

RADIOLOGIC IMAGES IN DERMATOLOGY

The basic principles of computed tomography and magnetic resonance imaging

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Computed tomography (CT) and magnetic resonance imaging (MRI) are the most widely used cross-sectional imaging methods used in medicine. CT was a revolutionary development of the 1970s. The term *computed tomography* derives from *computed* (with computer), *tom* (to cut), and *graph(y)* (pictures). CT uses ionizing radiation, or x-rays, coupled with an electronic detector array to record a pattern of densities and create an image of a "slice" or "cut" of tissue. The x-ray beam rotates around the object within the scanner such that multiple x-ray projections pass through the object (Fig 1). The internal structure of the object can then be reconstructed from the multiple projections of that object.¹

As x-rays pass through the patient, they are attenuated. The amount of attenuation depends on the type of tissue through which the x-ray beam passes. X-ray imaging contrast is generated as a consequence of differences in attenuation between adjacent tissues. The higher the attenuation of the x-ray beam, the brighter the tissue on CT images, and the lower the attenuation, the darker the tissue on CT images. Therefore bone and calcification that significantly attenuate the x-ray beam are white. Fat, being rich in carbon, is more transparent than water containing oxygen, which attenuates x-rays to a greater degree.¹ Therefore fat is blacker than water on CT. Air causes little attenuation of x-rays and is very black (Figs 2 and 3). Regional or focal deviations from the normal CT appearance will be

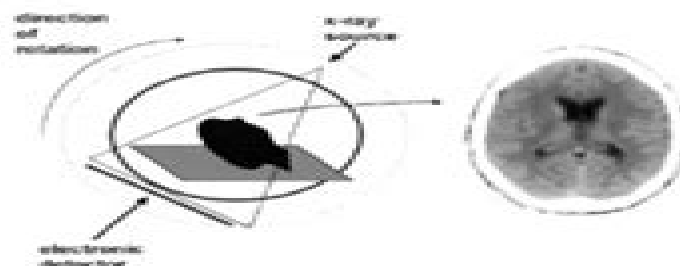


Fig 1. Diagram of CT scanner. X-ray beam rotates around patient lying in the center of the scanner. X-rays pass through the patient from multiple projections and are detected by an electronic detector array that records pattern of densities. Through complex reconstruction methods, an image is generated that records internal structure of object.

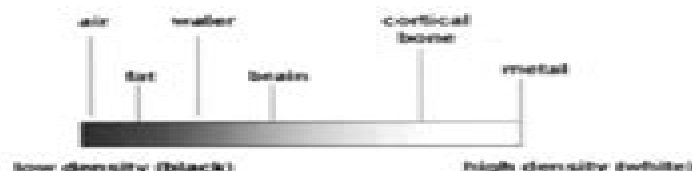


Fig 2. Relative CT density of structures is shown.

described as either increased (whiter) or decreased (black) attenuation or density.

CT is excellent for detection of calcification and evaluation of bone structures. Iodinated contrast media can be used to increase the contrast between normal structures and pathologic tissues and to "opacify" the vascular structures (Fig 4). Iodine caus-

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Magnetic Resonance Imaging Basic Principles

Lingjun Ying

A decorative red circular graphic with a gradient, appearing as a partial circle or a stylized 'C' shape, located to the right of the author's name.

Magnetic Resonance Imaging Basic Principles:

The Enigmatic Realm of **Magnetic Resonance Imaging Basic Principles**: Unleashing the Language is Inner Magic

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