

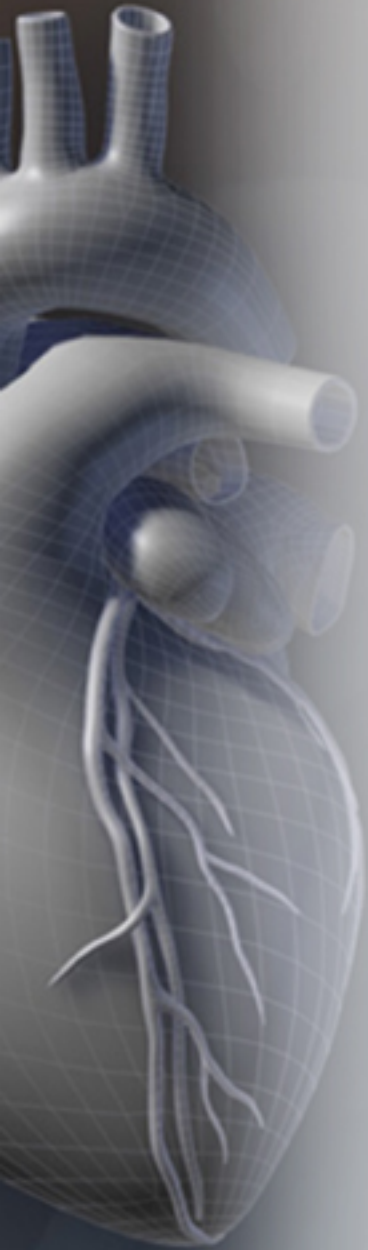
Getting to the heart of the matter

James Heppenstall
Superintendent Radiographer
Sheffield Teaching Hospitals

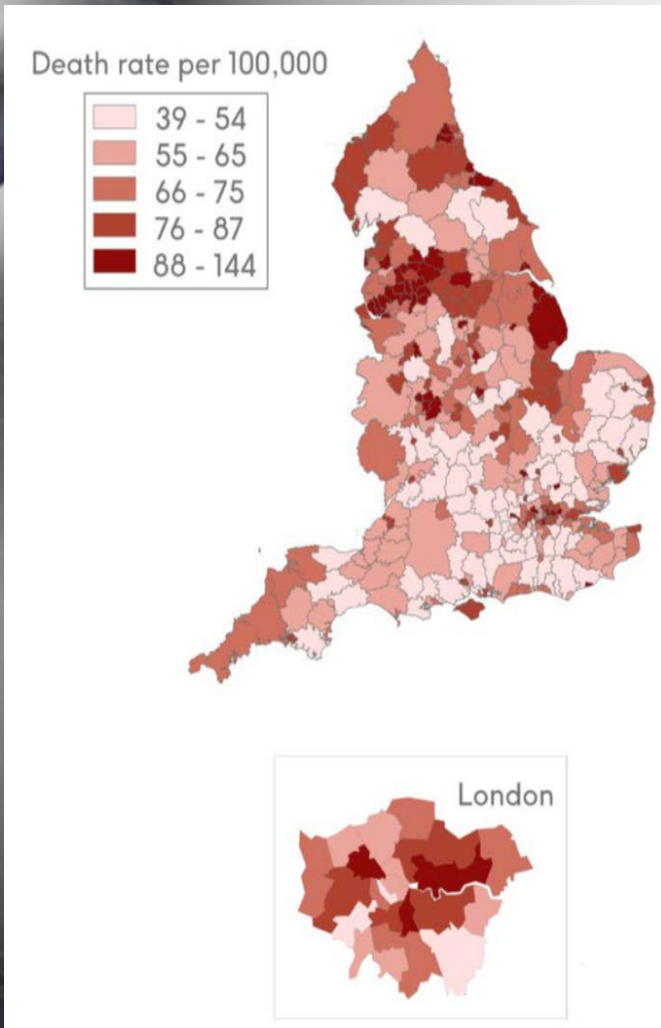
No conflicts

Angiography

- ἄγγειον (angeion), meaning "vessel"
- γράφειν (graphein), "to write" or "record"
- Why is it important?
- Scale of problem



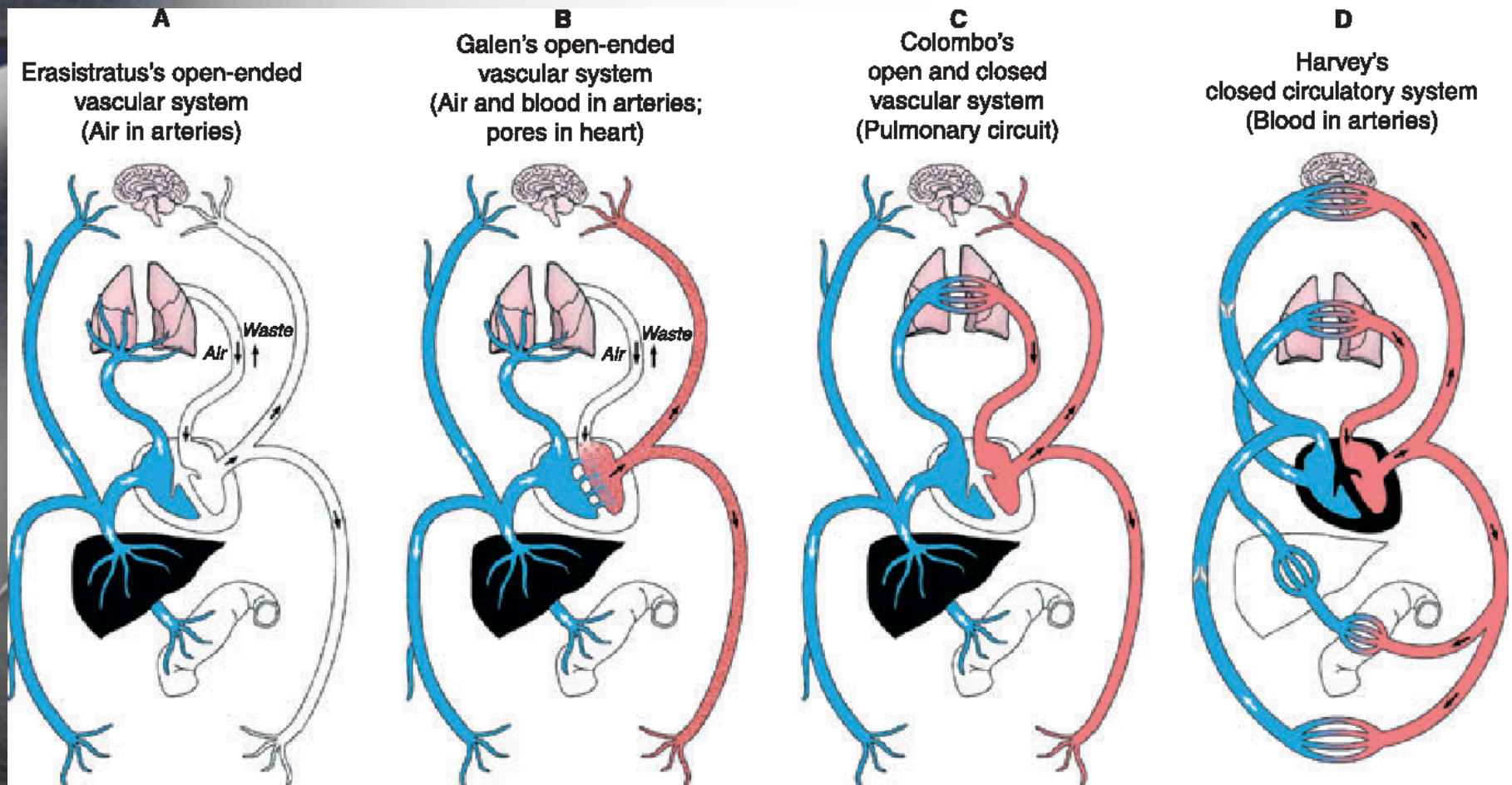
Why is it so important?



- There are currently 1.9 million people living with Coronary Heart Disease in England alone (6.1 million living with CVD)
- CHD is the leading cause of M.I's
- 82,000 hospital admissions in England every year
- 7.4 Billion pounds each year
- Decline in numbers since 1961
- Northern living!

Figures supplied by BHF Aug 2019

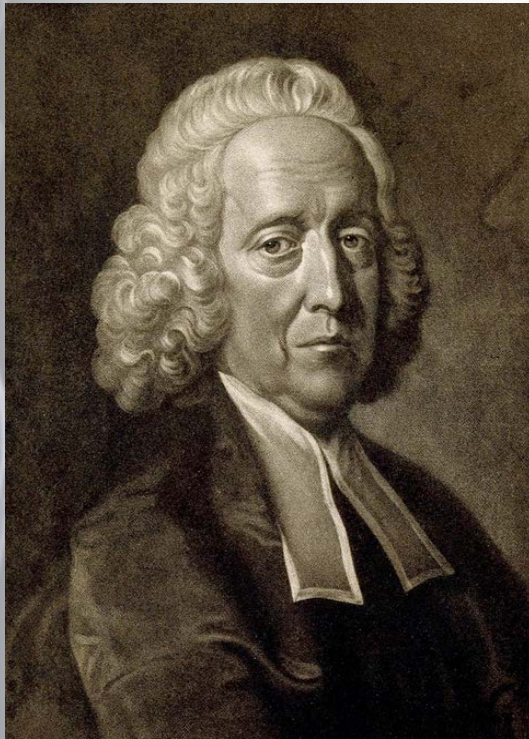
CV system (or so they thought)



Angio through the years

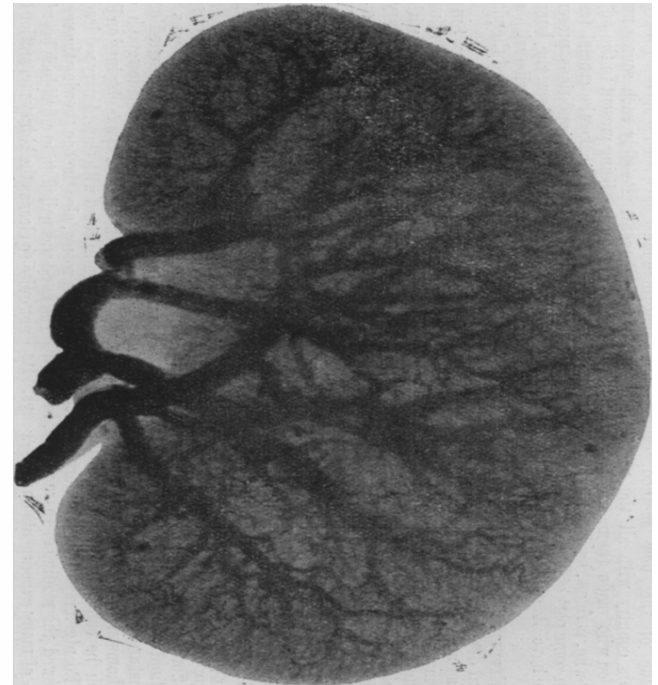
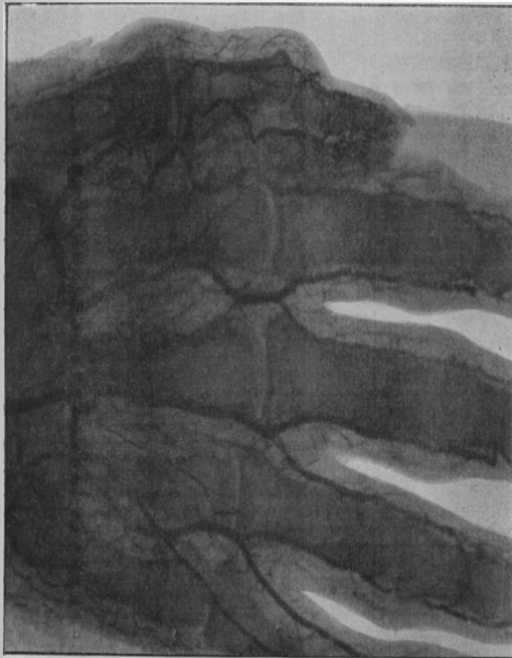
- 1711

Stephen Hales passes a catheter into the ventricle of a horse

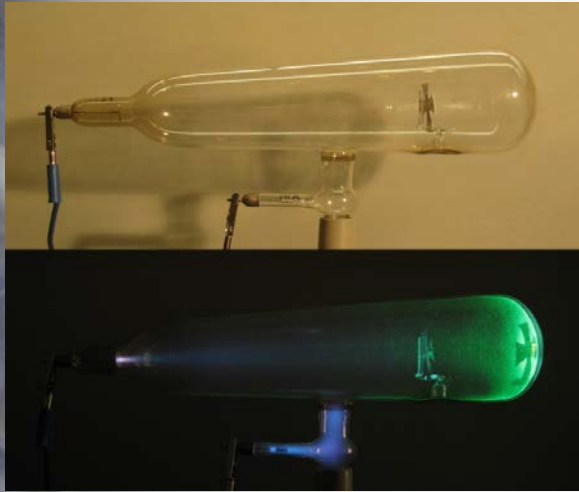


Angio through the years

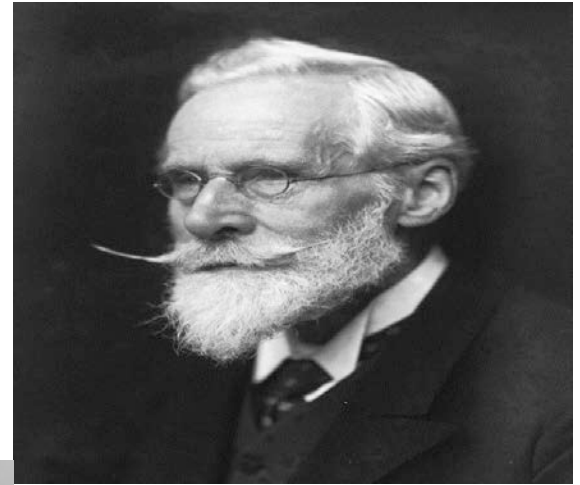
- 1711 Stephen Hales passes a catheter into ventricle of a horse
- 1844 Claude Bernard passed a catheter in the R/L ventricles of a horse
- 1896 Feb 22nd Sheffield join the Angio club!



Angio through the years



Crookes Tube



Sir William Crooke



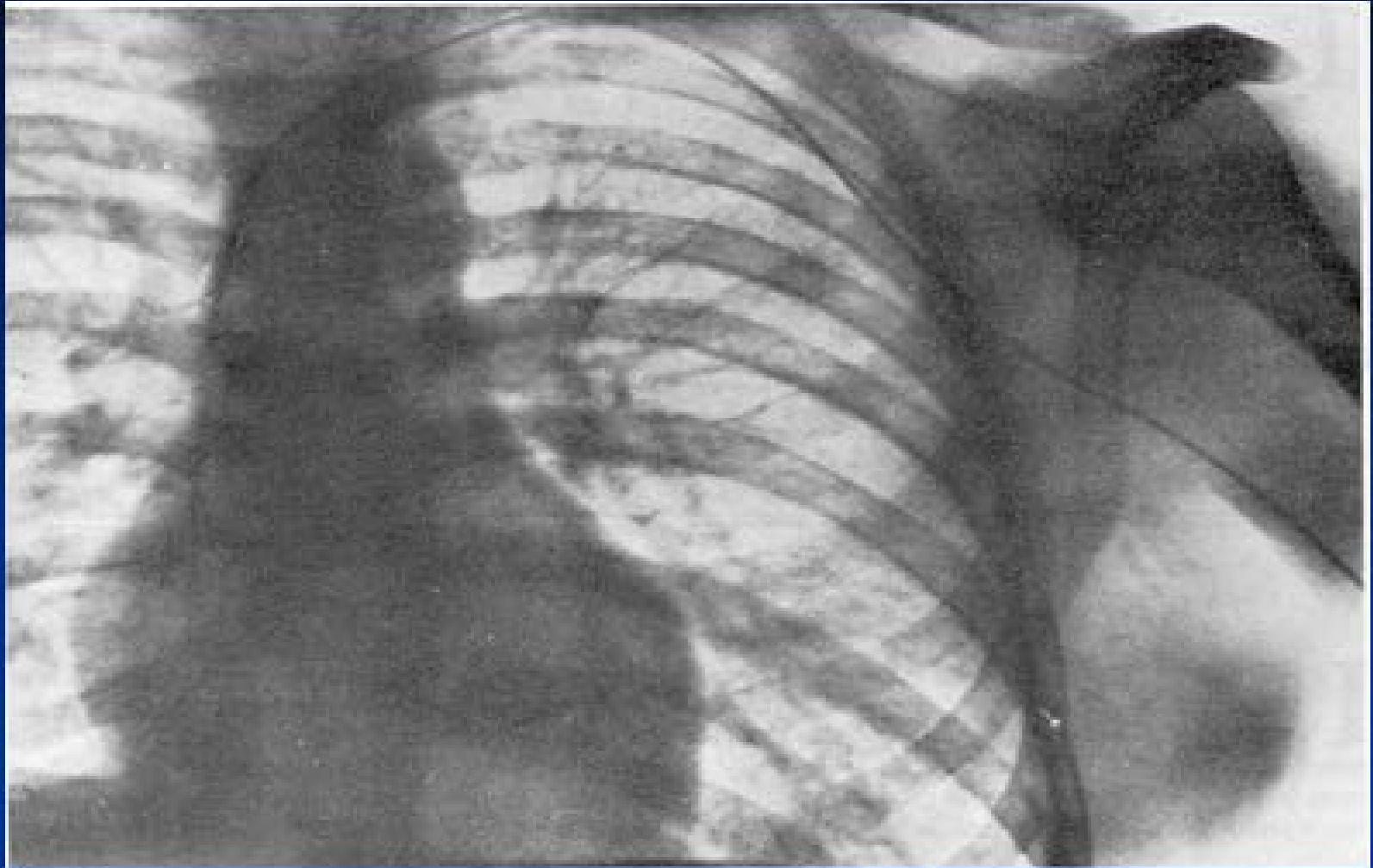
Wilhelm Röntgen

Angio through the years

- 1711 Stephen Hales passes a catheter into ventricle of a horse
- 1844 Claude Bernard passed a catheter in the R/L ventricles of a horse
- 1896 Feb 22nd Sheffield join the Angio club!
- 1929 Anders Werner Forssmann placed catheter through his ACV into Rt atrium / PA



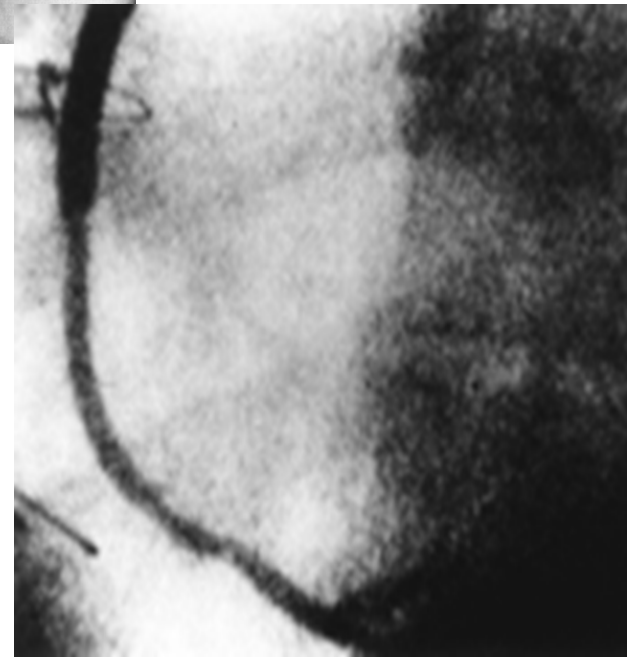
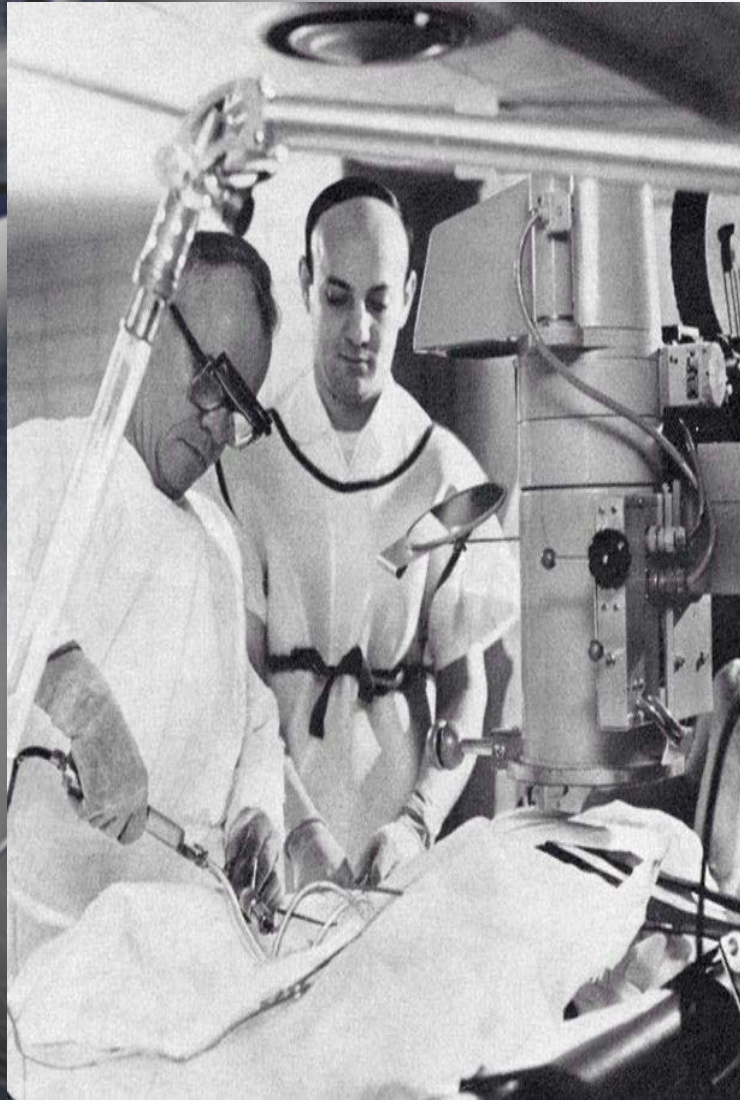
First Cardiac Catheter in Man

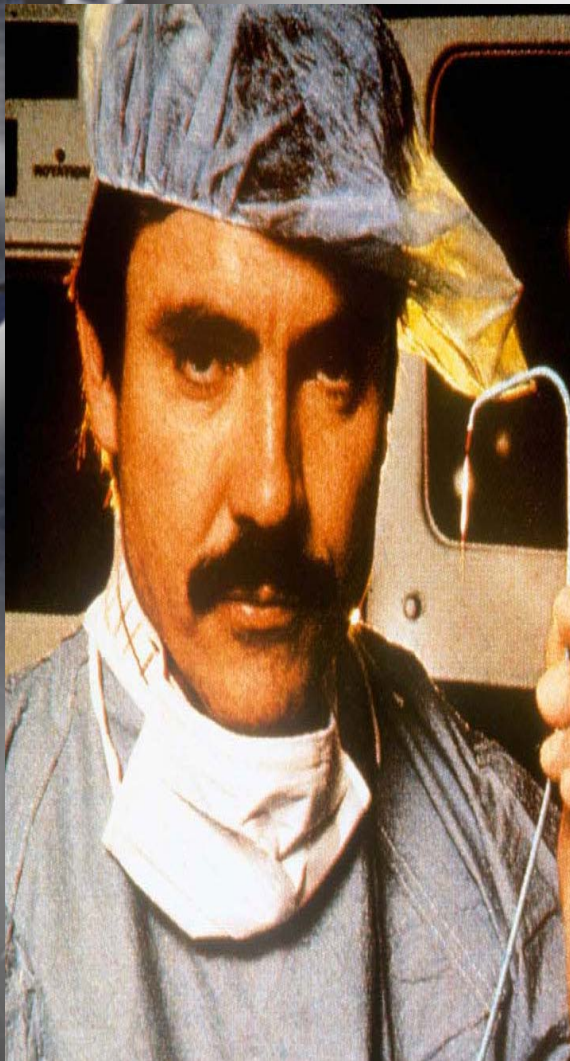


Angio through the years

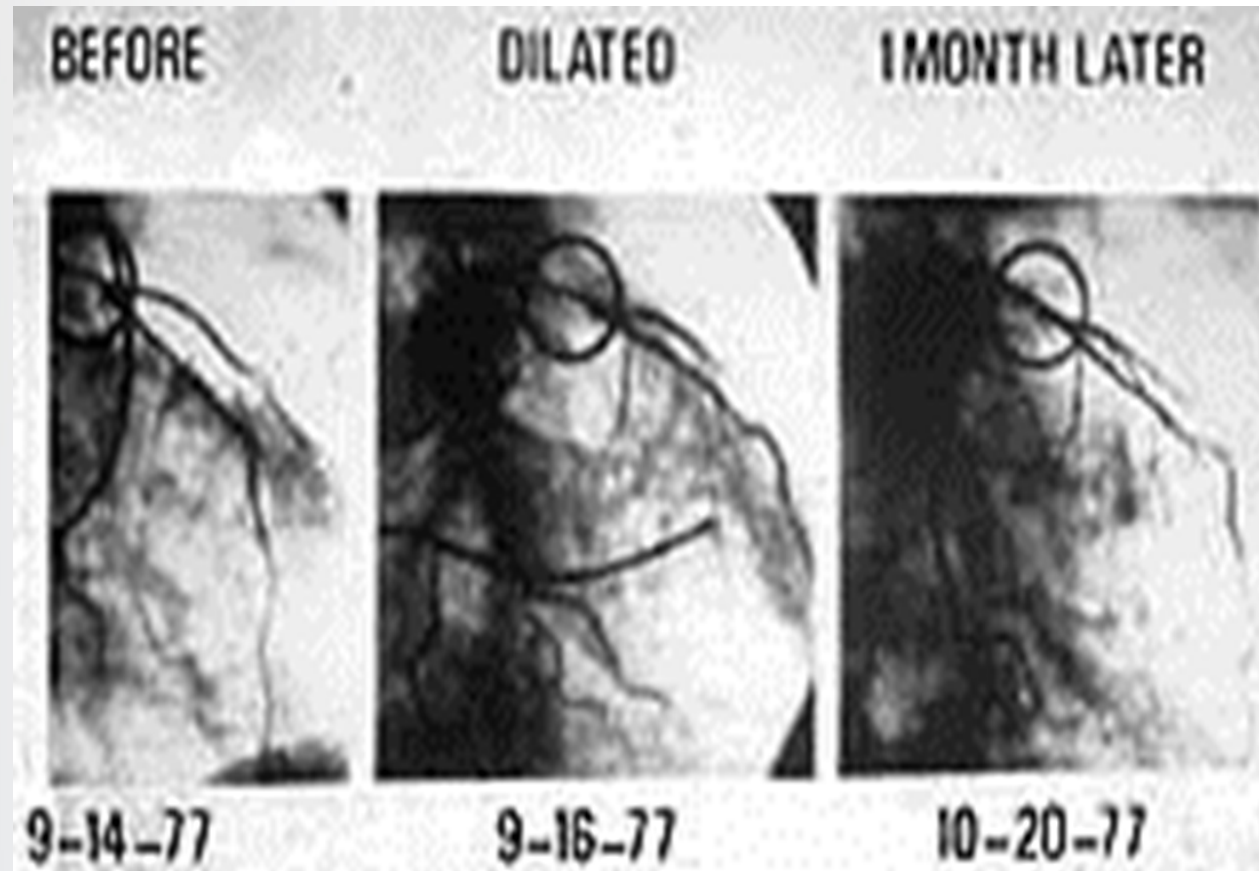
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- 1929 Anders Werner Forssmann placed catheter through ACV into Rt atrium / PA
- 1941 Cournard placed catheter into rt Ventricle
- 1945 1st Cardiac output measured
- 1958 1st brachial coronary injection Sones first selective coronary angio (by accident !)







Andreas Roland Gruentzig



1977 – Gruentzig performed the first PCI in a man

1986 the first stents were implanted.

Radiation Safety



AN EARLY RADIOGRAPHER



- Sister Blandina (1871-1916)
- 1898, started work as “radiographer” in Cologne
- Held nervous patients & children with unprotected hands
- Controlled the degree of hardness of the X-ray beam by placing her hand in it!
- Swollen and red
- Fingers / hand and arm....Gone
- Shortness of breath
- Open wounds
- RIP

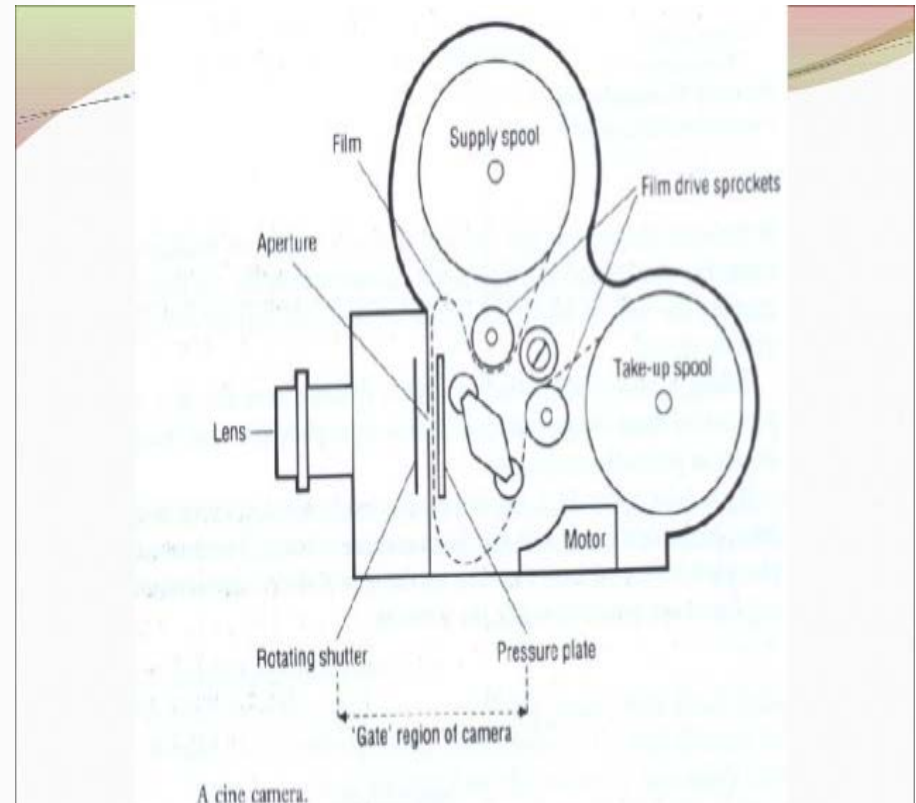
1st Fluoro System – 1920's



FLUOROSCOPY IN THE 1920s (WENCKBACH SCREENING APPARATUS)

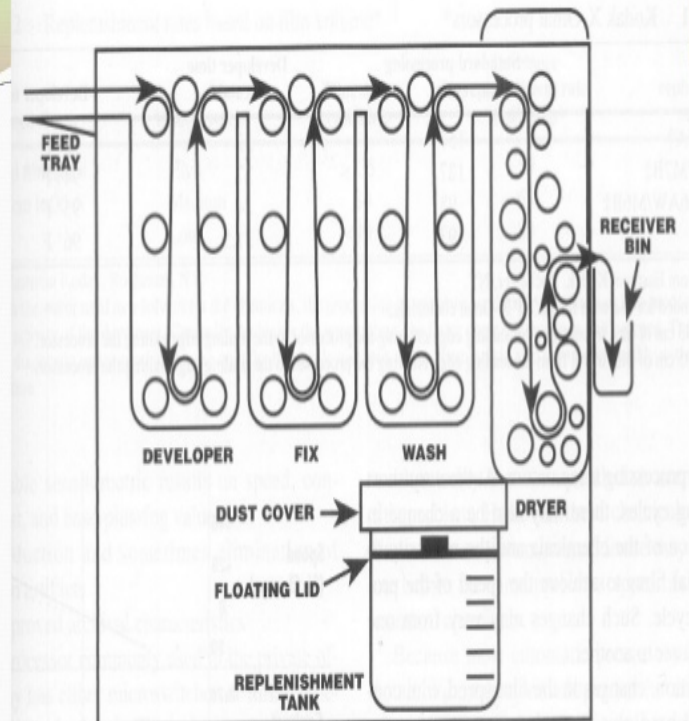
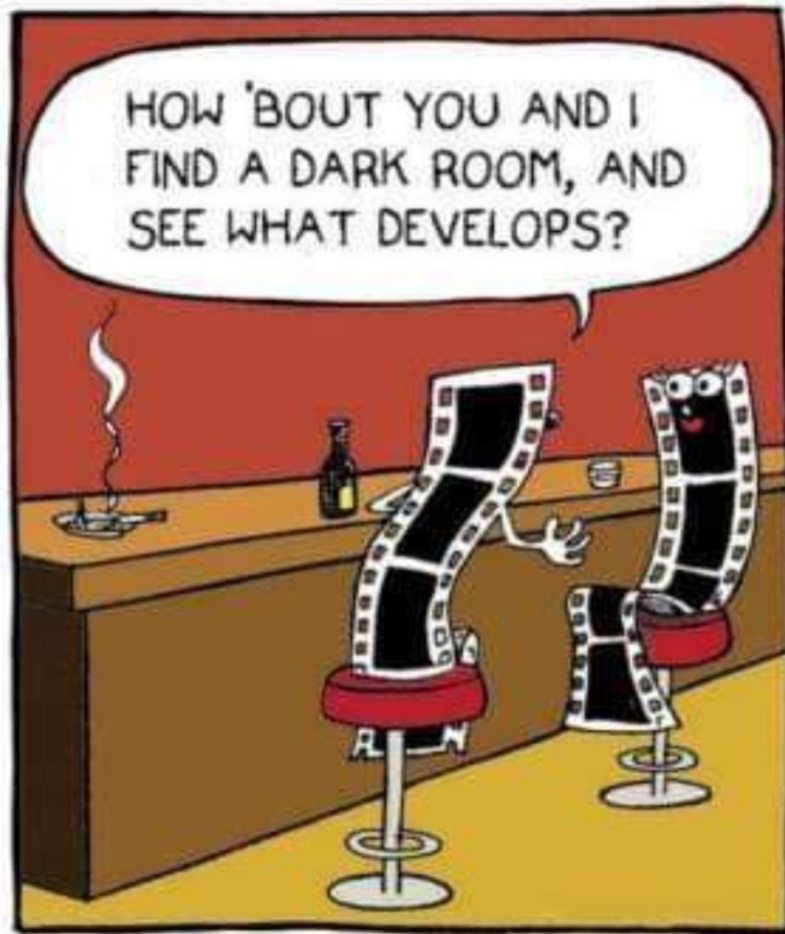
THIS SHOWS ONE OF THE EARLY FLUOROSCOPIC (SCREENING) UNITS IN USE. A RADIOLOGIST EXAMINING A PATIENT'S THORAX VIEWED A DIMLY LIT FLUORESCENT SCREEN IN TOTAL DARKNESS. NOTE THE COMPLETE LACK OF ANY RADIATION PROTECTION. MANY EARLY RADIOLOGISTS AND RADIOGRAPHERS LATER SUFFERED FROM RADIATION INJURIES.

Cine Camera



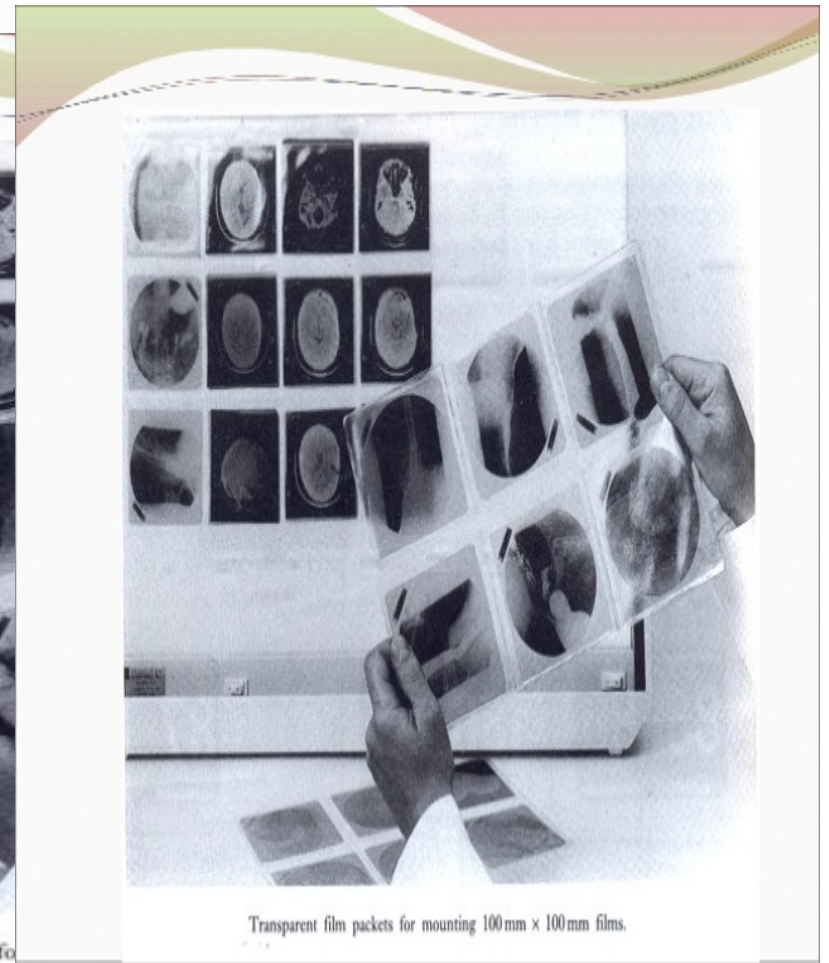
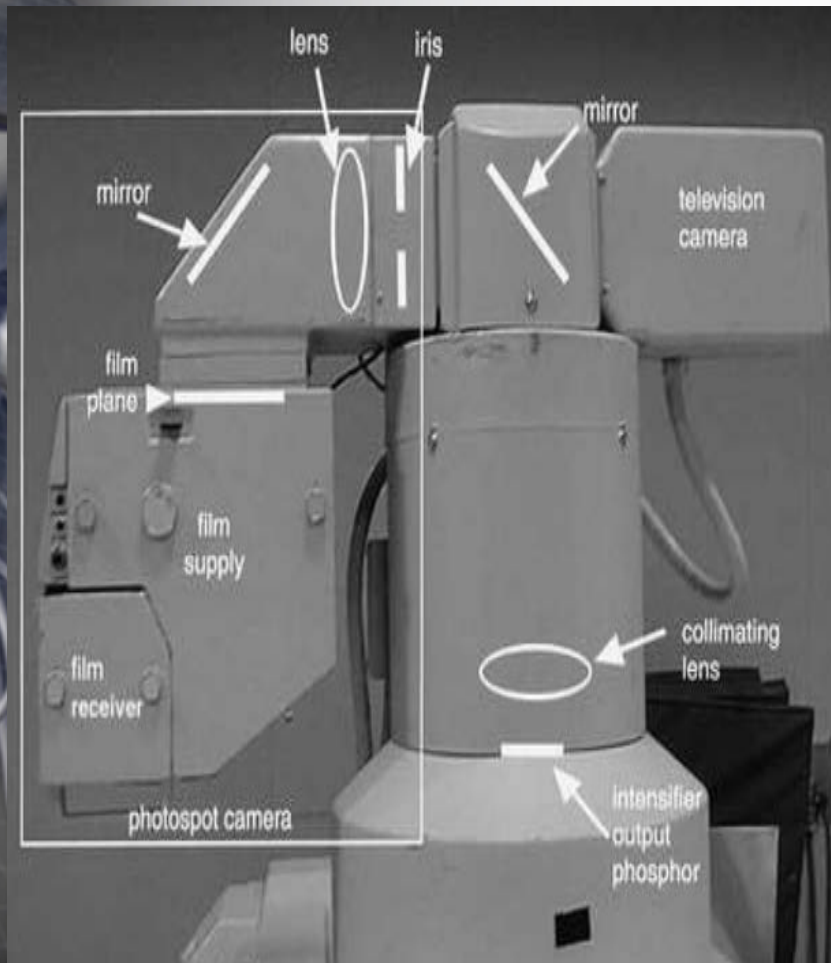
When a cine camera is used to record images from the image intensifier, the process is commonly known as cinefluorography.

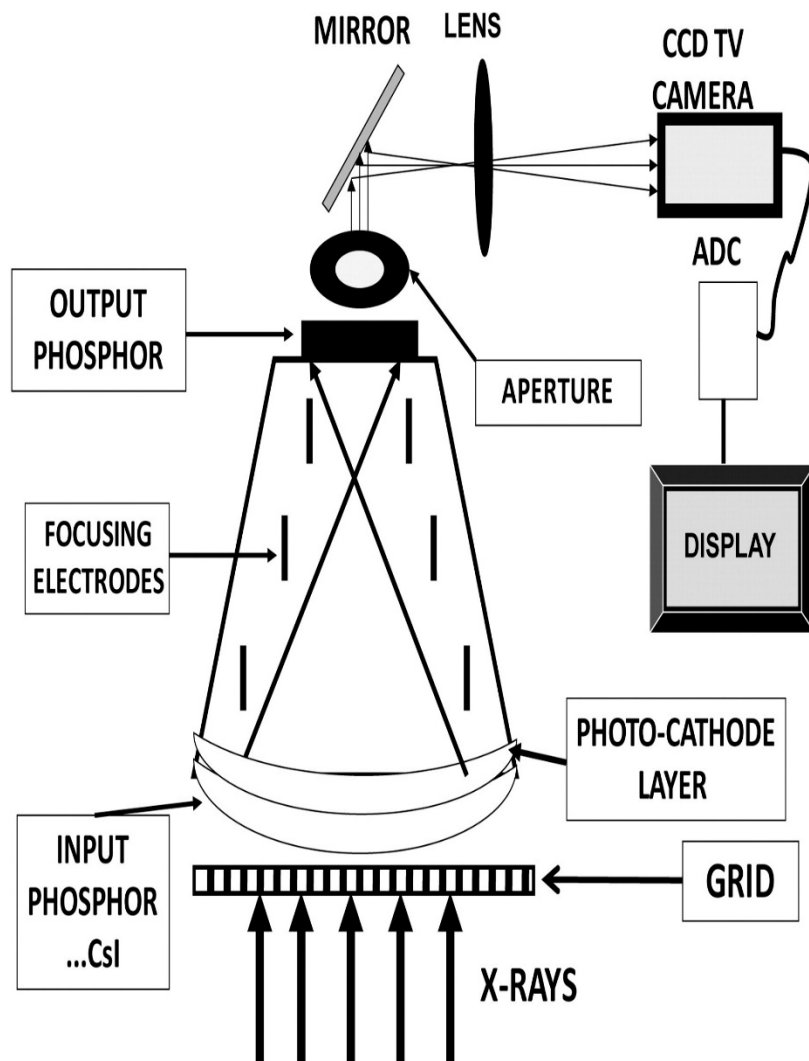
Cine



The Scopix 12 roll film processor. The processor is capable of processing all roll films from 35 mm to 105 mm and with special feeder will also process 100x 100 mm film sheet

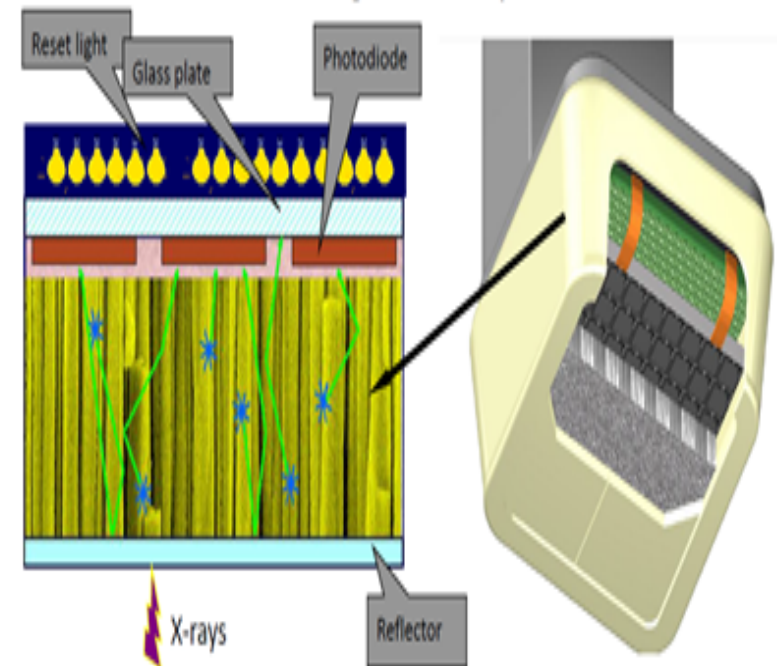
Spot film



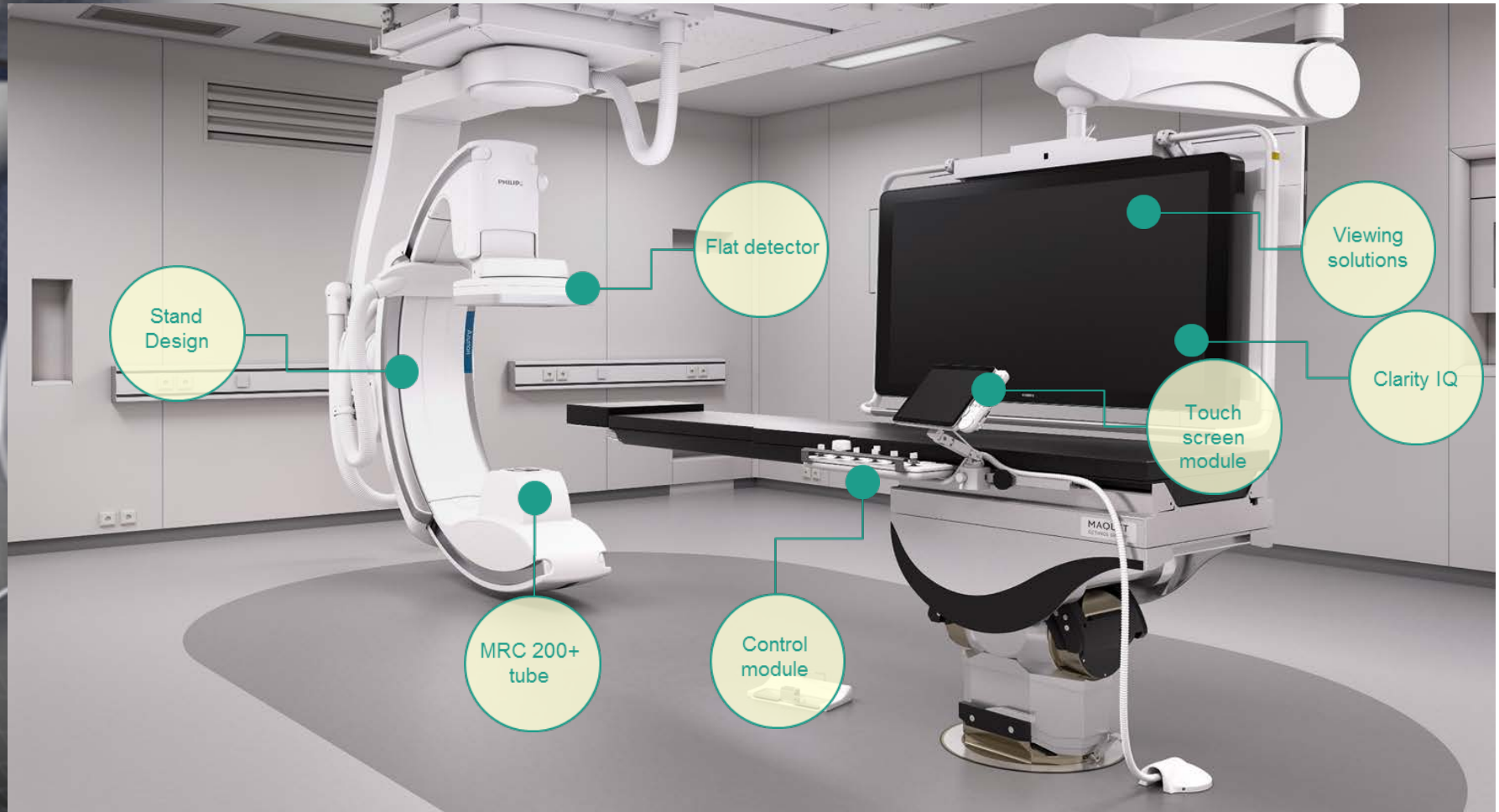


Flat Detector

- CsI scintillator:
 - Needle-like crystals convert the X-rays into light and transmit the light to the photodiodes

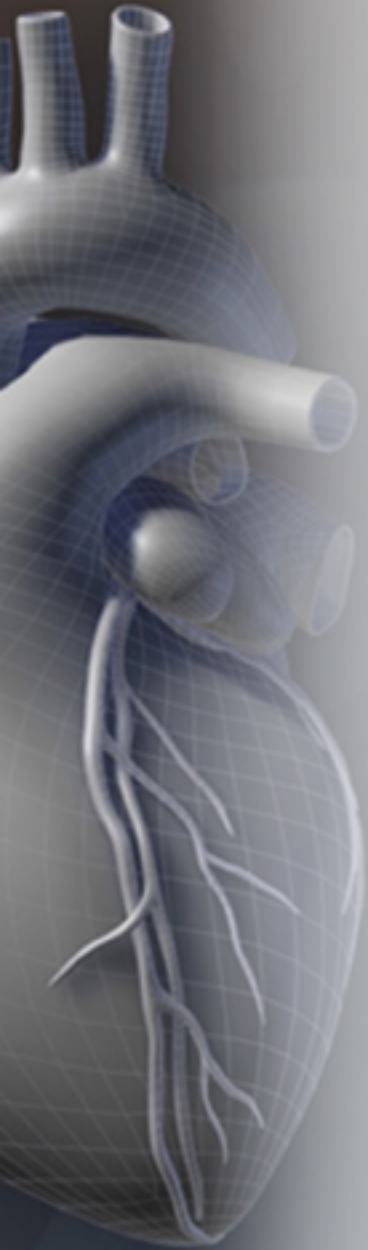


The Future / The Now



Modern developments

- User interface
- Flex Spot
- Flex Vision XL
- Table side module (TSM)



Flex(ible) Spot



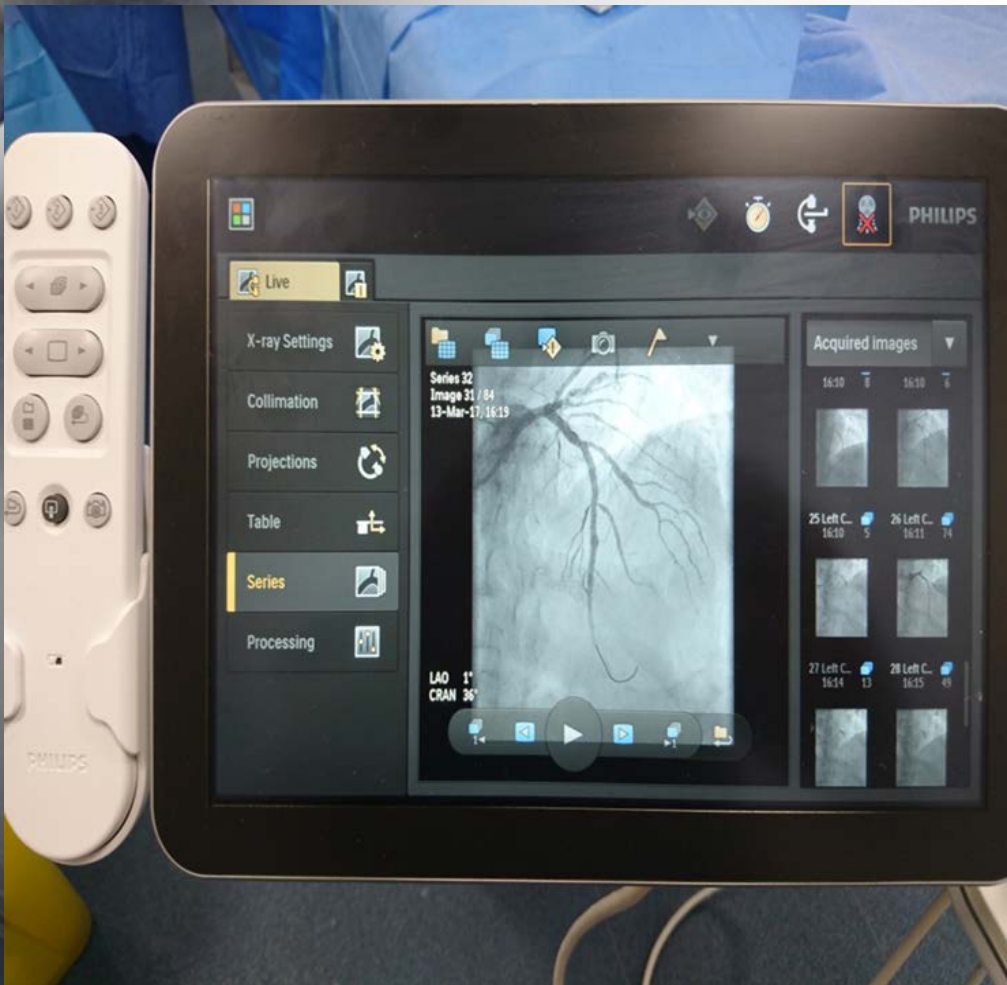
- Total room set up
- Parallel working
- Adaptable !
- Procedure cards

Flex Vision XL



- Multiple displays
- Clinically customisable
- Addition inputs displayed

T.S.M – Not an



- Radiographic workstation with lab
- Lay out is based on Procedural card
- Allows for altered fluoro / exposure rate
- Multiple tabs for patient imaging
- Additional keyboard and mouse functionality

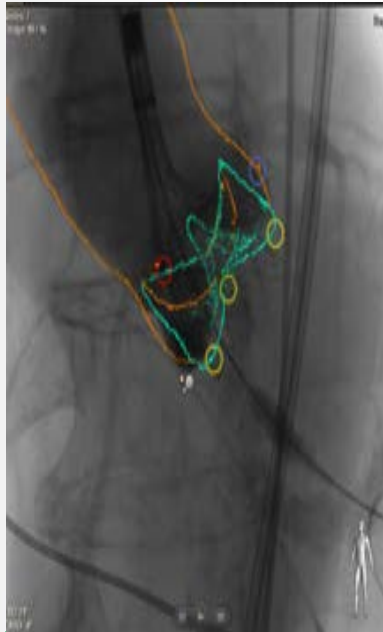
Happy Consultant + Happy Team =
Best Clinical Care



Multiple functionality



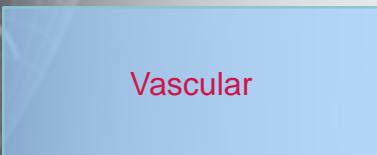
Percutaneous
Coronary
Interventions



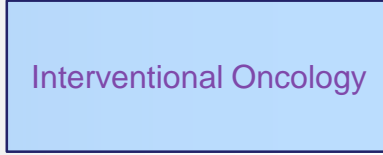
Structural Heart
Disease



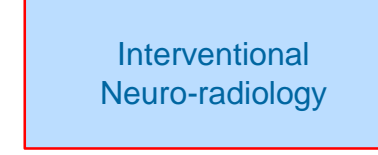
Electrophysiology



Vascular



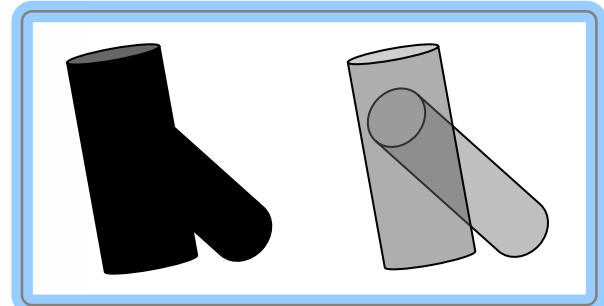
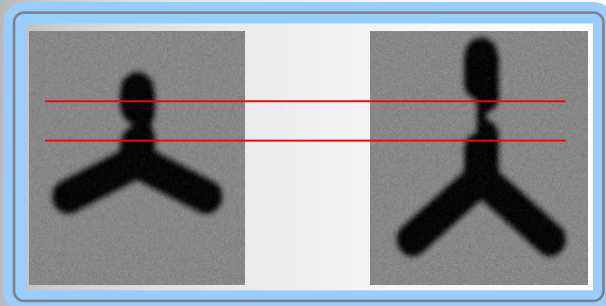
Interventional Oncology



Interventional
Neuro-radiology

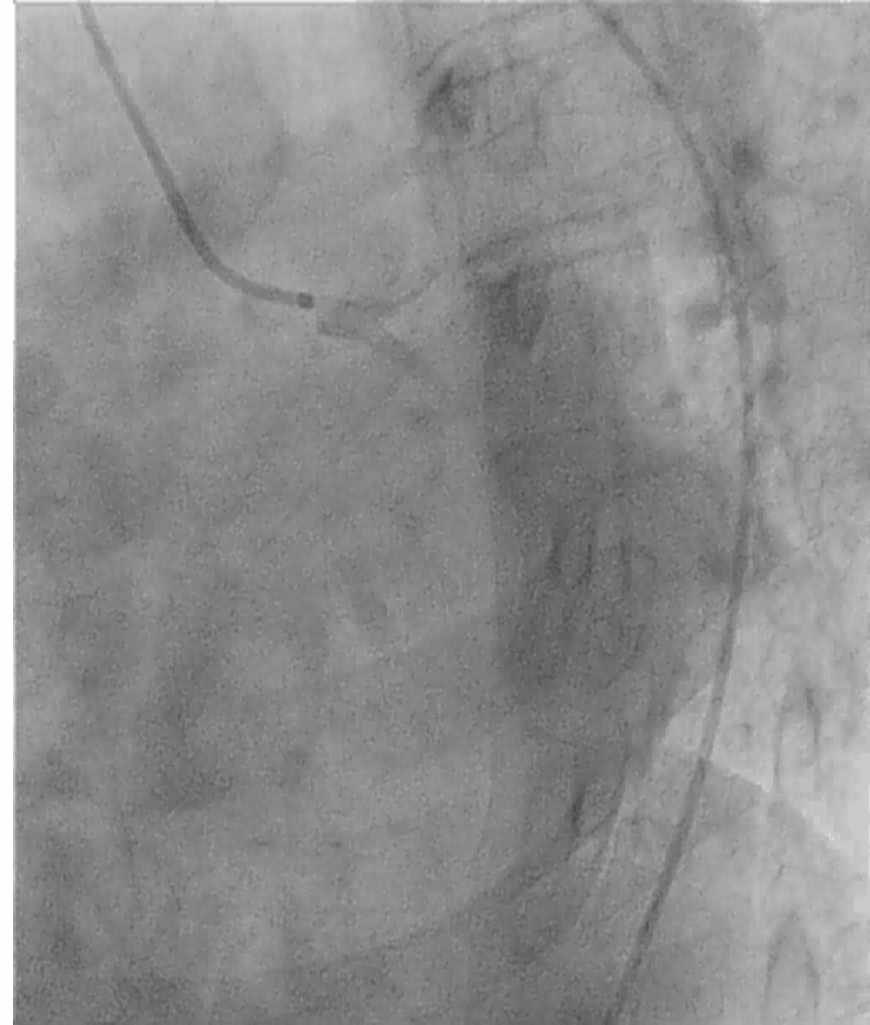
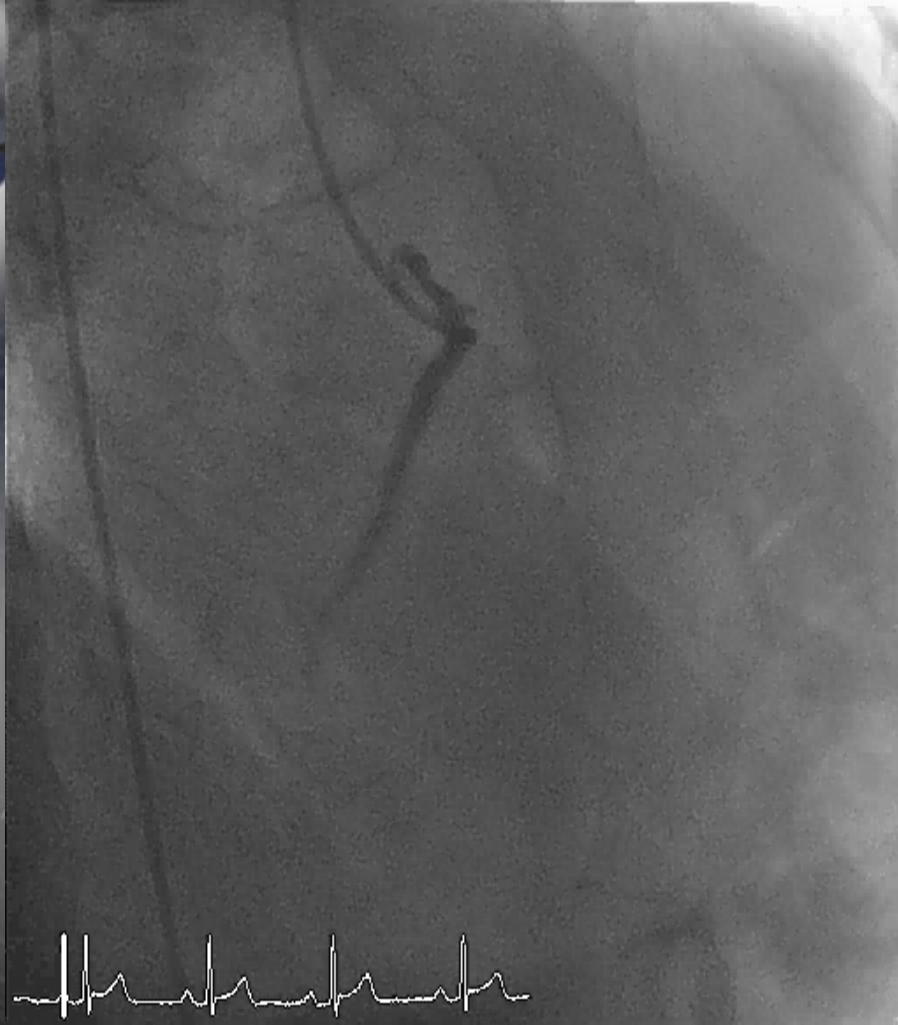
Rotational Angiography

- Current 2D imaging can misrepresent the 3D reality allowing for misrepresentation of:
 - overlapping branches
 - true length of the stenosis



(Courtesy of Dr. Gheeraert, UZ Gent).

Rotational Angiography

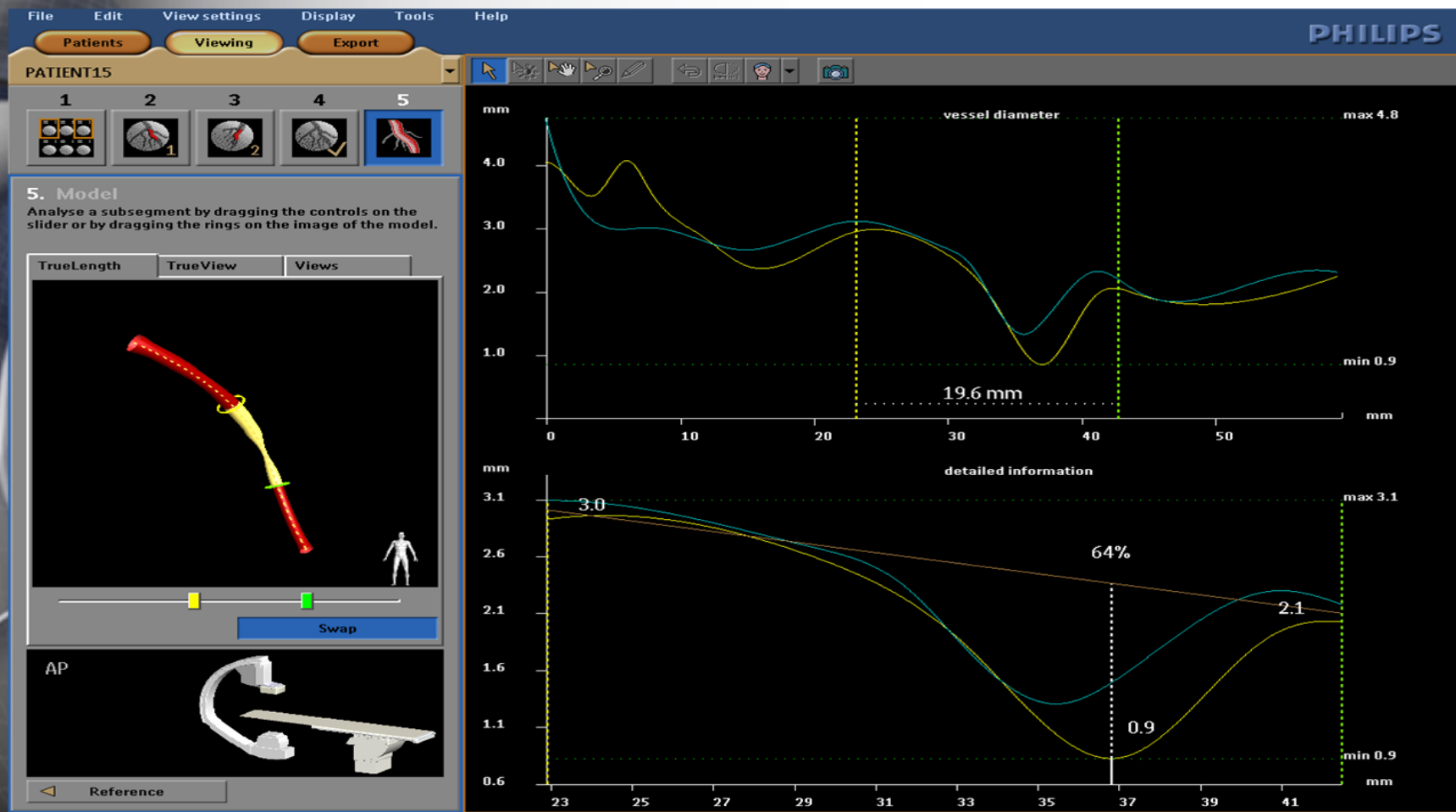


A 3D anatomical model of a human heart, rendered in a light blue/white color. A semi-transparent wireframe mesh is overlaid on the heart's surface, particularly visible on the left ventricle and the coronary arteries. The model is positioned on the left side of the slide, partially cut off by the edge.

Capabilities of Rotation

- **3D modelling**
- “True Length” measurements
- “True View” ability - foreshortening calculation
- Tortuous anatomy

True Length Calculations

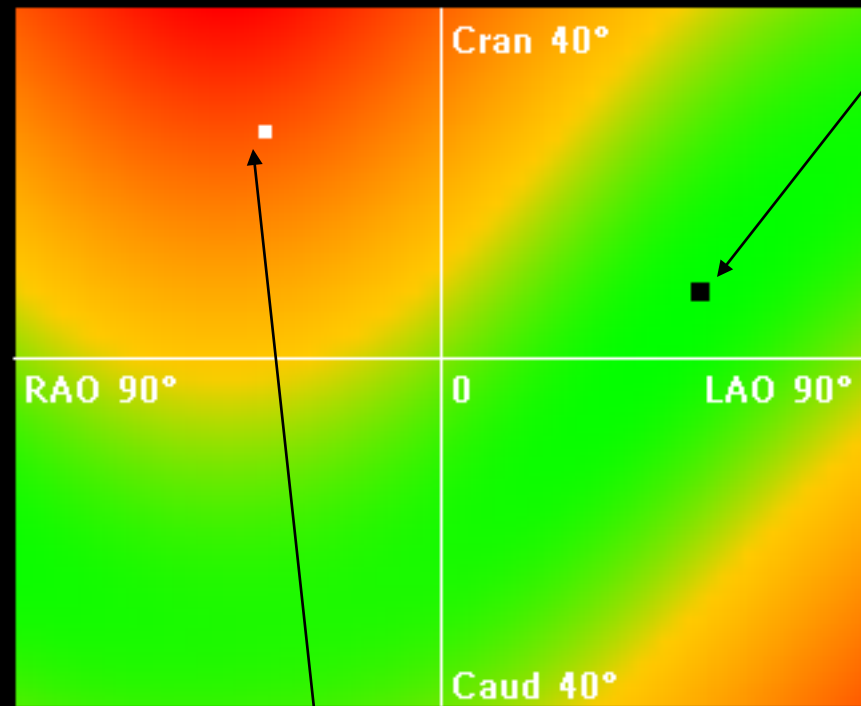


“True View” Capability

Current foreshortening: 44.3 %

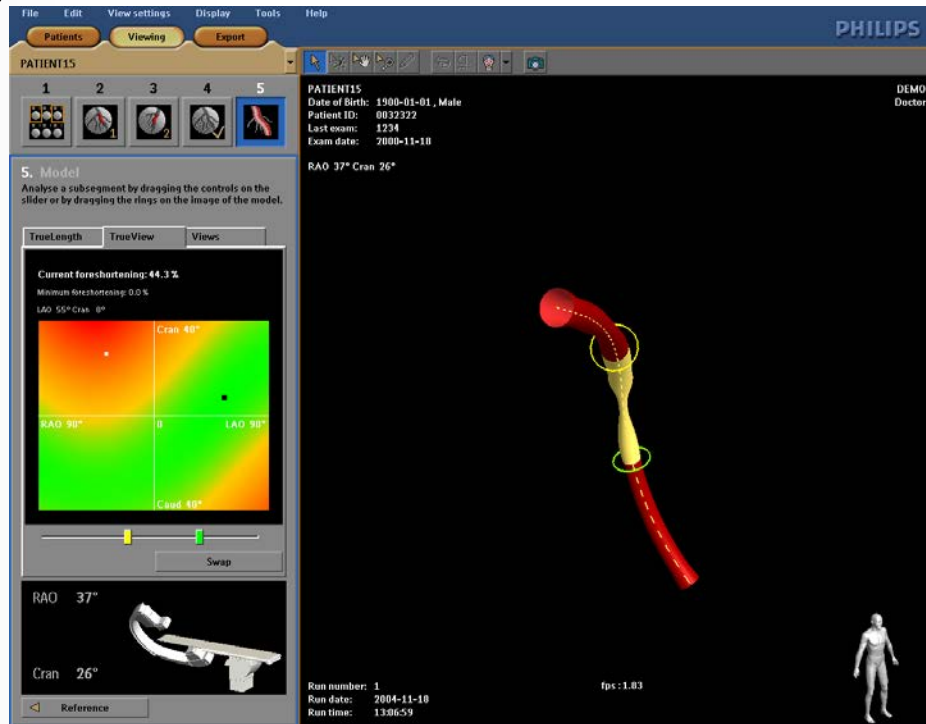
Minimum foreshortening: 0.0 %

LAO 55° Cran 8°

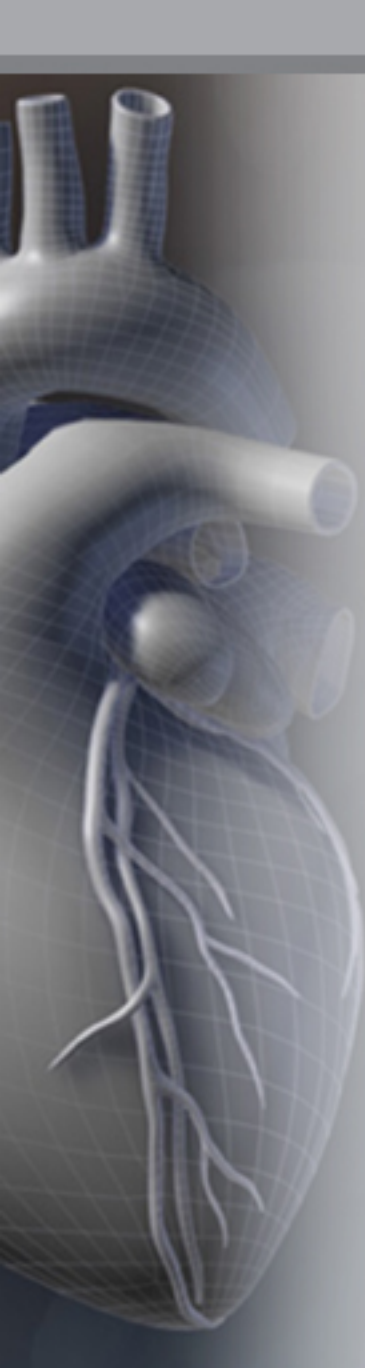


Current view

Optimal view



“True View”



PHILIPS

File Edit View settings Display Tools Help

PATIENTS Viewing Export

PATIENT15

1 2 3 4 5

5. Model
Analyse a subsegment by dragging the controls on the slider or by dragging the rings on the image of the model.

TrueLength TrueView Views

Current foreshortening: 0.1 %
Minimum foreshortening: 0.0 %
LAO 55° Cran 8°

Cran 40°
RAO 90° 0 LAO 90°
Caud 40°

Swap

LAO 55°
Cran 7°

Reference

PATIENT15
Date of Birth: 1900-01-01, Male
Patient ID: 0032322
Last exam: 1234
Exam date: 2000-11-18
LAO 55° Cran 7°

Current view is optimal view with 0% foreshortening

Run number: 1
Run date: 2004-11-18
Run time: 13:06:59

fps : 1.10

DEMO Doctor

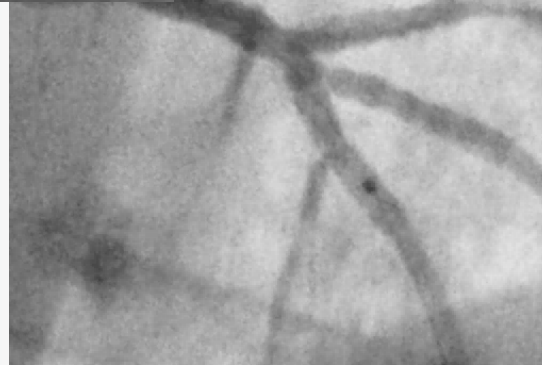
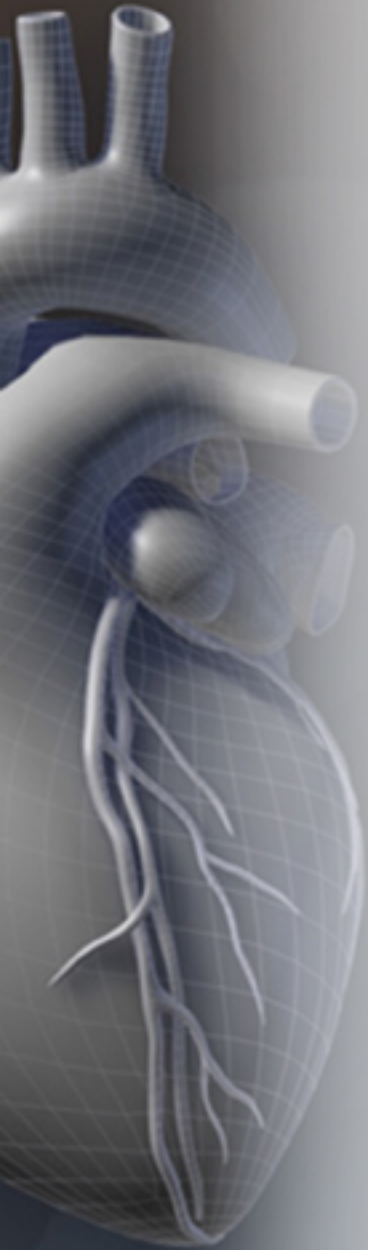


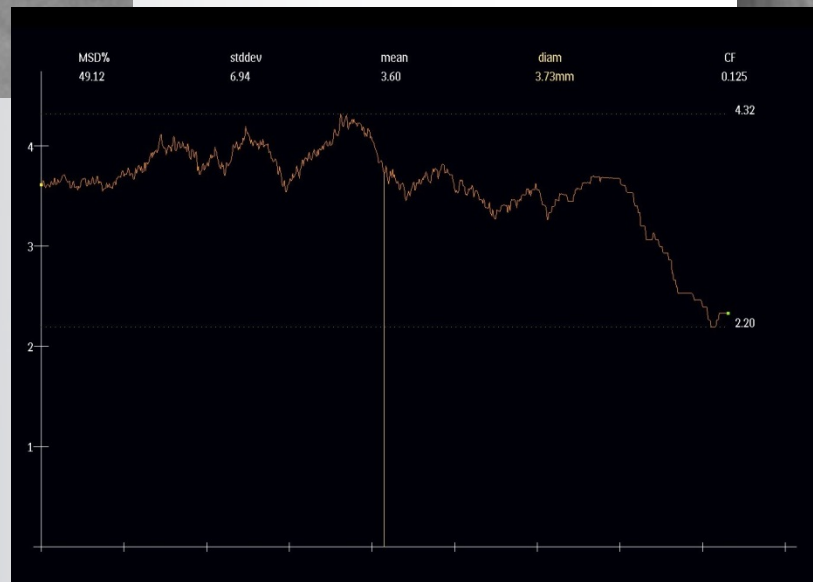
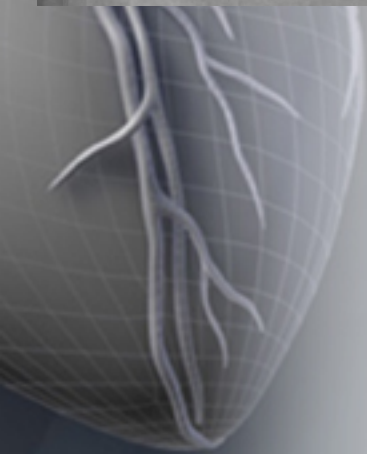
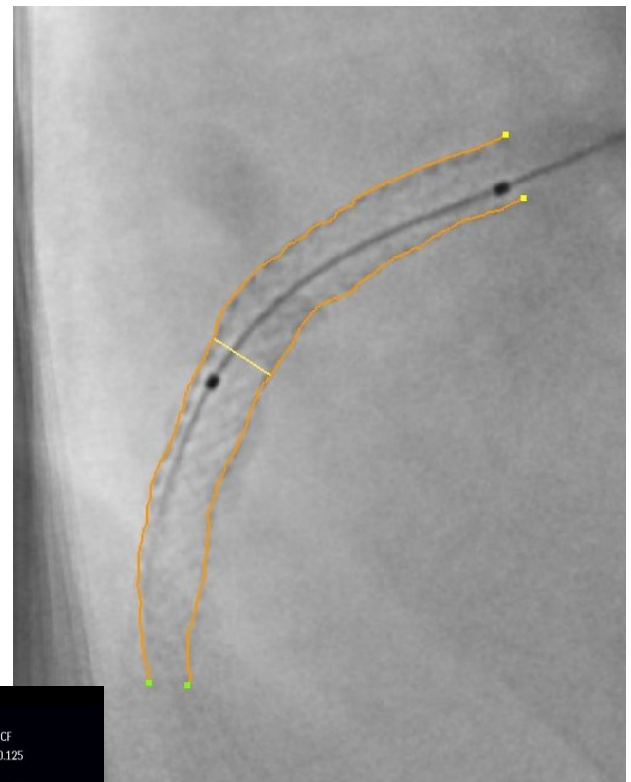
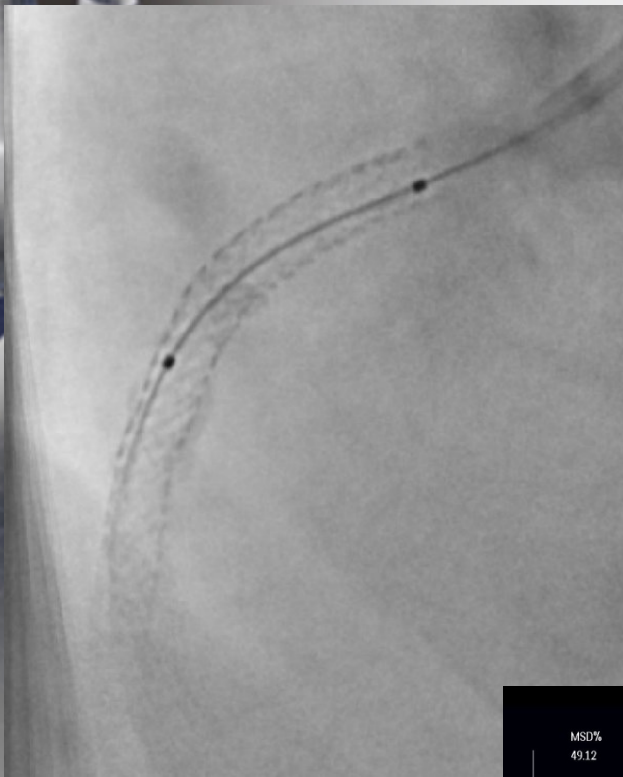
Stent Boost

- Visualisation of stents now challenging due to reduction in stent strut thickness (great for deliverability)
- High resolution image improving deliverability of stent location
- Uses markers from stent delivery so no exchange equipment required
- Stent boost facilitates in stent placement in coronary interventions.
- Visualize the stent in relation to vessel wall with Stent boost Subtract
- Improved clinical outcomes at 6mth / 12mth

Effect of StentBoost imaging guided percutaneous coronary intervention on mid-term angiographic and clinical outcomes.
Dong Joo Oh et al., Int J Cardiol 2013 Sep 16;168(2):1479-84

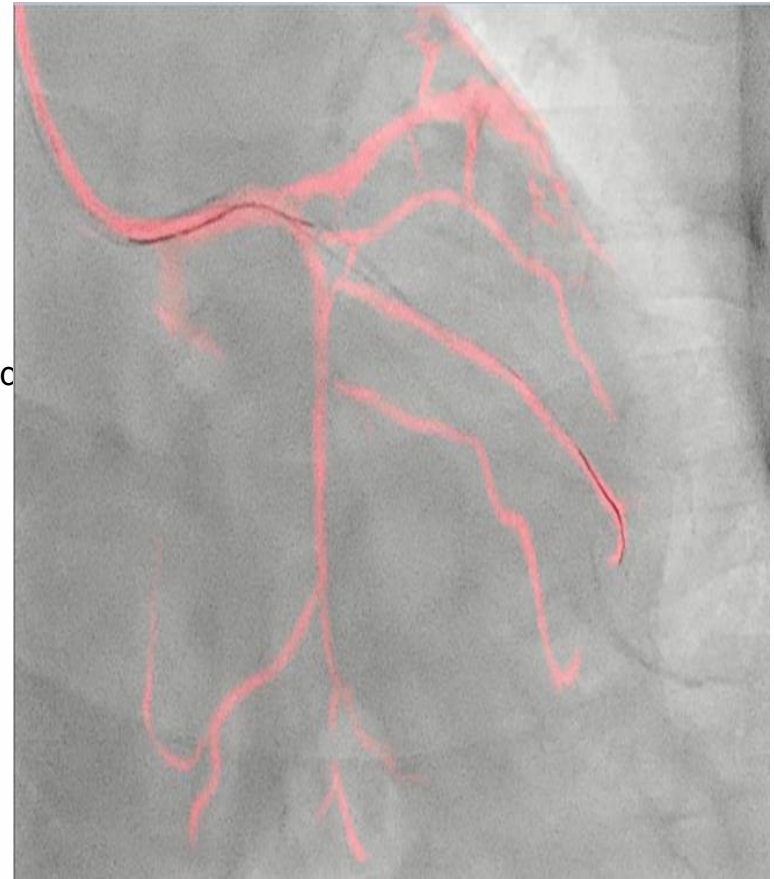
Stent Boost Subtract (SBS)





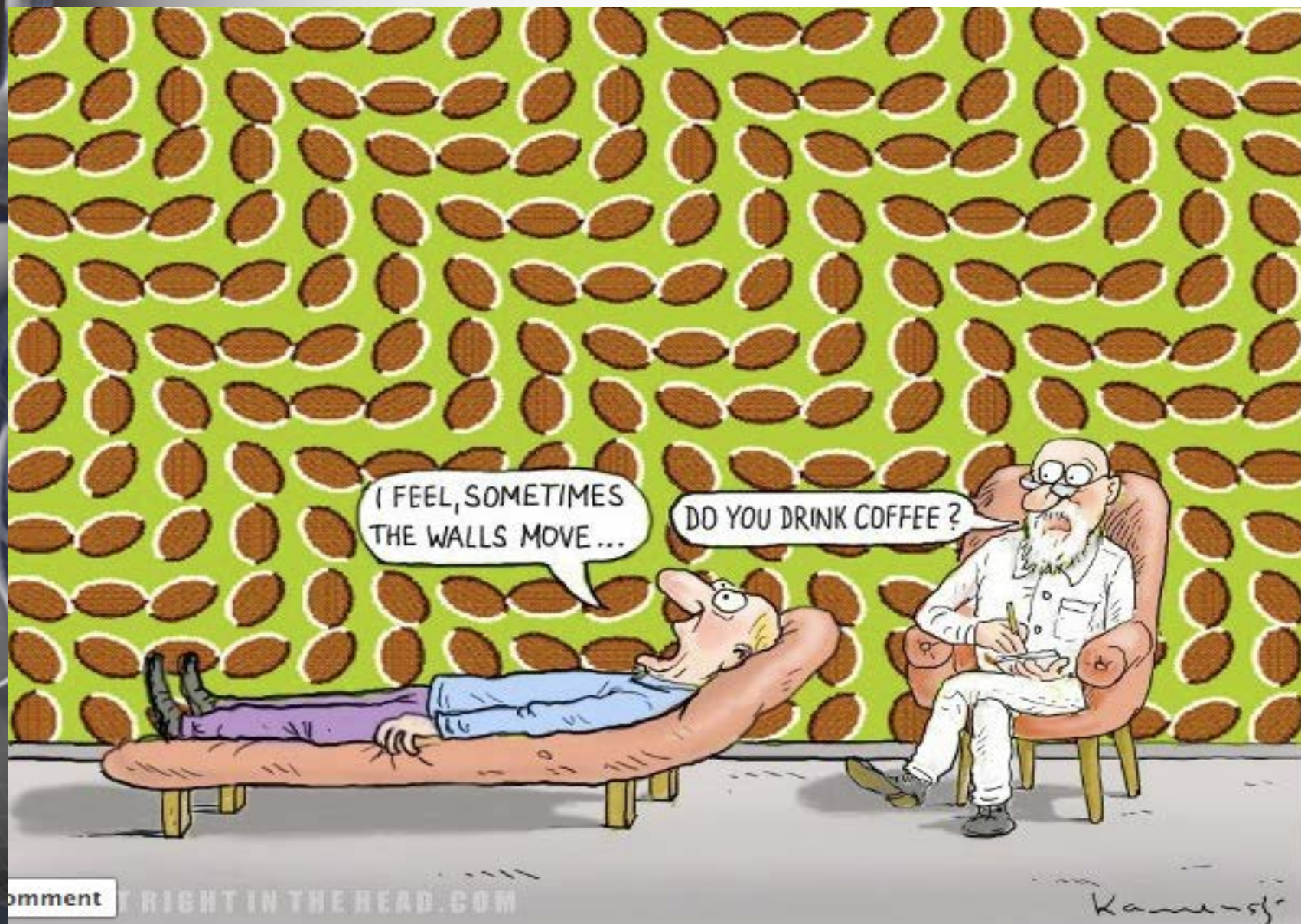
The future – Dynamic Coronary Roadmap

- Real time navigational guidance for PCI. Confident navigation through the coronary anatomy
- Overlays Coronary Angiogram onto live screening in colour
- Enables the visualisation of catheters, wires and stents aiding correct placement.
- Reduces dose as procedural time is reduced
- Reduced amount of contrast media administered allowing more renally impaired patients to be imaged
- Ability to tackle difficult/tortuous anatomy



The End?







KEEP
CALM
and...

...ok, not THAT calm!