Medical Imaging

LECTURE SIX

Computed Tomography (CT scan)

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Medical Imaging

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Introduction

Computed tomography (CT) medical-imaging systems generate three-dimensional (3D) images of internal body structures using complex x-ray and computer. i) CT sometimes called "computerized tomography" or "computed axial tomography" (CAT). Clinical Computed Tomography (CT) was introduced in 1971. It developed into a versatile 3D whole body imaging modality for a wide range of applications in for example oncology, vascular radiology, cardiology, traumatology and interventional radiology. This new technique of CT reconstructs a cross-sectional image of the body from a 'virtual pile of X-ray photographs'. A tomographic image is an image of a slice through the body. The word 'tomography' comes from the Greek: tomos means slice, graphein stands for 'to write'. So, tomography literally means 'writing slices'. Structures and lesions previously impossible to visualise can now be seen with remarkable clarity. The principle behind CT: a thin collimated beam of X-rays passes through the body to a detector that measures the transmitted intensity. The collimator is a set of narrow lead tubes or an array of small holes in a lead plate, resulting in a thin straight beam of X-rays. Measurements are made at a large number of points as the source and detector are moved past the body together. The x-ray generator is then rotated slightly about the body axis and again scanned. This is repeated at, for example, 1° intervals for 180°. The intensity of the transmitted beam for the many points of each scan, and for each angle, are sent to a computer that reconstructs the image of the slice. The image is presented on a computer monitor.

Note that the imaged slice is vertically to the long axis of the body. For this reason, CT is sometimes called computed axial tomography (CAT), although the abbreviation CAT, as in CAT scan, can also be read as computer-assisted tomography. The added imaging dimension allows the system to generate multiple slices in parallel. Photo-detector arrays used in CT imaging have as many as 1000 detectors in the long dimension along the semi-circular arch;