

DISEASES THAT ARE DIAGNOSED AND TREATED BY X-RAYS AND GAMMA RAYS**Sajad Kareem Khalaf Hassan**

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Received: May 22, 2024; Accepted: Jun 10, 2024; Published: Jul 06, 2024;

Abstract: -rays have long been one of the most effective tools in detecting and diagnosing diseases because of their effective and practical properties in diagnosing the various diseases that appear in the x-ray image. Diagnostic x- rays are considered an examination carried out using To see the internal anatomy of the body Accurately and pinpoint the tiny spots. The x-ray beam passes through the body, and is absorbed in different quantities, depending on the absorption capacity of the material. Dense materials such as bones and metal appear in white in the x-ray image, while air in the lungs appears in black, and muscles and fat appear in shades of grey. In some tests, we resort to introducing contrast dyes such as iodine or barium into the body to provide more details of the part to be imaged, such as imaging the bile ducts, spinal cord (myelography), urinary tract, and other parts that need the use of contrast dyes. in These methods enabled us to diagnose various diseases such as chest diseases and various cancers If a foreign body is detected or calcium calcifications are seen.

Keywords:This is an open-access article under the [CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/) license**Introduction**

Solar spectrum: The spectrum is defined as the characteristic wavelengths of electromagnetic radiation (or part thereof) that is emitted or absorbed by a particle, substance, or molecule. The red light (IR) until it rises to the ultraviolet (UV) rays, and it certainly contains the visible light that can be seen and observed with the naked eye and which falls between the infrared and ultraviolet rays. Violet is in the colors of the solar electromagnetic spectrum, and the sun does not produce infrared rays Visible light and ultraviolet rays are colors of the solar spectrum. Indeed, the fusion processes that occur in the center of the sun's disk also produce large-energy gamma rays. This article will talk about Colors of the solar spectrum and its benefits in the field of astronomy.

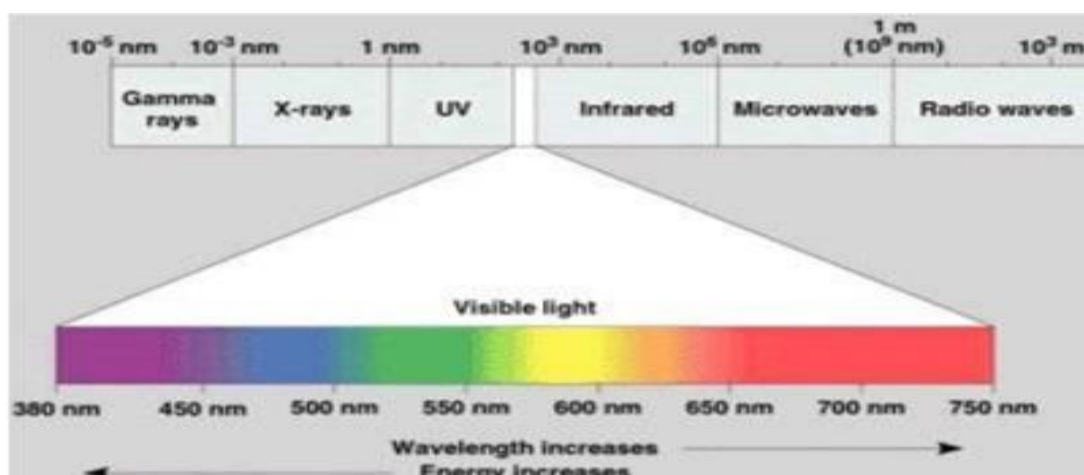


Figure (1.1) Colors of the solar spectrum

X-rays or X-rays (X-rays) They are electromagnetic rays with a wavelength ranging from 10 picometers to 10 nanometers, which is equivalent to 10×10^{-10} m. The energy is electron 18 10×10^{-18} J up to 1.5×10^{-15} J. Frequencies range from 30 petahertz to 30 exahertz (Hz). volts. X-rays are widely used. It ranges from 124 MeV to 124 KV In radiography and in many technical and scientific fields. It was discovered by the German scientist William Roentgen in 1895 at the University of Würzburg, and he won the Nobel Prize in Physics in 1901. Generation of X-rays (production of X-rays) The idea of relying on x-rays depends on the reverse photoelectric phenomenon (i.e. the incident of an electron ray on a metal surface and the emission of electromagnetic waves represented by Generation of X-rays in the laboratory occurs using an X-ray tube, which is made up To prevent oxidation of the cathode. 1. A glass tube containing a bulge in the center, emptied of air and So that air molecules do not impede the movement of electrons emitted from the cathode towards the anode. 2. The tube contains a cathode (Mhbo) and is connected to the filament. When the filament heats up, the cathode heats up and emits Electrons, so the function of the cathode is to emit electrons. 3. The anode (anode) is made of a heavy metal with high hardness, because the density of the hard materials is high. It is heavy and can withstand high temperatures and is not easily damaged. 10 - 10 (volts). 6 3 4. A very high continuous voltage source ranging from 5. The ray tube is surrounded by sparking pearls to protect researchers and workers from the danger of rays The sapphire rays have a high density and when the density is high, they absorb the sapphire rays You can escape bullets only through a small opening in the bullet barrier.

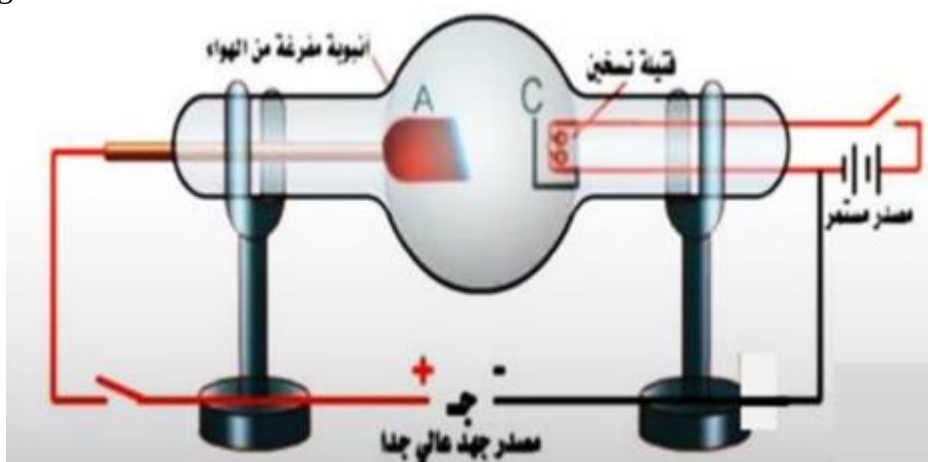


Figure (2-1) Laboratory X-ray tube

Gamma rays Gamma rays are a beam of electromagnetic energy (photons) emitted from the nucleus of some radionuclides after radioactive decay. Gamma In the electromagnetic spectrum, it is expressed as: photons are the most energetic photons. Greater than 100 keV, with frequencies denoted by the symbol γ cy“Gclaems mpear-

Gamma rays are produced through fission in nuclear reactors and energy physics experiments. High temperatures, explosions and nuclear accidents. Sources of gamma rays: There are multiple sources for producing gamma rays, and among those sources are the following: 1. Nuclear fusion: Fusion occurs at very high temperature and pressure. These two factors force Hydrogen nuclei need to fuse into a helium nucleus, so that the mass of the resulting helium nucleus is less than approximately 0.7% of the mass of the nuclei involved in the reaction, where the aforementioned mass difference leads to the production of energy Gamma ray body. 2. Nuclear fission: It is a reaction during which a heavy nucleus splits into two light nuclei of equal mass. Roughly, this process results in the resulting light nuclei colliding with other particles, which causes A chain of nuclear reactions occurs that produces energy in the form of gamma rays 3. Alpha decay: Alpha decay occurs when a heavy nucleus emits a helium - 4 nucleus. Due to this process, the nucleus can carry excess energy, which it emits in the form of gamma rays. X-rays when they enter the human body 1. Some of the x-rays penetrate the patient towards the x-ray receiver (Penetration). 2. Some of the X-rays are absorbed into the patient's body 3. Some of the X-rays are scattered X-ray energy - thickness - The interaction of X-rays with the human body depends on several factors, including: atomic number - mass. The more energy X-rays have, the greater their ability to penetrate, and vice versa. D - The atomic number of the element decreases the ability of X-rays to penetrate, so absorption increases as it increases. Also Density and thickness determine the ability of the rays to penetrate. The greater they are, the

Bloc And scattering. Also less penetrating X-rays. This is why lead is used as a shield against X-rays because it has a large number.

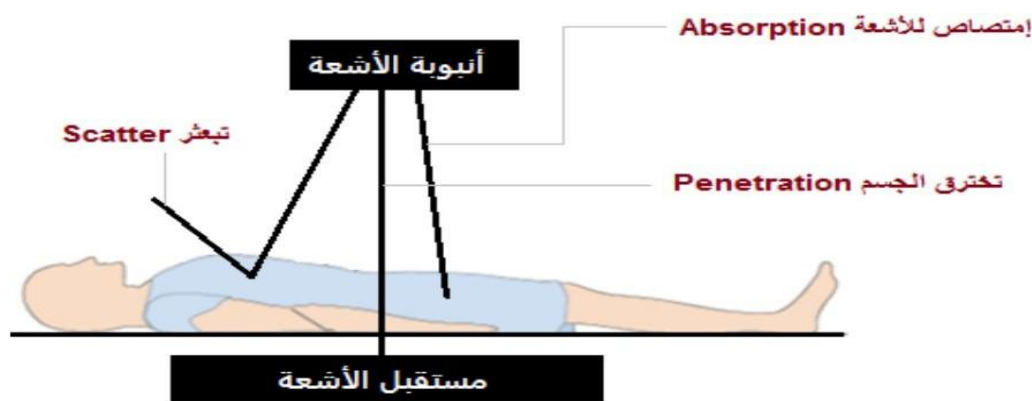


Figure (3-1) The interaction of X-rays when they enter the body

How x-rays work X-ray beams pass from their source through the body. They are absorbed by the various tissues in the body, and some of them pass to the other side, where they are received. For example, ordinary x-rays are recorded on a sensitive plate and display different colors (white, grey, bright), and the sensitivity of the tissues through which they pass varies so that they are presented to the specialist doctor at a later time. Endoscopic fluorescence scans are displayed at the same time on the computer, and are used during the examination. Fluoroscopic scans and contrast materials, such as barium scans, are used in examining the digestive system (esophagus - stomach - duodenum - intestines) or installing medical catheters. Forming the image through X-rays X-rays use x-rays to see parts that are not visible or difficult to image. It is an examination during which electromagnetic rays issued by a special radiation device penetrate the body's tissues and strike a plate that is usually placed behind the body. On this plate or through the computer in cases of CT imaging, the images are formed. X-rays are used to draw a picture in which the internal organs of the body that have been penetrated by the rays of different organs appear in white and bright colors, and

in various shades of grey. The presence of differences between colors symbolizes the density of organ



tissue in the body. For example, the high-density organs of our body (bone, for example) absorb the majority of the radiation that hits them. Using a panel illuminated by certain metal lights and placed behind the body, it can create a white “shadow” in the shape of the bone that was photographed. This is what It will happen if the rays collide with any light from metal or various materials, which are materials In particular, it is used to clarify the vision of certain organs in the body. Since the rays do not pass through these organs, a bright white shadow appears on the scattering plate. As for the other parts of the Ja`~~~~, which are: If the tissues contain air (such as the lungs, for example), they will appear as a black “shadow,” while the tissues that contain fat, organs, or tissues of different families will appear gray in varying shades. Using x-rays to examine parts of the body does not result in any pain, and these rays Pictures of the components inside the Bones, which are used in diagnosing the sick person's condition, are extracted body are produced, especially This procedure is suitable for children and adults. The primary goal of Before x- rays.

Figure (4-1) X-ray of the right knee

Uses of radiation in medicine

Uses of X-rays

Examination of teeth and bones. The most important cases include fractures and infections that appear clearly on x- rays, arthritis in which the doctor can monitor the progress of the disease by using radiation at separate intervals, dental caries, osteoporosis that can be diagnosed with a specific x-ray light, and benign and malignant bone tumors. It is also considered a stone of relief in the treatment of infectious diseases and infections such as pneumonia. The irradiation of the gastrointestinal tract can be done using a bar-based contrast material that the patient can irradiate, or given through a transverse injection to show the affected areas along the gastrointestinal canal, or the penetration of foreign bodies in children’s cases. X-rays are used to determine the light and location of the body before medical intervention Uses of gamma rays Gamma rays can be applied in many fields, including medicine. Doctors use gamma rays to diagnose and treat various diseases, including diseases such as cancer and heart disease. Medical tests help Nuclear radiation, which relies on radioactive materials to determine cell activity with great accuracy, thus making it possible to detect The disease is in the early stages, and it is also possible to know whether a person is responding to treatment. Gamma rays are used in the field of cardiology, including detecting the extent of coronary artery narrowing and diagnosing damage to the heart after a heart attack. It can also be used in bone diseases such as diagnosing bone fractures, infections, And arthritis.

Devices that work using X-rays Regular X-ray machine , The parts of the X-ray machine work together in an integrated manner to produce It helps the electronic logo reach the vacuum glass tube, as it is a tube Vacuum glass containing a negative end and a positive end, and a fuse made of a material is placed in it High-melting tungsten material; As the melting point of tungsten reaches 2000 degrees Celsius, the tube gives energy to the electrons in the outer shell of the atom, and thus these electrons are released towards the anode, and then an electromagnetic signal containing X-rays is released.

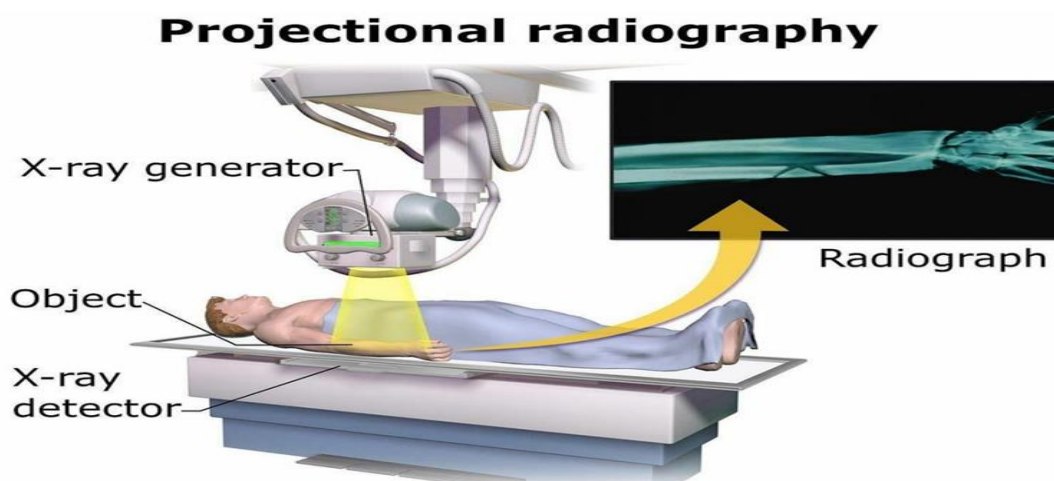


Figure (1-2) A regular X-ray examination room and how to perform imaging

can Tomography Computed device The first CT scan device was invented by the British scientist Hounsfield Godfrey at the central research laboratories of Thorne EM Company, where he began developing his idea in 1967 and succeeded in 1972. He produced the first CT imaging device and won the Nobel Prize in 1979 with his partner Allan. Cormack, with whom he later worked. The original C-frame, which was designed in 1971, was designed to be able to take 160 sections of the human body, and each section takes 180 images around the body axis. The human imaging Conventional X-ray that victorious device uses X-rays instead of CT to obtain a three-dimensional image of an object It provides simple information about the human skeleton and some organic organs. CT scanning devices are considered a development for imaging and diagnosis using Thin slices to determine the disease and its location accurately and at high speed. The main components of the CT scan device can be distinguished, including: Gantry X-ray Tube , High pressure transformer Generator ,Detector / Data Acquisition System (DAS) ,Table ,Operator unit or device control unit



Figure (2-2) CT scan device

The mechanism of image formation in the tomography device While the person to be imaged by the CT scanner lies on a special bed, the bed moves slowly to become. In the middle of the gantry scanning device, the gantry contains an The rotation of the After completing a full cycle, the device may scan and photograph another section of the body. Using X-rays, he photographed the entire area to be photographed in the form of sections. In this way, the device moves and rotates the The computer controls the intensity of the X-rays according to the area of the human body to be imaged. After completing scanning the entire human body , The computer collects all the information it obtained from the reagents to form a three-dimensional image of the body. It is worth noting that the entire human body is not scanned. Usually, the doctor specifies the required part to the specialized technician. Tinge Since the body is imaged through a section and from various angles, the images that we obtain using the CT Compared to traditional imaging using X-rays and V-rays scan device are

more detailed and clearer. In conclusion, the CT scan has become one of the basic diagnostic devices that doctors rely on for treatment.

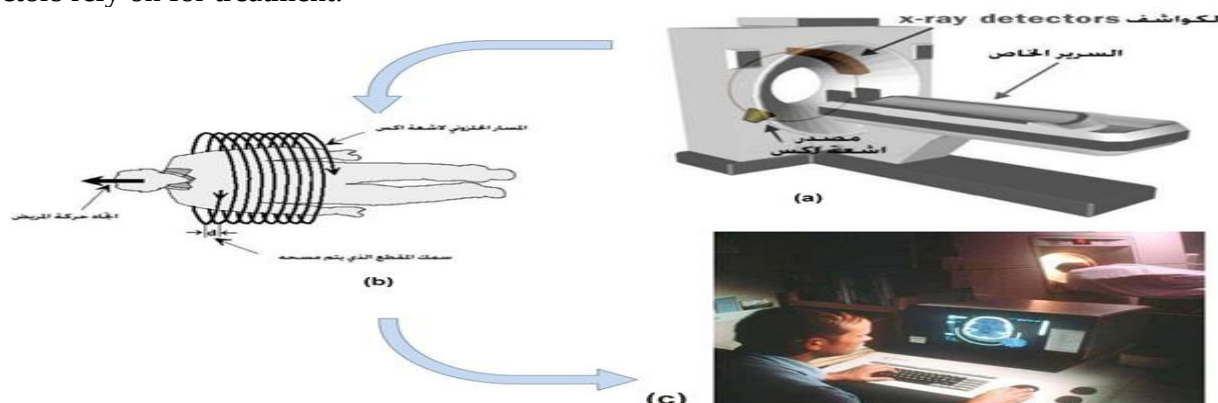


Figure (3-2) shows (a) the shape of the scan-CT device and an image, (b) a clip showing the movement of the X-ray in relation to the patient (c) the computer room and control of the CT device

Pros and cons of CT scan: ÿ Benefits of CT scan Because it provides

1. The CT scan is the secrets and most accurate tool for examining the chest, abdomen, and pelvic imaging, as well as detailed images and cross-sections of all tissues.

2. CT scans are used to examine patients who suffer from injuries or wounds upon exposure For accidents, such as vehicle accidents.

3. CT scans are performed for patients who suffer from severe chest or abdominal pain or difficulty breathing

Breathe to determine the cause of the pain.

4. CT scans are used to detect the presence of cancer in the chest, abdomen, and pelvis area, for example

Lymphoma, lung cancer, liver cancer, kidney cancer, ovarian cancer, and pancreatic cancer.

It allows the doctor to confirm the presence of the tumor, measure its size, determine its precise location, and

determine the extent of its spread in other nearby tissues.

5. CT scans help detect, diagnose and treat vascular diseases that can lead to stroke, kidney failure, or even death.

6. Conducting a pulmonary angiogram helps evaluate pulmonary embolism (blood clots in the lung vessels) as well as examine aneurysms in the aorta Harmful effects of CT scans and their side effects . Although the x-rays

1. The harms and risks associated with a CT scan are very few CT exposes the patient to more notice than regular X-rays, but the risk of infection is very high if the patient Ray has only one scan. Cancer caused by X-ray radiation. An individual's risk of developing cancer may increase over time if he has several sessions

For a CT scan. 2. Some people can be allergic to contrast materials, which cause a mild reaction in most, This happens very rarely, as it can lead to itching or a rash. However, in this case, it may result Contrast dye to cause a life-threatening allergic reaction to the individual. For this reason, the patient must be monitored for a short period after the CT scan. 3. The individual must inform the doctor about any allergies he has to medicines, seafood, or iodine (as most contrast materials contain iodine). In this case, the doctor may give the patient an allergy medication or steroids to counter any possible side effects of the contrast material. In rare cases, contrasting substances can cause kidney problems. Mammography device It is a special device used to detect and diagnose breast tumors and early detection of breast tumors. Samples of these tumors can be taken when needed with the help of these devices. There is a trend in many developed detection of cancer. Breast countries to routinely use this X-ray light for middle-aged women to help in early Mammography is an enhanced

radiological examination to detect breast cancer. Technological advances over the past several decades have greatly improved the diagnostic sensitivity of mammography. Early X-ray mammography was performed using direct exposure film, required high notification doses, produced low contrast images, and had poor diagnostic quality. Mammography using the x-ray process was very popular in the early 1970s, but the poor sensitivity and high radiation dose compared to mammography in the 1980s and with digital mammography led to its demise in the late



Figure (4-2) Breast imaging device

Components of the breast imaging device x-ray tube digital detector with Gantry pressure Station Control unit, High pressure transformer cabinet Generator Advantage Review Work station Advanced display unit, The basic idea of making a breast imaging device X-rays pass through most objects, including your body. Once carefully targeted at the part of the body being examined, the X-ray machine produces a small burst of radiation that passes through the body, recording an image on photographic film or a special detector. Different parts of the body absorb X-rays to varying degrees. Dense bones absorb more radiation while soft tissues, such as muscle, fat and organs, allow more X-rays to pass through them. As a result, bones appear white on X-rays, soft tissues appear in shades of gray and the air appears black. Most photos are digital files that are stored electronically. These stored images are easily accessible for diagnosis and disease management. Two main types of mammograms the first type Mammogram examination of the breast to detect signs of breast cancer in women who do not suffer from any Before feeling it, this is how breast cancer is detected symptoms or problems in the breast, and often, the condition is easier to treat, as it detects the disease before it progresses and spreads. It can also detect minute calcium calcifications in the breast. The second type Breast examination with a diagnostic mammogram, to diagnose breast cancer after the appearance of a lump in the breast or the appearance of some accompanying symptoms, such as breast pain, or the appearance of discharge from the nipple, but these was symptoms may often be indicative of benign disorders, so it is recommended to perform a mammogram to ensure the reason. This method is used to examine women who have completed treatment for breast cancer. It is also used in the event that abnormal results appear in a routine examination to detect breast cancer. Benefits and harms of the breast imaging device (mammogram) the Mammography is used to detect breast changes that may indicate the presence of cancer in women who do not have signs or symptoms. Its goal is to detect cancer cells They are small, so the disease is less invasive and treatment is easier. Mammography exposes the breast to small amounts of hair, but the harms and benefits must be compared according to the patient's condition, but in general the benefits of mammography outweigh any potential harm from exposure to hair. Devices that operate using gamma rays, Kama Knife gamma It is an advanced therapeutic technique that uses gamma rays to treat children and adults. This technique is used to treat many diseases and disorders, such as: small and medium brain tumors, arteriovenous malformation, and ducts. Despite the name of the technique, which indicates the use of a knife, in

reality the knife is not used during the treatment session, and no wound is opened. Rather, gamma rays are delivered at a high dose and focused with high precision on the area to be treated without harming the surrounding tissue. This treatment is usually performed under the supervision of an oncologist and a surgeon ,After conducting medical examinations. Neurologist and medical physicist together.



Figure (5-2) Kama Knife X-ray device

How Kama Knife works First, an IV is inserted into the patient, usually used to facilitate the delivery of materials that aid imaging , MRI or CT scan to the brain, such as dyes, or giving a sedative to the patient to help calm his nerves. Sometimes the patient is given complete anesthesia, as if the patient were a child. The operation is then carried out by the surgeon placing a hole on the patient's head, to ensure that the head is fixed to ensure the accuracy of the operation. Then the patient is given four local anesthesia needles in the head, two in the front of the head on each side, and two in the back to ensure that the head does not move. Then the back. These sites use the insertion of needles to fix the socket in the head, and the radiation therapist takes head measurements to determine the treatment plan that should be followed. The patient's head is scanned with magnetic resonance imaging and computed tomography to determine the area to be treated. This process may take about 30 minutes. Then the supervising physician and the assisting staff determine the treatment plan for the patient by specifying the area to be treated, the dose of gamma rays, and how to reach the affected area, the computer, and his family or friends in his room. Then as accurately as possible. During this time, the patient can spend time with the treatment part, where the helmet is installed in the Gamma Knife device to hold the patient's head in a way that ensures the accuracy of the X-ray imaging, and the medical team monitors and supervises the operation from another room that contains the computer programmed to perform the operation. The bed connected to the Gamma Knife device quickly moves into the device and the process begins, Gamma rays are applied to the affected area, and the patient does not feel pain or hear anything during treatment. The session may take about 30 minutes - 4 hours depending on the size and location of the injury, and the number of doses the patient receives. Finally, the bed moves out of the device and the joint is removed by the medical team.

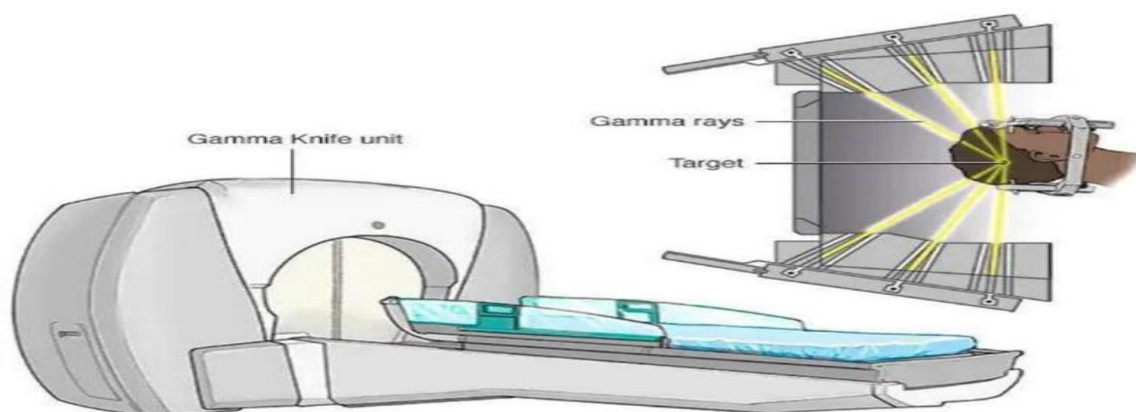


Figure (6-2) A picture showing the working principle of the Kama knife

Cases treated using Kama Knife technology Gamma Knife technology is used to treat the following conditions:

1. Acoustic neuroma: It is a benign tumor that usually grows close to the nerves responsible for balance and sense

Hearing. 2. Brain tumors (benign and malignant): These include pituitary gland tumors, pineal gland tumors, craniopharyngeal tumors, meningiomas, chordomas, chondrosarcomas, the spread of other cancerous tumors in the body to the brain, and glial cell tumors. Benefits and harms of the Kama Knife technique
 Benefits of Kama Knife technology Preserving the tissues surrounding the area to be treated, The treatment process does not include opening a wound. You do not need complete anesthesia, The patient can leave the hospital immediately after the operation without having to stay there. The operation can be skipped and performed in one day. Complications resulting from the surgical procedure, such as bleeding and infection, can be avoided when using the camera Nayef. The patient can resume his daily activities normally after two or three days.
 Damage of the Kama Knife to traditional surgery, "Kama Knife" compared Despite the low rate of side effects that may be associated with it, it may involve some complications and side effects that the patient must be aware of, including: hydrocephalus, headache, nausea, numbness or weakness in the facial area, and problems with balance and vision. Vomiting, dizziness, swelling, bouts of temporary hair loss near the treated area, and hives the brain. Camera Gamma camera It is an electronic device used in medical diagnosis to image the distribution of radioactive compounds in tissues after injection to the patient. It is an imaging device used in the field of medicine, often in nuclear medicine, to photograph gamma rays emanating from radioactive compounds in the body. It is a device consisting of one or more detectors installed between the place where the patient is placed and connected to a control system to operate the device and store the images. A gamma camera, called a gamma camera. Also a scintillation camera. It is used to photograph and analyze the distribution of radionuclides that emit gamma rays that are medically introduced into humans. A gamma camera consists of a collimator level, a crystal level, and a group of photomultiplier tubes connected to a collimated computer system, usually a single plate of lead or tungsten Having many holes through it, this allows photons to travel parallel to the holes Collimation reaches the crystal located behind the coulometer level as soon as the photons reach the crystal.

It is absorbed into the crystal and this absorbed energy is emitted in the form of flashes of light, proportional to the lines of energy absorbed by the crystal. The flashes of light are converted into an electronic signal that is processed into the light and eventually produces light.



Figure (2-7) The camera device

The parts that make up a camera ,collimator, Detector Scintillation, A machine that detects and magnifies electrons, Tubes Photomultiplier , Circuitry Position , Data Analysis Computer Data Analyst

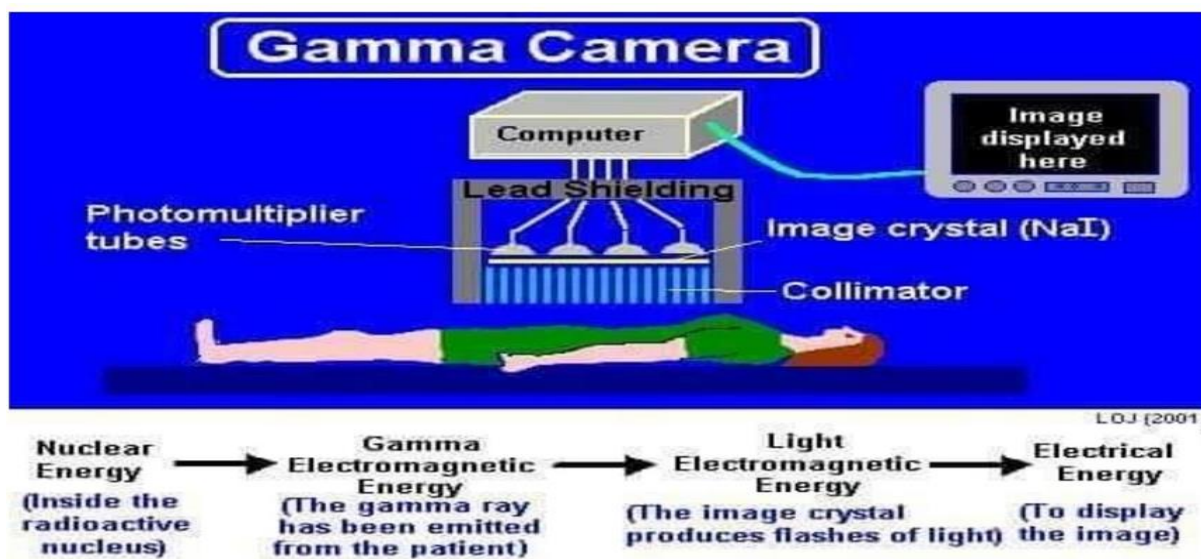


Figure (2-8) shows the main components of the camera device

Benefits and harms of gamma rays , The camera device is characterized by intelligent magnification, which enables it to accurately detect many diseases. It also helps doctors in making the appropriate treatment decision for many diseases, such as atomic scanning of the bones, kidneys, heart, lungs, and all areas of the body. As for the harmful effects of camera radiation, it is high cost, long exposure, and the spatial resolution of the image cannot be stopped. The sources need to be replaced, and the radiation is of poor quality and few, and the use of radioactive isotopes requires handling them carefully and disposing of them to prevent exposure to the radiation. X ray imaging is

one of the main methods in diagnosing various cancerous tumors, as the regular x-ray device is used in imaging and diagnosing one of the most important signs of cancer, which is lung cancer. Breast cancer can also be irradiated using an x-ray device for mammography. Scan-CT makes it possible to radiate the light of many cancerous tumors, such as bladder cancer, liver cancer, lung cancer, and colon cancer. In this section, we will discuss some insights into cancerous tumors and diseases that we can irradiate and sometimes their device. Keasm. a Treated with X-rays and Cancerous tumors, The most important types of these tumors are: lung cancer, breast cancer, and brain cancer Lung cancer is one of the causes of cancers that begin in the lung, which is the main cause of cancer deaths around the world. People who smoke are more likely to develop lung cancer than others, despite the radiation. With lung cancer, in this case it may not be People who have not smoked are more susceptible to lung cancer. There is a risk of lung cancer, and the risk of lung cancer increases with the increase in the period of smoking and the number of cigarettes. .Chimney, Chest as Lung cancer can be diagnosed by a low-dose CT scan, but there are great risks to this light of examination, as it may affect the tumor and lead to death. However, studies have shown that a low-dose CT scan may benefit patients, but there is great uncertainty about the possible effects of the examination and the possibility of generalizing the results. .

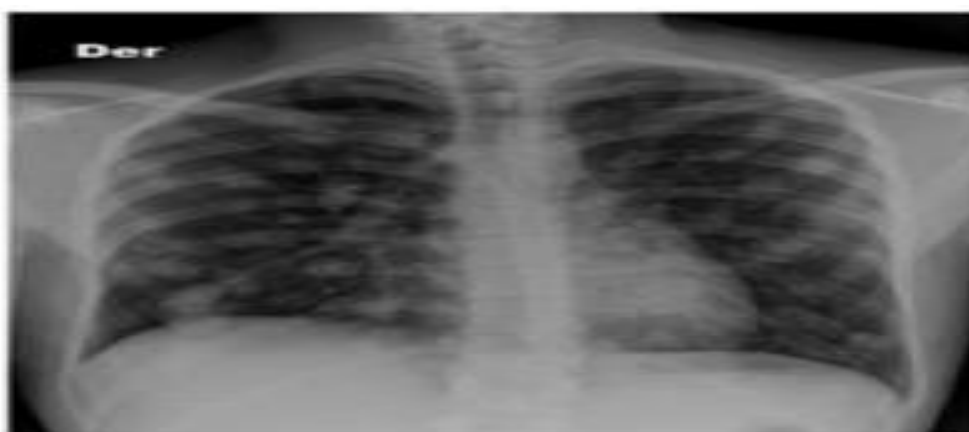


Figure (1-3) Lung cancer in a regular x-ray machine

Breast cancer, Breast cancer is the second leading cause of cancer deaths among women. The development of breast cancer is a multi-step process that affects multiple types of cells, and its prevention remains a challenge in the world. Prepare Early diagnosis of breast cancer is one of the best ways to prevent this disease. In some developed countries, the 5-year survival rate for breast cancer patients is more than 80% due to early prevention. In the last decade, great progress has been made in understanding breast cancer as well as in developing preventive methods. Mammography is considered the most effective way to detect breast cancer and has the ability to detect breast cancer and treat the breast early. There is a trend in many countries to conduct periodic examination of women to detect breast cancer.

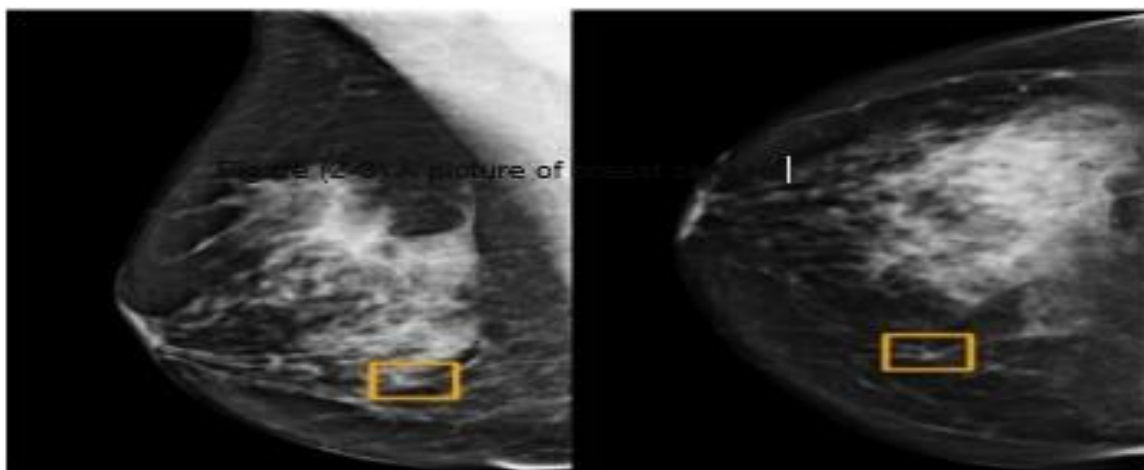


Figure (2-3) A picture of breast cancer

Brain cancer ; A brain tumor is a mass or growth of radioactive cells in the brain. There are different types of brain tumors. Some are noncancerous (benign), and some are cancerous (malignant). A brain tumor may begin in an area of the brain (primary brain tumor), or the cancer may begin elsewhere in the body and spread to the brain as secondary (metastatic) brain tumors. The speed of brain tumor growth varies. The rate at which a tumor grows and its location determines how much it affects the function of your organ Neurological. Treatment options for brain tumors depend on the light, size, and location of the tumor. A brain tumor is diagnosed by computed tomography (SCAN CT). In most cases, a CT scan of the brain is performed. This examination is irradiated by X-ray scanning (X-ray). ray), but it provides very detailed information using 3D imaging.

In most cases, a contrast material is injected into the bloodstream, which is a procedure that does not involve any risk of injury. Highlight abnormal areas during the scan.



Figure (3-3) Image of brain cancer using computed tomography

Infections and chest diseases X-rays represent the main means of diagnosing chest diseases and infections, as well as deformities. Congenital in the chest, lung, or even the heart. By imaging the chest in several positions in a regular x-ray machine, we have the possibility of diagnosing many chest and lung diseases and infections, such as: We will discuss some of these in our research

Pleural effusion It is an abnormal accumulation of stingrays in the pleural space (the area that

lies between two layers of thin tissue in which For a large number of Arabs, including stingrays can accumulate in the pleural space as a result of folding of the lungs.yg Infections, tumors, complications, and injuries to the heart, lung, or liver, and blood clots in the blood vessels. Symptoms may include difficulty breathing and chest pain, especially . (and medicines RPulmonary emboli When breathing and coughing. Diagnosis is made by performing chest x-rays and laboratory tests of the fluid, often An ultrasound scan of the vessels is performed, and their entire area is also irradiated using ultrasound waves. Acoustic.

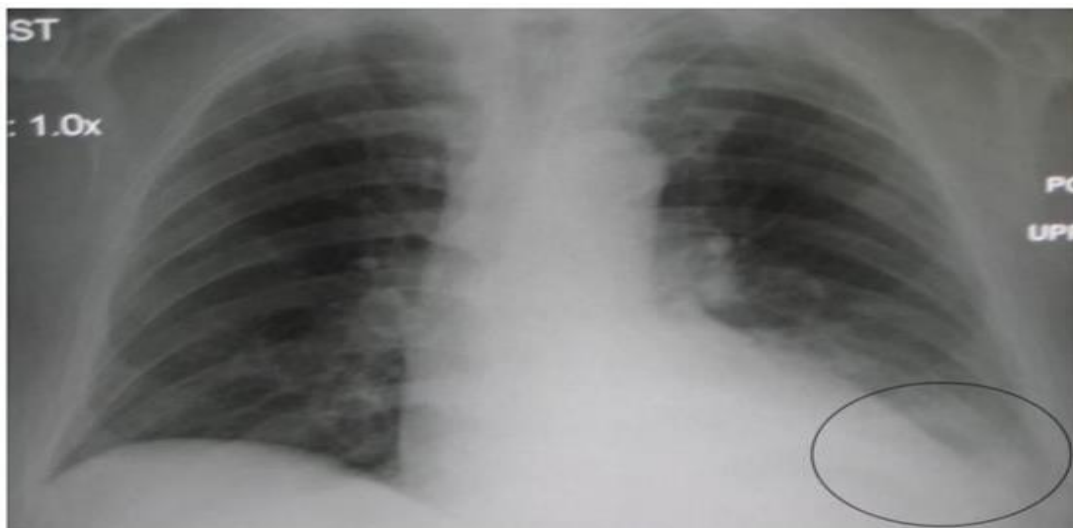


Figure (4-3) Pleural effusion

Pneumothorax It is a collapse of the lung, and a state of pneumonia appears when air expands into the space between the lung and the wall of the thymus, and this air collapses on the outer side of the lung, which exposes it to constriction and collapse. Pneumonia pneumonia may result from the lung or a double collapse of a lower part of the lung. Of mwahyicbhe. a complete collapse, and A severe or penetrating chest injury, some medical procedure, or damage resulting from an underlying lung disease, or it may happen to you for no apparent reason. A in breathing, and it may be atelectasis in some people Symptoms usually include sudden pain in the thoracic area and weakness A life-threatening condition. Usually, treatment for ataxia of the thymus involves inserting a needle or thymus tube between the In cases where it is necessary to remove excess air. However, pneumothorax may resolve spontaneously. Pneumothorax is generally diagnosed using a chest



Figure (5-3) Pneumothorax

Emphysema It is a disease that affects the lungs and leads to shortness of breath and difficulty

in performing activities. It greatly results in the destruction of the air sinuses and small passages of the lung, making it extremely difficult to exhale. This is amazing An injury that occurs over a long-term period, and gradually within the lung, and its symptoms appear after a while on the respiratory tract, where the lung valves necessary to support the flexible and functional rays of the lungs have been subjected to significant damage in those affected. It is classified within a group of infections called chronic obstructive pulmonary disease (COPD). Emphysema causes severe pulmonary edema by destroying the lung sacs and the smaller airways around them, the bronchial tubes, making these bronchial tubes unable to maintain their volume at a correct rate when exhaling. Diagnosis is made by chest X-ray or computed tomography.



Figure (6-3) Emphysema

Stenosis Spinal Spinal stenosis occurs when the spine inside the spine is too small. It can help you Pressure on the spinal cord and the nerves that pass through the spine. Spinal stenosis occurs most often In the lower back and neck. Some people with spinal stenosis do not show any symptoms. While it may be difficult over time Pain, tingling, numbness, and weakness in the buttocks. Symptoms may gradually increase Time. The most common cause of spinal stenosis is wear and tear changes in the spine. And associated with arthritis. People with severe cases of spinal stenosis may need Surgical intervention. Through surgical intervention, the stinger can be expanded inside the spine. It can relieve you of symptoms resulting from a squeeze on the spinal cord or nerves. But surgery cannot cure arthritis, so arthritis pain in the spine may persist. Spinal stenosis is diagnosed through radiographic examinations These tests include: X-rays: X-rays of the back may reveal changes in the bones that narrow the mediastinum inside the spinal canal. Each x-ray examination may require exposure to a small amount of radiation. Computed tomography: If you cannot perform an MRI, you may need to have an X-ray taken from several different angles. In Computerized tomography. This test collects CT images of the nerve, and a contrast dye is injected to determine the positions of the spinal cord and nerves. This examination can detect herniated discs, bone spurs, and tumors.

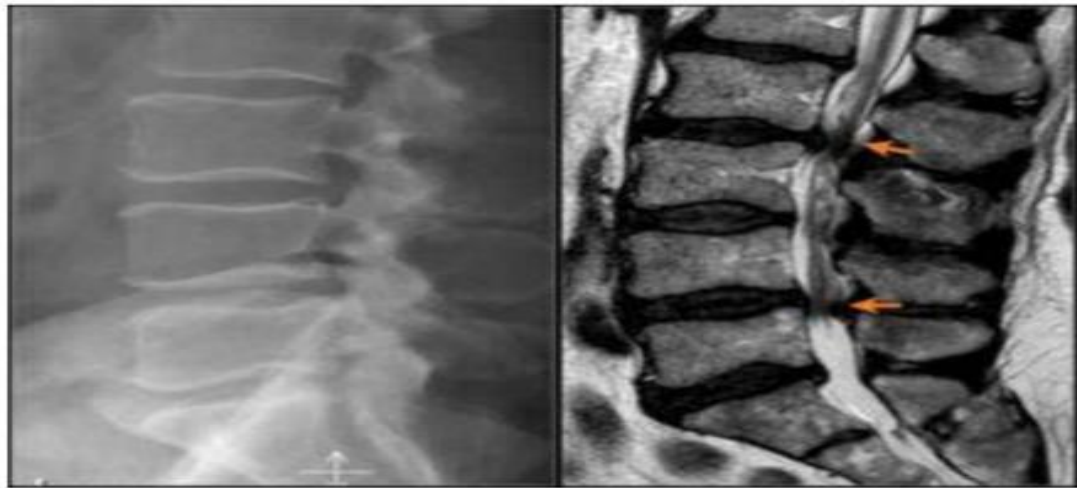


Figure (7-3) An image showing stenosis

Osteoarthritis Degenerative osteoarthritis, osteoarthritis, or osteoarthritis is considered one of the most common Bone disease is a widespread disease, which is a non-regenerative damage to the articular cartilage tissue It reduces the friction resulting from constant movement of the joints, and acts as a cushion to protect the bones. The erosion of this protective layer due to disease leads to friction between the bone joints, and the friction makes it difficult for inflammation of the joint cavity and causes pain. In general, all joints in the body are subject to changes and damage This disease makes it difficult for the knee and hip joints to suffer from osteoarthritis in the cartilaginous tissue, but the most common joints are ,The joints are resistant to the weight of a person. It is diagnosed by X-rifays, as the cartilage does not appear on the most.



Figure (3-8) pictures X-rays showing osteoarthritis

Diseases diagnosed by gamma rays

Hyperthyroidism is an overactivity of the thyroid tissue, which causes excessive production of thyroid hormones and thus an overactivity of the thyroid gland and causes thyrotoxicosis, which is a medical condition caused by an increase in thyroid hormones in the blood. It is important to note that hyperthyroidism and thyrotoxicosis are not synonymous. For example, thyrotoxicosis can occur due to the ingestion of thyroid hormone from outside the body or due to inflammation of the thyroid gland, which leads to the secretion of its stores of thyroid hormones. Thyroid hormone is important at the cellular level, affecting almost all tissue lights in the body. the body . Hyperthyroidism usually begins with an epidemic. At first, doctors may misidentify the symptoms as simple nervousness due

to stress. Thyroid scintigraphy is used to diagnose hyperthyroidism, and this examination involves two types of related tests: iodine uptake test and cam scan. The iodine absorption test is done by administering a dose of radioactive iodine, and iodine is usually used Suitable for diagnostic study of the thyroid gland. TA -123I or 123I, which is one of the most starchy isotopes of iodine

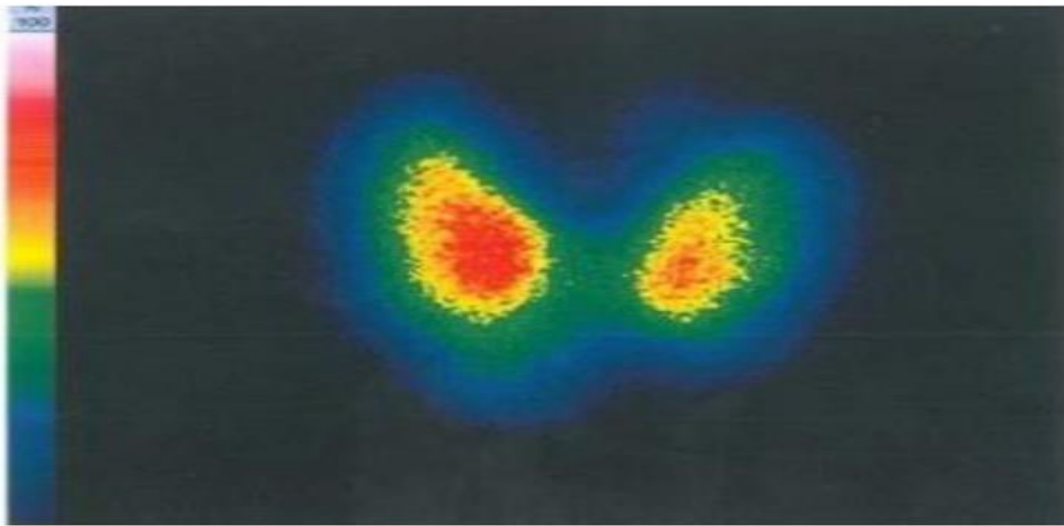


Figure (9-3) Image showing hyperthyroidism, camera gamma by hyperthyroidism

Therapeutic uses of X-rays Treatment of mammary gland cells with high doses of mammary radiation. High doses of mammary radiation kill mammary cells or slow their growth by damaging their DNA. After the DNA of cancer cells is damaged, they stop dividing or die and are then divided or eliminated by the body.

In this way, many of the symptoms of the sycamore are treated, such as the head, neck, breast, cervix, prostate, and eye. Therapeutic uses of gamma rays Gamma rays are used in medicine to kill cancerous cells and prevent them from growing. Gamma rays penetrate the skin and ionize the cells, which Gamma rays have therapeutic uses in surgery causes the killing of those cells. Also comfort GG tumors, as it is beneficial for Radiation using Gamma Knife is the most common method for treating several conditions, including brain Radiation in the management of small non-cancerous (benign) and cancerous (malignant) brain tumors, .Radiation destroys genetic material (DNA) in cancer cells. The cells lose their ability to Sherardizes, and The embay diethyl has Catching Cobalt therapy is the medical use of gamma rays from the radioactive isotope cobalt-60 to treat conditions such as cancer. Cobalt-60 was widely used in the early 1950s in external radiation therapy machines (remote therapy), which produced a beam of gamma rays that was directed at the body. patient to kill tumor tissue. Because these “cobalt machines” were expensive and required support Specialized, they are often housed in cobalt units. Cobalt therapy was a revolutionary advance in treatment Radiation in the period after World War II. The role of the cobalt unit has been partially replaced by the linear calorimeter, which can generate high-energy radiation, which, With irradiated all get rid of irradiated her lover. The treatment still produces irradiated waste that radioactive isotopes do for you

Cobalt plays a useful role in certain applications and is still widely used throughout the world, because the machine is relatively reliable and easy to maintain compared to a modern linear guide.



Figure (8-3) The first cobalt production machine in Italy, installed in Borgo Valsugana in 1953

Conclusion

Gamma rays and X-rays are both types of electromagnetic radiation, and each image has side effects. After exposure to X-rays, you need to remove hairs from the body, but what is recommended is:

Just drink more water. Water helps the body deal with the damage that may result from exposure to X-rays, but once the X-ray machine is turned off, the effect stops and the same hair does not accumulate in the body and therefore nothing needs to be removed. Gamma rays are nuclear particles produced by nuclear decay, while X-rays are energy electrons. Gamma rays have a much higher penetrating power because they are high-energy ionizers compared to X-rays. Advantages of gamma rays compared to X-rays: 1.No need for electrical supplies 2. Smaller, lighter and less expensive quipment 3. More APSU equipment and more powerful More easily accessible Less distraction Greater penetrating power Advantages of gamma rays compared to X-rays: .Poor quality radiographs ,Exposure times can be longer Sources need to be replaced Notification cannot be stopped.

References

- [1]. Arvinti, B., Iacob, E.R., Isar, A., Iacob, D., & Costache, M. (2022). Enhanced Child Care: Contrast Correction for Pediatric Hip Ultrasound Using Hyperanalytic Wavelets. *Journal of Personalized Medicine*, 12(8), 1328.
- [2]. Bach, PB, Mirkin, JN, Oliver, TK, Azzoli, CG, Berry, DA, Brawley, O.
- [3]. W., ... & Detterbeck, F. C. (2012). Benefits and harms of CT screening for lung cancer: a systematic review. *Jama*, 307(22), 2418-2429.
- [4]. Bachetti, M., Harrison, F.A., Walton, D.J., Grefenstette, B.W., Chakrabarty, D., Fürst, F., ... & Zhang, W. W. (2014). An ultraluminous X-ray source powered by an accreting neutron star. *Nature*, 514(7521), 202-204.
- [5]. Cassileth, B. R., Volckmar, D., & Goodman, R. L. (1980). The effect of experience on radiation therapy patients' desire for information. *International Journal of Radiation Oncology* Biology* Physics*, 6(4), 493-496.
- [6]. Centers for Disease Control (US), Centers for Disease Control, & Prevention (US). (2000). *Morbidity and mortality weekly report* (Vol. 49). US Department of
- [7]. Health, Education, and Welfare, Public Health Service, Center for Disease Control.
- [8]. Gøtzsche, P. C., & Jørgensen, K. J. (2013). Screening for breast cancer with mammography. *Cochrane database of systematic reviews*, (6).

- [9]. Kuntz, E. (2006). *Hepatology Principles and Practice: History Morphology Biochemistry Diagnostics Clinic Therapy*. Berlin, Heidelberg: Springer Berlin Heidelberg.
- [10]. Motch, C., Pakull, M. W., Soria, R., Gris , F., & Pietrzy ski, G. (2014). A mass of less than 15 solar masses for the black hole in an ultraluminous X-ray source. *Nature*, 514(7521), 198-201.
- [11]. Page, BR, Hudson, AD, Brown, DW, Shulman, AC, Abdel-Wahab, M.,
- [12]. Fisher, B. J., & Patel, S. (2014). Cobalt, linac, or other: what is the best solution for radiation therapy in developing countries?. *International Journal of Radiation Oncology* Biology* Physics*, 89(3), 476-480.
- [13]. Saba, L., & Suri, J. S. (Eds.). (2013). *Multi-Detector CT imaging: principles, Head, neck, and vascular systems (Vol. 1)*. CRC Press.
- [14]. Setiawan, R., Ubaidillah, S., Utami, E.T., Barokah, A., Khoiriyah, Z., & Ulum, FB *Untitled-Universitas Hasanuddin*.
- [15]. Singh, A. K., & Gupta, B. (2015). A novel approach for breast cancer detection and segmentation in a mammogram. *Procedia Computer Science*, 54, 676-682.
- [16]. Sun, Y.S., Zhao, Z., Yang, Z.N., Xu, F., Lu, H.J., Zhu, Z.Y., ... & Zhu, H.P.
- [17]. (2017). Risk factors and preventions of breast cancer. *International journal of Biological sciences*, 13(11), 1387.
- [18]. Wright, F. W. (2001). *Radiology of the chest and related conditions*. CRC Press.