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Computed Tomography (CT): Advanced Imaging for Precise Diagnosis.

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Introduction

Computed Tomography (CT), also known as a CT scan or CAT scan, is a powerful medical imaging technique that combines multiple X-ray measurements taken from different angles to produce detailed cross-sectional images of the body. This technology allows doctors to visualize internal structures with high clarity, improving diagnosis and treatment planning across numerous medical fields [1-3].

CT is a diagnostic tool that uses a series of X-ray images taken around a patient to create detailed 3D images of bones, organs, blood vessels, and soft tissues. Unlike traditional X-rays, which provide only flat, 2D images, CT scans deliver comprehensive slices of the body, which can be reconstructed into three-dimensional models. The patient lies on a motorized table that slides through a circular opening of the CT scanner. Inside, an X-ray tube rotates around the patient, emitting X-rays. Opposite the X-ray source, detectors measure the amount of X-rays passing through different tissues. Multiple X-ray measurements are collected from various angles. A computer processes the data to produce cross-sectional images (slices) of the scanned area. The slices can be stacked and manipulated to create 3D images for enhanced analysis [4-6].

Detects brain injuries, tumors, strokes, or bleeding. Assesses lungs, heart, and blood vessels. Examines organs such as liver, kidneys, and intestines. Visualizes blood vessels to detect blockages or aneurysms. Provides detailed images of fractures and bone diseases. Rapidly evaluates internal injuries and bleeding. Locates tumors and assesses spread. Detects coronary artery disease and vascular abnormalities. Identifies abscesses and inflammatory diseases. Assists in biopsies, drainage, and surgeries. Produces detailed images quickly, crucial in emergencies. Differentiates various tissues including bone, muscle, fat, and blood vessels. Provides internal views without surgery. Commonly found in hospitals and clinics worldwide [7-9].

CT uses ionizing radiation, which poses a risk with repeated scans, especially in children and pregnant women. Sometimes require injection of iodine-based dyes, which can cause allergic reactions or kidney problems. Generally more expensive than standard X-rays. Techniques to minimize radiation while maintaining image quality. Uses two X-ray energy levels to better differentiate tissues. Enhance image clarity and reduce noise. Expanding access in emergency and remote settings [10].

Conclusion

Computed Tomography has transformed medical imaging by providing rapid, detailed, and versatile views of the body's interior. It is an indispensable tool in diagnosis, treatment planning, and emergency care. While radiation exposure requires careful management, ongoing technological improvements continue to enhance CT's safety and

diagnostic power, cementing its vital role in modern healthcare.

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