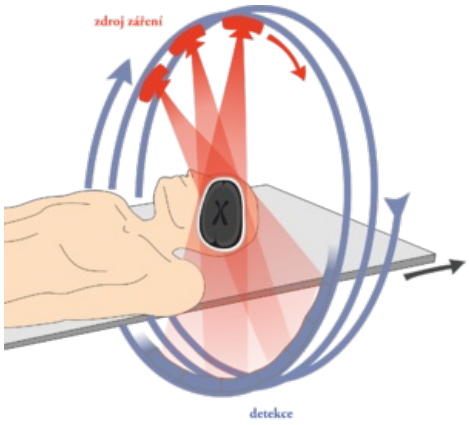
CT

🔎 *For more information see Computed tomography and Hounsfield units.*



Computed Tomography (Template:En, **CT**, sometimes also incorrectly ``computed tomography*) is an imaging method that allows using X-ray radiation view the whole body in a series of slices. The resulting image is created by mathematical reconstruction from a series of X-ray projections obtained successively from different angles. Computed tomography also displays soft tissues, e.g. spleen, pancreas, kidneys, brain, muscles. CT can only diagnose pathological processes that differ in their density from the surroundings during a simple examination or after the administration of a contrast substance.*

Implementation

Transverse sections are taken with the patient lying down using computed tomography. The patient is fixed on a sliding bed, which gradually passes through the scanning (scanning) stand. It has a slit source of X-rays (X-rays) on one side and a set of scintillation detectors on the opposite side. In some tomographs, the detectors are placed against the X-ray tube and move in agreement with it. In the most modern tomographs, the detectors form a complete ring around the patient that does not move.

The patient is gradually enlightened in a certain plane point by point. The X-ray machine works in pulses, the pulse lasts 1−4 msTemplate:Source. X-rays pass through the patient where they are partially absorbed. An exposure is made in the given position of the patient and data on the degree of attenuation of X-ray radiation obtained using scintillation detectors are recorded in the computer memory. Then the X-ray machine-scintillation detector system is rotated by a certain angle and the whole process is repeated. After all patient scan cycles are completed, all data from each scintillation detector is stored in the computer memory. These data are processed in a computer and '*the resulting tomogram is given by the values of the absorption coefficients from the individual tissue locations of the given cut*.

CT works on two construction principles: On a **fan**' or on a **circular** construction. In the fan machine, both the X-ray tube and the detector system rotate, and in the circular tomograph, only the X-ray tube rotates and the detectors are located around the entire circumference of the device.

From the point of view of technical development, 5 generations of CT are usually described:

1. generation: X-ray radiation was collimated into a thin beam and, after passing through the patient, detected by an opposite detector rotating together with the X-ray tube. 2. generation: X-radiation from the X-ray tube is collimated into a fan shape and after passing through the patient is detected by a larger number of detectors located in one row on the circular section opposite the X-ray tube, rotating together with the X-ray tube - this greatly accelerated the examination. 3. generation: X-rays from the X-ray machine are collimated into a wider fan shape similar to the 2nd generation, but the passed radiation is detected by a large number of detectors located on a circular arc in multiple rows, scanning multiple "multi-slice CT" slices simultaneously. It is the most widely used in modern medicine today. 4. generation: the detectors are arranged stationary in a complete circle around the patient, while only the X-ray tube rotates 5. generation: electron beam cardiotomography

History

The basic influence on the invention of CT was Wilhelm Conrad Röntgen, who in 1895 discovered X-rays, with which X-ray images are still taken today. We consider the British Godfrey Newbold Hounsfield to be the discoverer of CT itself. Independently of him, the American Allan McLeod Cormack made the same discovery in 1979 - both won the Nobel Prize. Previously, the examination took 20 minutes, today it takes tens of seconds.

Use of CT in healthcare

There is no contraindication to examination in emergency medicine. CT is widely used in diagnostics and also for therapeutic procedures. It uses X-rays to visualize internal organs and the skeleton.

Benefits of CT

A big advantage of computed tomography is the fact that it allows to visualize and differentiate low-contrast soft tissues. This is mainly due to two reasons. The scintillation detectors that capture the X-rays passing through the patient's body are very sensitive, and the data provided by the scintillation detectors are very quickly processed by the computer and expressed as absorption coefficient values, which increases the accuracy of the examination many times over.

A contrast agent is often given before and during a CT scan to highlight the differences between normal and pathological tissue.

Links

Related Articles

- Computed tomography (password)
- PET/CT

External links

Zdroj

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- SEIDL, Zdeněk. *Radiologie pro studium i praxi*. Praha: Grada, 2012. ISBN 978-80-247-4108-6.