

Types of X-Ray Studies

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Annotation: This paper examines radiography, which uses ionizing radiation to obtain images of the internal structure of various parts of the body. It is shown that modern X-ray machines deliver minimal radiation doses, making the examination relatively safe. This method provides high information yield, allowing the physician to quickly assess the condition of the anatomical area of interest. Images can also be obtained in just a few minutes, allowing for rapid treatment initiation or adjustments to existing treatment plans.

Keywords: radiography, images, anatomical structure, contrast solution, vascular system, organ, apparatus, picture, film, clinical symptoms.

Radiography as a diagnostic method first appeared several years before the end of the 19th century and became a breakthrough in medicine, providing the ability to visualize the body's internal structures without the need for invasive intervention. For a century, X-rays remained a fundamental diagnostic tool, and despite significant advances in computed tomography and magnetic resonance imaging, radiographic examinations are still widely used in clinical practice.

In modern diagnostics, radiography is used much more frequently than CT or MRI, as this method provides fast and inexpensive imaging of anatomical structures. According to statistics, over 125 million radiographic procedures are performed annually in public healthcare institutions, of which every fifth examination is performed on digital devices. This diagnostic method is comparable in frequency of use only to ultrasound.

Radiography is an imaging technique that uses ionizing radiation to produce images of the internal structure of various parts of the body.

The operating principle is based on the ability of X-rays to pass through body tissues of varying density, allowing the image to be captured on film or digital media.

There are several key concepts associated with radiographic examination:

- Fluoroscopy is a method in which a doctor views images in real time on a special screen, capturing changes within the patient's body. This examination takes several minutes, and multiple images may be taken to document specific points.



Fig. 1. X-ray image

- An X-ray, or radiograph, is an image of the area being examined, either captured on film or in digital format. This image clearly shows bones and organs, with dense structures such as bone appearing light and air-filled structures appearing dark.



Fig. 2. X-ray image on film

X-rays can be used to visualize virtually any part of the body. By adjusting the X-ray machine's settings, greater image precision can be achieved, allowing for better visualization of anatomical details.

To obtain a dynamic picture of the processes in the body, several images with changes in the patient's position may be required, and for a more accurate diagnosis, the introduction of contrast solutions into the vascular system or organ cavities.

Modern X-ray machines provide a minimal dose of radiation, making the examination quite safe.

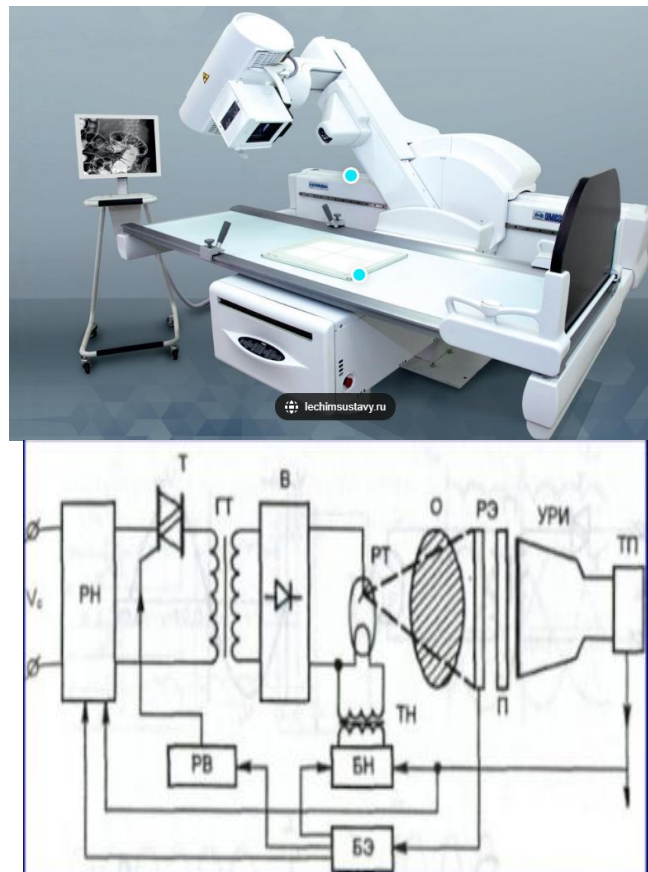


Fig. 3. Modern X-ray machine

At the same time, digital devices allow images to be stored electronically and displayed on a monitor without the need for film development, which significantly speeds up the diagnostic process.

The main indication for conducting X-ray examination in oncology is the need to obtain reliable information about the state of a specific anatomical area in real time.

This is important for diagnosing any abnormalities that cause specific clinical symptoms.

X-rays are performed on all cancer patients already at the initial examination stage.

The following anatomical areas are typically examined:

- Primary malignant neoplasm zone.
- Areas of likely metastasis. For example, a chest X-ray, or "lung X-ray," is often used to detect metastases.
- Areas suggested by the patient's symptoms and clinical signs as possible sites of metastasis.

Radiography is also used in the treatment process:

- To plan the optimal extent of surgical intervention, it is necessary to understand the location and relationship of the tumor with adjacent anatomical structures.
- After surgery with intubation and anesthesia, chest x-rays are regularly performed to monitor the development of possible inflammation.
- After surgery, X-rays are taken to check that the catheters or stents are correctly installed .
- When conducting cyclic chemotherapy, regular radiographic monitoring is required to assess the dynamics of metastases in the lungs and bones.

- Identification of complications of specific treatment or the natural course of the oncological process, for example, in the lungs or gastrointestinal tract.
- For dynamic monitoring after completion of treatment, images are taken of areas at risk of recurrence or metastasis.

Contraindications to X-ray examination in oncology are extremely rare and are relative.

X-rays are usually not performed:

- Pregnant women, as radiation exposure may affect fetal development.
- Patients in critical condition. However, if the acute condition is caused by an underlying disease, X-rays can help in choosing the appropriate treatment strategy, and rapid access to information about the patient's condition often outweighs the risks.

In oncology, the absence of absolute contraindications makes radiography an important and accessible diagnostic method.

Radiography has several advantages that make it indispensable in the diagnostic process, especially in oncology. This method provides high information yield, allowing the physician to quickly assess the condition of the anatomical area of interest.

Images can be obtained in just a few minutes, allowing for rapid initiation of treatment or adjustments to existing strategies.



Fig. 3. X-ray diagnostics

Key advantages of X-ray diagnostics include:

- Accessibility and speed. X-rays can be performed at virtually any medical clinic, and they take minimal time.
- Low cost - compared to CT and MRI, X-ray is a more affordable procedure, making it accessible to most patients.
- Diagnostic accuracy – the method provides a reliable image of bone structures and tissues, which is especially important when assessing metastases and other pathological changes.
- Treatment monitoring - X-rays allow us to monitor the dynamics of the oncological process, assess the condition of the lungs after surgery, and check the installation of medical devices such as stents or catheters.

To improve diagnostic accuracy, it is advisable to take images not only in one (direct) projection, but also in the lateral one, which allows for a more detailed picture of the localization of pathologies within the organ.

However, the method also has certain limitations:

- Lack of information for some organs. Some structures, such as the pancreas, are virtually invisible on X-rays. The same applies to the intestines, which can only be visualized by their contents. Contrast agents can improve the visibility of some hollow organs, but overall, X-rays are not a substitute for CT or MRI when a detailed examination is needed.
- Radiation exposure: each X-ray contributes to the patient's total radiation dose. This is especially important in oncology, where frequent X-ray monitoring is necessary. However, the benefit-to-harm ratio justifies this method in most cases, especially in cancer.
- Less clarity compared to CT and MRI. X-ray images are less detailed than tomographic images. However, speed and accessibility of the examination often take precedence over maximum detail.

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