



## Red tech official for radiographer

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### ✓CT Basic Principles

**1.** What does the term 'pitch' refer to in CT scanning?

- A. X-ray tube voltage
- B. Ratio of table movement to beam width
- C. Rotation speed of gantry
- D. Number of detectors used

✓**Answer:** B. Ratio of table movement to beam width

**2.** Who is credited with developing the first commercial CT scanner?

- A. Wilhelm Roentgen
- B. Johann Radon
- C. Godfrey Hounsfield
- D. Alan Cormack

✓**Answer:** C. Godfrey Hounsfield

**3.** In which year was the first 3rd generation CT scanner introduced?

- A. 1971
- B. 1974
- C. 1979
- D. 1989

✓**Answer:** B. 1974

**4.** Which CT generation uses a rotating X-ray tube with a stationary detector ring?

- A. First
- B. Second
- C. Third
- D. Fourth

✓**Answer:** D. Fourth

**5.** What is the purpose of collimators in a CT scanner?

- A. Increase scatter radiation
- B. Decrease image contrast
- C. Shape and limit the X-ray beam

D. Amplify X-ray output

✓**Answer:** C. Shape and limit the X-ray beam

**6.** Hounsfield Unit (HU) for water is:

A. -1000

B. 0

C. 100

D. 500

✓**Answer:** B. 0

**7.** Which material has the lowest Hounsfield Unit (HU)?

A. Fat

B. Air

C. Water

D. Bone

✓**Answer:** B. Air

**8.** What is the matrix size commonly used in CT image reconstruction?

A. 128x128

B. 256x256

C. 512x512

D. 1024x1024

✓**Answer:** C. 512x512

**9.** Which of the following determines CT image resolution?

A. Gantry speed

B. Slice thickness

C. Patient weight

D. Radiation dose

✓**Answer:** B. Slice thickness

**10.** What does a voxel represent in CT imaging?

A. A 2D point

B. An X-ray source

C. A 3D pixel

D. A filter

✓**Answer:** C. A 3D pixel

**11.** What is the main advantage of spiral CT scanning over sequential scanning?

A. Lower radiation dose

B. Better patient comfort

C. Faster acquisition and volumetric data

D. Uses more detectors

✓**Answer:** C. Faster acquisition and volumetric data

**12.** What does "isotropic imaging" mean in CT?

- A. Only axial images are taken
- B. All sides of the voxel are equal in size
- C. Contrast is not used
- D. Image is rotated

✓**Answer:** B. All sides of the voxel are equal in size

**13.** What is the range of typical tube voltage (kV) in CT?

- A. 40-70 kV
- B. 80-140 kV
- C. 150-200 kV
- D. 200-300 kV

✓**Answer:** B. 80-140 kV

**14.** Increasing the mAs in CT scanning results in:

- A. Increased image noise
- B. Lower radiation dose
- C. Improved image quality
- D. Lower patient temperature

✓**Answer:** C. Improved image quality

**15.** Which scan type allows continuous table and gantry movement?

- A. Axial scan
- B. Sequential scan
- C. Spiral scan
- D. Static scan

✓**Answer:** C. Spiral scan

**16.** What is a typical pitch value where the helical path coils just touch each other?

- A. 0.5
- B. 1.0
- C. 1.5
- D. 2.0

✓**Answer:** B. 1.0

**17.** What causes partial volume artifacts in CT?

- A. Low kVp
- B. Wide slice thickness
- C. Fast gantry speed
- D. Tube cooling delay

✓**Answer:** B. Wide slice thickness

**18.** What is the role of the Data Acquisition System (DAS) in CT?

- A. Rotate the gantry
- B. Transmit X-rays
- C. Convert raw data from detectors

D. Create 3D images

✓**Answer:** C. Convert raw data from detectors

**19.** What is the function of slip rings in CT scanners?

- A. Increase radiation dose
- B. Enable continuous rotation
- C. Focus the X-ray beam
- D. Cool the tube

✓**Answer:** B. Enable continuous rotation

**20.** Which generation CT uses a fan-shaped beam and multiple detectors in a row?

- A. 1st
- B. 2nd
- C. 3rd
- D. 5th

✓**Answer:** B. 2nd

**21.** What does the CT number depend on?

- A. Number of slices
- B. Patient size
- C. X-ray attenuation of tissues
- D. Detector configuration

✓**Answer:** C. X-ray attenuation of tissues

**22.** What is the unit for expressing radiation dose in CT?

- A. Gray
- B. Becquerel
- C. Curie
- D. Sievert

✓**Answer:** A. Gray

**23.** High pitch value in helical CT implies:

- A. Lower speed of table
- B. Overlapping slices
- C. Increased scan speed
- D. Better image resolution

✓**Answer:** C. Increased scan speed

**24.** What is CT angiography primarily used for?

- A. Bone assessment
- B. Tumor grading
- C. Vascular imaging
- D. Brain perfusion

✓**Answer:** C. Vascular imaging

**25.** Which reconstruction technique provides images in multiple planes?

- A. Filtered back projection
- B. Helical interpolation
- C. Multiplanar reconstruction (MPR)
- D. Scanogram

✓**Answer:** C. Multiplanar reconstruction (MPR)

**26.** What does the term “window width” in CT imaging refer to?

- A. Size of voxel
- B. Range of HU displayed
- C. Resolution setting
- D. Image matrix size

✓**Answer:** B. Range of HU displayed

**27.** What is the standard brain window setting in CT?

- A. W 1500, L 300
- B. W 80, L 30
- C. W 2000, L -200
- D. W 350, L 50

✓**Answer:** B. W 80, L 30

**28.** What component controls the focus and filtration of the X-ray beam in CT?

- A. Generator
- B. Gantry
- C. Collimator
- D. Detector array

✓**Answer:** C. Collimator

**29.** Which of the following best reduces motion artifacts in CT?

- A. Higher kV
- B. Slower gantry rotation
- C. Faster scan time
- D. Thicker slices

✓**Answer:** C. Faster scan time

**30.** The ability to distinguish between two tissues with small density differences is called:

- A. Spatial resolution
- B. Temporal resolution
- C. Contrast resolution
- D. Axial resolution

✓**Answer:** C. Contrast resolution

**31.** What is the primary use of electron beam CT (EBCT)?

- A. Lung biopsy
- B. Coronary artery imaging
- C. Brain mapping

D. Oncology staging

✓**Answer:** B. Coronary artery imaging

**32.** What does MSCT stand for?

A. Multi-sectional CT

B. Multi-scan computed tomography

C. Multi-slice CT

D. Matrix-slice CT

✓**Answer:** C. Multi-slice CT

**33.** Which generation of CT introduced slip ring technology?

A. 1st

B. 2nd

C. 3rd

D. Spiral CT

✓**Answer:** D. Spiral CT

**34.** What is the primary drawback of higher pitch values in CT scanning?

A. Increased radiation dose

B. Poorer spatial resolution

C. Slower scan speed

D. Overlapping images

✓**Answer:** B. Poorer spatial resolution

**35.** What does window level in CT control?

A. Image sharpness

B. Number of slices

C. Center of HU range

D. Image blur

✓**Answer:** C. Center of HU range

**36.** What is the typical value of HU for cortical bone?

A. -1000

B. 0

C. 1000

D. 3000

✓**Answer:** C. 1000

**37.** What artifact results from dense metal objects in CT?

A. Ring artifact

B. Beam hardening

C. Star artifact

D. Motion blur

✓**Answer:** C. Star artifact

**38.** Which parameter most affects patient dose in CT?

- A. Matrix size
- B. Gantry size
- C. mAs
- D. Window setting

✓**Answer:** C. mAs

**39.** Which parameter primarily controls tissue penetration in CT imaging?

- A. Matrix
- B. Voltage (kV)
- C. mAs
- D. Pitch

✓**Answer:** B. Voltage (kV)

**40.** What is the typical pixel size in a  $512 \times 512$  CT matrix with a 25 cm FOV?

- A. 0.25 mm
- B. 0.49 mm
- C. 1.25 mm
- D. 2.5 mm

✓**Answer:** B. 0.49 mm

**41.** What component of CT is responsible for detecting transmitted X-rays?

- A. Gantry
- B. Collimator
- C. Filter
- D. Detector array

✓**Answer:** D. Detector array

**42.** Which of the following artifacts appears as concentric rings?

- A. Motion artifact
- B. Partial volume
- C. Ring artifact
- D. Beam hardening

✓**Answer:** C. Ring artifact

**43.** What is the main cause of beam hardening artifact?

- A. Motion during scanning
- B. Use of high kVp
- C. Differential absorption of X-rays
- D. Overlapping slices

✓**Answer:** C. Differential absorption of X-rays

**44.** What is the basic principle of CT image reconstruction?

- A. Ultrasonic reflection
- B. Radon transform
- C. Magnetic field mapping

D. Light attenuation

✓**Answer:** B. Radon transform

**45.** Which scanning mode is typically used for trauma patients?

- A. Axial
- B. Spiral
- C. Sequential
- D. Localizer

✓**Answer:** B. Spiral

**46.** What does "filtered back projection" refer to in CT?

- A. Beam collimation
- B. Image display method
- C. Reconstruction algorithm
- D. Detector alignment

✓**Answer:** C. Reconstruction algorithm

**47.** What is the unit for expressing voxel volume?

- A. mm<sup>3</sup>
- B. cm
- C. pixels
- D. HU

✓**Answer:** A. mm<sup>3</sup>

**48.** CT values are measured in:

- A. Gray
- B. Sievert
- C. Hounsfield Units
- D. Centigray

✓**Answer:** C. Hounsfield Units

**49.** Which body region benefits most from a lung window setting?

- A. Abdomen
- B. Liver
- C. Brain
- D. Thorax

✓**Answer:** D. Thorax

**50.** What is the main limitation of conventional tomography that CT overcomes?

- A. Cost
- B. Detector noise
- C. Superimposition of structures
- D. Image brightness

✓**Answer:** C. Superimposition of structures

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**51.** What kind of detector arrangement is used in adaptive arrays?

- A. Equal-sized detectors only
- B. Alternating wide and narrow detectors
- C. Rotating single detector
- D. Parallel plates

✓**Answer:** B. Alternating wide and narrow detectors

**52.** Which of the following windows would best visualize a lung mass?

- A. Brain window
- B. Bone window
- C. Lung window
- D. Mediastinal window

✓**Answer:** C. Lung window

**53.** What scan mode is used in CT angiography?

- A. Step-and-shoot
- B. Spiral with contrast
- C. Scout scan
- D. Dual-phase scan

✓**Answer:** B. Spiral with contrast

**54.** What does “slice thickness” affect in a CT scan?

- A. Image matrix
- B. Field of view
- C. Resolution and partial volume
- D. Gantry tilt

✓**Answer:** C. Resolution and partial volume

**55.** What is the purpose of using a bowtie filter in CT?

- A. Reduce beam scatter
- B. Improve image contrast
- C. Equalize beam intensity
- D. Increase dose

✓**Answer:** C. Equalize beam intensity

**56.** Which scan mode provides volumetric data acquisition?

- A. Step-and-shoot
- B. Spiral scan
- C. Scout view
- D. Cine scan

✓**Answer:** B. Spiral scan

**57.** What determines the number of slices in MSCT?

- A. Voltage

- B. Pitch
- C. Number of detector rows
- D. Collimator width

✓**Answer:** C. Number of detector rows

**58.** What is the primary advantage of a thinner slice?

- A. Lower dose
- B. Less noise
- C. Better spatial resolution
- D. Faster scan

✓**Answer:** C. Better spatial resolution

**59.** Which component allows power transfer to a rotating gantry?

- A. Flywheel
- B. Slip rings
- C. Transformer
- D. Capacitor

✓**Answer:** B. Slip rings

**60.** The basic unit of digital image display is:

- A. Pixel
- B. Voxel
- C. Bit
- D. Matrix

✓**Answer:** A. Pixel

**61.** What influences the brightness in a CT image?

- A. Window level
- B. mAs
- C. Pixel size
- D. Gantry tilt

✓**Answer:** A. Window level

**62.** What does Hounsfield scale represent?

- A. Spatial frequency
- B. Absorption coefficient comparison
- C. Temporal resolution
- D. Rotational speed

✓**Answer:** B. Absorption coefficient comparison

**63.** What limits the maximum spatial resolution of a CT scanner?

- A. kVp
- B. mAs
- C. Detector size
- D. Gantry diameter

✓**Answer:** C. Detector size

**64.** What is the benefit of a wider window width?

- A. Improved soft tissue contrast
- B. Displaying tissues with very different densities
- C. Higher resolution
- D. Improved signal-to-noise

✓**Answer:** B. Displaying tissues with very different densities

**65.** What is an axial scan?

- A. Scout scan
- B. Image reconstructed from sagittal cuts
- C. Image acquired slice by slice without helical motion
- D. 3D reconstruction only

✓**Answer:** C. Image acquired slice by slice without helical motion

**66.** Why is CT better for imaging the retroperitoneum than X-ray?

- A. Faster image acquisition
- B. Less radiation
- C. Superior contrast resolution
- D. Larger field of view

✓**Answer:** C. Superior contrast resolution

**67.** What does "gantry" in a CT machine refer to?

- A. Detector housing
- B. Rotating framework holding X-ray tube and detectors
- C. Cooling unit
- D. Table control system

✓**Answer:** B. Rotating framework holding X-ray tube and detectors

**68.** What type of reconstruction is used in CT coronary angiography?

- A. Axial only
- B. Cine loop
- C. Retrospective ECG-gated reconstruction
- D. Forward reconstruction

✓**Answer:** C. Retrospective ECG-gated reconstruction

**69.** What is the main disadvantage of very thin CT slices?

- A. Higher image contrast
- B. Reduced scanning speed
- C. Increased noise and dose
- D. More motion artifacts

✓**Answer:** C. Increased noise and dose

**70.** What is the primary reason to use contrast in CT imaging?

- A. Better signal-to-noise
- B. Increased matrix size
- C. Visualize blood vessels and enhance lesion detection

D. Decrease motion

✓**Answer:** C. Visualize blood vessels and enhance lesion detection

**71.** What determines the CT number accuracy?

- A. Pixel size
- B. mAs
- C. Calibration and beam quality
- D. Gantry rotation speed

✓**Answer:** C. Calibration and beam quality

**72.** The main factor affecting spatial resolution in CT is:

- A. Pitch
- B. Detector size
- C. Matrix
- D. Slice overlap

✓**Answer:** B. Detector size

**73.** The first generation of CT scanner used how many detectors?

- A. One
- B. Two
- C. Several rows
- D. A full ring

✓**Answer:** A. One

**74.** What is the field of view (FOV)?

- A. The distance between gantry and patient
- B. The area included in image acquisition
- C. Detector arc length
- D. Voltage setting

✓**Answer:** B. The area included in image acquisition

**75.** What scanning protocol is preferred for stroke CT?

- A. Bone window scan
- B. Lung scan
- C. Non-contrast brain CT
- D. CT angiography

✓**Answer:** C. Non-contrast brain CT

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**76.** What is the main use of CT perfusion imaging?

- A. Bone density analysis
- B. Blood flow evaluation
- C. Lung volume estimation

D. Spine injury detection

✓**Answer:** B. Blood flow evaluation

**77.** In CT, what is the benefit of using automatic exposure control (AEC)?

- A. Decreases detector dose
- B. Adjusts mAs to patient size
- C. Improves spatial resolution
- D. Controls gantry movement

✓**Answer:** B. Adjusts mAs to patient size

**78.** What is the role of contrast bolus timing in CT angiography?

- A. Reduces noise
- B. Synchronizes scan with peak enhancement
- C. Lowers radiation dose
- D. Improves pixel size

✓**Answer:** B. Synchronizes scan with peak enhancement

**79.** What does the term "interpolation" mean in spiral CT?

- A. Adjusting window settings
- B. Estimating data between slices
- C. Calibrating gantry
- D. Increasing matrix resolution

✓**Answer:** B. Estimating data between slices

**80.** What artifact can be caused by patient movement during scanning?

- A. Ring artifact
- B. Motion blur
- C. Beam hardening
- D. Star artifact

✓**Answer:** B. Motion blur

**81.** What is the primary parameter to improve soft tissue contrast in CT?

- A. High pitch
- B. Low kVp
- C. High mAs
- D. Thick slices

✓**Answer:** B. Low kVp

**82.** CT image noise increases when:

- A. mAs increases
- B. Slice thickness increases
- C. mAs decreases
- D. Pitch decreases

✓**Answer:** C. mAs decreases

**83.** Which filter is commonly used to reduce beam hardening artifacts?

- A. Soft tissue filter
- B. Reconstruction kernel
- C. Bowtie filter
- D. Edge filter

✓**Answer:** C. Bowtie filter

**84.** In cardiac CT, what is used to minimize motion artifacts?

- A. Short FOV
- B. ECG gating
- C. Low pitch
- D. Thinner slices

✓**Answer:** B. ECG gating

**85.** What does “detector efficiency” refer to in CT?

- A. The noise level produced
- B. Amount of X-ray absorbed and converted
- C. Speed of gantry rotation
- D. Image sharpness

✓**Answer:** B. Amount of X-ray absorbed and converted

**86.** What determines the level of image contrast in CT without contrast agents?

- A. Voltage and tissue density
- B. Matrix and pitch
- C. Tube rotation speed
- D. Slice thickness

✓**Answer:** A. Voltage and tissue density

**87.** Which mode is used in CT for dynamic imaging (e.g. perfusion)?

- A. Sequential
- B. Cine mode
- C. Helical
- D. Scout scan

✓**Answer:** B. Cine mode

**88.** What is a scout image in CT?

- A. 3D reconstruction
- B. Image used for localization before scan
- C. Image with contrast
- D. MPR image

✓**Answer:** B. Image used for localization before scan

**89.** What component controls the gantry rotation speed?

- A. Detector array
- B. Generator
- C. Software settings

D. X-ray tube

✓**Answer:** C. Software settings

**90.** What is the benefit of dose modulation in CT?

- A. More uniform voxel size
- B. Automatic increase in kVp
- C. Reduced radiation exposure
- D. Faster table speed

✓**Answer:** C. Reduced radiation exposure

**91.** The ability of a CT scanner to acquire images rapidly over time is called:

- A. Temporal resolution
- B. Spatial resolution
- C. Voxel rate
- D. Matrix density

✓**Answer:** A. Temporal resolution

**92.** What is the difference between CT and MRI in terms of physics?

- A. CT uses ultrasound
- B. CT uses ionizing radiation
- C. MRI uses gamma rays
- D. CT is based on sound waves

✓**Answer:** B. CT uses ionizing radiation

**93.** What is the goal of iterative reconstruction in CT?

- A. Increase scan time
- B. Decrease image resolution
- C. Improve image quality with lower dose
- D. Remove all contrast

✓**Answer:** C. Improve image quality with lower dose

**94.** What is an advantage of multi-slice CT over single-slice CT?

- A. Less hardware required
- B. Lower image quality
- C. Faster scan and better coverage
- D. Only 2D imaging

✓**Answer:** C. Faster scan and better coverage

**95.** What is the advantage of isotropic voxel acquisition?

- A. Sharper 2D images only
- B. Better 3D image reconstruction
- C. Slower data storage
- D. More interpolation errors

✓**Answer:** B. Better 3D image reconstruction

**96.** What typically causes stair-step artifact in CT MPR images?

- A. High noise level
- B. Thick slice reconstruction
- C. Overlapping table movement
- D. Low pitch

✓**Answer:** B. Thick slice reconstruction

**97.** What is a benefit of thin collimation in CT scanning?

- A. Less scatter
- B. Increased image blur
- C. Better Z-axis resolution
- D. More noise

✓**Answer:** C. Better Z-axis resolution

**98.** What is the use of a calibration phantom in CT?

- A. Check table movement
- B. Confirm gantry alignment
- C. Standardize HU accuracy
- D. Test pitch setting

✓**Answer:** C. Standardize HU accuracy

**99.** In CT, the “z-axis” refers to:

- A. Axial plane
- B. Vertical axis
- C. Patient’s long axis
- D. Transverse plane

✓**Answer:** C. Patient’s long axis

**100.** What is the standard slice thickness for CT brain imaging?

- A. 1 mm
- B. 2.5 mm
- C. 5 mm
- D. 10 mm

✓**Answer:** C. 5 mm

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# Basic principles of computed tomography



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# Tomography



- **tomos** = slice; **graphein** = to write
- definition - imaging of an object by analyzing its slices

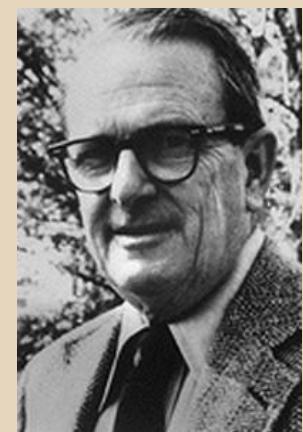


Damien Hirst  
*Autopsy with Sliced Human Brain*  
2004

# History



- 1924 - mathematical theory of tomographic image reconstructions (Johann Radon)
- 1930 - conventional tomography (A. Vallebona)
- 1963 - theoretical basis of CT (A. McLeod Cormack)
- 1971 - first commercial CT (Sir Godfrey Hounsfield)
- 1974 - first 3rd generation CT
- 1979 - Nobel price (Cormack & Hounsfield)
- 1989 - single-row CT
- 1994 - double-row spiral CT
- 2001 - 16-row spiral CT
- 2007 - 320-row spiral CT



# History



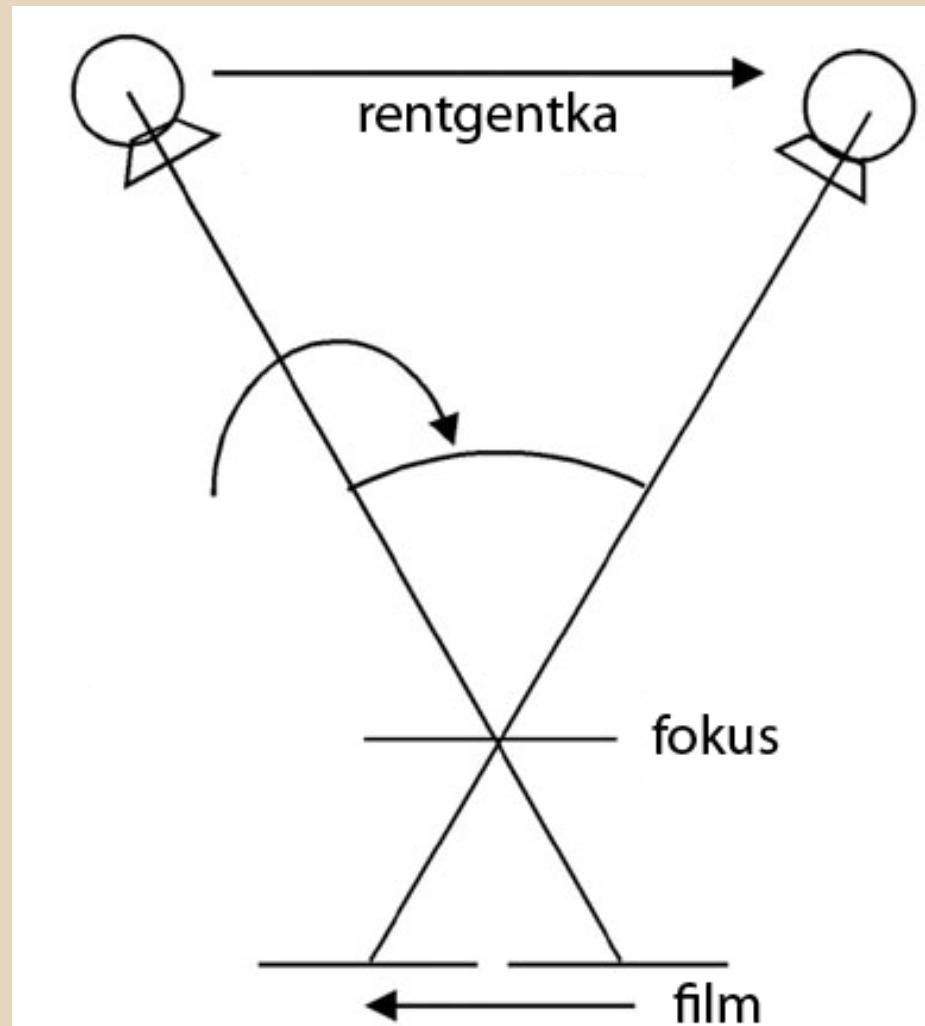
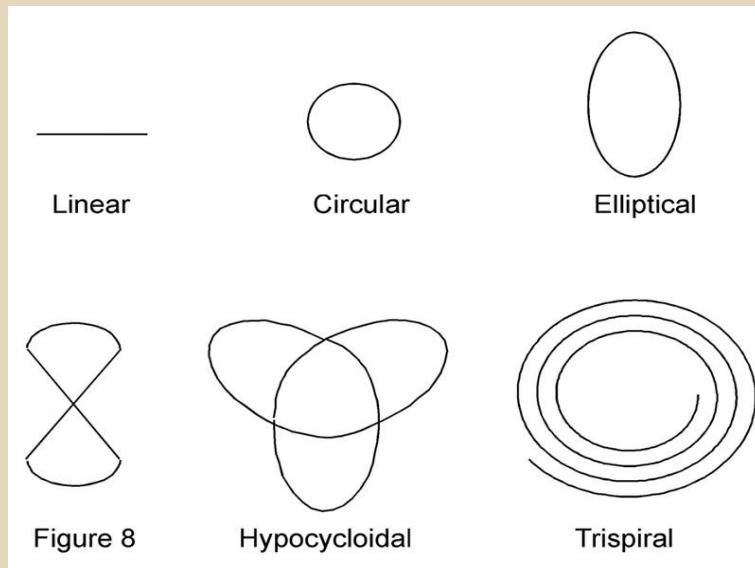
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# Conventional tomography



- x-ray tube moves in the opposite direction than detector
- areas outside the focus are blurred, therefore not shown



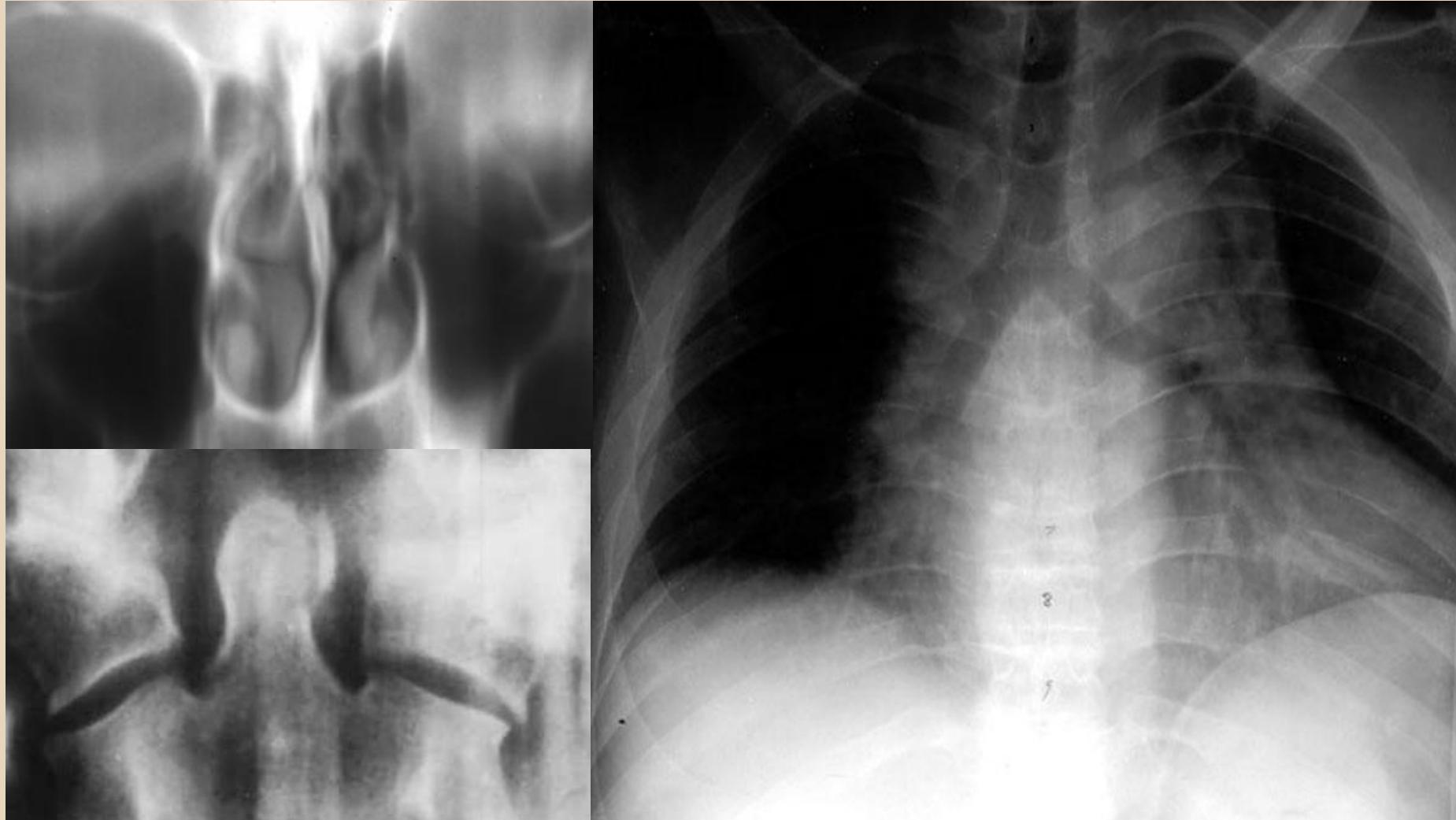
# Conventional tomography



# Conventional tomography



# Conventional tomography



# Imaging before CT



- entire body areas were inaccessible to radiography - brain, mediastinum, retroperitoneum
- diagnostic procedures showing better detail in these areas were potentially harmful and or poorly tolerated by the patient - pneumoencephalography, diagnostic pneumomediastinum, diagnostic laparotomy

# Imaging before CT



ventriculography



pneumoencephalography

# Imaging before CT



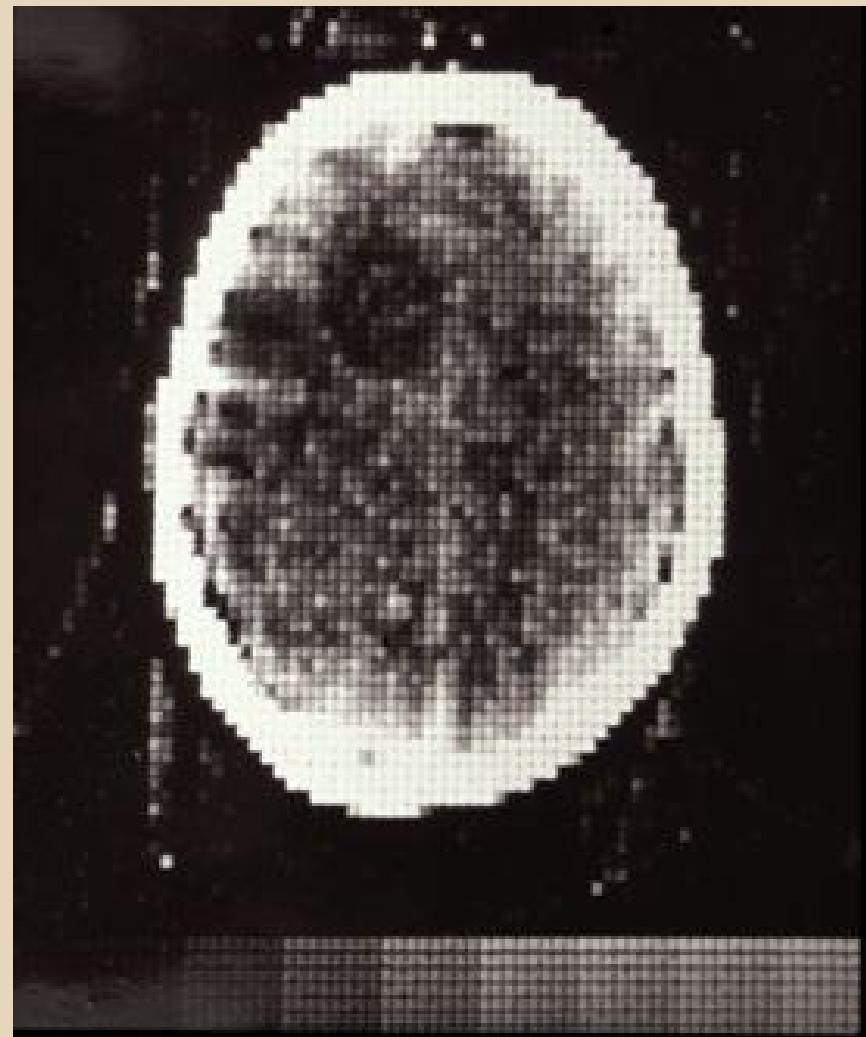
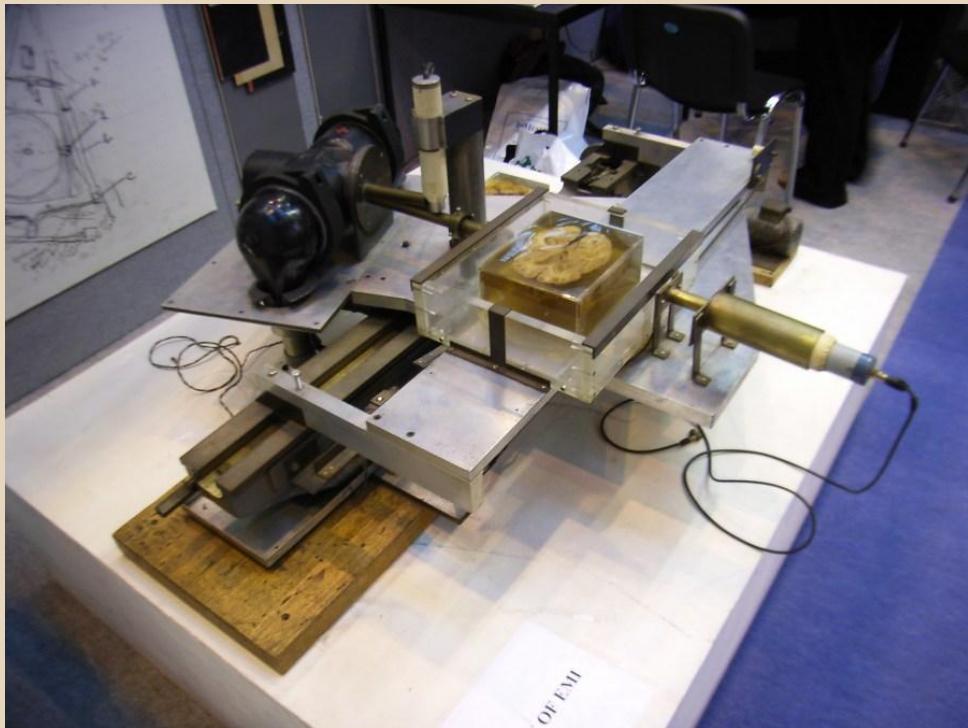
transfontanellar ultrasound



# CT prototype



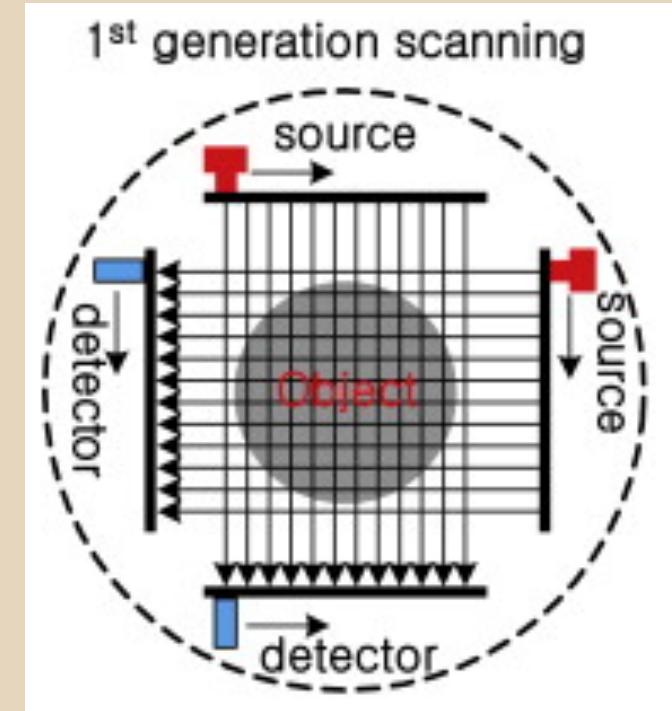
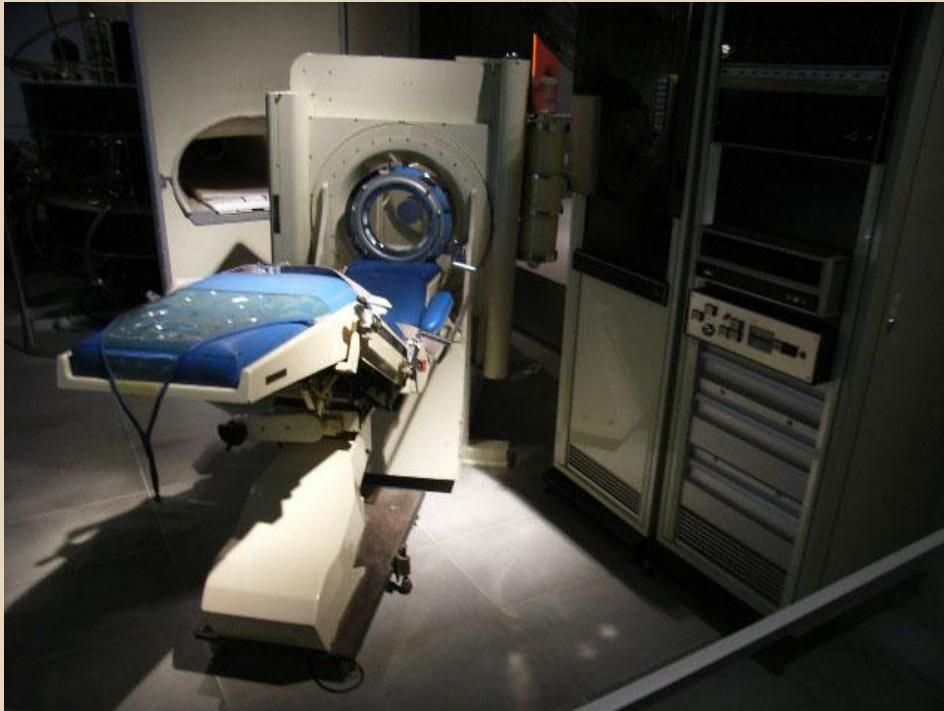
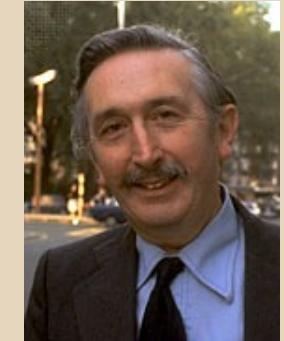
- scanning time: 9 days
- reconstruction: 2,5h
- resolution: 80x80



# 1st generation CT



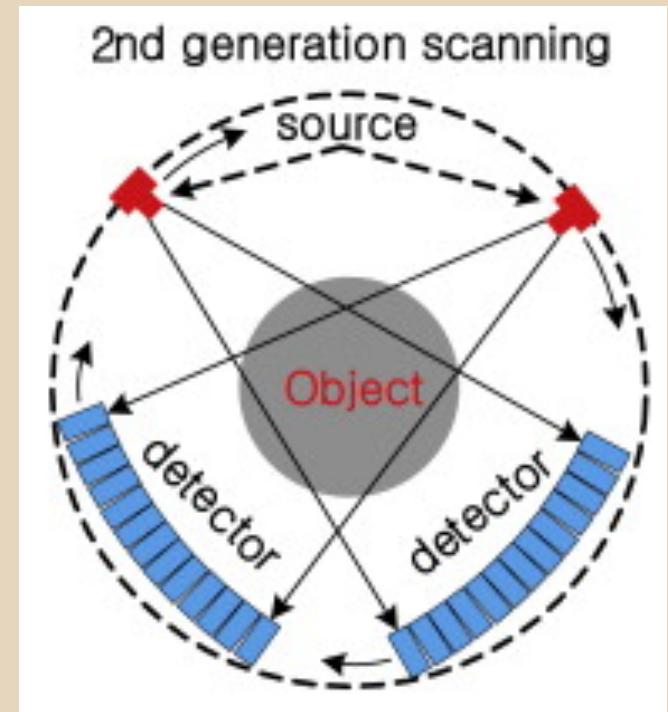
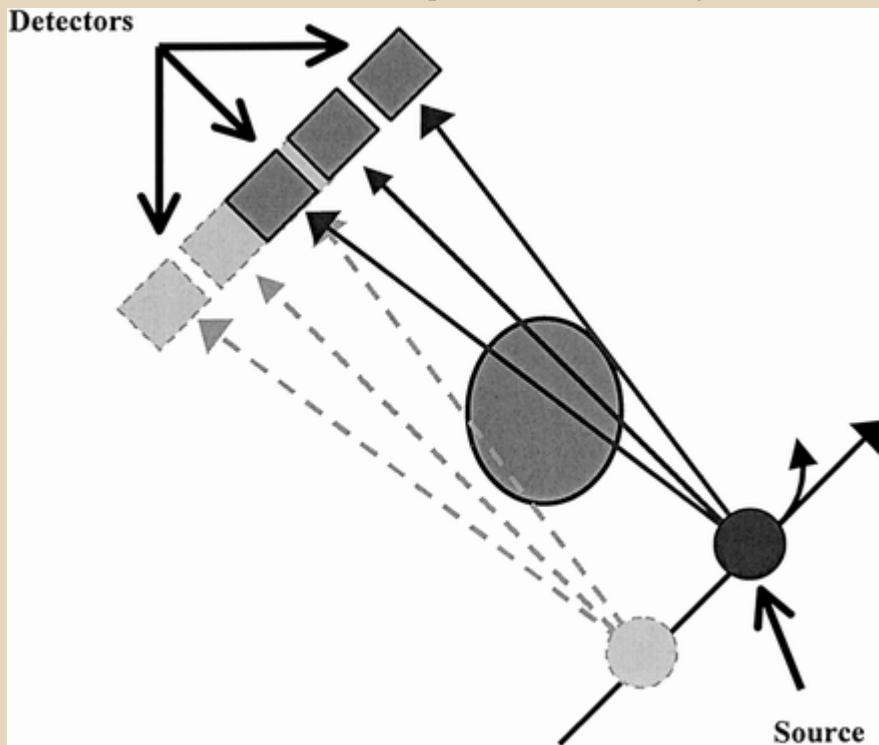
- xray tube and single detector are connected and move together by translation and then rotation
- xray beam has linear (pencil-like) shape



# 2nd generation CT



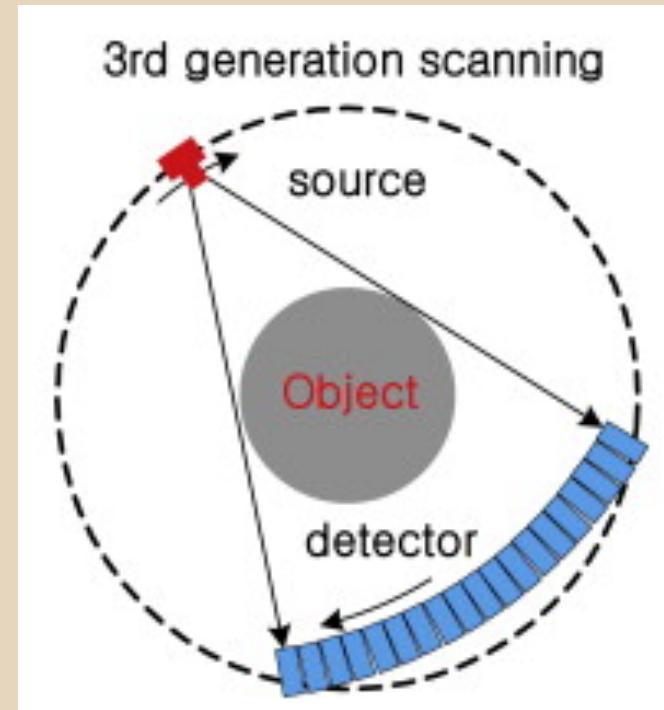
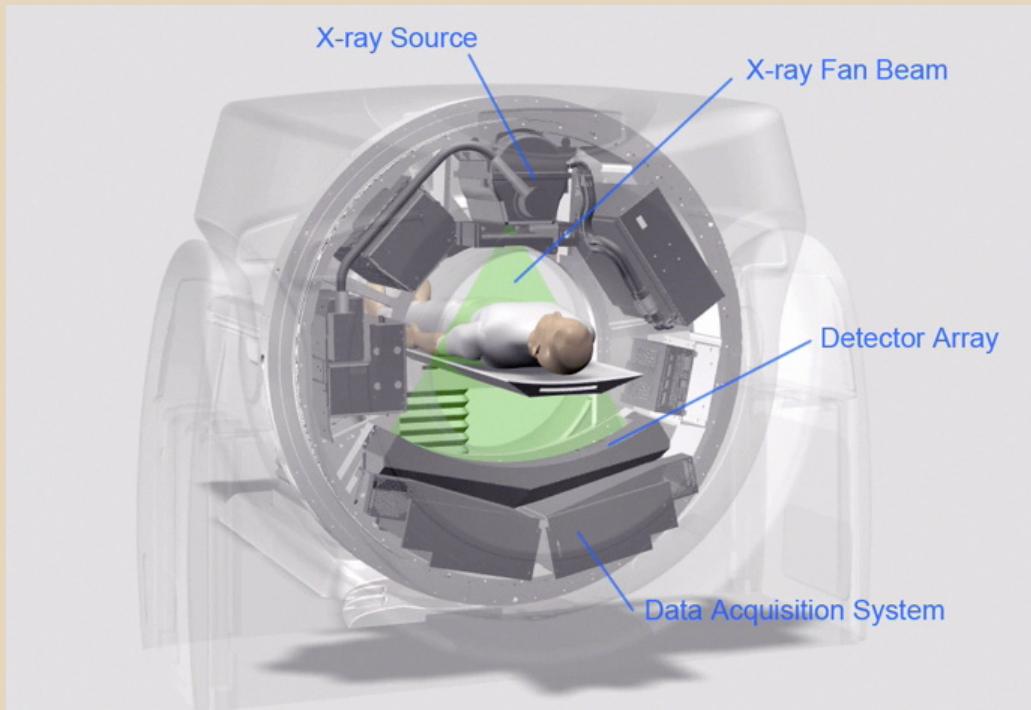
- same type of movement
- multiple detectors arranged in a row
- fan shaped xray beam instead of linear shaped



# CT III. generace



- full rotation of x ray tube+detectors complex



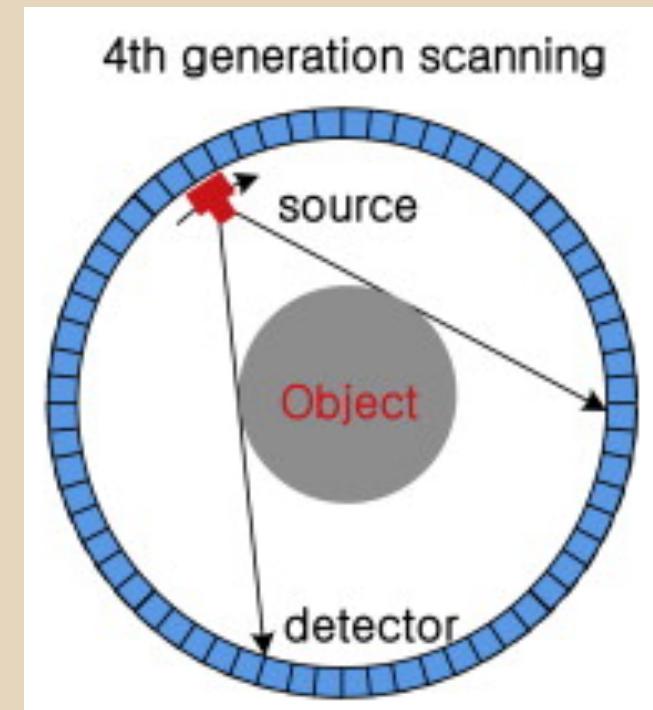
# CT III. generace



# CT IV. generace



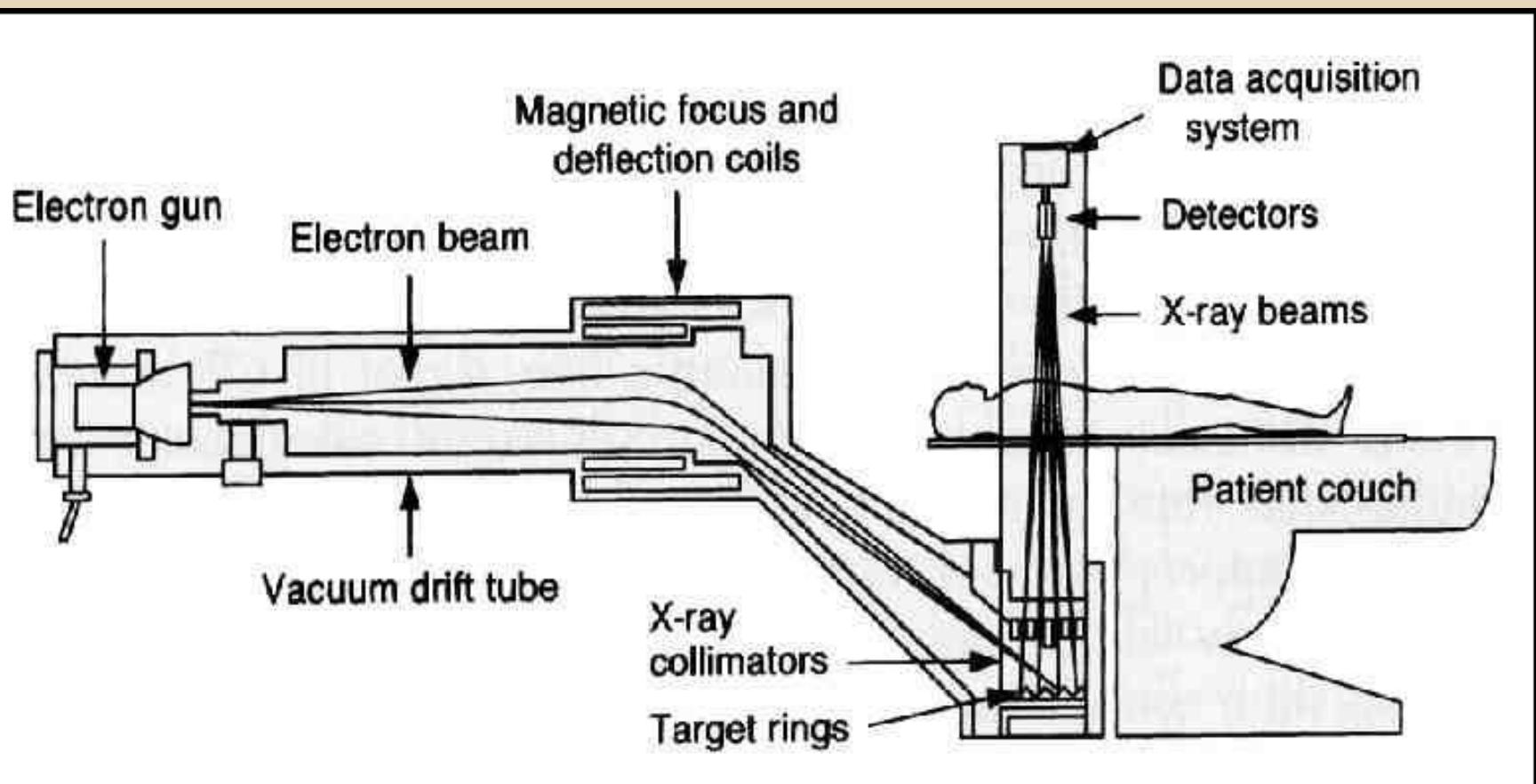
- only x ray tube rotates, detectors are stationary
- this technology was later abandoned



# V. generation CT



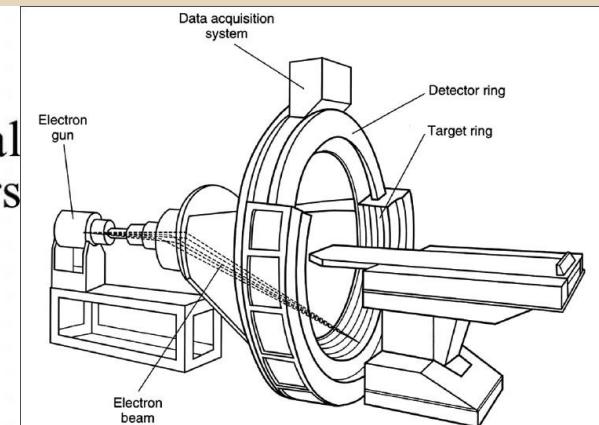
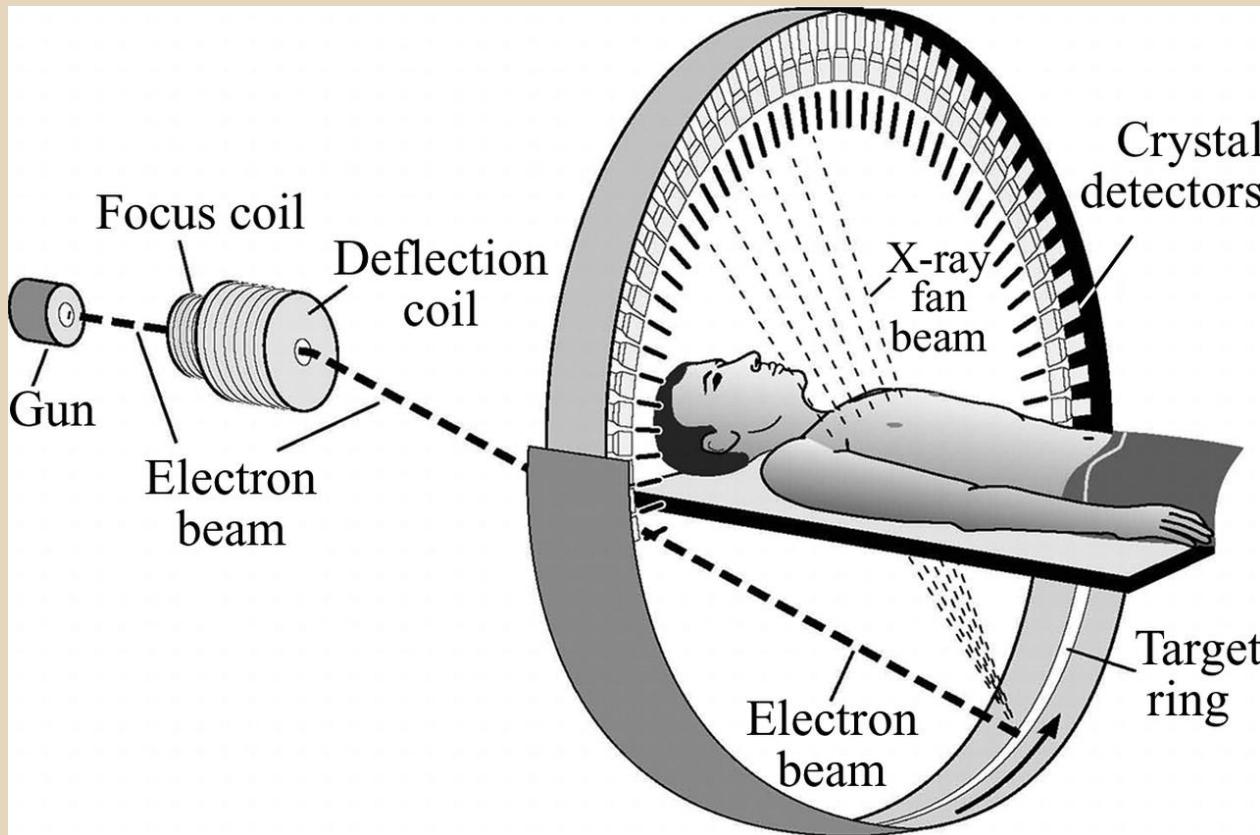
- electron beam tomography (EBT)



# V. generation CT



- electron beam tomography (EBT)

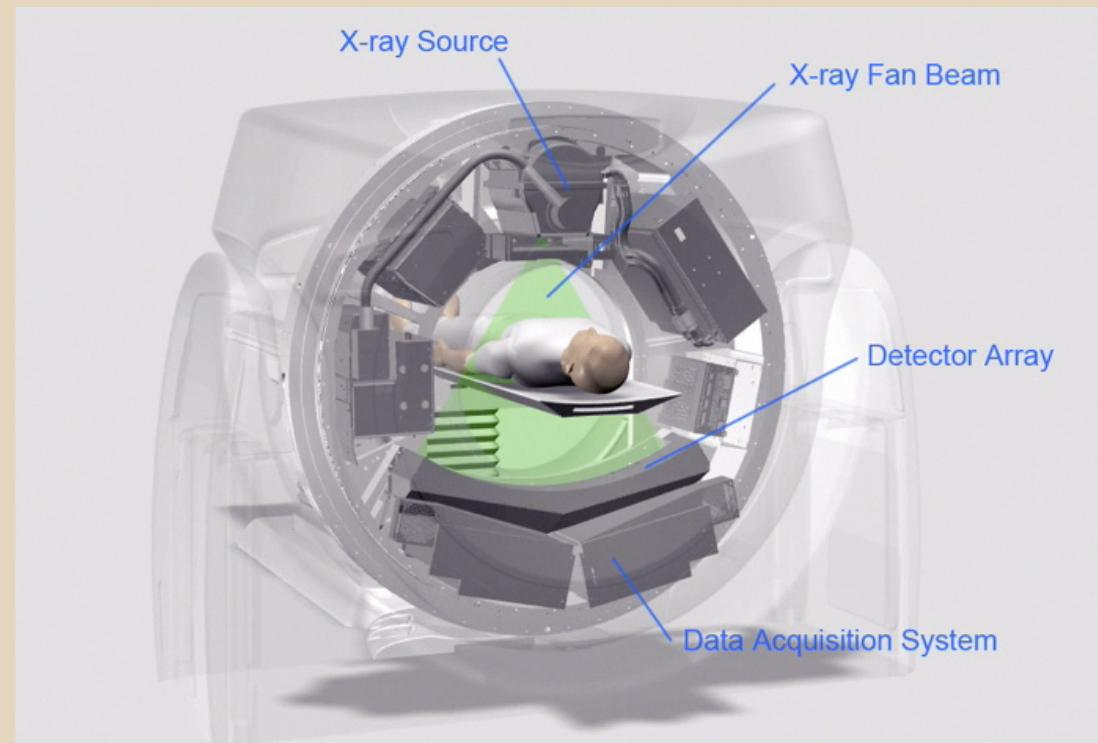


# CT machine anatomy



- energy source (140 kV) + slip rings
- x ray source
- detectors
- collimators
- DAS

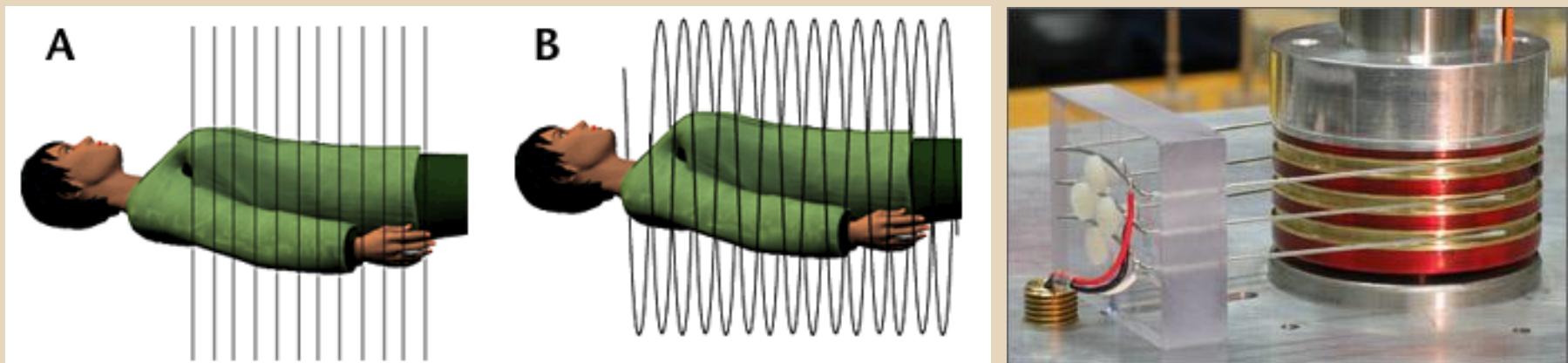
= data acquisition system



# scanning



- **sequential** - sequence of complete gantry rotation followed by table movement with the patient
- **spiral** - continuous gantry rotation and table movement
  - volume of raw data is generated, from which axial images are reconstructed using interpolation
  - slip ring technology allowed transmission of energy to rotating gantry without the need of cables

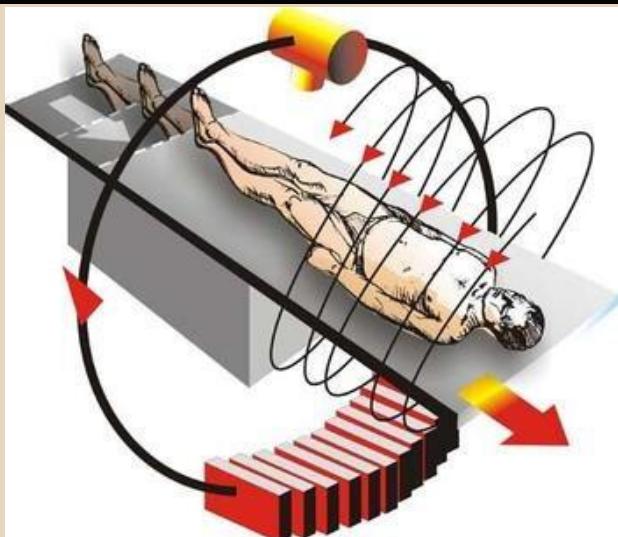
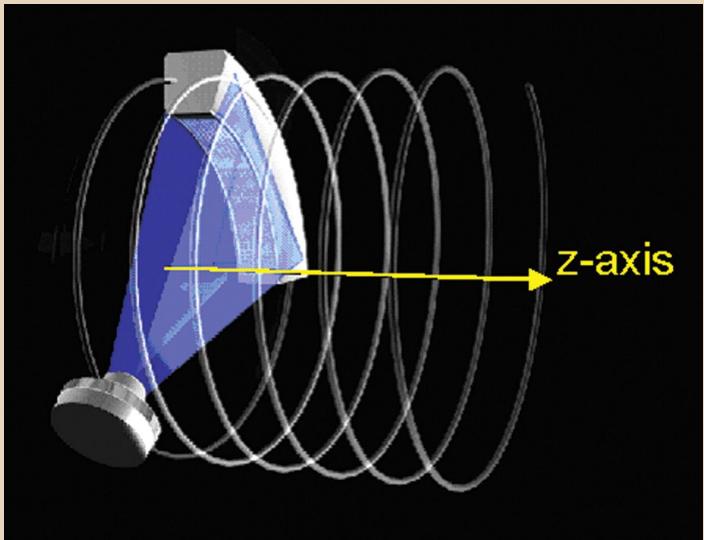
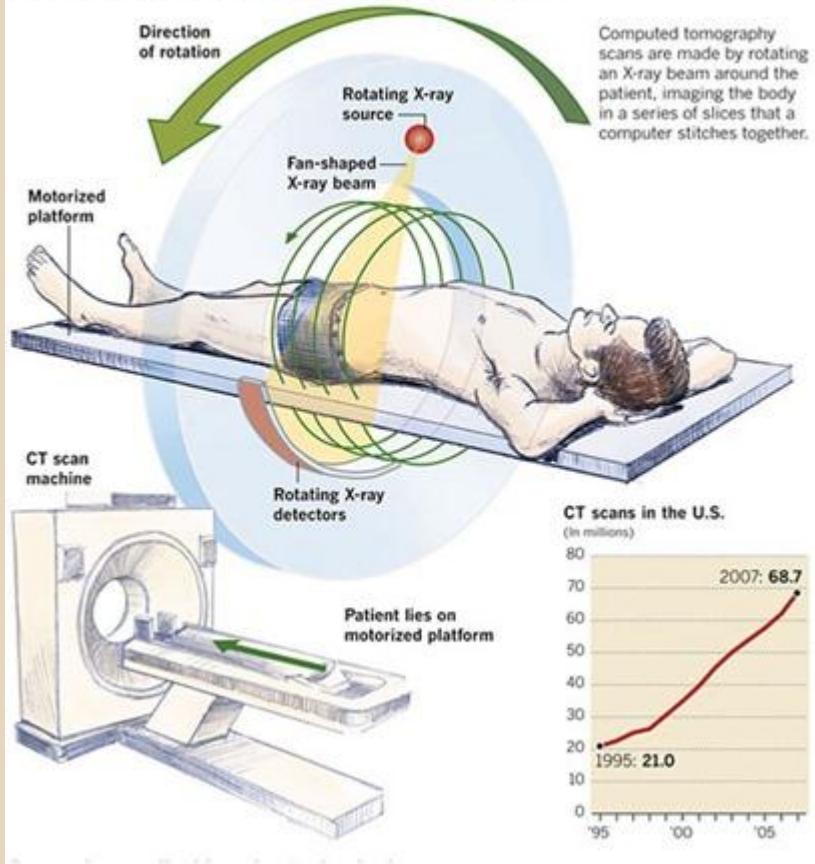


# spiral scanning



## Anatomy of a CT scan

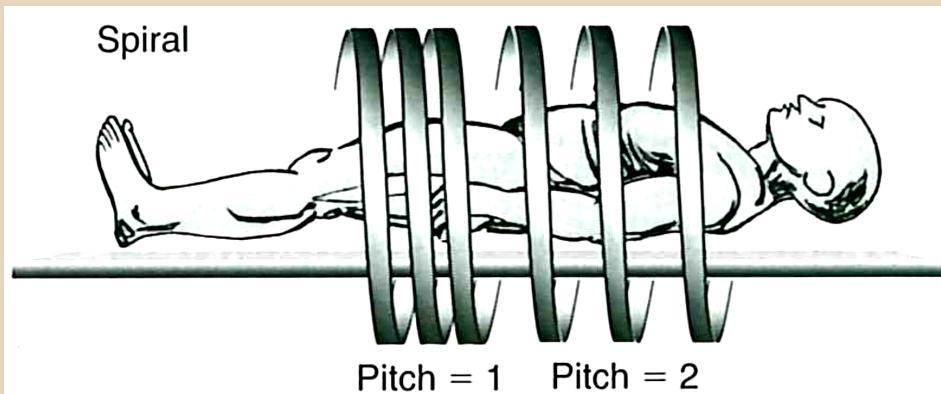
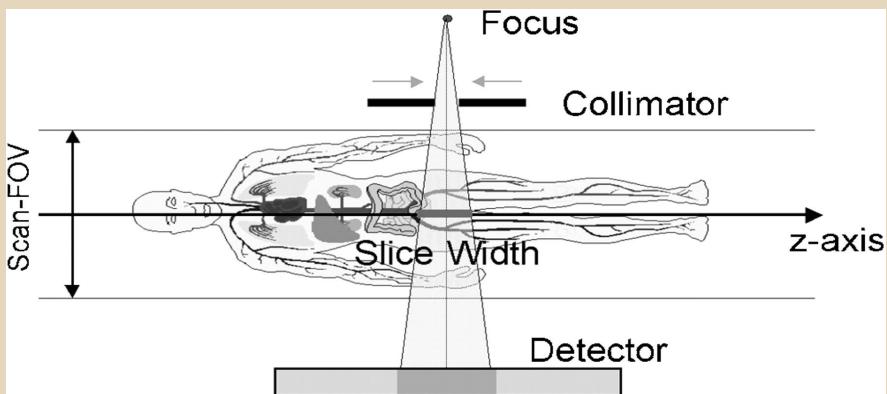
CT scanners give doctors a 3-D view of the body. The images are exquisitely detailed but require a dose of radiation that can be 100 times that of a standard X-ray.



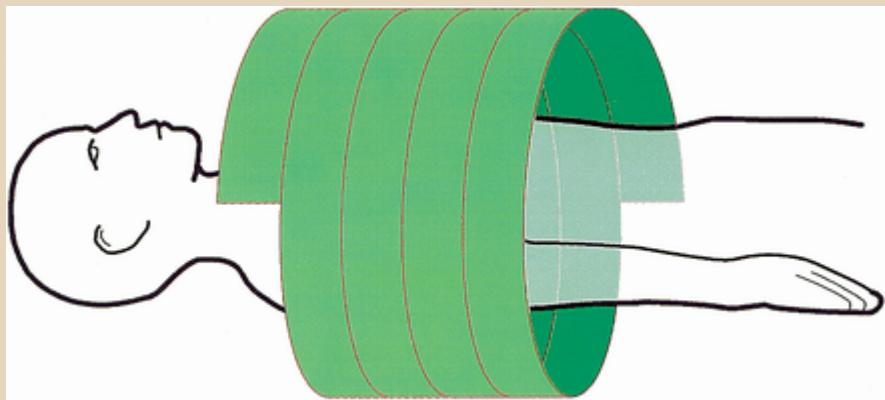
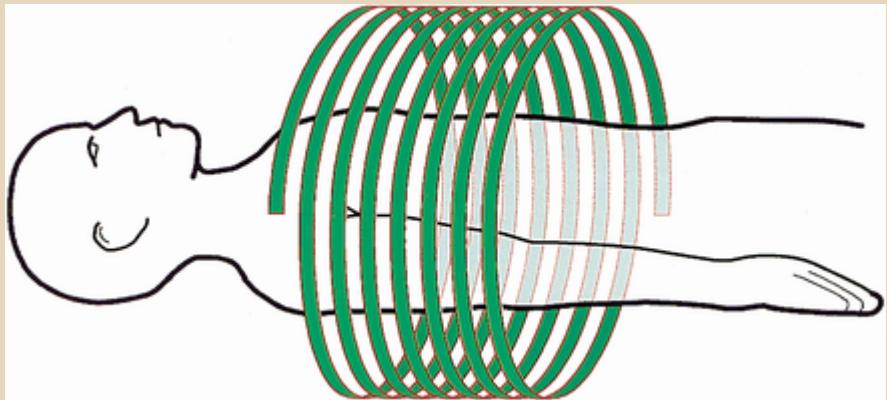
# pitch



- table travel - table movement per rotation
- collimation - x ray beam width in z axis
- $\text{pitch} = \text{table travel} / \text{collimation}$ 
  - pitch = 1 - coils of the helix are in contact
  - pitch < 1 - coils of the helix overlap
  - pitch > 1 - coils of the helix are separated



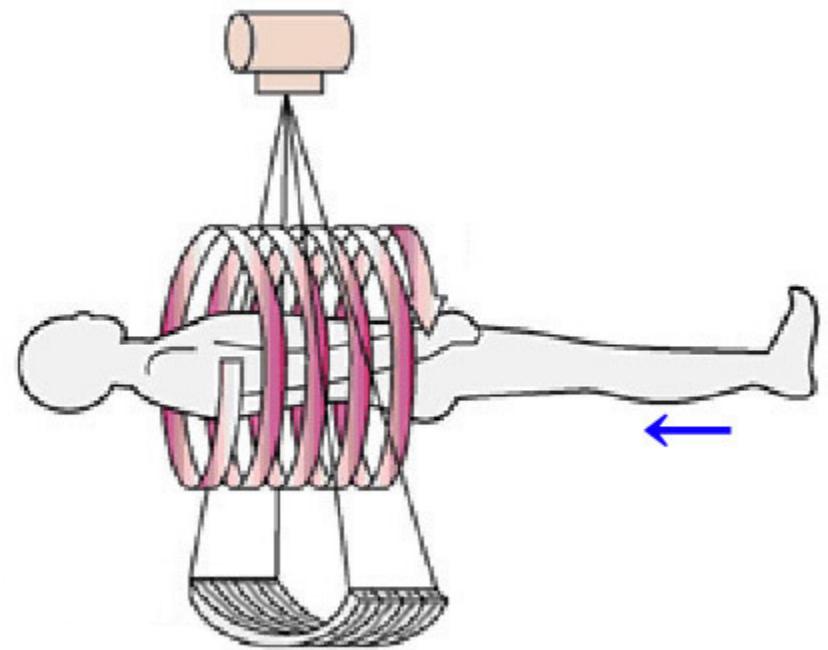
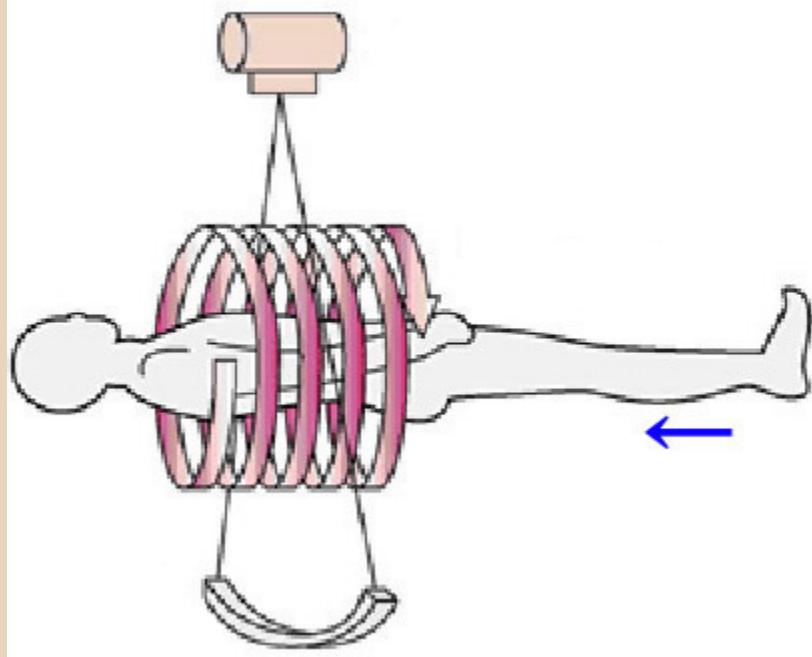
# pitch



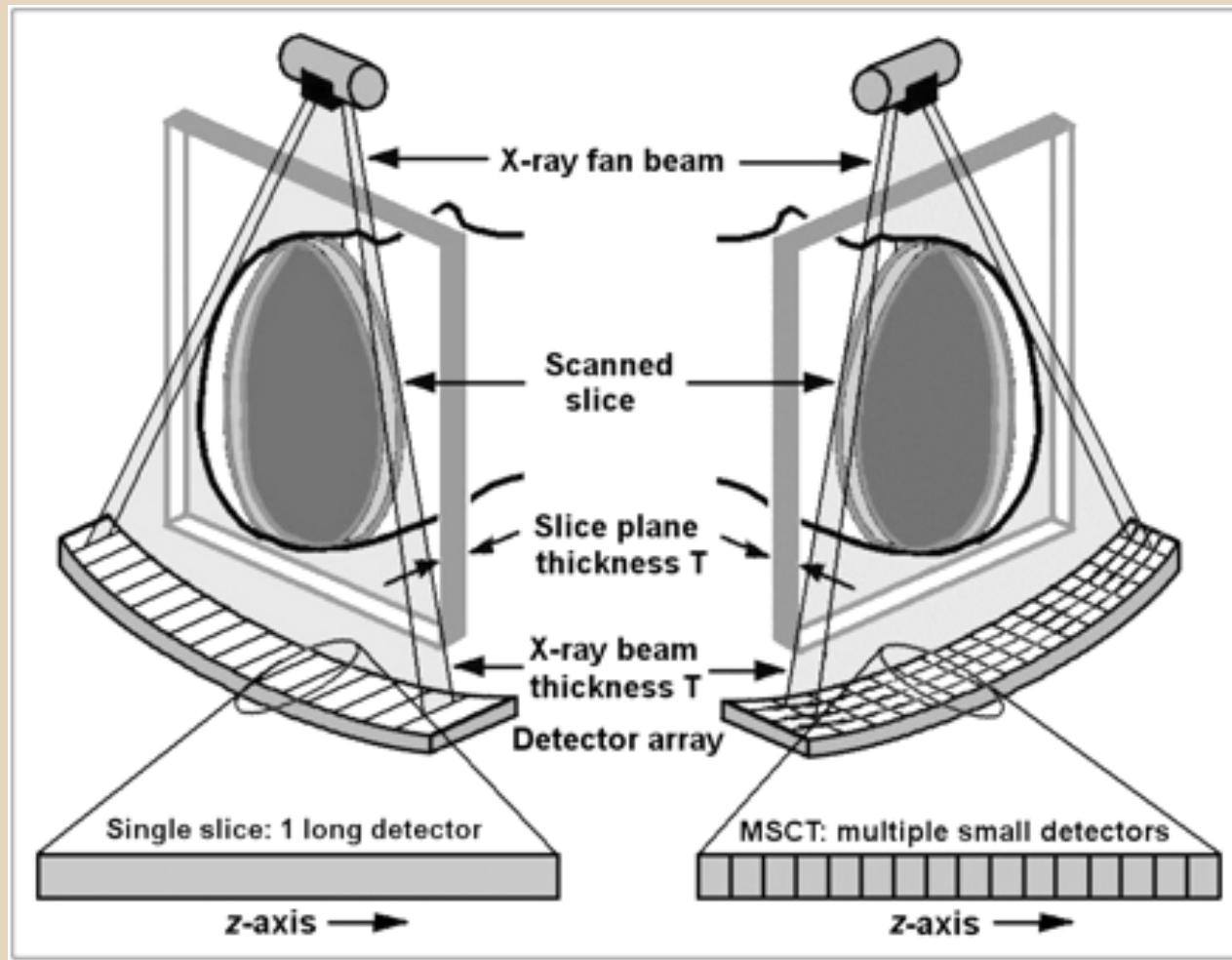
# SSCT vs. MSCT



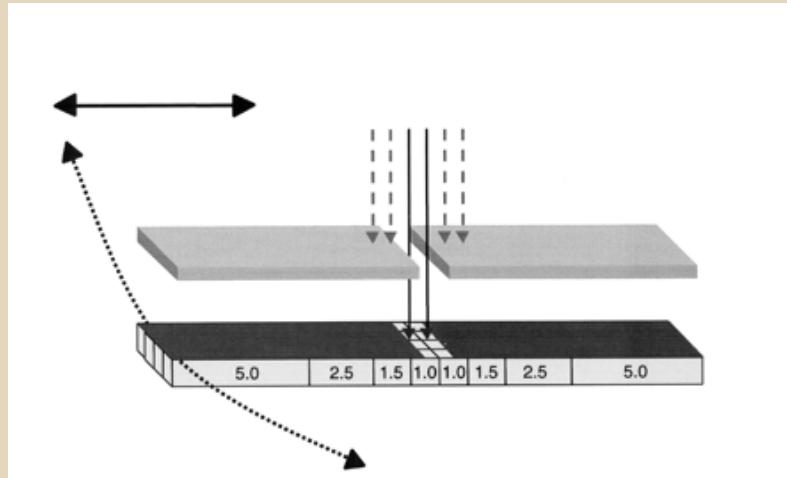
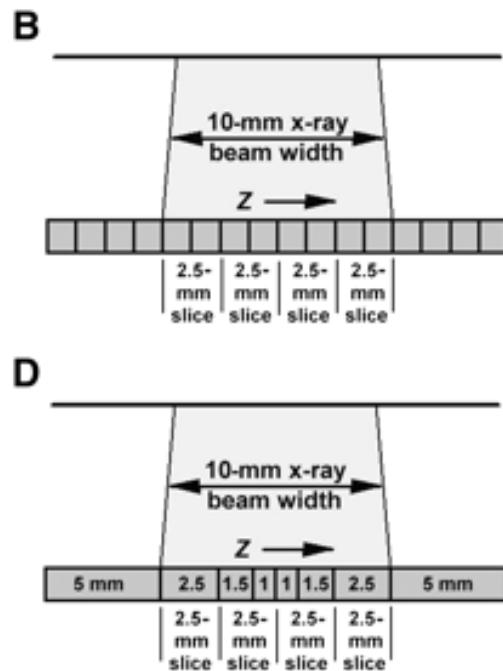
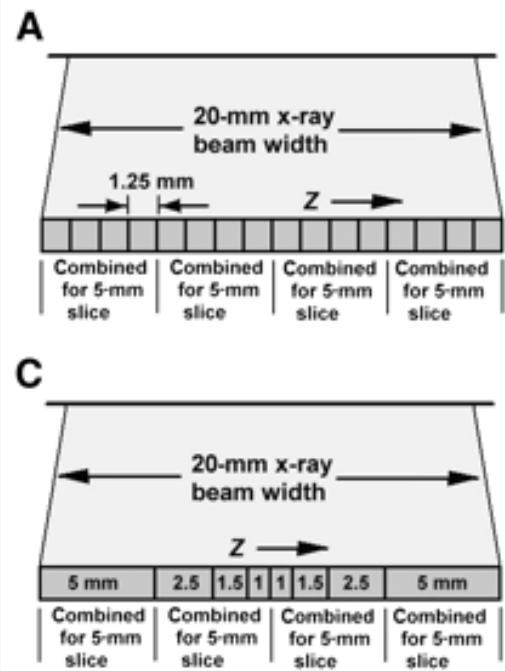
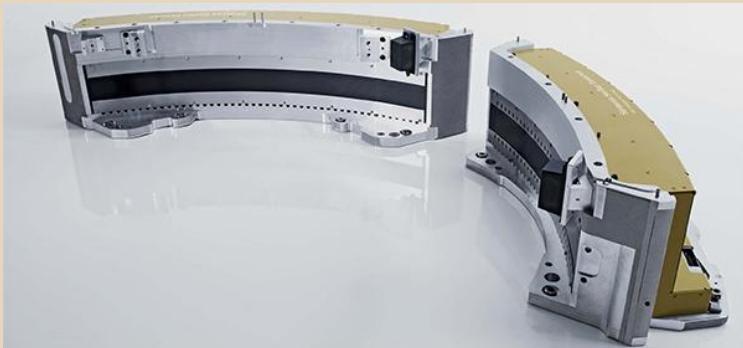
- SSCT - single slice CT
- MSCT - multiple slice CT



# SSCT vs. MSCT



# detectors



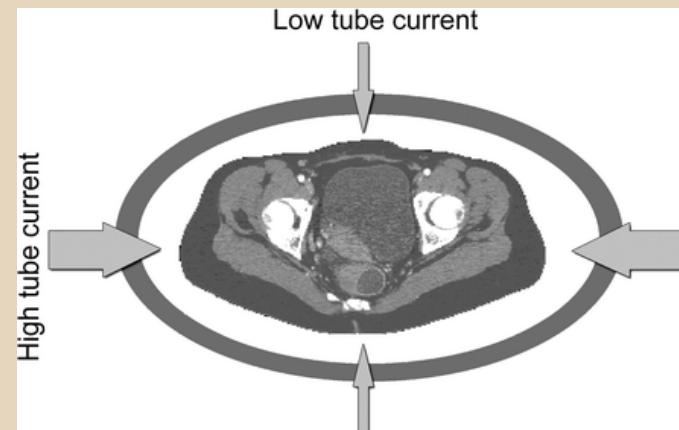
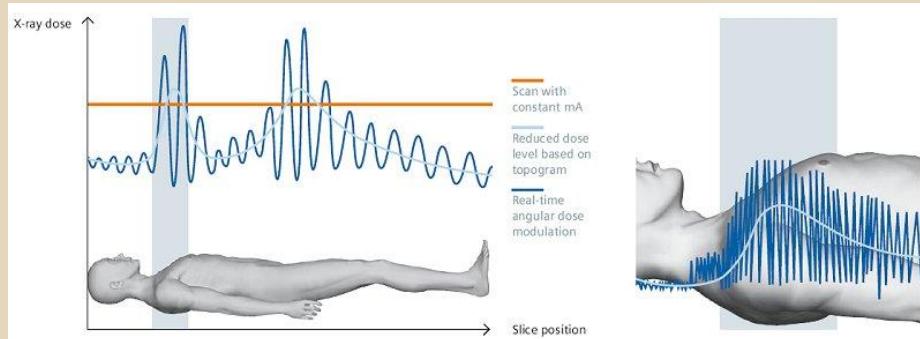
fixed array, 4 slice CT

adaptive array, 4 slice CT

# voltage vs. current



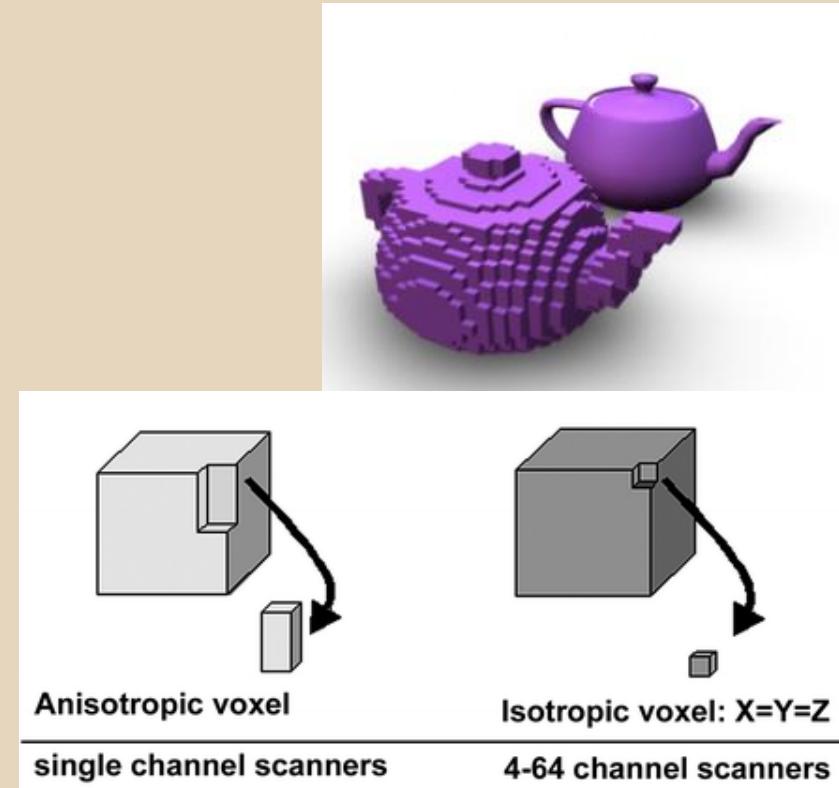
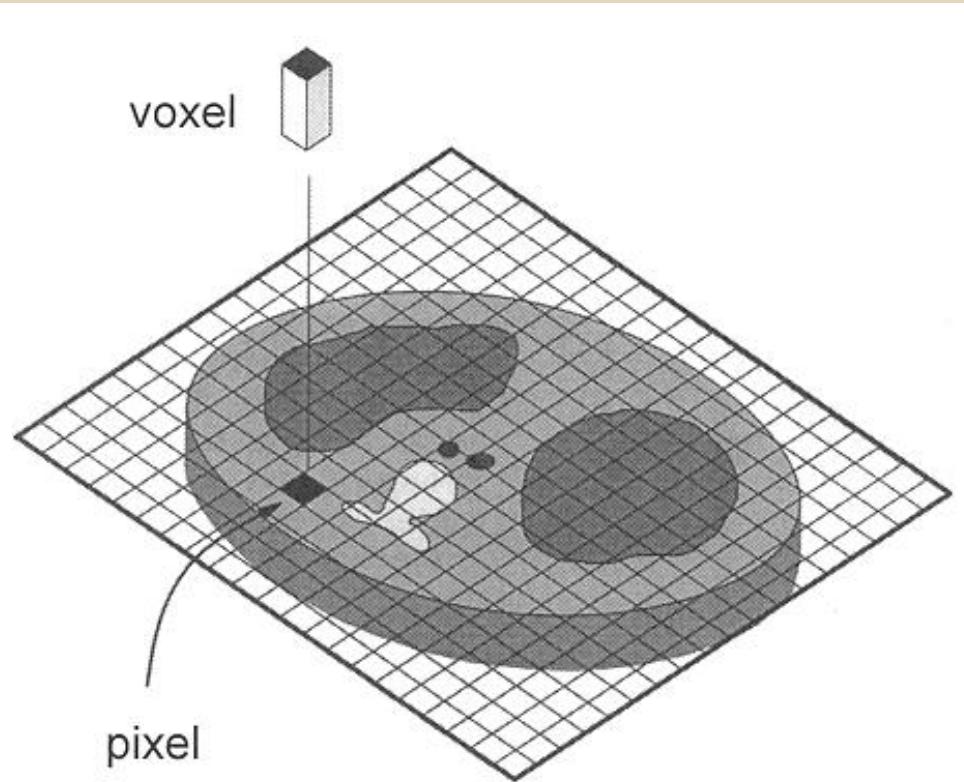
- voltage (kV)
  - 80-140 kV
  - higher the voltage, better the penetration of x ray, but worse tissue contrast and larger dose
- electric current (mAs)
  - 50-500 mAs
  - higher the current, better the image quality (lower noise), but larger dose



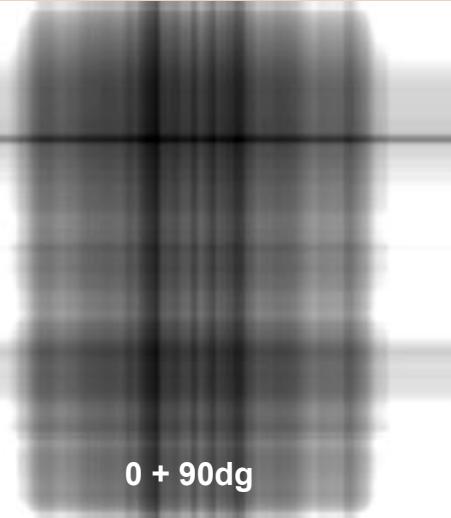
# image reconstruction



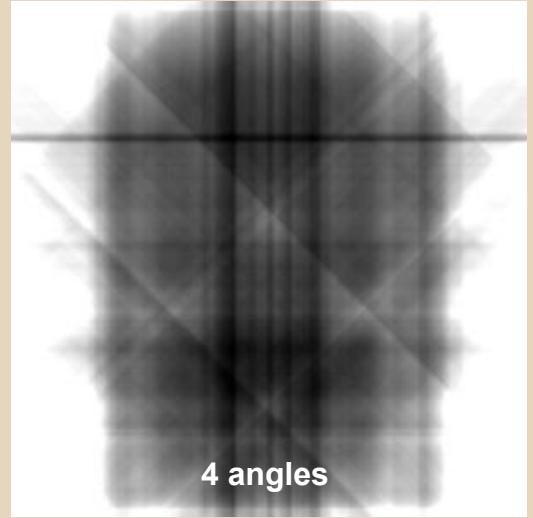
- matrix -  $512 \times 512$
- pixel - 2D object, smallest element of a raster image
- voxel - 3D object, smallest element of a 3D grid



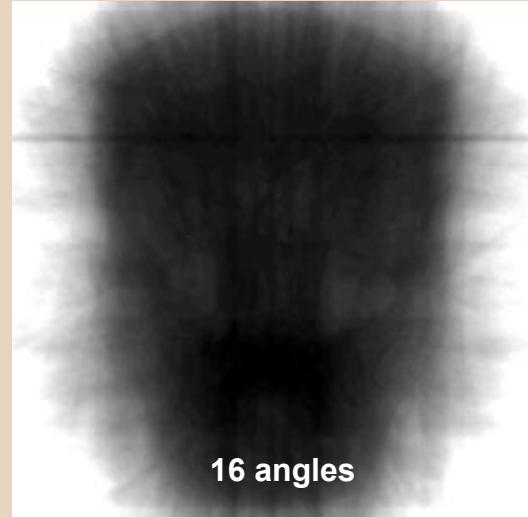
# image reconstruction



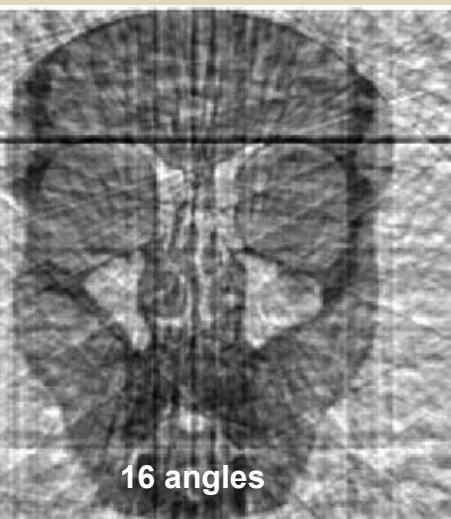
0 + 90dg



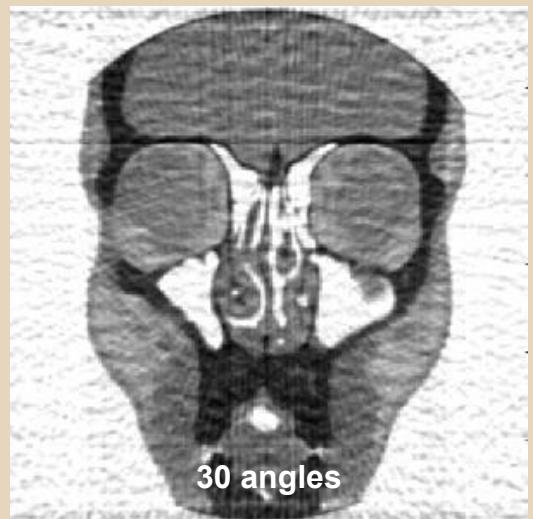
4 angles



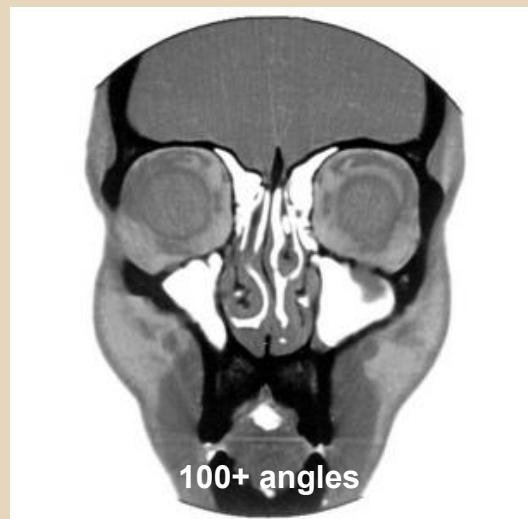
16 angles



16 angles



30 angles

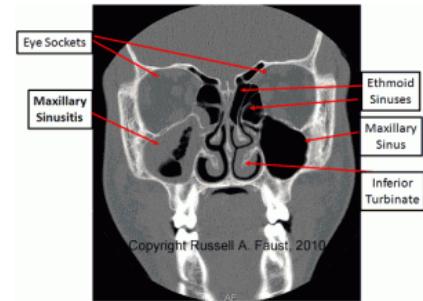
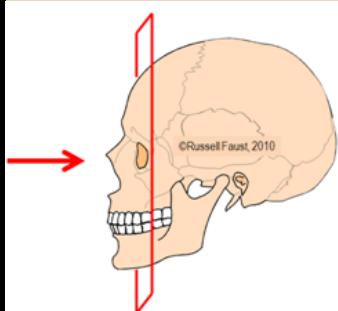
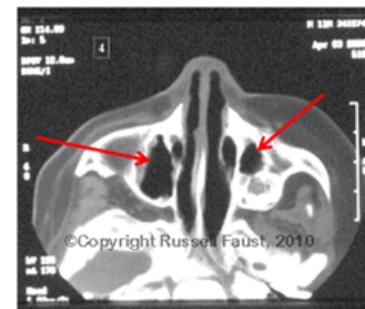
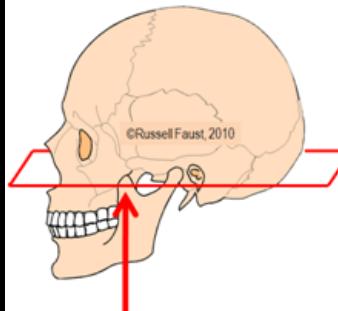
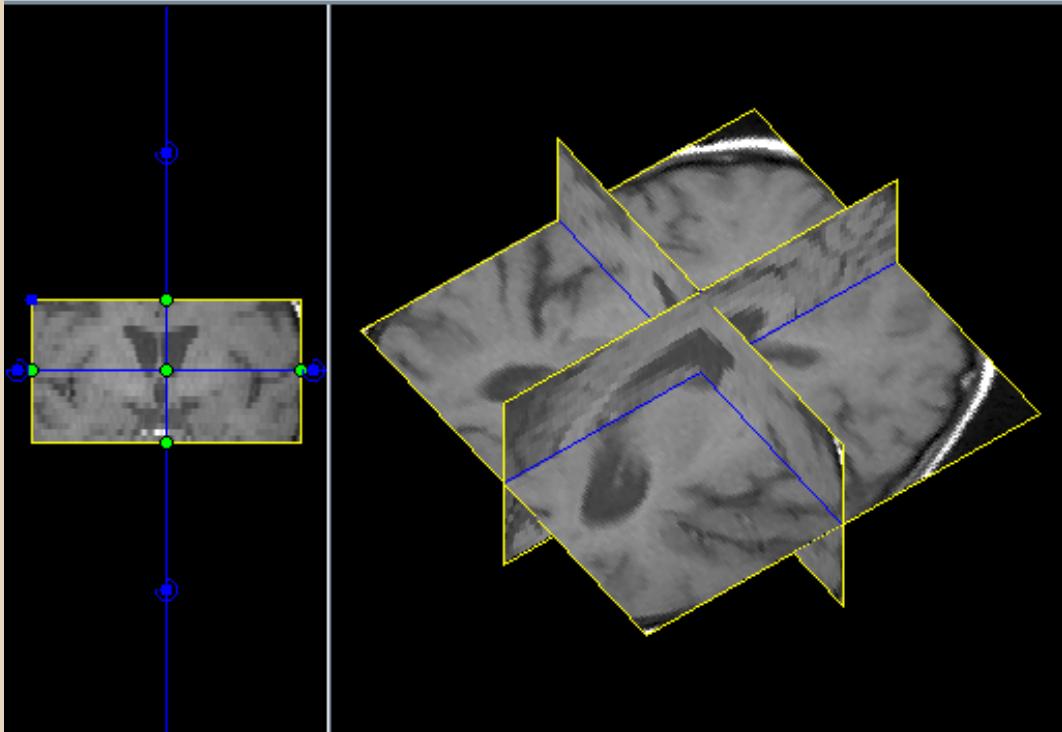
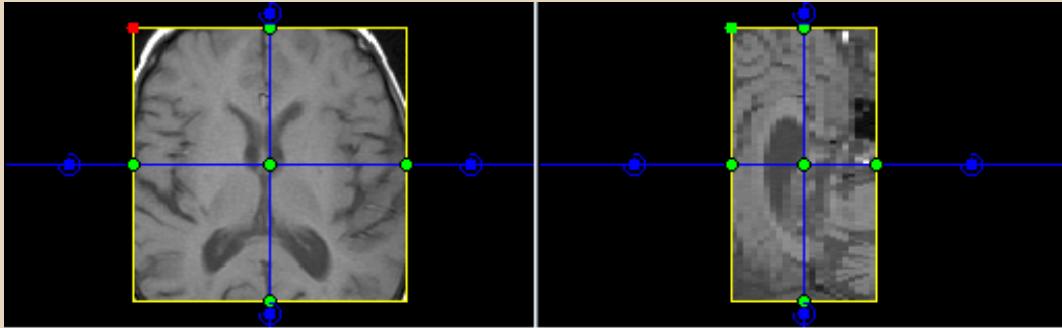


100+ angles

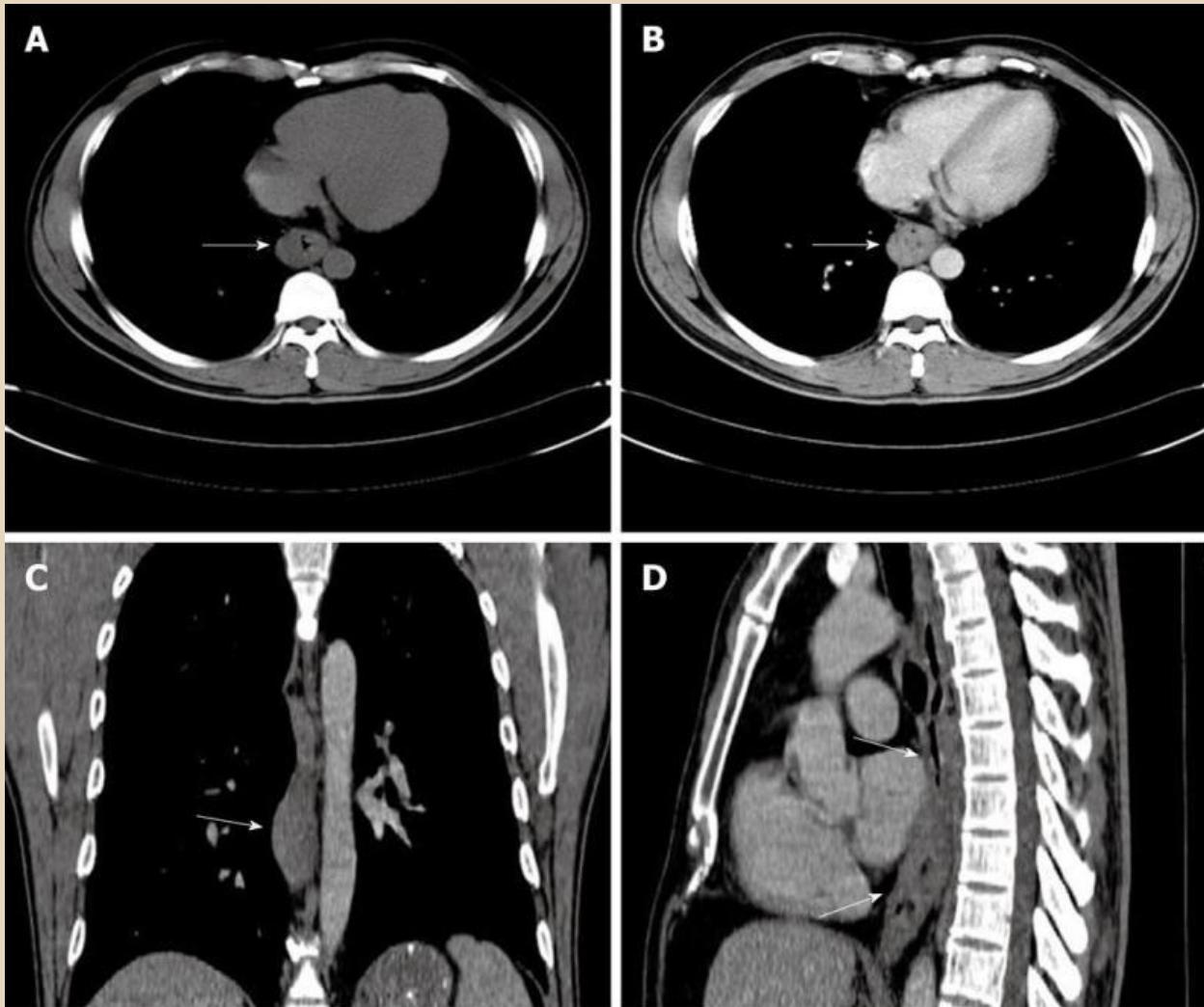
# image reconstruction



isotropic imaging - all 3 sides (x, y, z) of the voxel have equal size



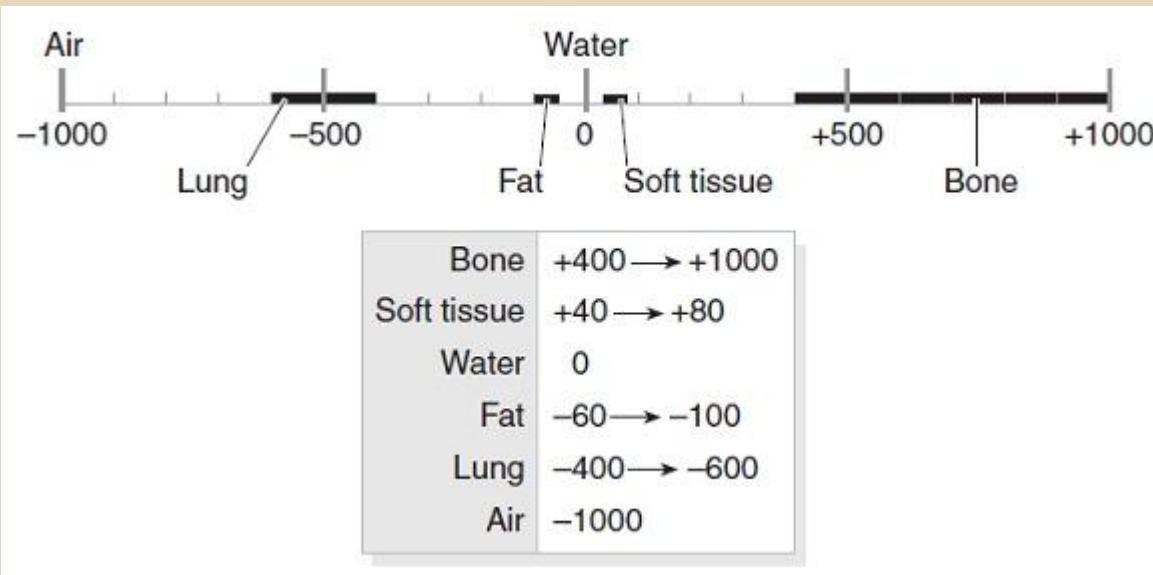
# image reconstruction



# image reconstruction



- Hounsfield scale - tissue density is expressed in different shades of grey in relation to its x-ray absorption
  - water = 0, air = -1000
  - scale -1000 to 3095



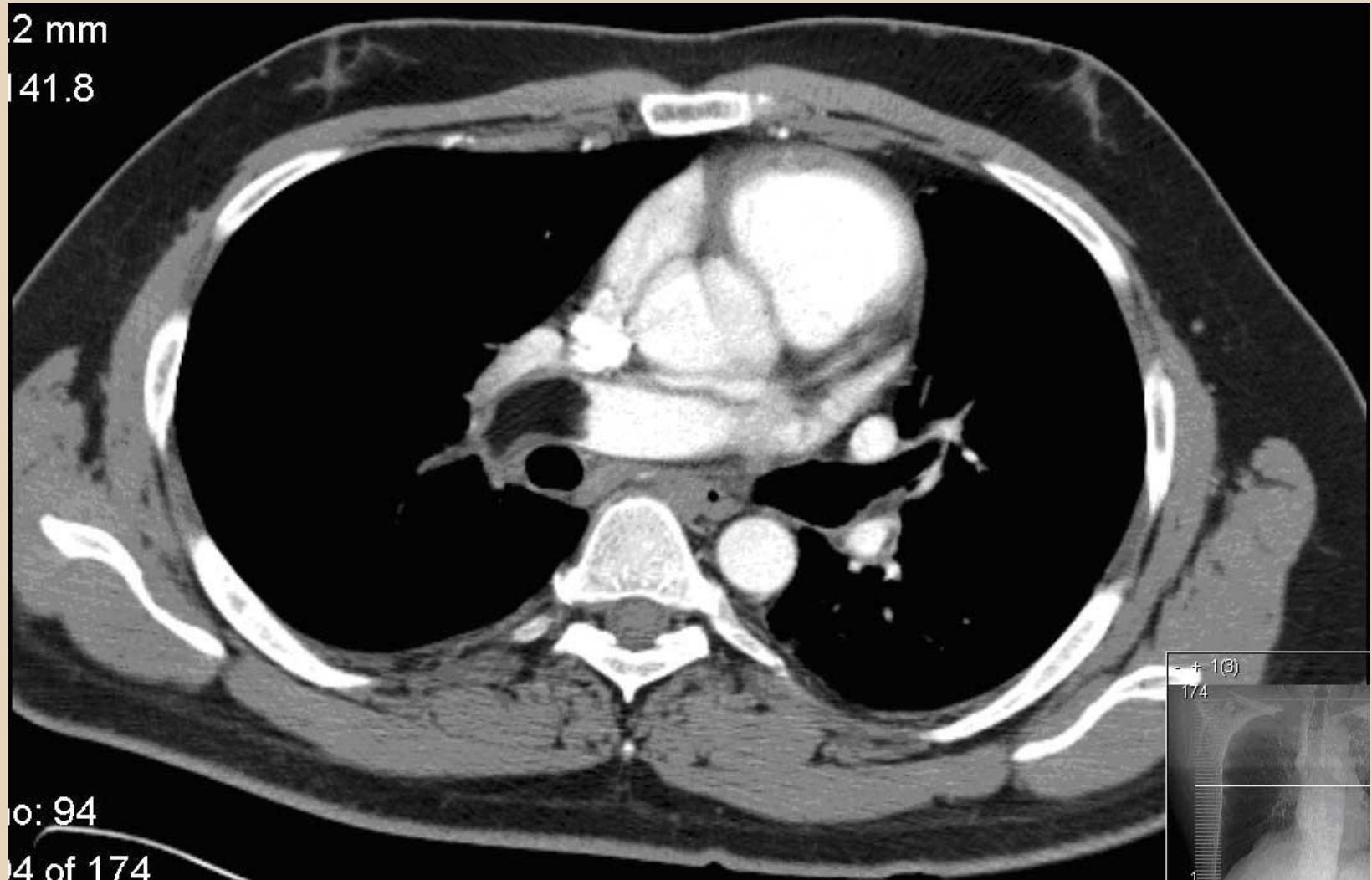
# image reconstruction



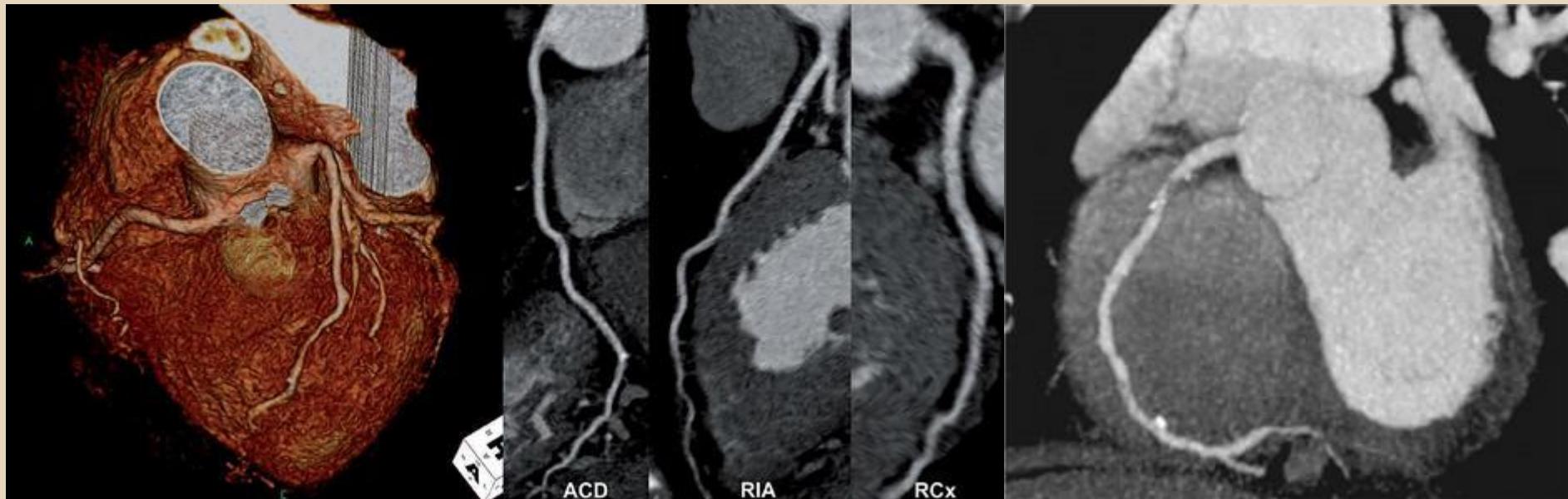
- CT window
  - window width
  - window level (center)
    - mediastinal window
      - W 350, L 50
      - lowest HU =  $-125$  ( $50-350/2$ )
      - highest HU =  $225$  ( $50+350/2$ )
    - lung window
      - W 2000, L -200
    - bone window
      - W 1500, L 300
    - brain window
      - W 80, L 30



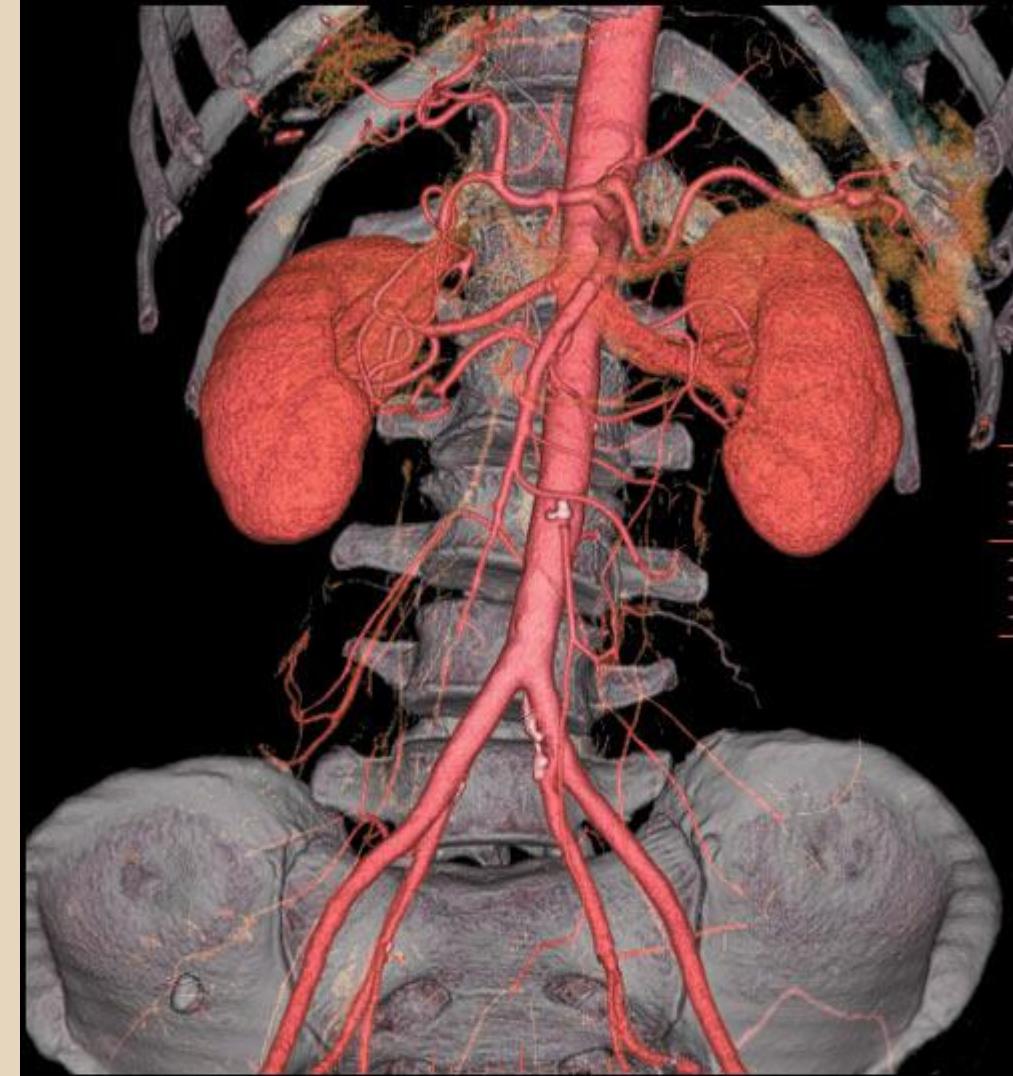
# image reconstruction



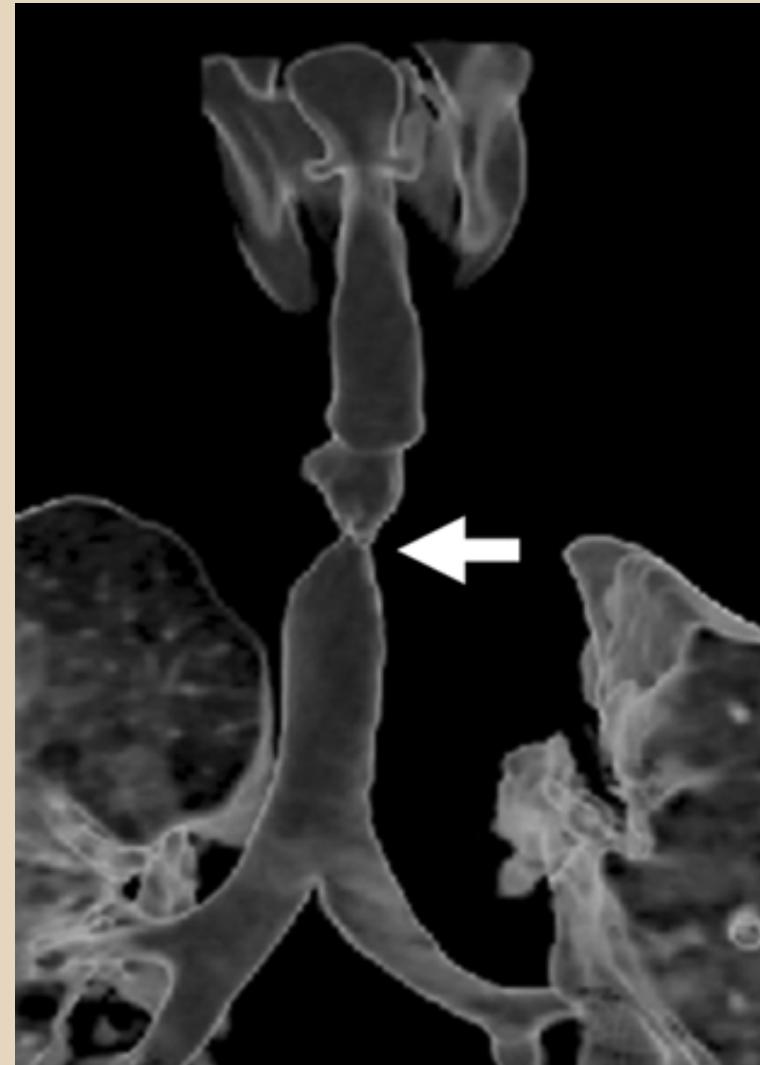
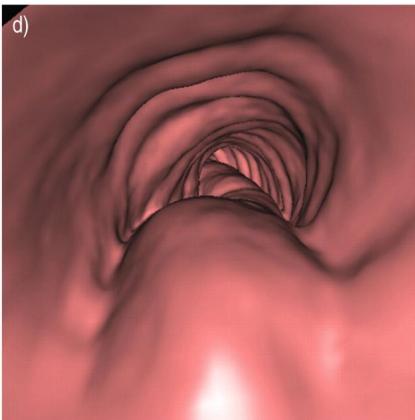
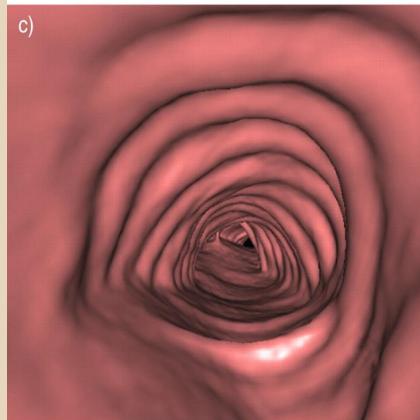
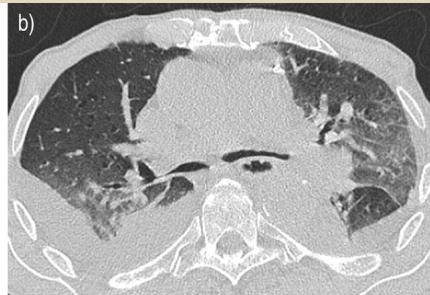
# CT coronaryography



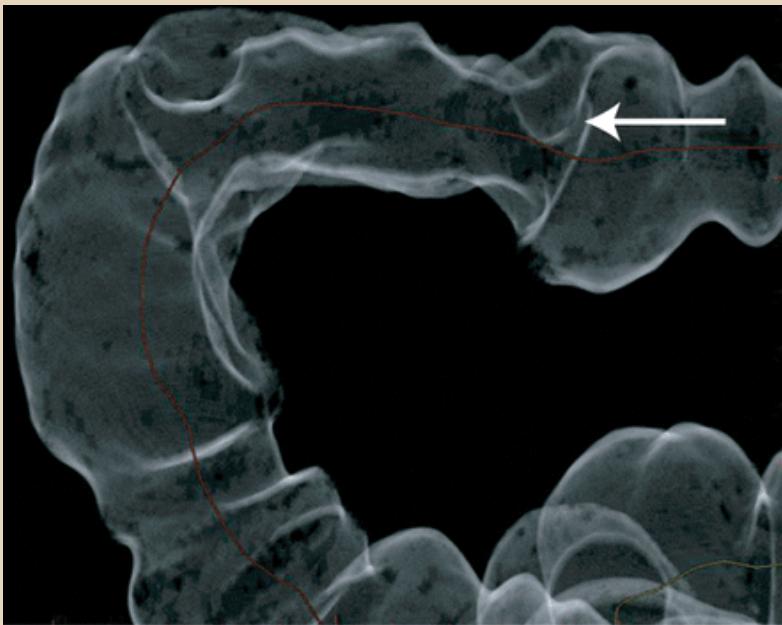
# CT angiography



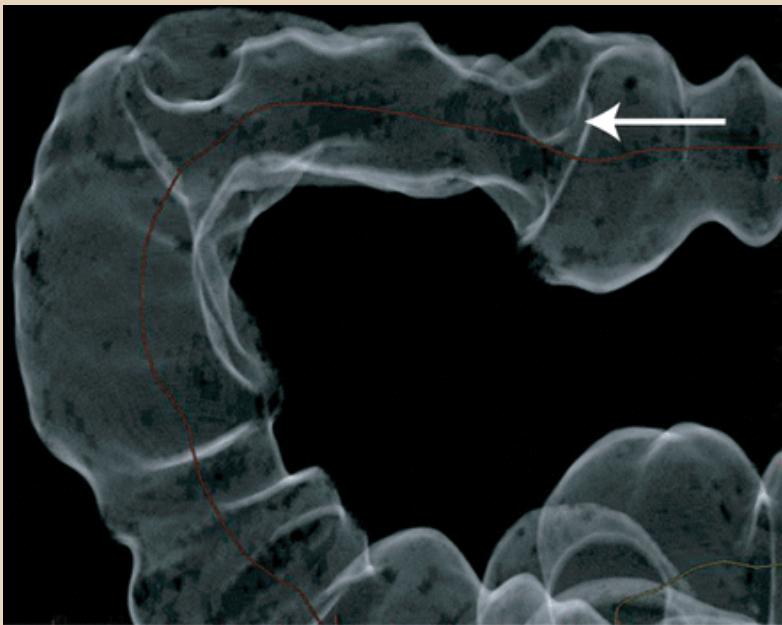
# CT endoscopy



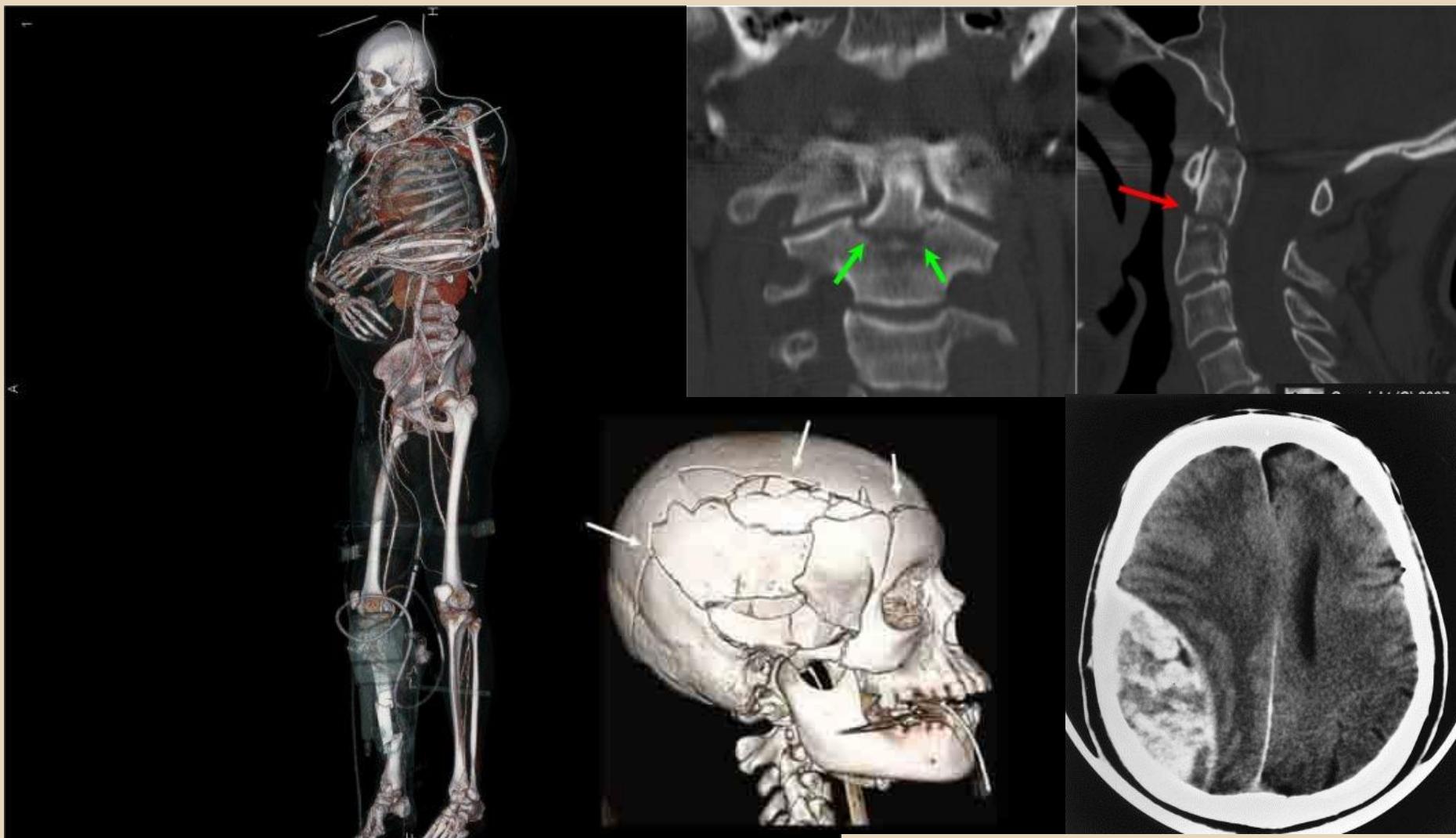
# CT endoscopy



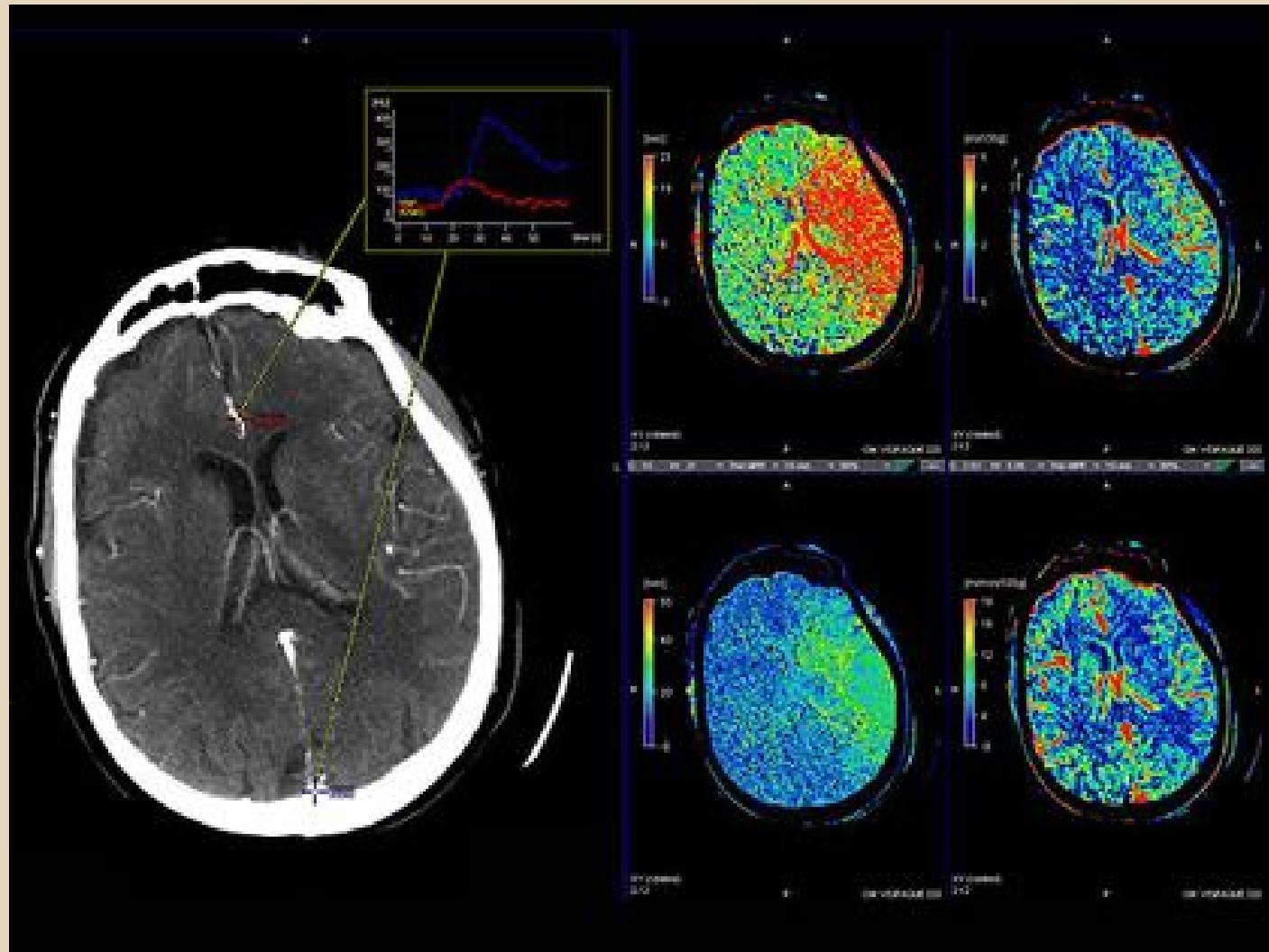
# CT endoscopy



# CT in polytrauma



# CT in acute stroke



# Thank you

