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Department of Biomedical Engineering

19BMT302 & RADIOLOGICAL EQUIPMENT

III Year : V Semester

TITLE: HELICAL CT RECONSTRUCTION

19BMT302/Radiological Equipment/Unit 2/Ms.B.Divya/AP/BME



HELICAL CT

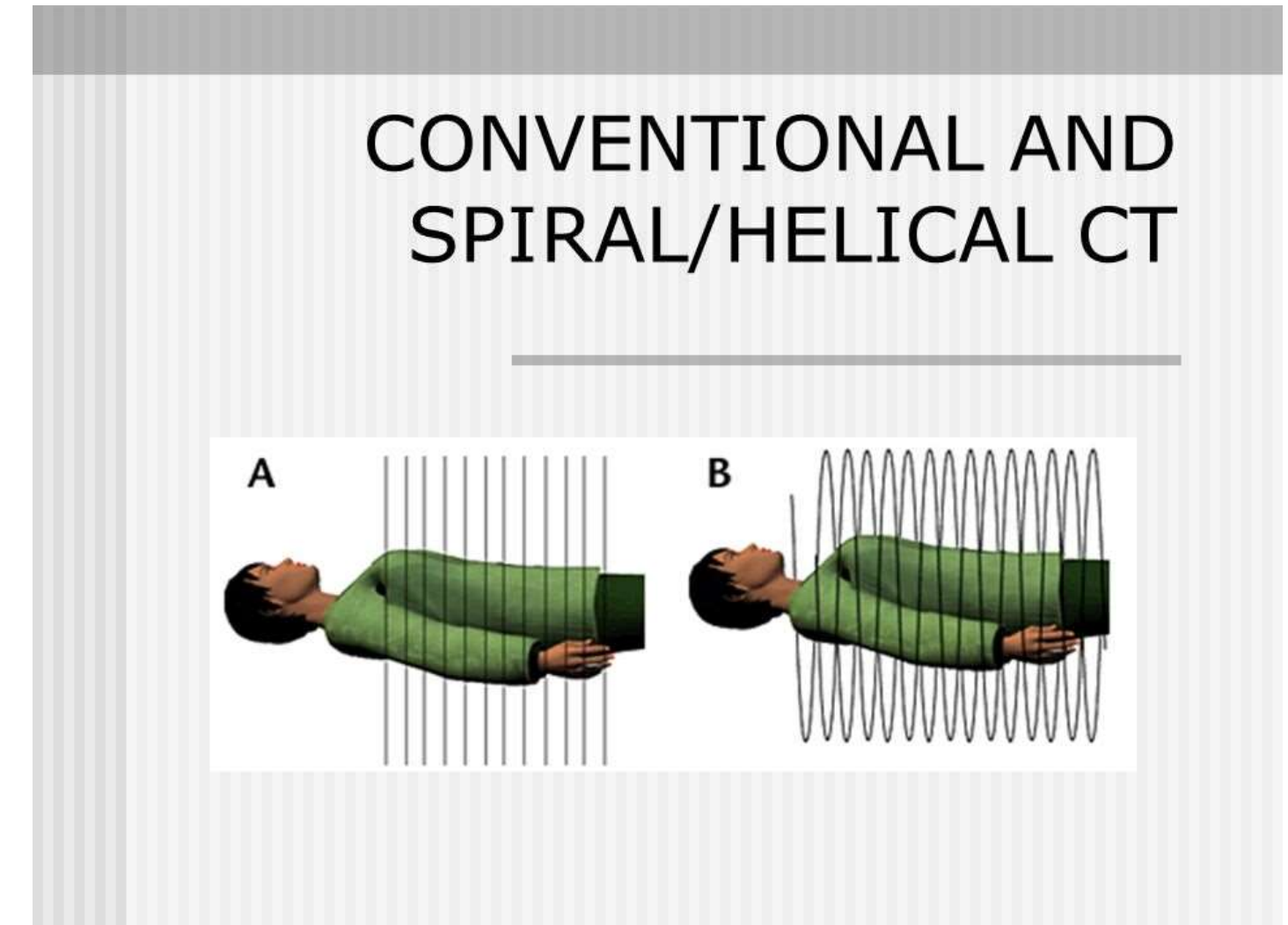
- Helical (Spiral) CT is a vast improvement over conventional CT scans. The patient lies on an exam table that passes through a doughnut-shaped scanner, while an X-ray tube rotates around the table. This movement results in a spiral shaped continuous data set without any gaps.
- This procedure is especially beneficial to the elderly, very young patients and acutely injured patients who are sensitive to longer exam times.
- Helical CT requires one to be more cognizant of the relationship between contrast material administration and scanning, since the optimal temporal window for detection of disease can be missed.





DIFERENCE BETWEEN SPIRAL AND HELICAL CT

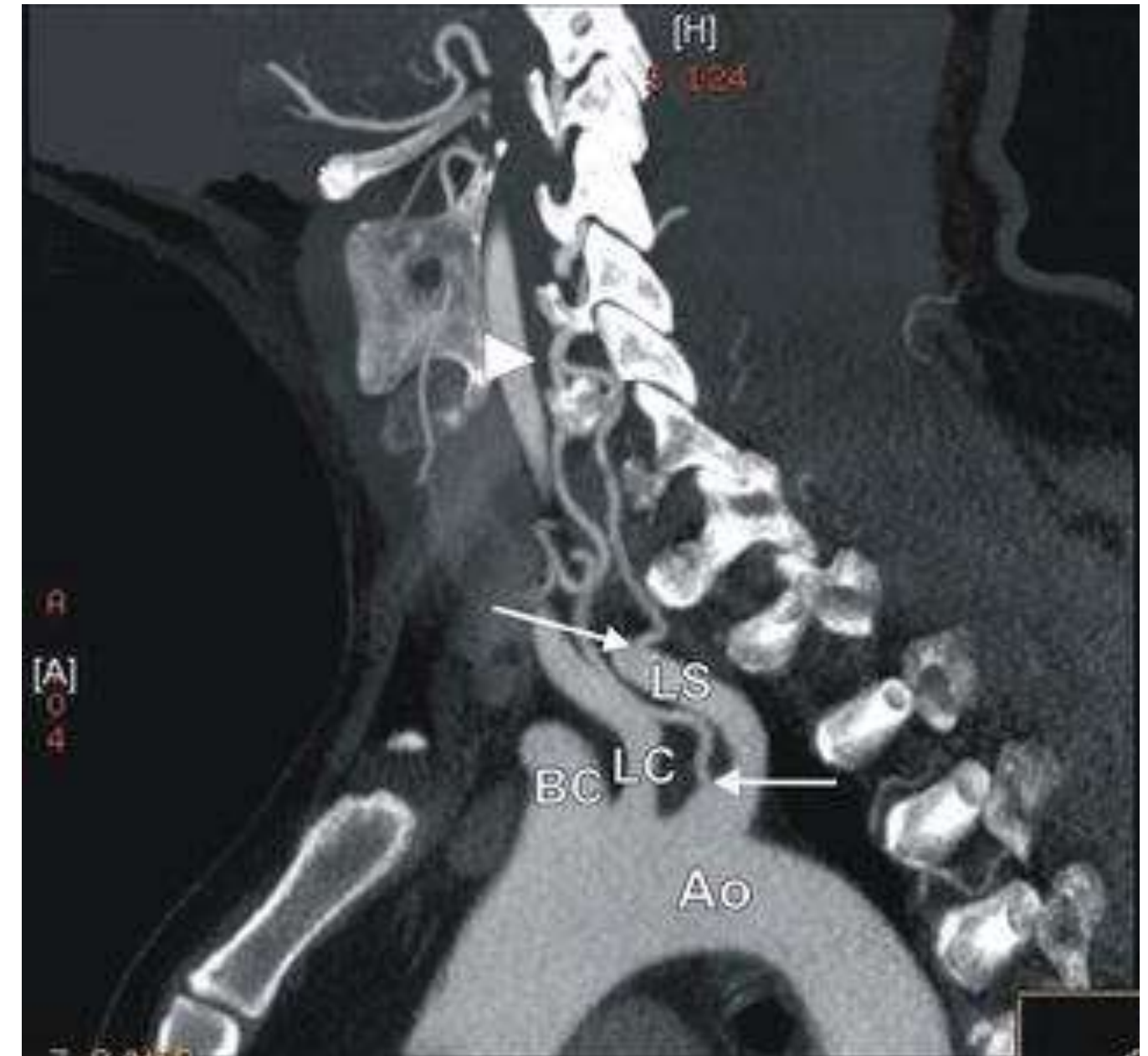
- Axial non-volumetric scanning is how CT began where one (or just a few) slices are acquired during each gantry rotation.
- With the helical CT, there is less likelihood to miss small tumors or abnormalities, and spiral CT is about 8 to 10 times faster than a traditional CT.
- Unlike a simple X-ray study, it offers a much higher level of detail, creating computerized, 360-degree views of the body's structures.





PRINCIPLES OF HELICAL CT

- Helical CT, also known as spiral CT, utilizes a rotating X-ray source and detector array to capture continuous data along the patient's body.
- This data is then reconstructed into cross-sectional images, providing detailed anatomical information.
- Helical CT refers to volume acquisition of image data in which the data set represents a series of projections obtained in a helical spatial distribution.





ADVANCEMENTS IN HELICAL CT

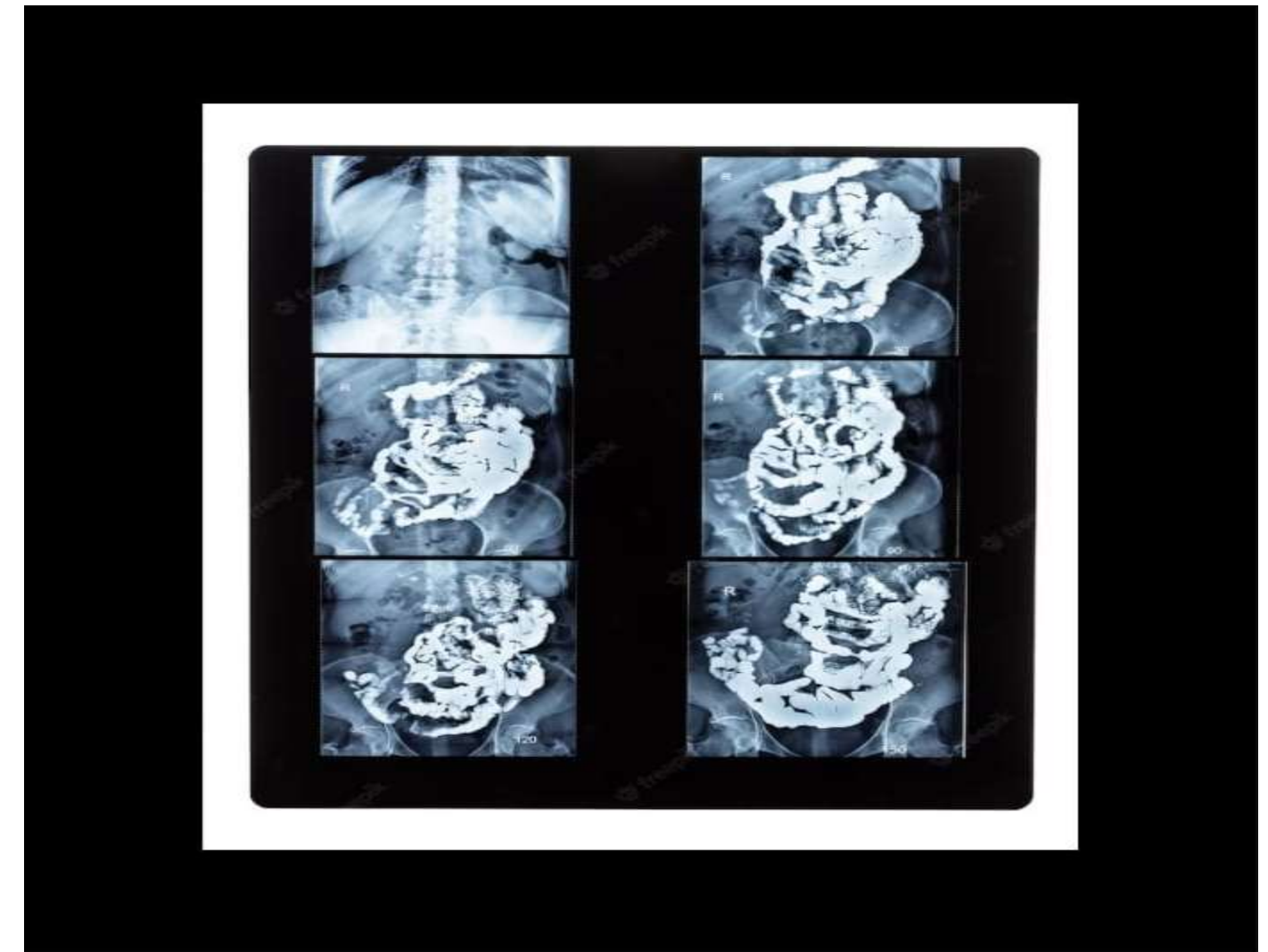
- A major advance on the earlier stepwise ("stop and shoot") method.
- The advances have led to a tremendous improvement in the speed with which the 3-dimensional volume can be imaged, and much better routine spatial resolution in the slice direction.
- The advancements include:
 - 1) Iterative reconstruction
 - 2) Dual-Energy CT
 - 3) Motion correction



Iterative Reconstruction



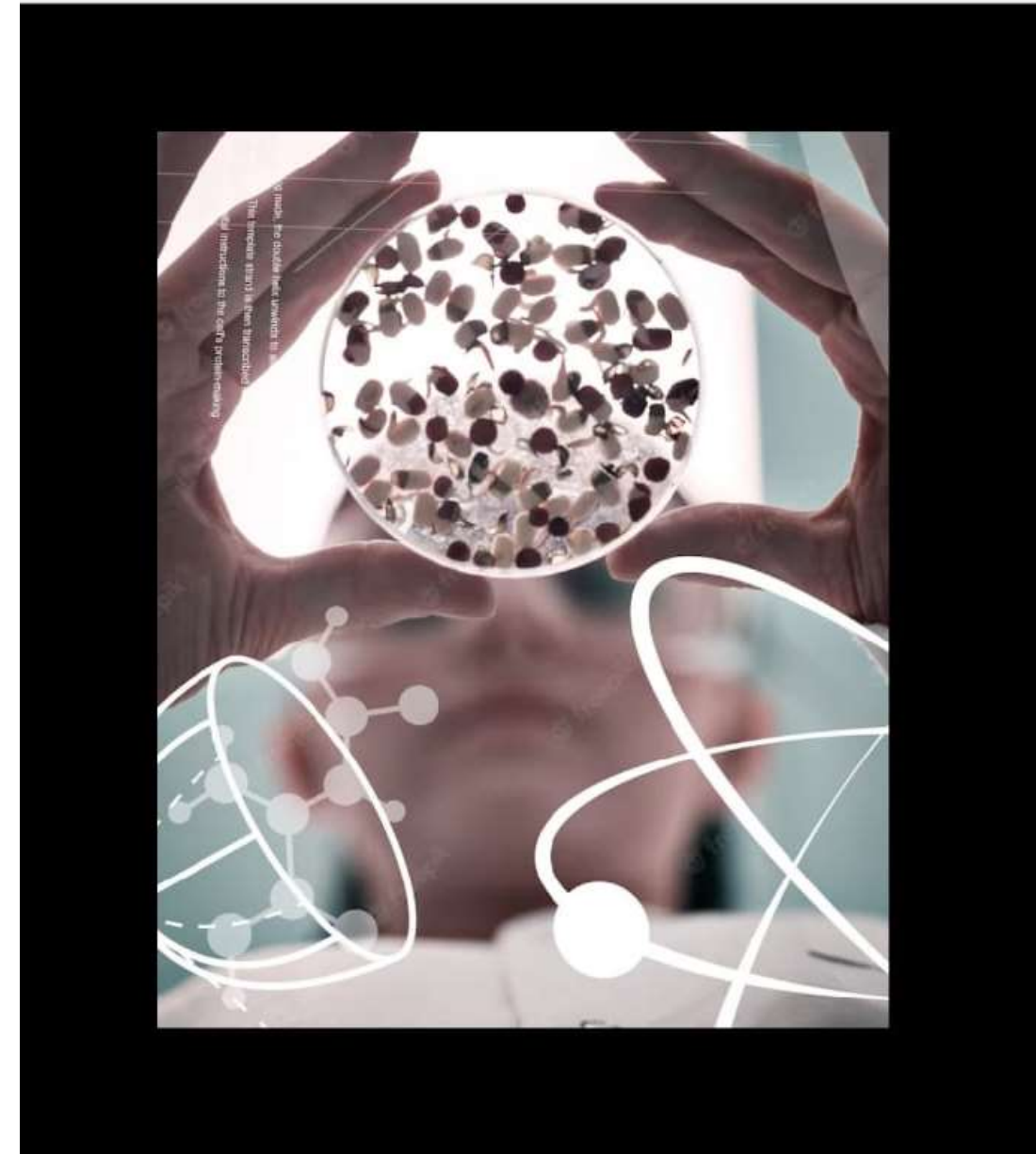
- Iterative reconstruction algorithms have significantly improved image quality in helical CT.
- By utilizing advanced mathematical models and iterative processes, these techniques reduce noise, enhance spatial resolution, and improve overall image fidelity.
- This advancement has led to clearer and more accurate diagnostic imaging





Dual –Energy CT

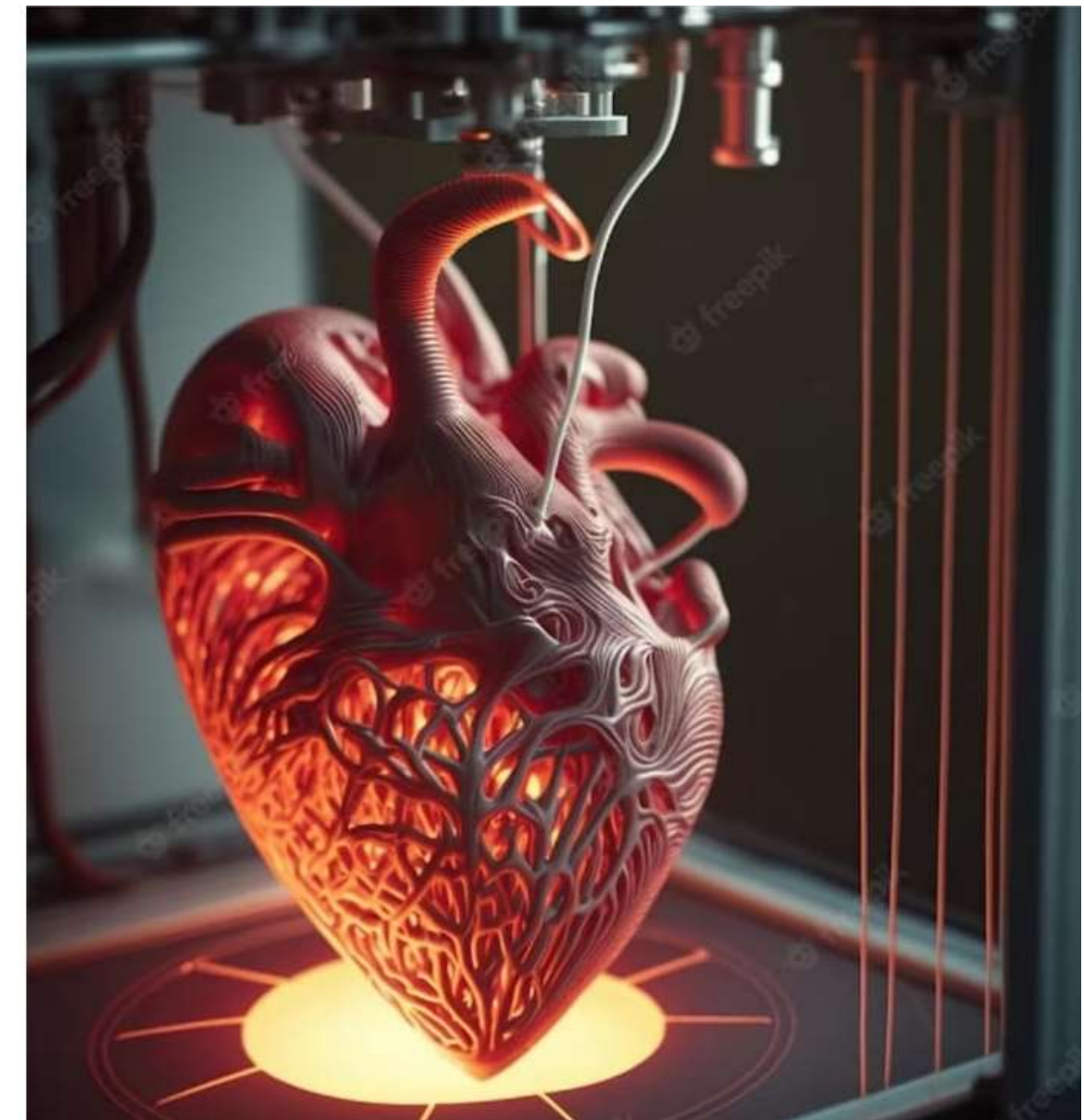
- Dual-energy CT enables the acquisition of images at different X-ray energy levels, allowing for material differentiation and improved tissue characterization.
- By analyzing the varying attenuation properties of different materials, such as iodine or calcium, dual-energy CT enhances the detection and visualization of lesions, calcifications, and contrast agents.





Motion correction

- Motion artifacts can degrade image quality in helical CT.
- Advanced motion correction techniques, such as prospective gating or retrospective image-based correction, compensate for patient motion during the scan.
- These methods improve image sharpness, reduce blurring, and enable more accurate assessment of dynamic structures, like the coronary arteries





Conclusion



- The advancements in helical CT reconstruction have propelled the field of medical imaging to new heights.
- Through iterative reconstruction, dual-energy CT, and motion correction, we have witnessed significant improvements in image quality, tissue characterization, and diagnostic accuracy. Vision Title 3
- These cutting-edge techniques have paved the way for enhanced imaging and better patient outcome.