



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
SNS Kalvi Nagar, Coimbatore - 35  
Affiliated to Dr MGR Medical University, Chennai



**DEPARTMENT OF RADIOGRAPHY AND  
IMAGING TECHNOLOGY**

**I YEAR**

**UNIT - 9**

**TOPIC : CT ARTIFACTS**



# INTRODUCTION



❖ Artifacts are the one which not only degrade image quality, but also leads to wrong or miss diagnosis.

The typical artifacts in CT images are,

(i) Motion artifacts

(ii) Streak artifacts

(iii) Beam-hardening artifacts,

(iv) Ring artifacts

(v) Partial volume artifacts

(vi) Spiral artifacts and

(vii) Rod artifacts.



# Motion Artifacts



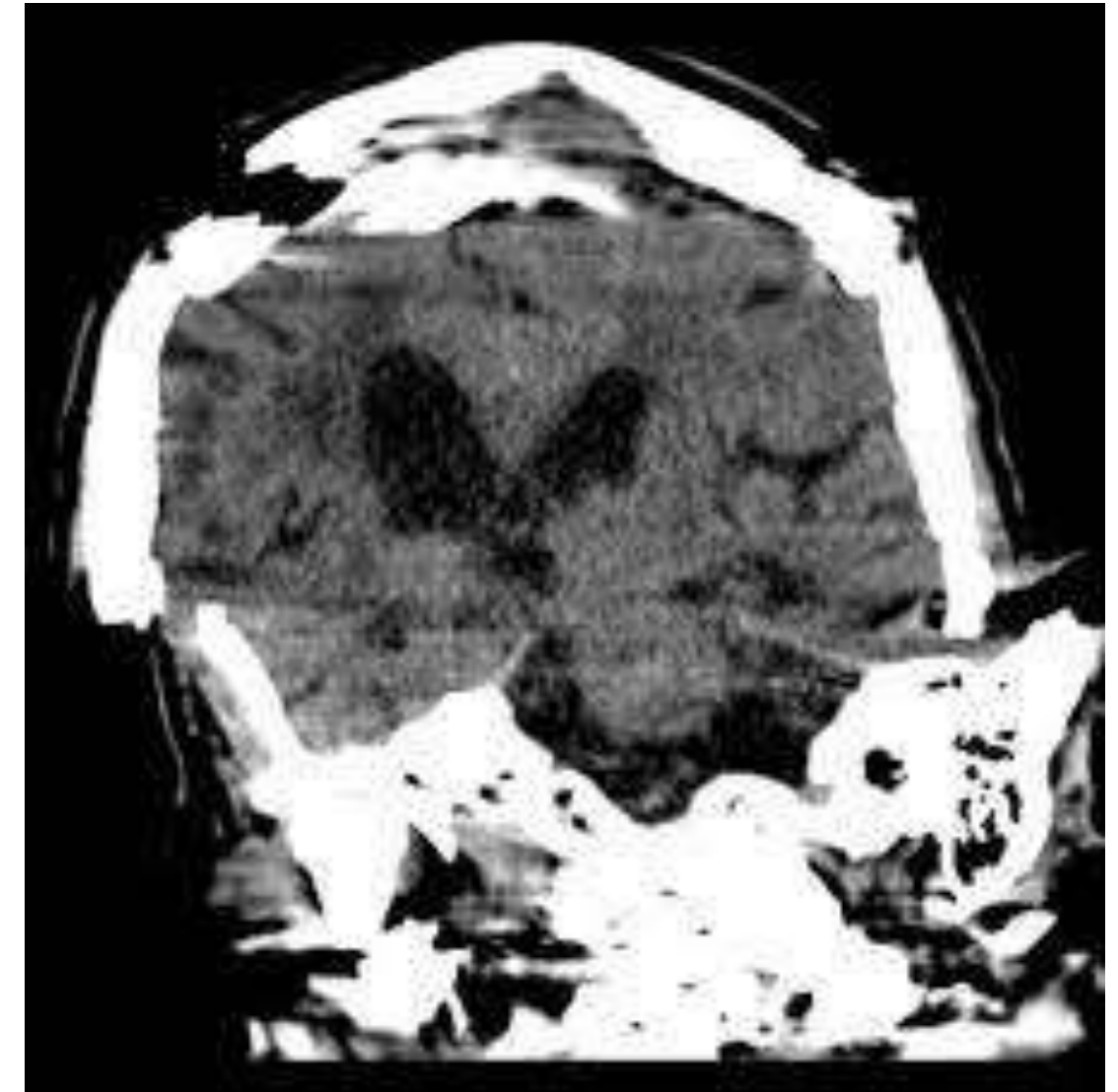
- ❖ The patient motion is random or unpredictable during CT scanning (e.g. patient's sneeze).
- ❖ The image will display the object motion as a streak in the direction of motion.
- ❖ It depends on the density of the object in motion and densities much different from the surroundings produces more intense motion artifacts.
- ❖ Motion artifacts are more prevalent in scan times of 0.5–2 s, due to involuntary and voluntary patient motion.



## CT BRAIN SHOWING MOTION ARTIFACT



- ❖ Structures move from one voxel to another, and introduce errors in reconstruction.
- ❖ Motion artifacts appear as double images or image ghosting that may leads to rescanning.





# Streak Artifacts

- ❖ Streak artifacts are due to absence of transmitted X-rays to the detector and it appears as dark and light lines.
- ❖ The sources of streak artifacts are high density material such as metal implants, dental amalgam, and shotgun pellet, etc.
- ❖ Streak artifacts increase with motion and metal correction algorithms are provided in some CT scanners.

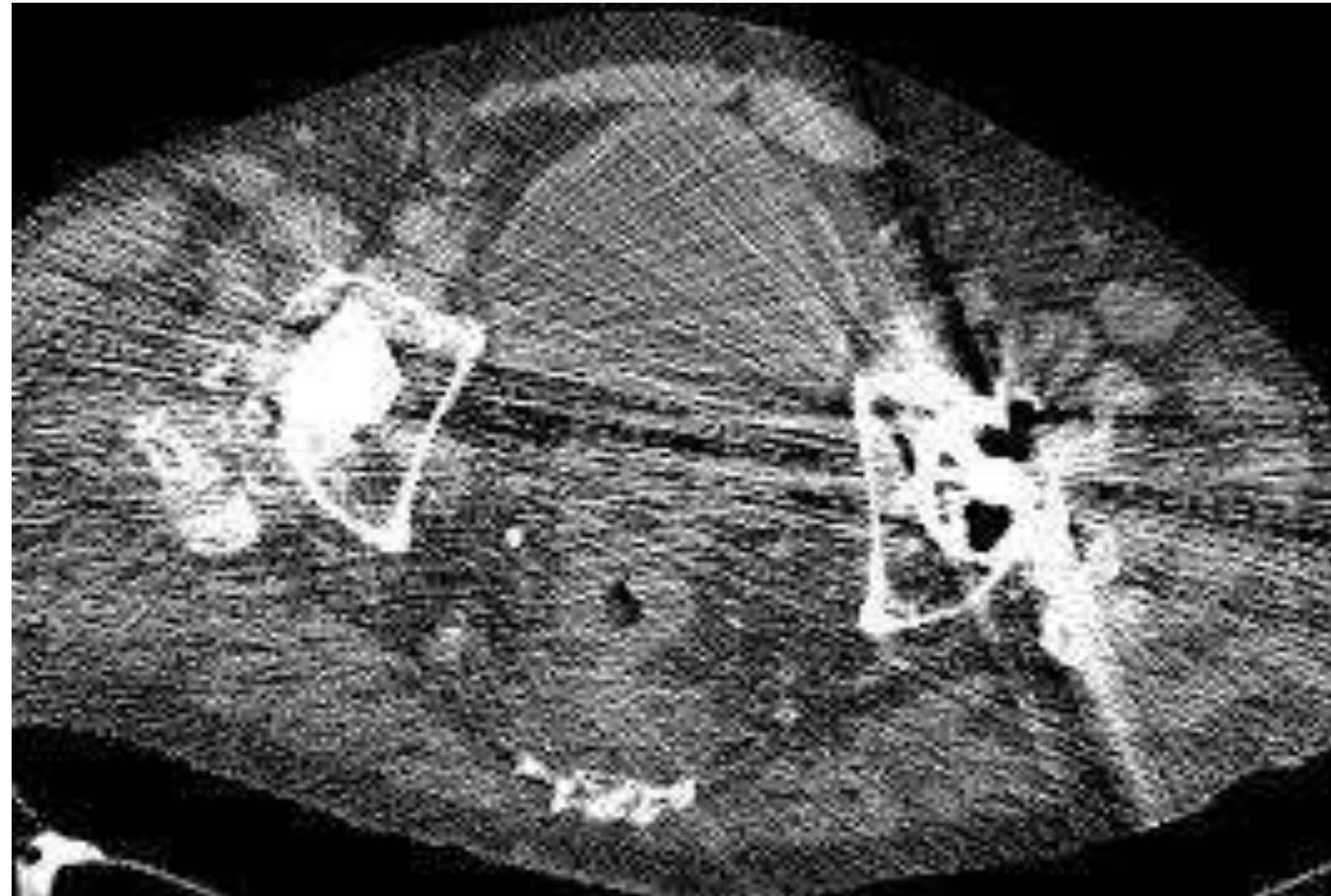


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# CT ABDOMEN SHOWING STREAK ARTIFACT





# ASSESSMENT



- ❖ Define Artifact.
- ❖ Define Motion artifact.
- ❖ Define Streak artifact.





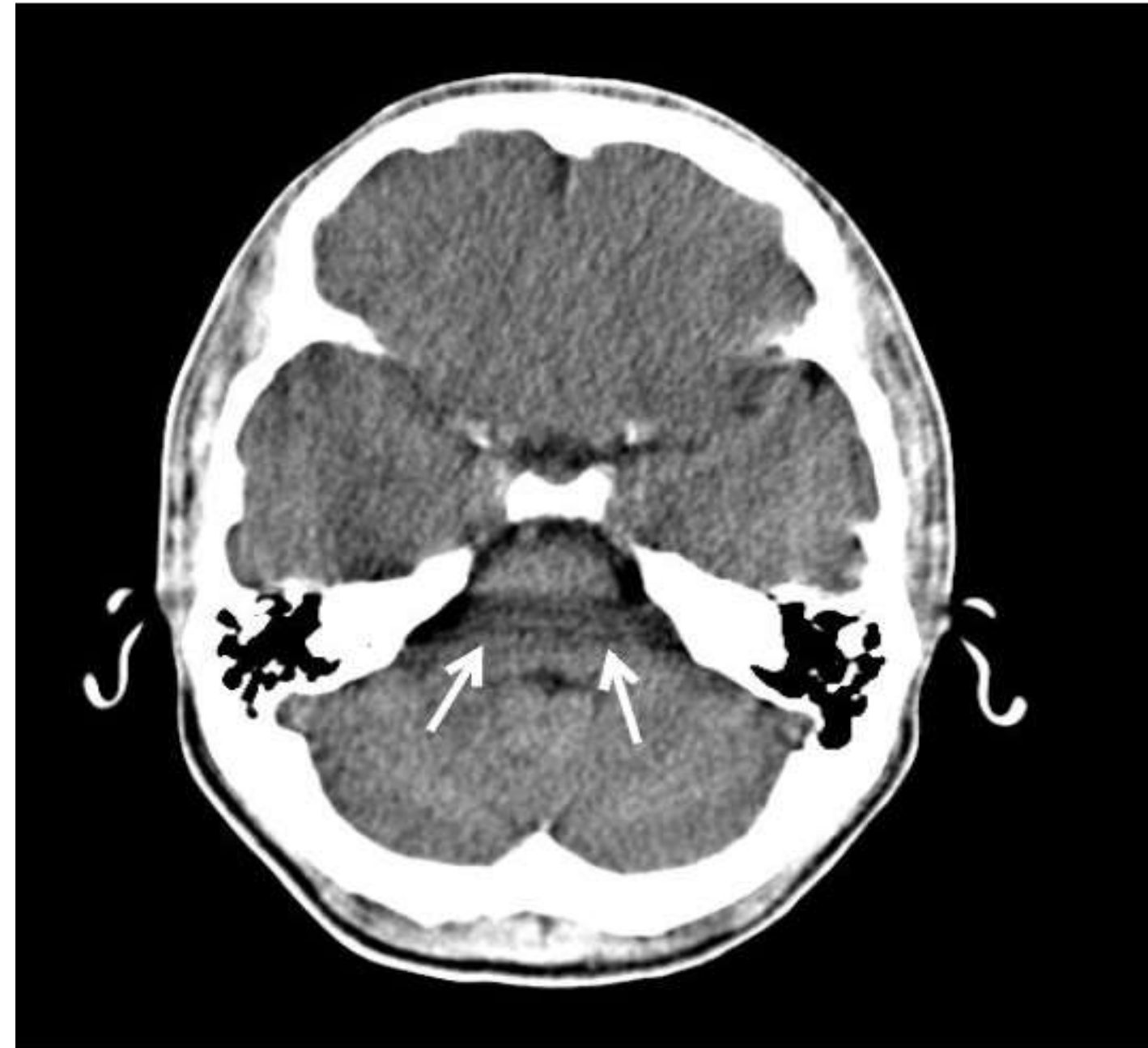
# Beam Hardening Artifact



- ❖ Beam hardening artifacts or cupping artifacts are caused by polychromatic nature of X-ray beam (25–120 keV).
- ❖ As the beam passes through the patient, low energy is absorbed, and the mean energy increases.
- ❖ As a result, the beam become hardened, that causes underestimation of and HU. It is possible to minimize the beam hardening effect by a suitable correction algorithm.
- ❖ Beam hardening artifacts are marked at high contrast interfaces (bone), e.g. petrous bones in the head.



# CT BRAIN SHOWING BEAM HARDENING ARTIFACT





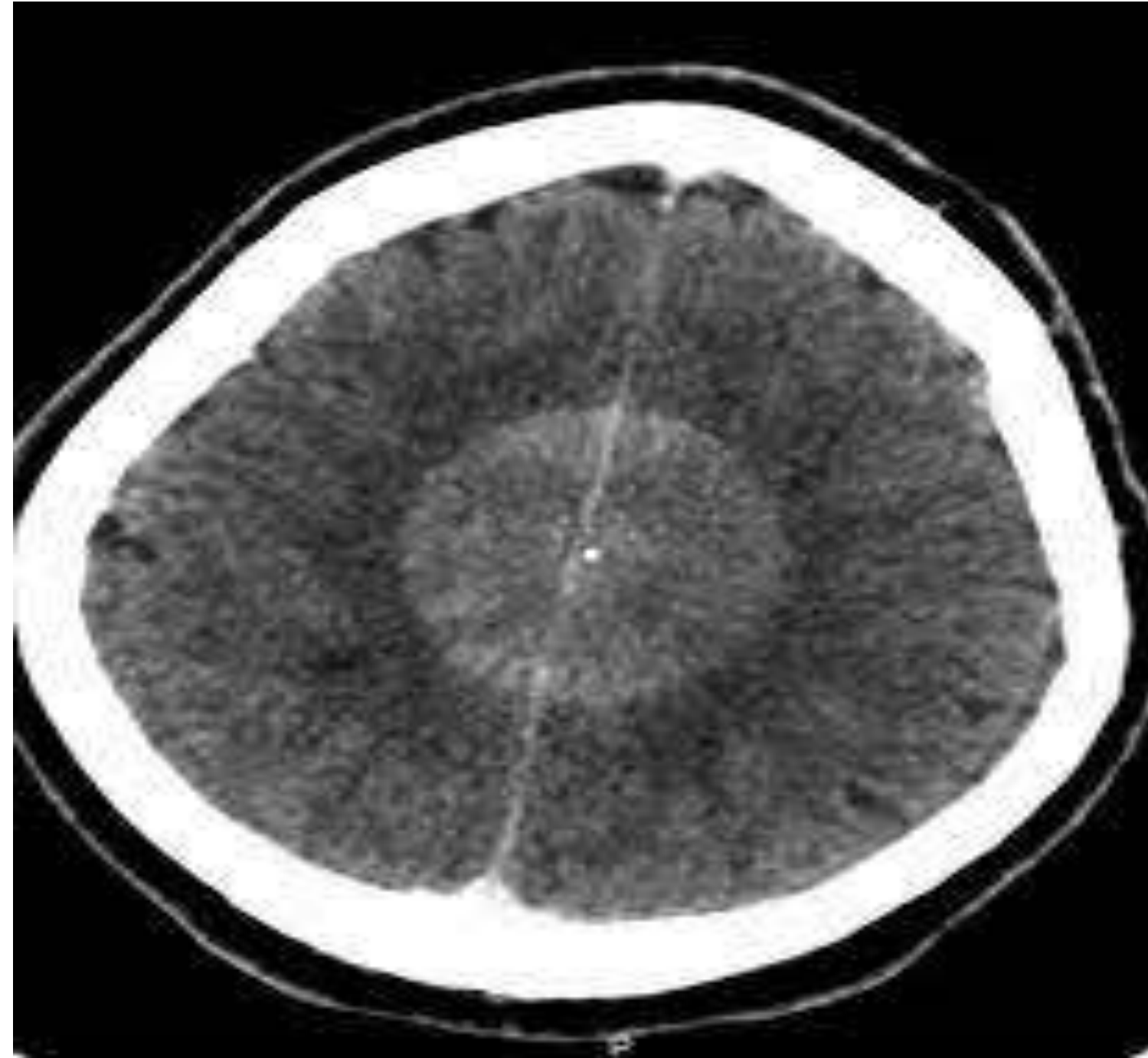
# Ring Artifacts



- ❖ Ring artifact is the result of mis-calibration or failure of one detector in rotate-rotate system of 3rd generation CT scanner.
- ❖ Due to the failure of a particular detector, incorrect data in every projection will appear as a ring in the image.
- ❖ Radius of the ring is determined by the position of the detector in the array and virtually disappeared in contemporary CT units.



# CT BRAIN SHOWING RING ARTIFACT





## Partial Volume Artifacts



- ❖ Partial volume artifact is result of averaging the linear attenuation coefficient in a given voxel that is heterogeneous in composition (e.g. presence of bone and soft tissue).
- ❖ This artifact increases with increasing pixel size and slice thickness. It is pronounced for softly rounded structures that are parallel to the CT slice.





❖ For example, when cranium shares few number of voxel with brain tissue, there is loss of details of brain parenchyma. Use of thinner slices and helical scan with interleaved reconstructions will reduce partial volume artifacts (e.g. 5 mm slices at the interval of every 2.5 mm).



# Spiral Artifacts



- ❖ A helical scan gives an image similar to partial volume averaging (PVA). In one direction, the PVA is determined by collimation, and in the other direction, it is by collimation and table increment per rotation.
- ❖ As a result, instead of a perfect circle, an ellipse like reconstruction is done.
- ❖ It is more apparent for large beam top angle, and large pitch,
- ❖ e.g...
- ❖ spiral scans of top of the brain: it is seen as two crescent shaped bands of increased density along the skull-brain interface, which mimics a subdural hematoma. These bands rotate around the brain as the X-ray tube rotates around the patient.



# Rod Artifacts



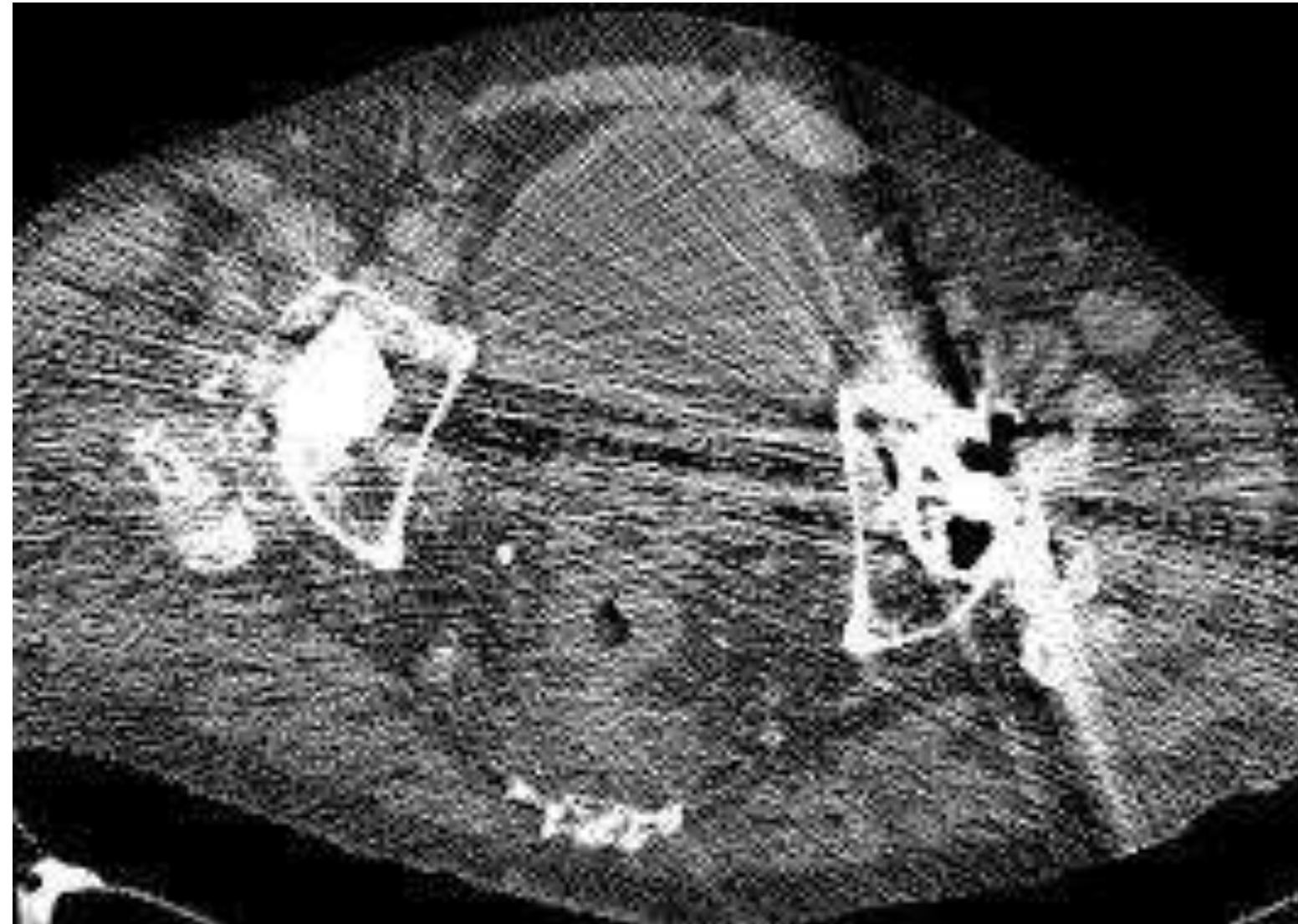
- ❖ Rod artifacts are apparent when high contrast objects vary in shape/position.
- ❖ For example, if a cylindrical object angulated with respect to the scan plane, then every projection locates the cylinder at a different position.
- ❖ As a result, the cylinder would appear as ellipse, without the table motion. With table motion, the ellipse gets distorted, extending to surrounding tissues and commonly seen in the liver/rib area.



# ASSESSMENT



**IDENTIFY THE ARTIFACT**





**THANK YOU**