



1. CT artifacts: causes and reduction techniques

Artifacts are commonly encountered in clinical CT and may obscure or simulate pathology. There are many different types of CT artifacts:

1. Patients Causes

Caused by such factors as patient movement or the presence of metallic materials in or on the patient.

- **Metal artifacts**

Metal streak artifacts are caused by multiple mechanisms, including beam hardening, scatter, Poisson noise, motion, and edge effects. The Metal Deletion Technique (MDT) is an iterative technique that reduces artifacts due to all of these mechanisms. In some cases, the improved image quality can change the diagnosis.

Because the density of the metal is beyond the normal range that can be handled by the computer--- incomplete attenuation profiles.

The metal produces a beam – hardening and photon starvation artifact. This can also happen with other high attenuation materials such as IV contrast.

Solution possible:

- Remove metal object.
- Decrease section width.
- Increase kV for better penetrability.
- Adjust W/L setting
- Metallic artifact reduction (MAR) software.



- Patients motion

Causes:

- Patient swallowing
- Breathing
- Pulsatility of heart and vessels.
- Patient moving.

If a patient or structure moves as the gantry rotates the object will be detected as being in several positions and represented in the image as such.

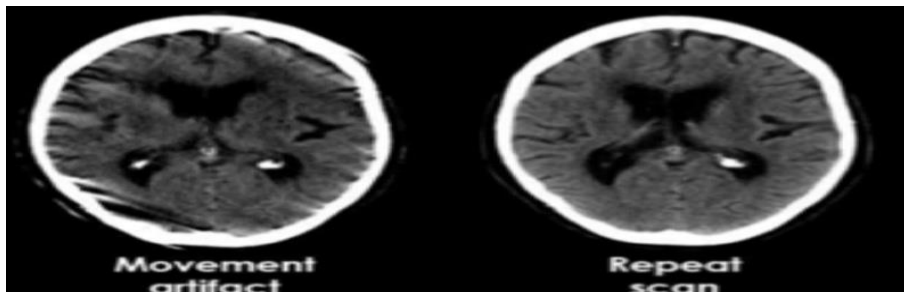
Solution:

Scan parameters

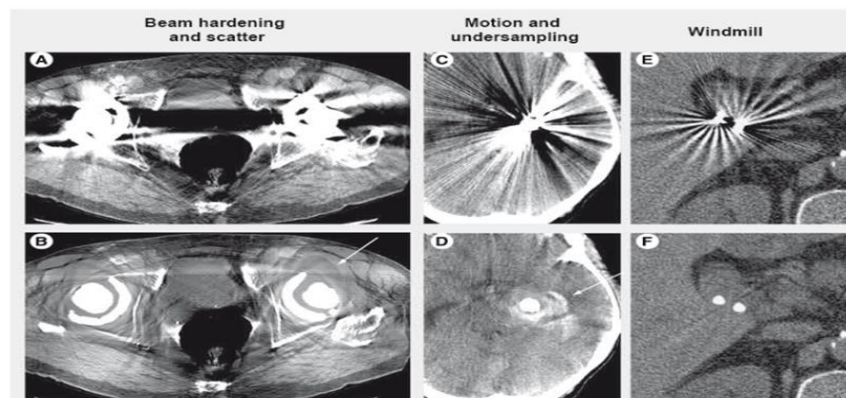
- Short scan time
- Spiral scanning

Patient parameters

- Breath hold
- Ensure comfortable patient position



The image on the left shows the result of movement during scanning. The degraded image was repeated and no pathology was shown.



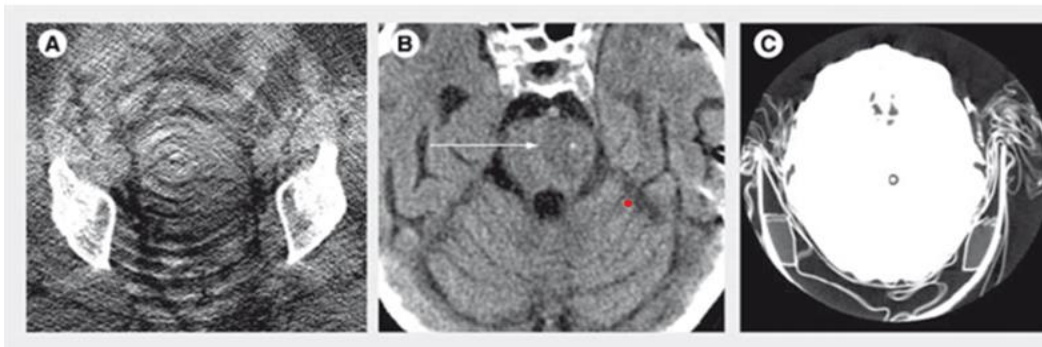


2. Scanner Based

Result from imperfections in scanner function

1. Streak and ring artifacts

Ring artifact is caused by a miscalibrated or defective detector element, which results in rings centered on the center of rotation. This can often be fixed by recalibrating the detector.

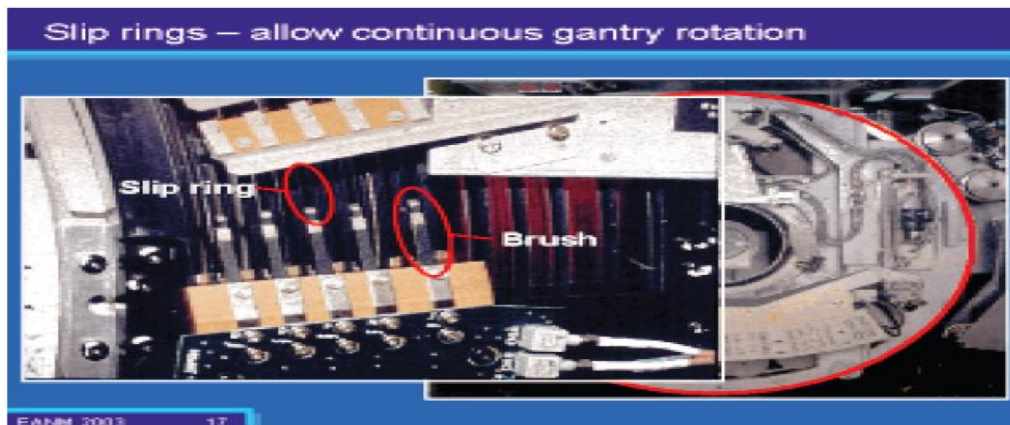
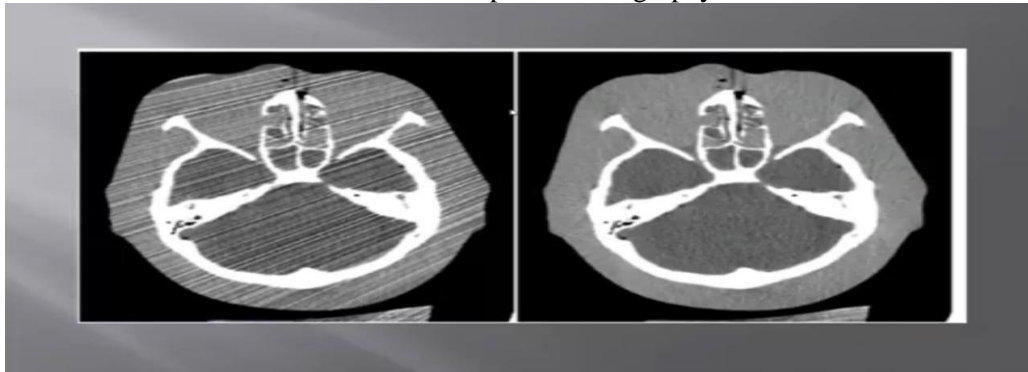


3. Cone beam artifact

This is particular artifact caused by multislice scanners. As the section scanned increase per rotation, a wider collimation is used because of this x-ray beam becomes cone-shaped instead of fan-shaped and the area imaged by each detector as it rotates around the patient is a volume instead of a flat plane.

4. Tube arcing artifact

Tube arcing is known to be caused by a temporary short circuit in the x-ray tube causing momentary loss of x-ray output.



2. Contrast

CT scans may be done with or without "contrast." Contrast refers to a substance taken by mouth or injected into an intravenous (IV) line that causes the particular organ or tissue under study to be seen more clearly.

3. Factor affecting image quality and patient Dose:

1. Increase mA
2. Increase kV
3. Contrast
4. Filter
5. Colimeter