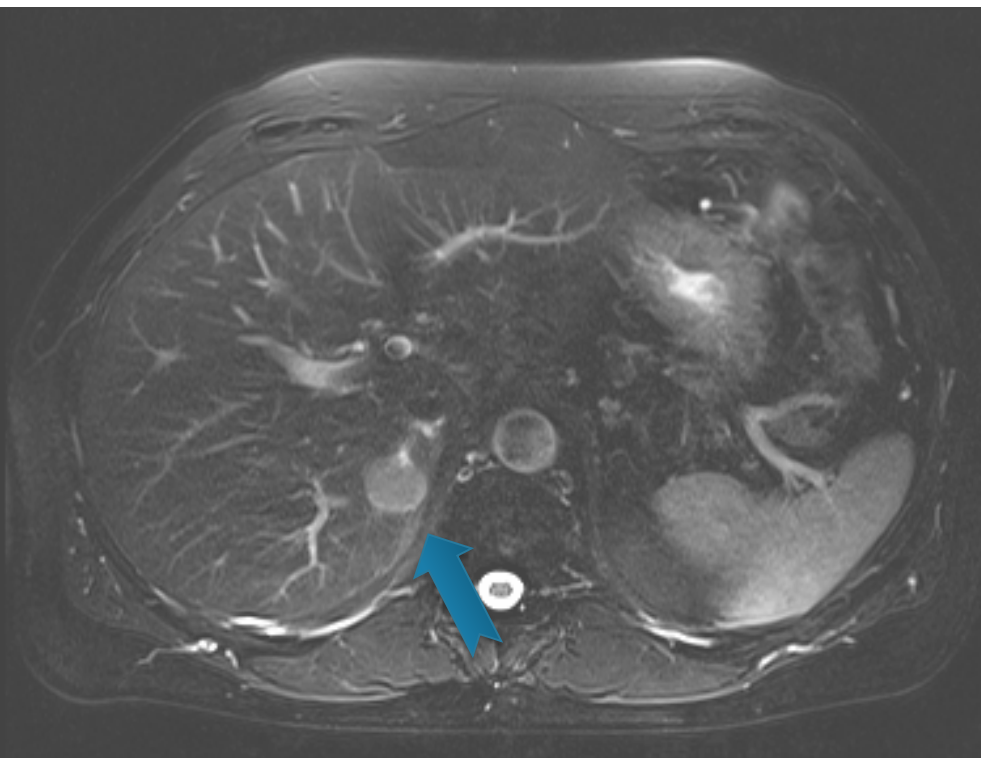
- Future may move toward specialization of PA, NPA, CNS as we have seen in the rest of medicine and Radiology
- Specific curriculum and recognition
- Better job description
- More involvement with research and data generation
- Role in teaching residents and future providers
- How to interact with the new multidisciplinary IR team and docs??

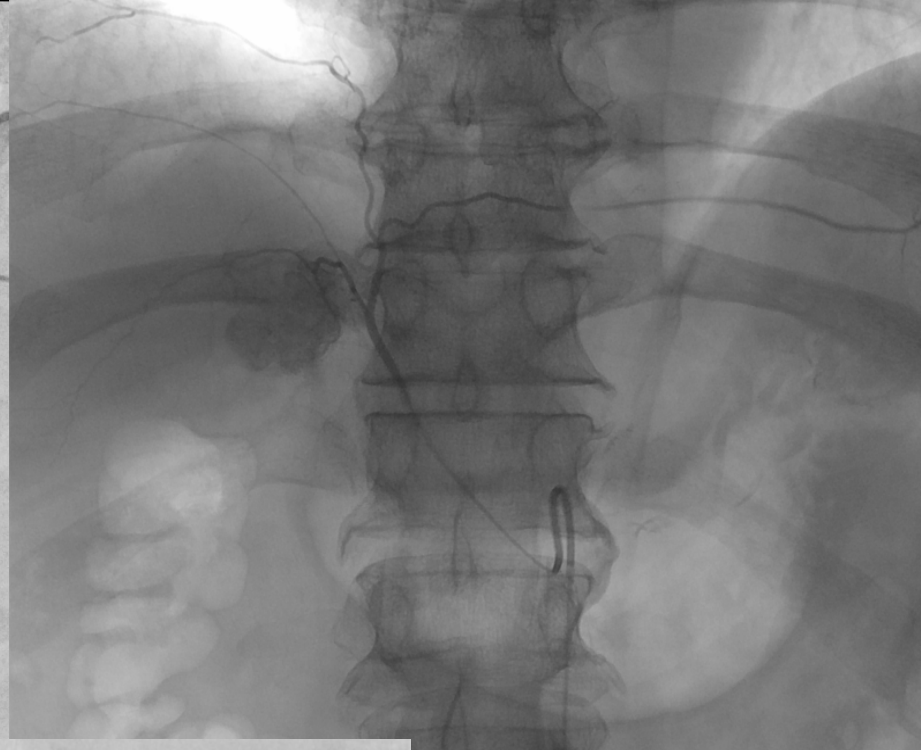
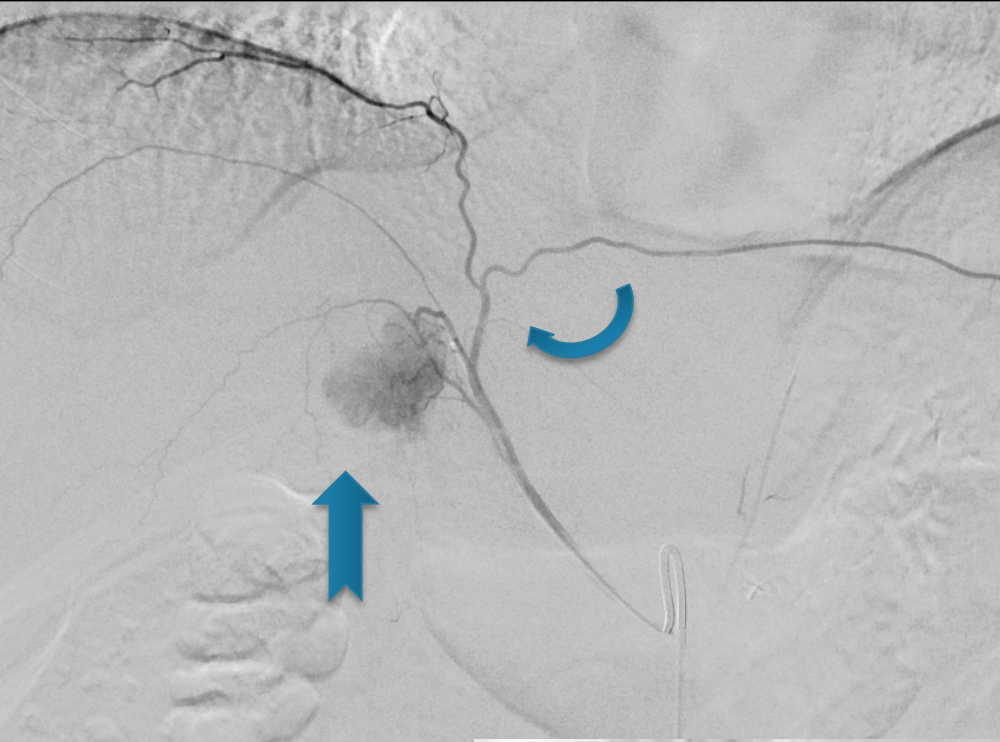
IR Nurse

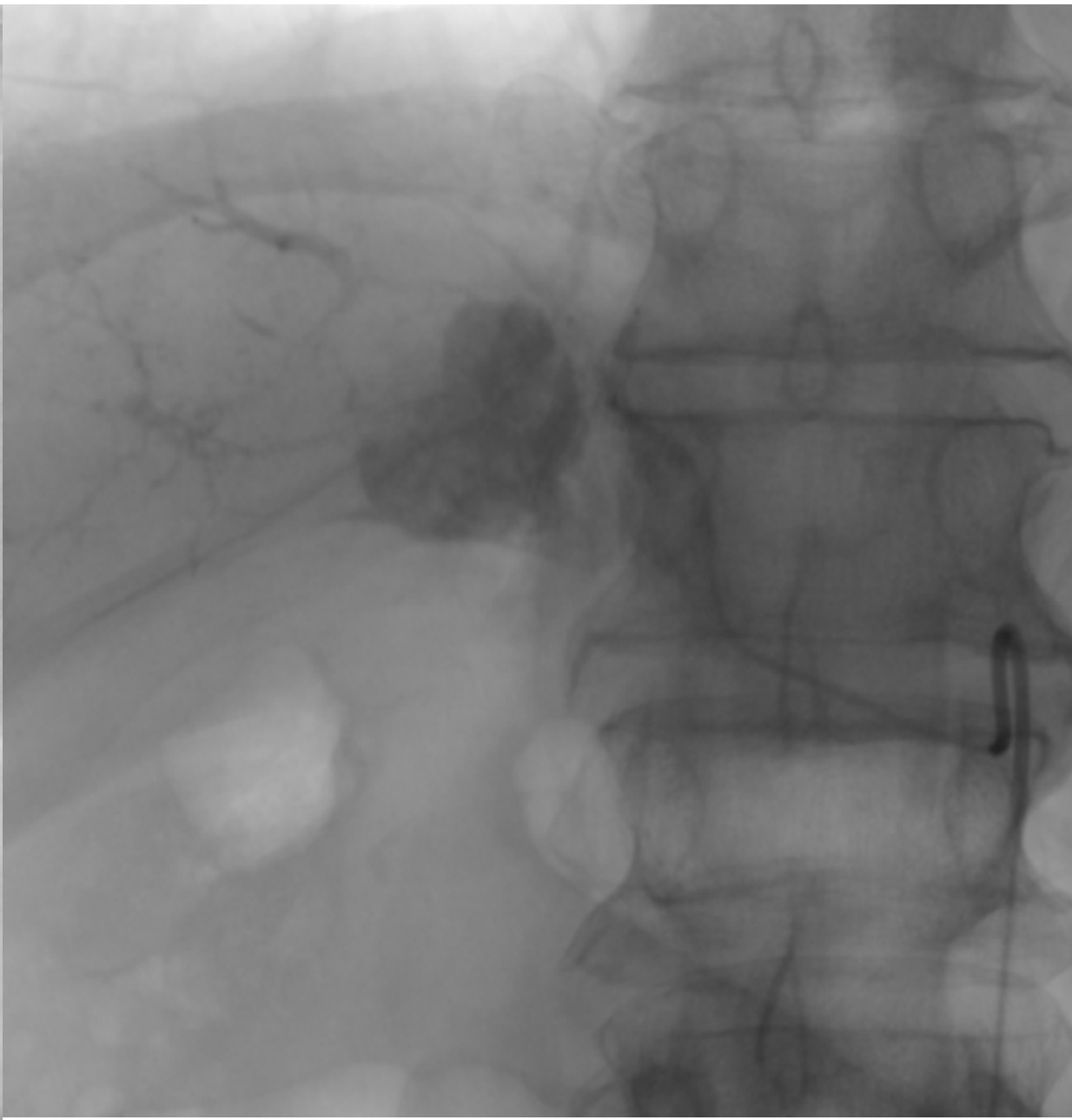
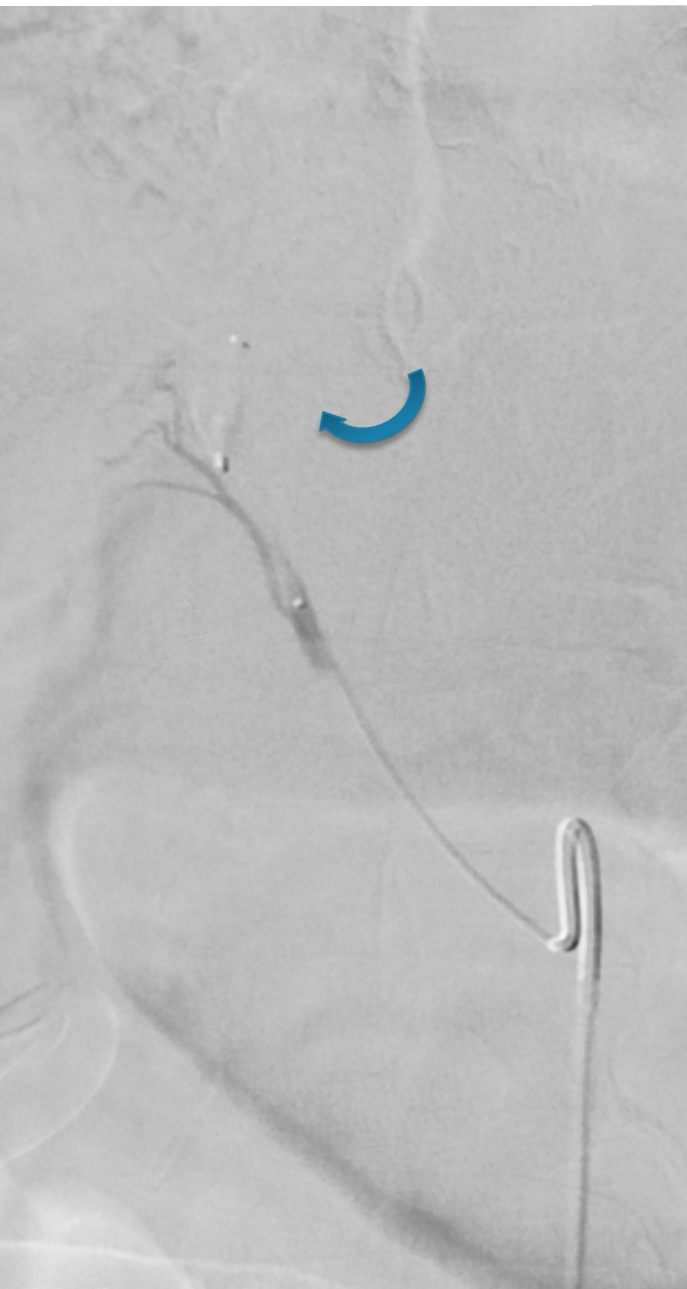
- Mostly experience nurses (ICU,..)
- Sedation
- Very computer savvy
- Often the first point of contact with the patient and referring physicians through clinic and/or preprocedural area
 - Patient-team relationship and confidence
- Serving as a liaison between the patient and the nursing staff

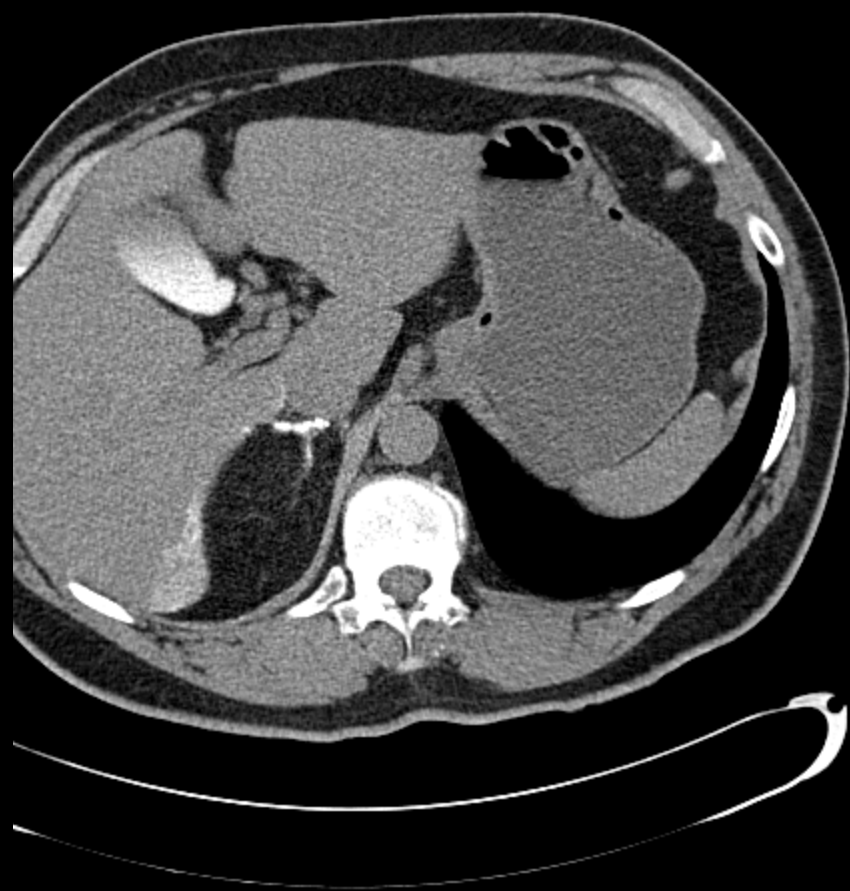
IR Nurse

- Attending patient consultations
- Performing initial examinations and patient assessments
- Writing pre-procedure orders
- Performing daily rounds and communicating patient progress to the medical staff and the radiologist
- Orchestrating patient discharge and making additional referrals for home care
- Sterility and infection control
- Patient follow up









IR Nurse

- Issues:
 - Training curriculum not much oriented toward IR and Radiology
 - Great knowledge of medicine but not much knowledge of the IR procedures in general
 - Usually not interested to know about the tools and imaging

IR Nurse

- Mock Code
- Connection of IR to the rest of the hospital
 - Hospital committees
 - Liaison to other units
- Guidelines
- Joint commission
- Patients prospectus
- Safety
- Role in teaching residents and future providers

IR Tech

- Back then:
 - Many radiology technical works
 - Positioning, Filming (dark rooms)
 - No room for mistake
 - Knowledge of materials
 - Assisting
 - Scheduling

IR Tech

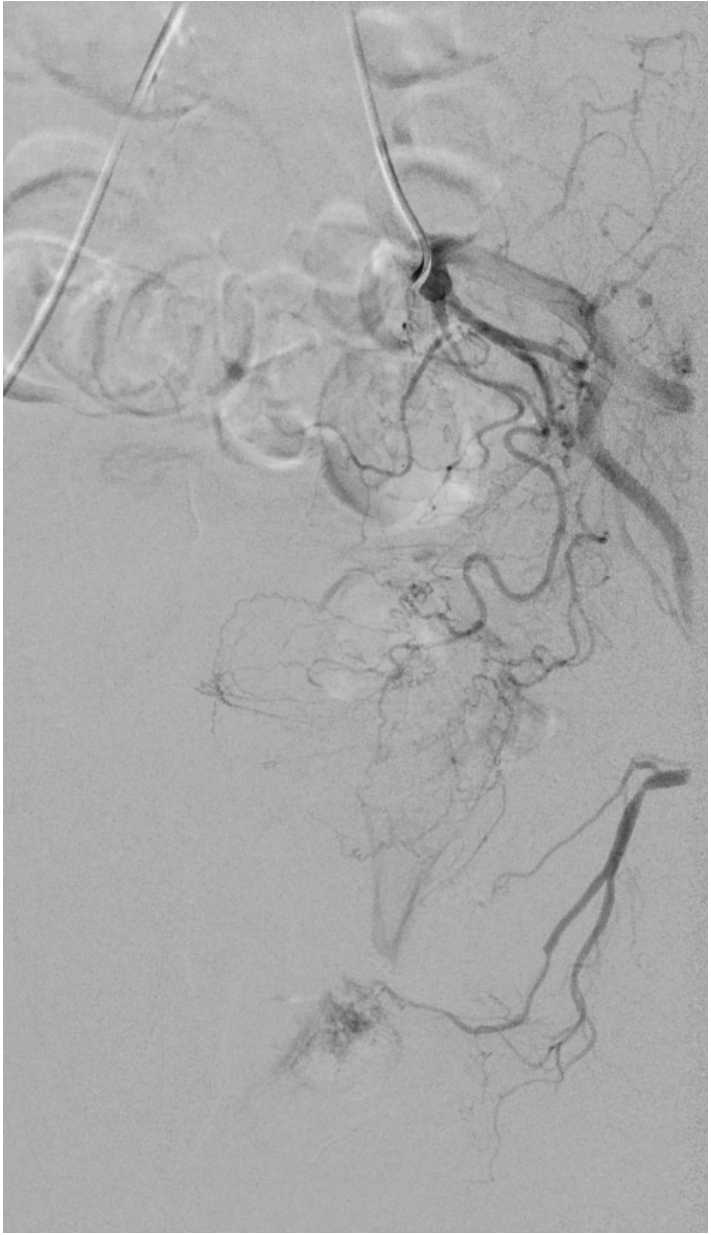
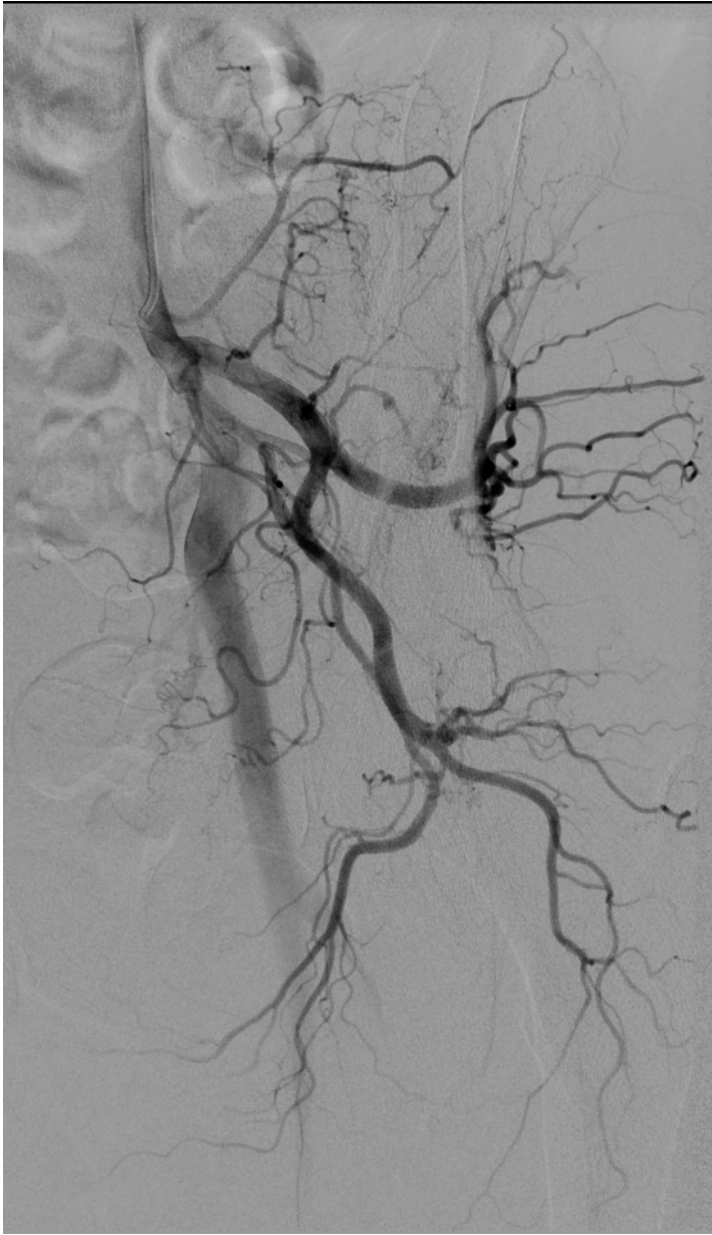
- Usually the most experience radiology techs
- Most experience with IR procedures and materials
- Extremely practical and to the point
- Creative
- Good understanding of procedures and steps
- Expertise in minimizing radiation exposure to the patient, self, and other members of the healthcare team

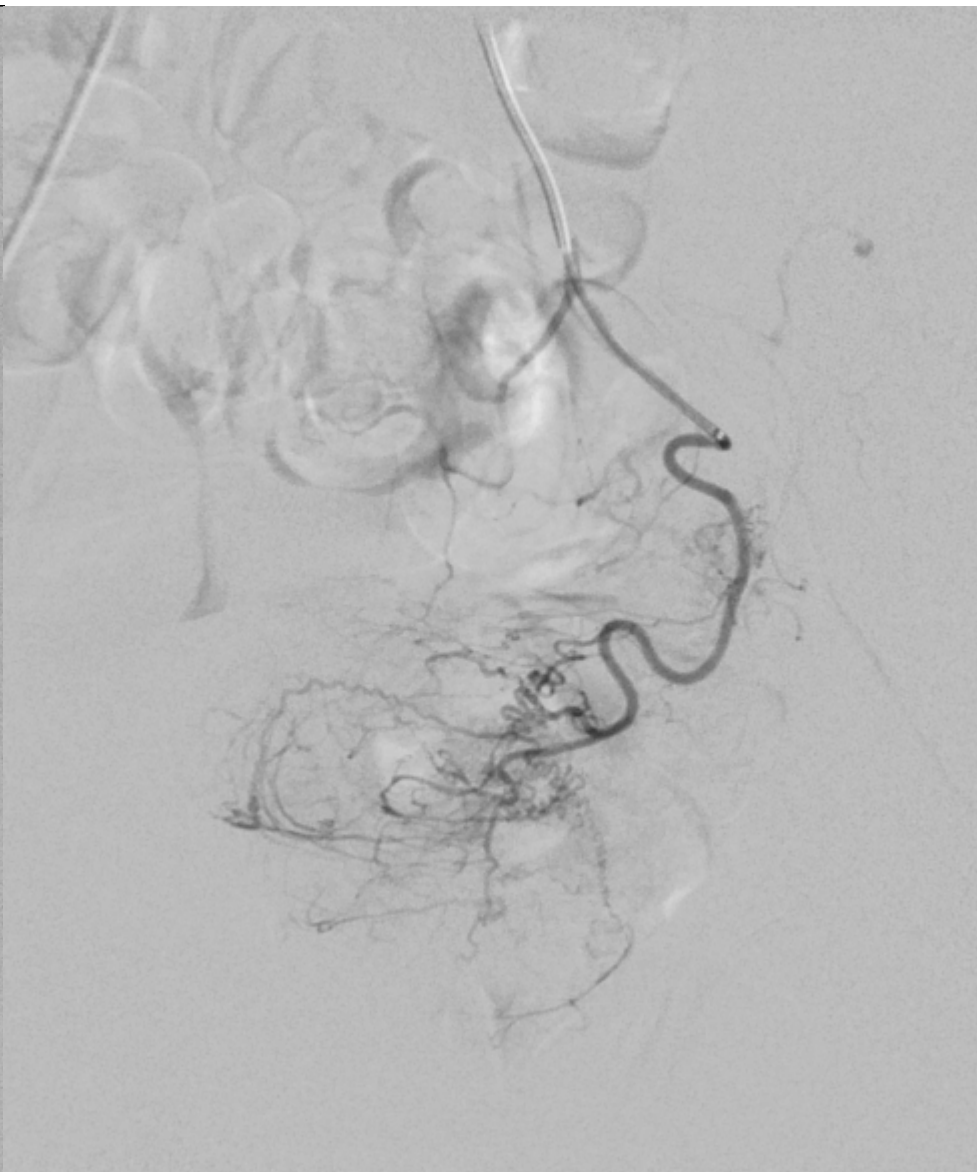
IR Tech

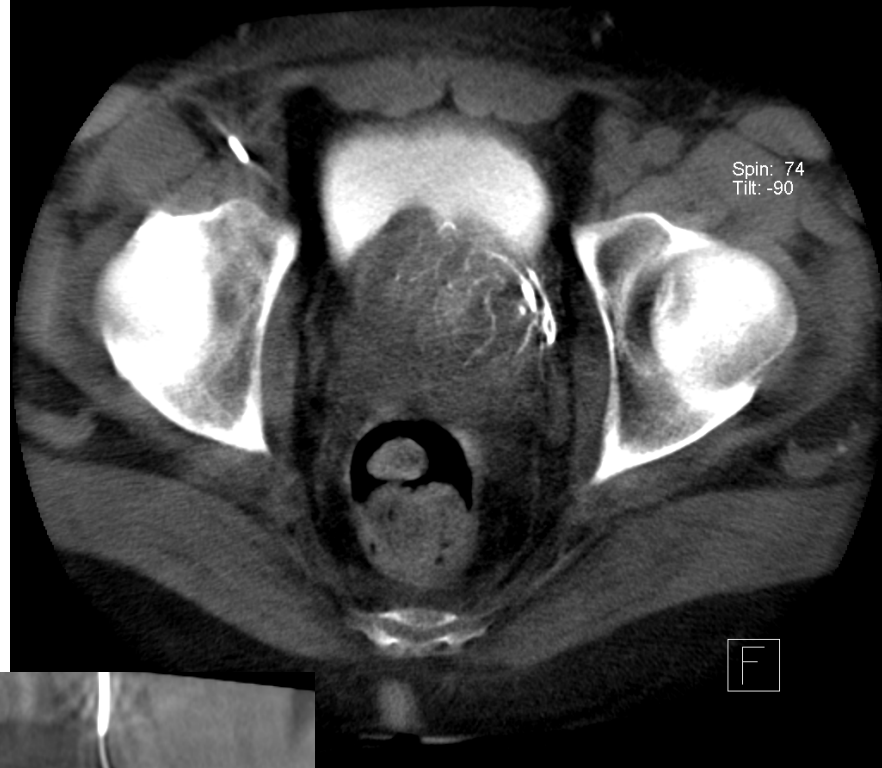
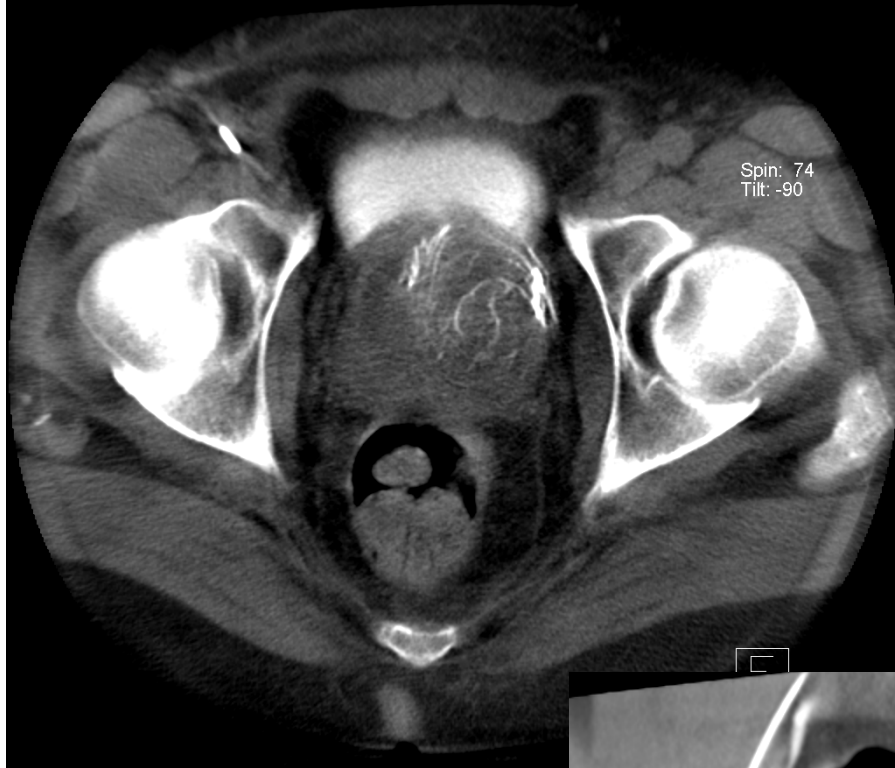
- Then came the computers, DSA, Digital imaging and PACS
- Significant increase in the new materials, techniques and procedures
- New players in town
 - Crisis in the role of techs

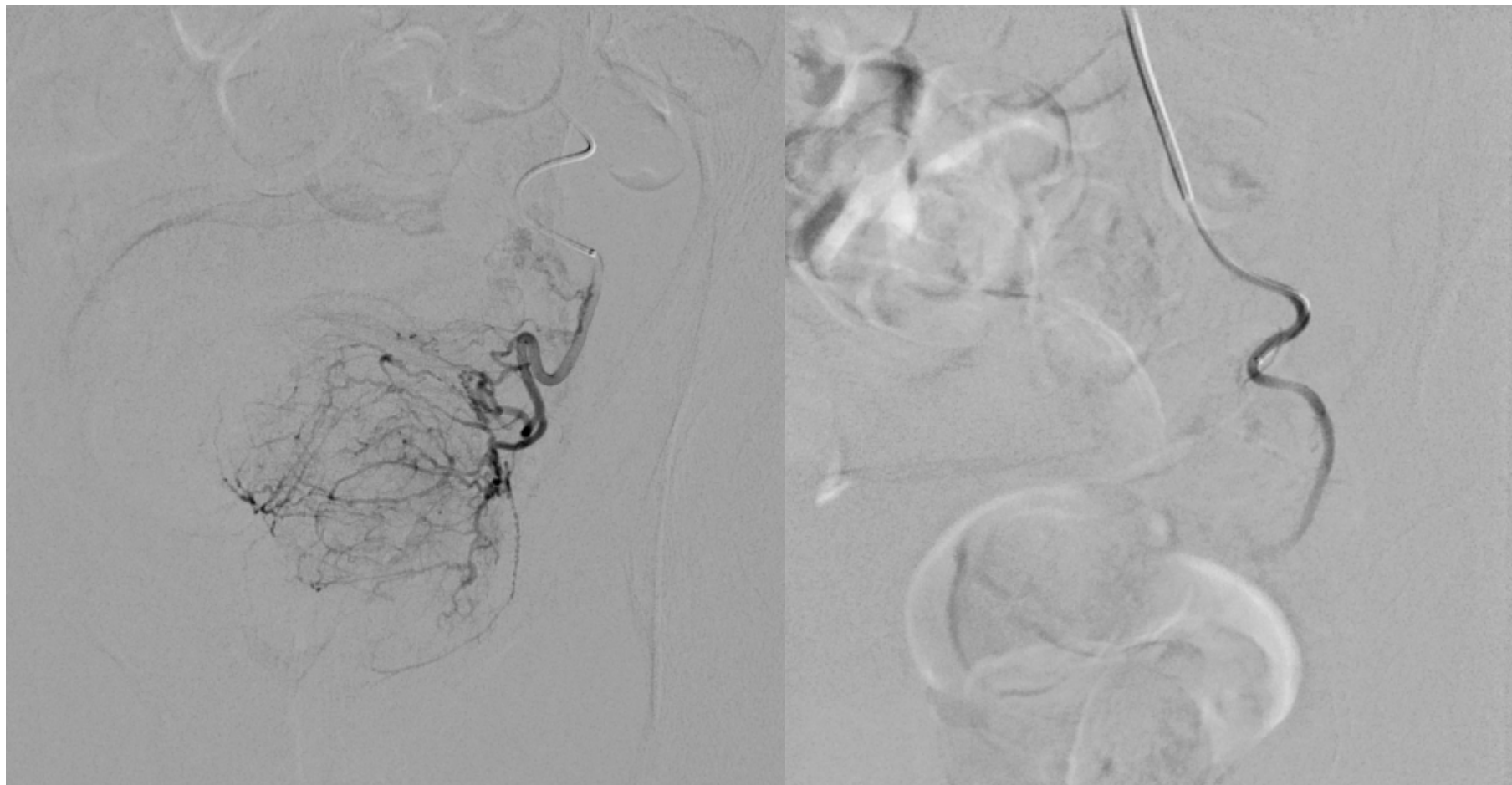
IR Tech

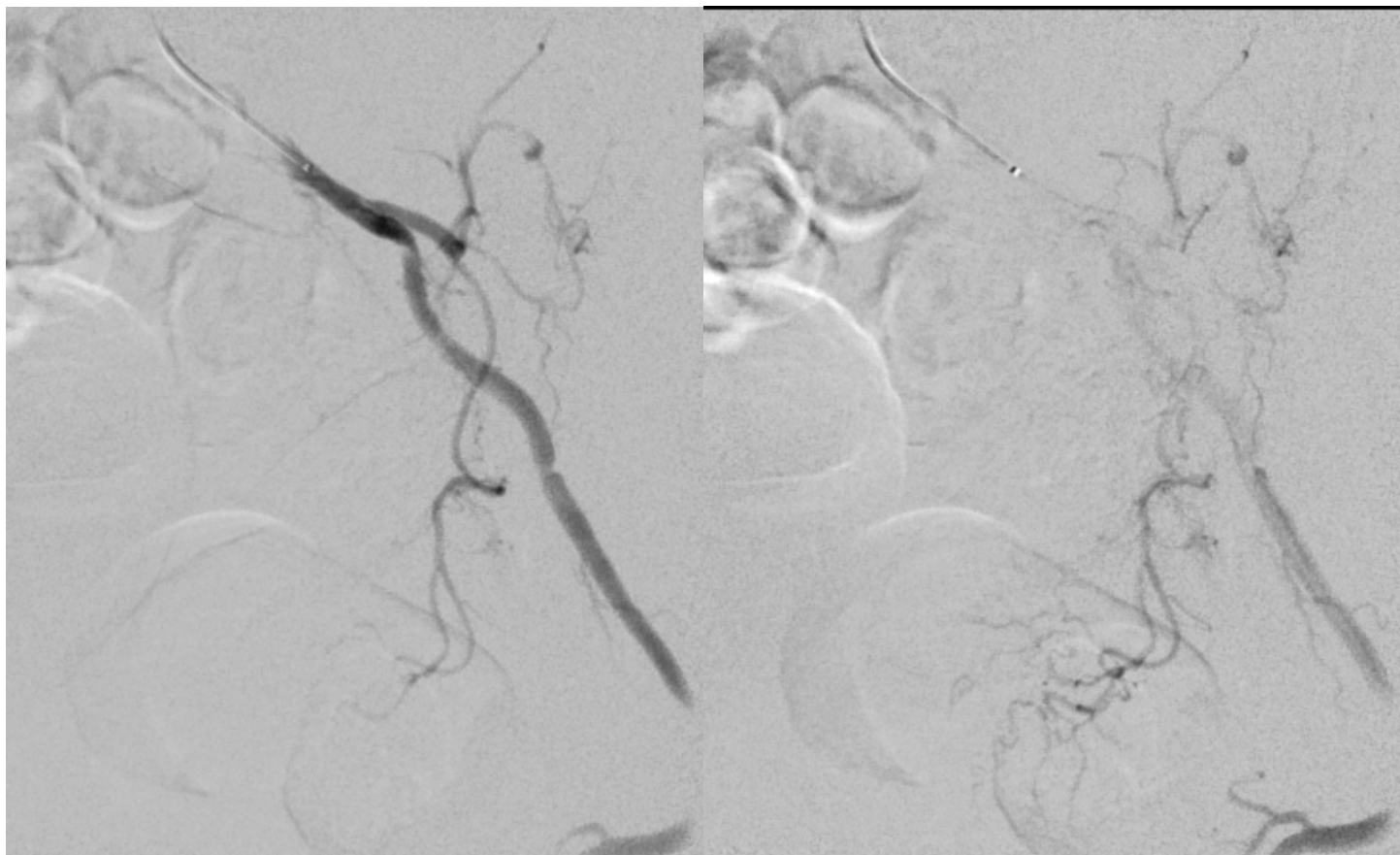
- Choice between being the central piece connecting every providers and members of the team
- or a person who positions/preps the patients and hand the materials
 - Don't become a commodity

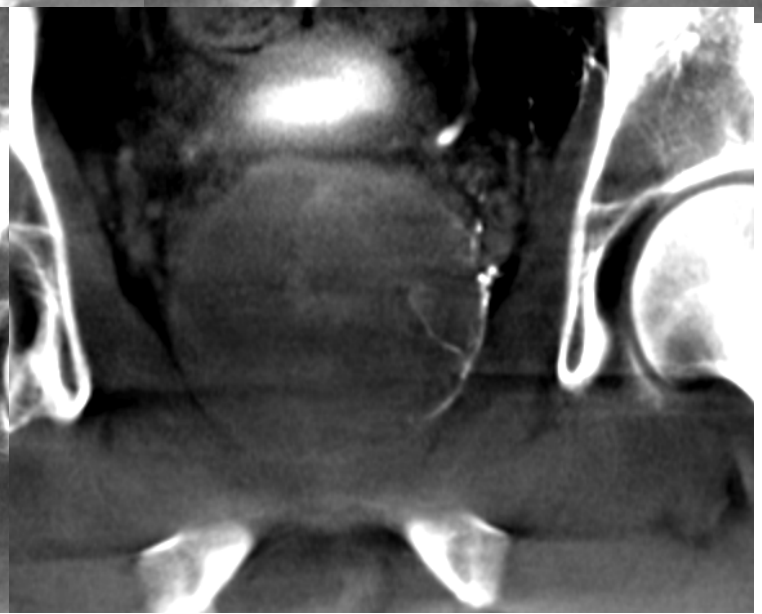
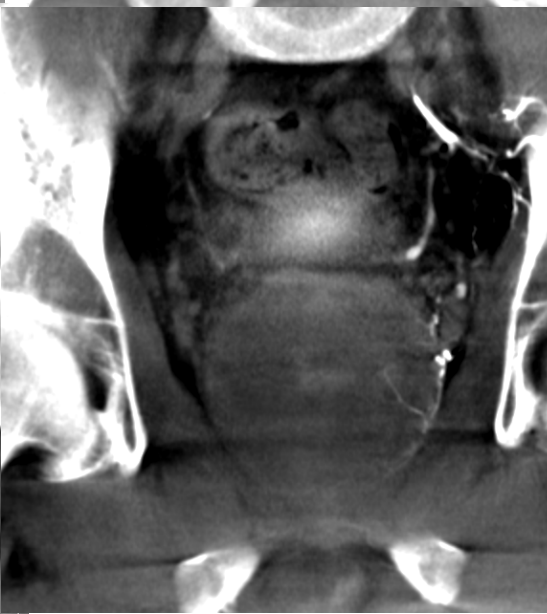
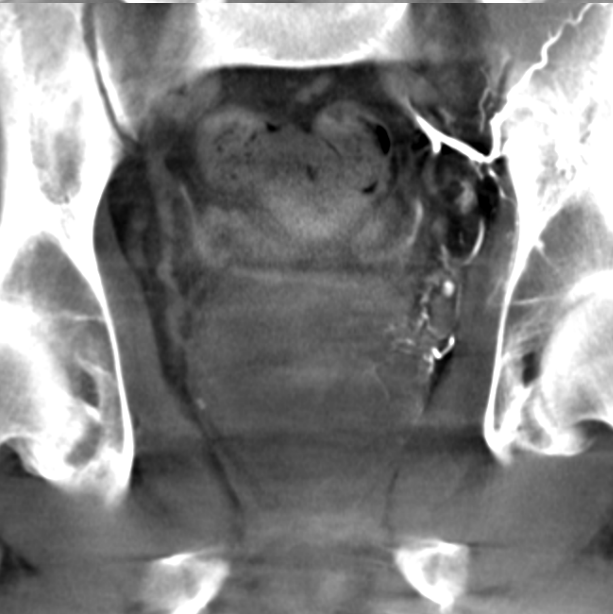












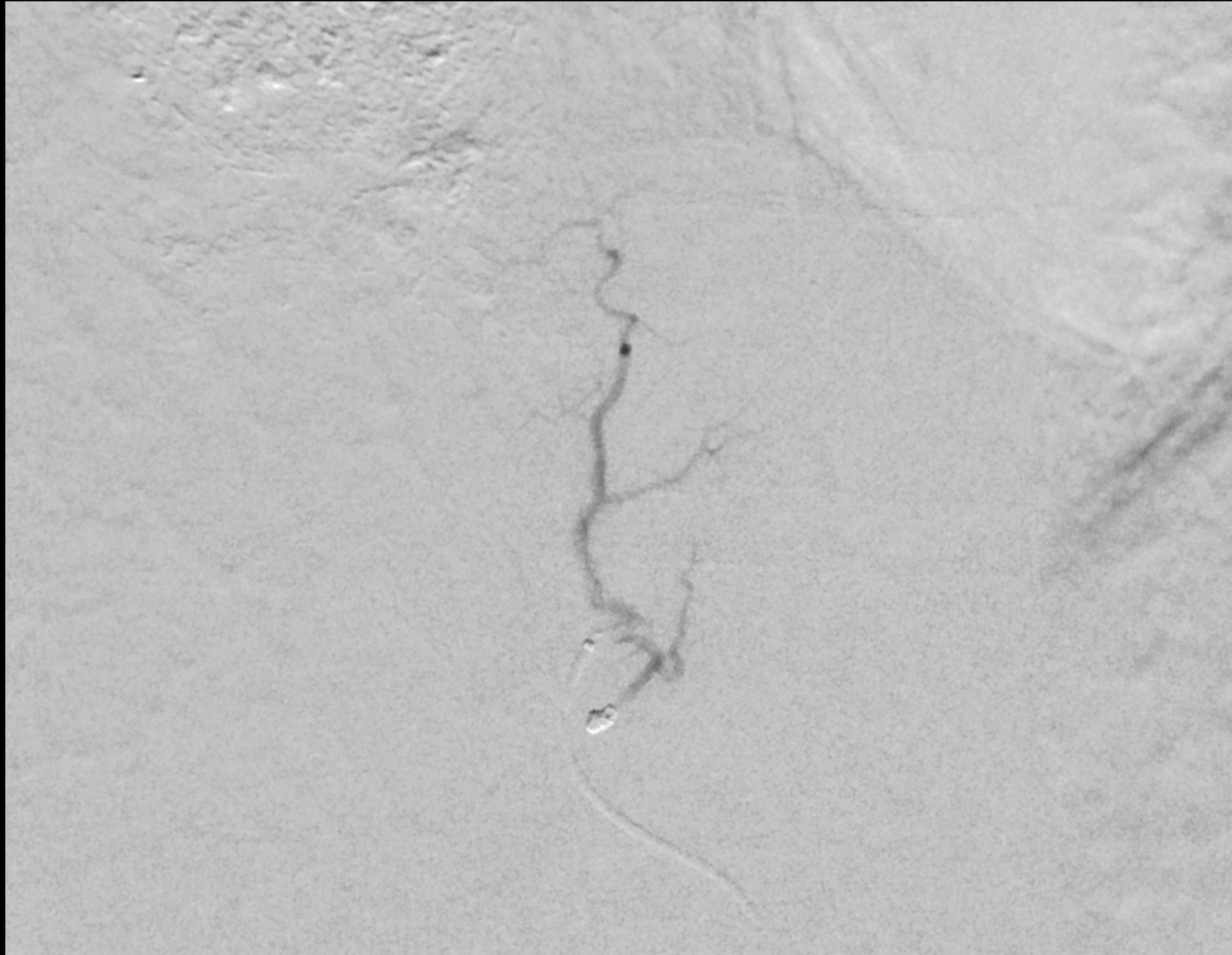










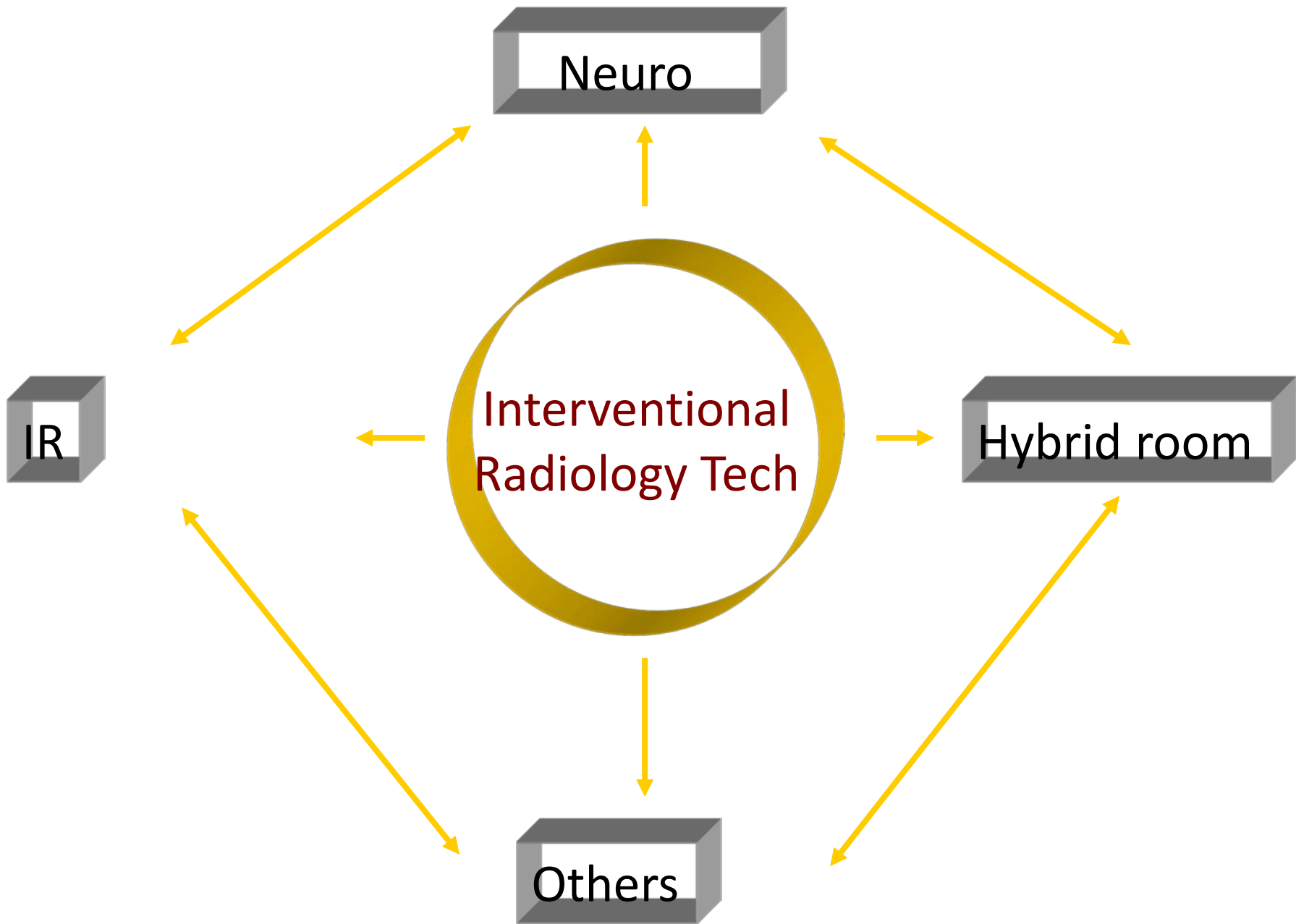


IR Tech

- Issues
 - Many technologists must cross-train in CT or interventional for department coverage
 - conduct examinations infrequently, which provides
 - less opportunity to become familiar with equipment, operation and technique
 - No standard training
 - Learning in the field
 - Lack of experience
 - Multitudes of materials and procedures needs long-term training
 - Computer skills

IR Tech

- Structured training is the most essential and immediate step
- Continuous education
- Familiarity with ALL materials
 - Inventory
- Mastering ALL of imaging (basics and advanced)
 - Cone Beam
 - Fusion imaging
 - Role in teaching residents and future providers



Team Definition

- A group of people with a **full set of complementary skills** required to complete a task or project

Team Members

- Operate high degree of interdependence
 - Share authority and responsibility for self-management
 - Are accountable for collective performance
 - Work toward a common goal
-
- A team becomes more than just a collection of people when a strong **sense of mutual commitment** creates **synergy**, thus generating performance greater than the sum of performance of its individual members

IR Team

- We need to embrace the changes and adapt ourselves to the new working environment
- We are distinct but complementary and have to build on this
 - People who share the same goal and champion it
 - People with compassion and confidence
 - People who care
 - Patient-driven
 - Innovators

IR Team

- Should know our history and be proud of who we are
 - Pioneered minimally medicine
 - Change medical practice and WE ARE the future of medicine
 - IR harnesses image-guided therapies to develop breakthrough treatments and improve standard of care

- Evolution is changing IR and challenges us. However, I have no doubt that the future is even brighter for **IR TEAM**