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Review Article about Laser and its Uses

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Abstract:

Laser in internal medicine: Let us say that one of the most important achievements made by lasers was controlling intestinal bleeding. After part years Albert Whitman from New York used lasers to treat a 58-year-old patient. of his stomach was removed, no treatment was effective. He developed infections and required blood transfusions several times. The doctor inserted a laser beam into the patient's stomach, connecting it to an internal endoscope. After identifying the bleeding areas with the endoscope, the doctor focused the laser beams on them. This process took a few minutes. The matter did not stop there, as current research indicates the possibility of blood YesUsing lasers in dangerous and delicate tasks, such as the liver - such as..vessels that may bleed severely during surgery to remove malignant tumors or treat wounds resulting from surgery. About accidents and other injuries, and recent studies on animals have shown that removing part of the liver with laser beams is easy and safe, with minimal bleeding, and no laser complications. It is also possible – by laser beams - to break up gallstones, as surgeons insert a laparoscope through a small hole in the abdomen, and using continuous thermal laser beams, the surgeon can separate the diseased gallbladder from the surrounding liver and pull it out through the small incision. When there are gallstones, they are broken up with shock waves and easily extracted from the gallbladder. Lasers are even used in pharmaceutical tablets and capsules, as the capsule can be punctured with a precise hole in its outer gelatinous shell using a laser, so that the capsule then releases a stable, equal dose of the drug into the blood over a long period.

Introduction

Emission. The word laser mere a trench sntoimlouglya t (eLda s raedr)i a isti o ann: a itb ibsr e av ligation n for Light Amplification beam with photons that share a frequency and whose waves are dentical so that the phenomenon of constructive interference occurs between their waves to transform into a light pulse with High energy. While the normal light source emits irregular scattered light waves, it does not have the power of the laser. By using crystals of suitable materials (such as ruby) of high purity, it is possible to stimulate their production of light rays of one color, i.e. with one wavelength and also in one wave phase, and when they match each other and are reflected several times between two mirrors inside the laser crystal, the waves are organized and overlap and exit the device with the desired high energy. The word laser is used to express any region. Spectrum regions, and to know the laser, one must actually know the short waves of high-electromagnetic spectrum, which starts from long radio waves to energy gamma rays, as shown in Figure 1-1. As is known, the narrow region of the spectrum, known to us as visible or white light, consists of the following light colors: red, orange, yellow, green, blue and vi . Number 1-2

The frequencies and wavelengths of these radiations are different and disturbed, they are more like noise when compared to sound waves, while we find that the light of laser rays is organized and focused. In the laser, the natural disturbance of the waves works on their coherence, as photons, the basic units of all spectral radiation, are emitted in the form of regular batches of a single frequency, and because the waves are coherent, the photons strengthen each other and increase their ability to transfer energy. To include beyond the ultraviolet region towards the high energy of X-rays, and each wavelength in these regions gives the ability and helps humans to invent various applications. Lasers produce a very thin, powerful beam of light. Some beams are so thin that they can punch 200 holes over a point the size of a pinhead. Because laser beams can be focused so precisely, they are very powerful. Some beams, for example, can penetrate diamond, the hardest material in nature, and some can produce a small nuclear reaction. The laser beam can also be transmitted to long distances without losing its power, which leads us to study the properties of the laser beam, whether they are physical or its spectral region. Simply put, It has no lasting effect. Y the laser beam is a beam and not radiation... This means that the beam has a time effect and its effect ends as soon as it touches the su) Properties of laser beams Monochromaticity: Monochromatic, or what is called “spectral purity of rays”: The laser beam has a narrow spectral width that produces a single pure frequency, and this wave formula was unique to radio rays, and the reason that the laser beam contains a single wavelength is that it is monochromatic is due to the fact that laser rays result from specific transitions between atomic or molecular levels, and theand Only: transitions also suffer from further narrowing by the presence of the resonator, which greatly reduces the monochromaticity of the wavelength, as will become clear in the coming chapters, and we note that light, An ordinary light (such as a lamp) contains a range of wavelengths of the electromagnetic spectrum. Parallelism of light beams, Collimation or so-called "directionality": that is, there is almost no dispersion or separation, and it is, by nature, focused without the need to use lenses, in the laser beam, it is non-existent, so it spreads in straight lines closer to parallelism, and therefore the laser beam has a high directionality so that the laser beam can travel to long distances without experiencing a significant

expansion in diameter, as the divergence angle is very large, as the beam cross-section expands by one millimeter for every meter the beam passes. The divergence angle of the laser beam is usually measured in radial angles and is defined on the basis of the diameter of the laser beam over the distance. The divergence angle of the laser beam varies from one device to another as it depends on the geonet. (3-2-1) Interconnection: Coherence is a very important property that distinguishes laser beams, as the coherence and coherence between the waves of a single beam spatially and temporally helps the light waves or photons to strengthen each otherto give high energy and power to the single beam. Lasers are in the form of light waves, so they will appear so that the peaks match each other and are in one direction. Ordinary light sources are incoherent due to spontaneous emission, as spontaneous emission is random in terms of time, phase and direction, while laser rays are formed as a result of the chain reaction of stimulated emission of photons, where they have, If we draw ordinary light in the form of light waves, all of them have the same frequency, phase and direction. We notice the phase difference between these waves, which is why it is called incoherent light. Intensity: Intensity: The intensity of the beam is high and concentrated in a narrow beam of diameter not exceeding one millimeter, and when using appropriate optics it can be exposed as needed. While the ordinary electric lamp used in lighting emits rays in the F directions, if we receive the rays from a meter, for example, the power emitted by a 100-watt electric filament lamp at a distance of 30 meters, The intensity of light falling on the eye is less than 1/100 of a watt, while the laser emits light in the form of a narrow beam whose energy is concentrated in an area of a very small area. This concentration of energy in a vacuum, or what is called optical density, is responsible for the high intensity of laser rays. If we assume that we look in the direction of the laser beam, which is a prohibited procedure, all the emitted power carried by the laser beams will fall on the eye, even if the laser power is in the order of one watt. The latter appears thousands of times higher in intensity than an electric lamp with a power of one watt. Some types of lasers emit light beams with an optical density greater than the optical density. On the surface of the sun millions of times. Features of laser beam, these are briefly the main properties that distinguish the laser beam, and there are other properties with great benefits, including: 1.The light beam of a laser beam has no mass, because the mass of the photons that compose it is Equal to zero. The light beam can be continuous or pulsed, and these pulses take multiple forms and different repetition rates starting from one pulse per second or parts thereof to millions of pulses per second. 3.Ease of control of the laser beam, especially with optical frequencies visible to the eye. Abstract. Other. The durability of the laser when compared to atomic and nuclear radiatEioasny. to manage and 4. Basic elements of laser beams, each type of laser has three basic elements: Each important laser device contains: (1) Active medium: It is the material that is responsible for generating the laser and has the distribution, Examples of active ingredients commonly used today. Solid crystals: such as synthetic ruby, aluminium garnet and reverse glass, from balayage. Gaseous materials: such as a mixture of helium and neon gases. • Ionized gases: such as argon gas and cork gas. • Gaseous molecules: such as carbon monoxide and carbon dioxide 2CO. • Liquid dyes: which are various organic chemical dyes dissolved in water. • Solid semiconductors: such as gallium arsenate. (2) Exciting source: This refers to the energy source that supplies the atoms of the active medium with energy to obtain the reverse distribution. The variety of energy sources currently used includes: • Electrical energy: This is represented in the use of direct electrical energy in two ways: the first is by using radio frequency sources as internal energy and the second is by using electrical discharge in direct current. An example of this is the carbon dioxide or carbon dioxide gas laser, the helium-neon laser, the argon gas laser, etc. •Light energy: known as optical pumping and can be emitted from two main sources. The use of high-power incandescent lamps as in the ruby laser. • Using a laser beam as a power source to another laser, this is commonly used to produce many laser radiations in different spectral regions. • Thermal energy: Both the kinetic pressure of gases and changes in the excitation of materials can cause laser beams to be emitted. Temperatures in Hath Wa (3) the resonator: It is the container and the activator for the magnification process. Usually, either of the following is used: • The external resonator: It is two opposite and parallel mirrors at the

end of the container tube. •The effective material, and the multiple reflections between them are the basis for the optical amplification process as in gas lasers. • The internal resonator: It is represented by coating the ends of the effective material to work as a mirror as in, Ruby crystal lasers and solid state lasers in general. In both cases, one of the mirrors must be completely reflective (100%) of the light photons, and the other must reflect 5% of the light falling on it in order to allow the laser beam to pass through it (90%).

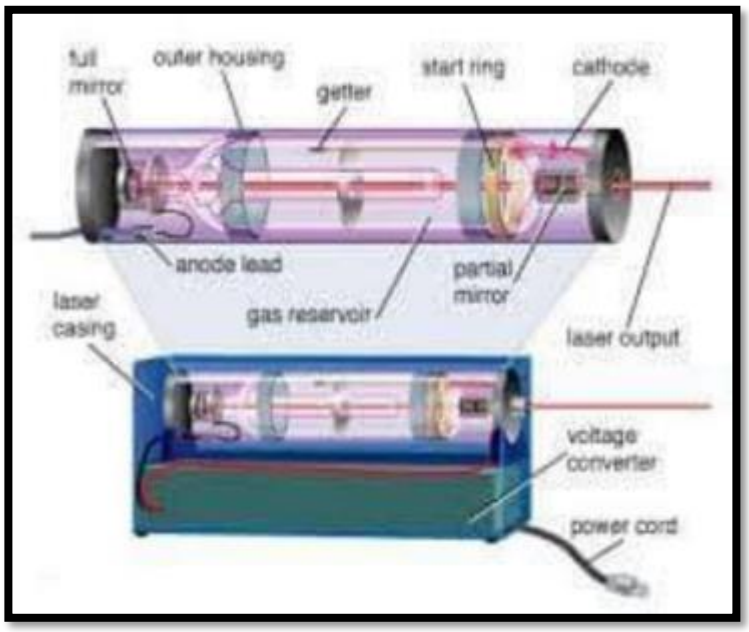

Figure (3-1) Basic components of the laser, Types of applied lasers

(1-5-1) Solid State Laser, In this case, the laser material is distributed in a solid matrix, such as a ruby laser. Neodymium-YAG laser is a laser that is produced by a material or mixture of solid materials such as ruby or aluminum-etherium alloy. (2-5-1) Gas-state laser Gas lasers are usually referred to as lasers that enter the laser state with an electric current. The most important types of this laser are: Helium-Neon Laser (Laser Neon Helium), and Carbon Dioxide Laser (CO2), which is a gas laser in which the resonator contains a gas such as helium, neon, or carbon dioxide gas, and its wavelengths are in the infrared range and are used in cutting materials. Solid for its high energy. (3-5-1) Liquid-state lasers (dye lasers) (Dye lasers): This laser uses some complex organic dyes. Such as using 6G Rhodamine) in a liquid solution as a medium for the laser. This laser is characterized by the fact that we can obtain a wide range of wavelengths from it. Liquid laser (or dye laser) is a laser whose active medium is a liquid, where organic dyes are dissolved in a second bath. The discovery of the liquid laser led to solving some of the problems that scientists were facing in several fields such as medicine, mechanics, communication, etc. After the scientist Maiman published the first article on the discovery of the solid ruby laser, attention turned to the discovery of other active media for generating the (4-5-1) Semiconductor laser Semiconductor lasers differ from solid-state lasers in the way energy levels are represented, and thus the pumping mechanism and light emission process, as semiconductor lasers contain ,Wide bands of energy levels, instead of single levels between which transitions occur, which participate in the laser emission process. Each of these bands contains a large number of similar energy levels that are not associated with specific atoms, and all of them share the crystal. The semiconductor laser is a junction (NP junction) and the most common type is gallium arsenide (GaAs) and the laser beam it emits is in the infrared region. It is an invisible light. (6-1) Some laser terms, Radiation: The form of energy emitted by nuclear particles as they descend lower levels. Electromagnetic radiation: the flow of energy in space in the form of transverse waves composed of, From electrical energy in a state perpendicular to magnetic energy, and both are perpendicular to the direction of movement. Radiation such as radio waves,

infrared rays, and visible rays...all of which differ from each other in their frequencies and wavelengths. Emission: The release or giving up of excess energy in the form of radiation. Optical fibers: Thin glass tubes of various diameters made of quartz or other glass materials that transmit light rays with minimal energy loss. Energy: is the product of the beam power (in watts) and the beam time (in seconds) and is measured in joules. Frequency: The number of cycles per second, and its unit is Hertz (HZ). Laser: A device that generates a beam of light from electronic, atomic or molecular transitions from higher energy levels to lower energy levels, and is characterized by wave coherence, intensity, and monochromaticity or frequency. The word LASER is derived from the first words of the following phrase: Light Amplification by Stimulated Emission of Radiation "Photoluminescence by stimulated emission radiation". Matter: is everything that occupies space and has weight. Power: The time rate of energy emission. Pumping: Thermal, electrical or optical excitation that supplies the active medium with the necessary energy. Bundle: It is a group of rays that are either parallel, divergent, or overlapping. Pulsed laser: A laser whose energy consists of single or successive pulses, with a pulse duration of less than 250 s. Inverse population: The state of a material medium in which the higher energy levels have more electrons, atoms, or molecules than the lower energy levels. Nalerin: The vibration or frequency of the particles of a material medium at a natural rate with the help of a vibrating source that has the same frequency or multiples thereof. The device composed is called a “resonator” or “warren” or “rattan Scattering: When light falls on an electronic medium, the medium vibrates under the influence of the electric field of the incident light. As a result, the particles of the medium emit light in all directions, which leads to scattering the incident light from its straight path. npenetration or passage of electromagnetic radiation through a material medium and is measured byPtehrempeearbcielintyta:g The Total transmitted light power to total incident light power. Therapeutic rate: The ratio of cancer cells killed to healthy cells. This term is used in laser cancer treatment or photon therapy. A quantity of energy having a single wavelength determined by the energy levels of the atoms between which it has moved. Photon: Q switch: A device that generates small laser pulses by enhancing energy storage and discharge. Q) Transfer from radio technologies to the active medium letter (electronic input and output) the killed microwave, called (Switch (Q.Research objectives, with the advancement of science and technology, man has become able to reach many solutions and overcome difficulties that were considered impossible in the past. With the arrival of the twenty-first century, man has opened up to a modern technology that has created a breakthrough in various fields, which is laser technology. This research aims in its first part to identify the laser and its characteristics (monochromaticity, parallelism of light beams, coherence-similarity and high intensity), and the advantages of the laser beam and its basic elements, and its types of applications, including the state laser (solid, liquid and, The second part also discusses the importance of lasers in medical sciences and the purpose of their use, which is to reduce the rate of error in surgical operations or other fields in which they are used. In medicine, they are used for many purposes, including reducing tissue destruction for the purpose of simple and rapid healing, reducing inflammation following surgery, and their extreme accuracy, sterilization, and their uses in bloodless operations. We are also interested in learning about surgical laser tools, including (scissors, forceps, scalpels, etc.). Lasers have also been used in orthopedic, cardiac, and neurological surgery, in dentistry to remove cavities, in cosmetics, and in the rest of the branches and fields of medicine. They have made a difference in this field since their first use, and scientists are still studying their development and Lasers have been used in medicine since 1990 - since the discovery of the laser - and the devices that have received wide attention are the neodymium-YAG, carbon dioxide, ruby, argon, krypton lasers, etc. The basic idea in using lasers in medicine is the ability of different cells and tissues to absorb the laser beam at a specific wavelength to perform the appropriate treatment. For example, the argon laser, which is suitable for treating eyes, is not suitable for removing malignant tumors or cutting the liver, etc. The visible argon beam is strongly absorbed by internal tissues and is very effective for photocoagulation. The argon beam can also be transmitted through optical fibers, and thus as continuous or long-pulse beams like a surgical scalpel. The CO2 laser is a highly effective

surgical device when used to cut and close small blood vessels in the liver, kidneys and stomach. But the problem with carbon 2CO is the difficulty of transmitting it through optical fibers, which requires large optical devices. In this, the neodymium-YAG laser beam excels, as it can be transmitted through optical fibers, and thus it can be used in treating internal ulcers and removing cancerous tumors from inside the body. Different laser devices have also been developed for use in treating the skin, eyes, brain, spinal cord, etc. Laser devices have entered every modern hospital, and laser surgery has become an indispensable matter in many surgical operations. This has been helped by the development of laser devices, which has eliminated many of the problems that have long hindered the use of lasers, such as the bulkiness and complexity of the old laser device, which in turn leads to a state of confusion inside the room. Operations.

(2-2) The importance of laser in medical sciences Laser has proven to be highly efficient in surgery in general, and in microsurgery in particular. Its effectiveness from a medical point of view lies in its high thermal energy concentrated in a very narrow diameter. In order to understand the importance of laser in medicine and surgery, we should examine its following features:

(1-2-2) Reducing tissue destruction for simple healing: Carbon when concentrated on tissues. Y The organic materials in the living cell absorb the dual laser beam. This causes the temperature of the internal and external cell water that absorbs the beam energy to rise to 100 C, i.e. to the point of evaporation, thus facilitating the cutting of the tissues to be removed, noting that the effect on the surrounding tissues does not exceed 100 microns in diameter from the point of contact, which makes the healing period short and thus less time for post-operative care. (2-2-2) Bloodless Surgery, Rays are used in surgical operations that involve cutting many blood vessels, such as in stomach, liver, and lung surgeries. The laser beam has two functions at the same time: cutting and clotting the blood at the open ends, so that the surgeon can focus on the operation without wasting time stopping the bleeding. (3-2-2) Reducing post-operative inflammation Cells close to the beam's focal points are not affected because the cutting strip is narrow after focusing the laser beam with special lenses to make the beam diameter very small, which makes the vitality of the cut cells recover quickly.

resulting from surgery (4-2-2) Reducing the machines, The laser beam is able to close the ends of the tiny nerves severed by surgery, which reduces pain to such an extent that sometimes anesthesia is not needed, as is the case in the treatment of Eyes. (5-2-2) Extreme precision, the user of the laser device has complete control over the penetration depth of the laser beam, which in turn depends on the laser power and exposure time. With the help of a microscope, the surgeon can precisely control the location of the beam. Since the laser works from a distance, this gives the surgeon a greater field of vision. The possibility of error when dealing with sensitive parts of the brain and spinal cord is zero. Previously, the error was caused by the shaking of the surgeon's hand, for example. However, with the laser, the surgeon determines in advance the area where the rays fall and then releases the (6-2-2) the effect of mechanics there is no risk of mechanical movement of living cells resulting from pressure, due to the absence of pressure when using a laser beam. (7-2-2) Transportation and delivery the energy of the rays can be transmitted through optical fibres and delivered to the affected internal areas. From the body and thus treat it, and some cases of blocked arteries are treated in this way. (8-2-2) Sterilization, There is no risk of contamination as there is no contact between the surgical instruments and the tissues being treated, in addition to the laser beam being able to vaporize pathogenic germs near the surgical site. (3-2) surgical laser instruments (1-3-2) Laser shears, Laser scissors first appeared. Three decades ago in 1998, Esperanza and Dr. Rounds, while working at the Pasadena Institute for Medical Research, proposed that lasers could be used to study the structure and function of cells and organelles. In the years that followed, the study foun, Burns and his colleagues showed that laser scissors could be used to study nuclear organelles such as chromosomes and even intervene during the spindle phase of chromosome division during the delicate process of cell division. Lasers also facilitated the study of components such as

mitochondria, the cell's power plants, (2-3-2) Laser tweezers, In the mid-1980s, Ashkin discovered that a low-power continuous-wave laser beam (less than one watt) could optically trap single bacteria and single-celled animals. Ashkin, who won the Nobel Prize in Physics in 1997, and his colleagues at Stanford University were able to show that laser tweezers could also capture molecules. Laser tweezers could also trap moving cells. A group of scientists in Irvine, Nader, Rossonk, and Draight, were able to show for the first time that laser tweezers could capture and manipulate human sperm cells. Desire.

(3-3-2) Laser scalpels: Lasers are not only good surgical scalpels, but they are also highly selective, rather than simply cutting anything they encounter. This property allows the laser beam to penetrate into a cell or organ while leaving the outside intact, something that any other surgical scalpel can do. The basic idea behind using a laser as a scalpel is to take advantage of the laser's straight beam, which has a small divergence and can be of Lenses, and the energy of the beam is quickly absorbed by the water in the cells and tissues, and the heat generated works to remove these tissues and vaporize them. (4-3-2) Lasers and optical fibers this is based on fiber optic technology that has revolutionized the vision of the internal organs of the human body, which has had an impact on the accuracy of diagnosing and treating various diseases. These fine, flexible fibers have opened a window to see living tissues. By inserting the fibers into the natural openings in the human body or through small surgical openings and pushing them through the passages in the body, ÿ the treating physician can see the bronchial tubes in the lungs, the chambers of the heart, and other parts that were previously inaccessible. Surgeries can also be performed inside the human body by directing a beam of laser rays through the optical capillary. Thanks to this method, it has been possible to save many of the complex procedures that the doctor used to resort to in order to reach the site of the disease, which sometimes caused the erroneous cutting of healthy tissue.

(5-3-2) Medical Endoscopes, The medical endoscope was the first application of fiber optic technology in the field of medicine. It is a device for seeing through optical fibers and consists of two fiber bundles: one provides illumination and carries light to the tissues, and the other in the image-forming bundle that transmits the image to the observer. The fiber optic bundle in the endoscope includes ten thousand hairs, and the thickness of the entire bundle, and it can form objects with a width of up to 70 microns, and cannot exceed one millimeter inserting the endoscope into the veins inside the human arm. In recent years, the most important application of inserting it inside the body for treatment or for optical fibers in the field of medicine has been to provide laser energy and, To perform surgeries, the body tissues' reaction depends on both: the wavelength and the intensity of the rays, as the light is absorbed by the tissues to a degree that varies depending on the wavelength and the proportion of materials. Colored like hemoglobin and melanin. (6-3-2) Except for the endoscope It is an endoscope that works with fiber optics, light sensors, and a surgical machine that can be used to take samples from the affected parts of the body. The diameter of this device is less than 2 millimeters, and it has a capillary to transmit laser beams. The sensors are used to measure blood pressure, temperature, and blood flow velocity. There is also a capillary to pump fluids and gases through it. The capillary is inserted into the blood vessels, so the doctor can see blockages and measure the blood flow velocity. Laser beams are passed through the capillary to evaporate the blockage, stopping the blood flow using a balloon. The gases resulting from the evaporation are passed and pumped out of the body. The sensors connected to the computer alert the doctor when the heat (4-2) Laser in surgery (1-4-2) Laser in cell surgery, the laser is used to grasp single cells and smaller components with forceps. These optical lasers, while the structures they are grasping can be modified with extreme precision, open up new ways to investigate and manipulate cells. Just as surgeons guide microscopic robotic forceps and scissors through endoscopes to perform minimally invasive surgeries on cells and their organelles, when laser scissors were introduced, Esperanza and Dr. Rounds, while working at the Pasadena Institute for Medical Research, suggested that lasers could be used to study the structure and function of cells and organelles. At that time, the focus was on researching and defining the parameters of the lasers

that could be used, such as the wavelengths of the laser light, the duration of exposure to the cell, and the power of those light beams. Organelles that could be successfully manipulated with laser scissors could then be used to study nuclear organelles such as chromosomes and the mitotic spindle that separates chromosomes during cell division. Lasers facilitated the study of components such as mitochondria, the cell's powerhouses, and structures such as microfilaments Important in maintaining cellular Or microscopic and central bodies that play a role structure and in transporting molecules between cells. The Brighton Group workers in Yervin, using platforms to light thIeir chemical components in any other way, lasers open a single cell so the time (2-4-2) Laser in general surgery: The surgeon's scalpel and his skill still lead the work in the field of surgery, but the introduction of the laser and endoscopy has created modern and simple methods of treatment. The laser has the ability to remove benign and malignant tumors, and has advantages over the regular scalpel in these cases, in removing tumors, there is no bleeding as the laser beam will stop bleeding from the blood vessels at the site of removal. In addition, the laser can reach the depths of some organs that the surgeon’s hand cannot reach accurately, and this is the essence of the principle. As for the application of this, we find it in removing tumors of the stomach, esophagus, pharynx, lower part of the digestive tract, gallstones, and others. As for what the National Institute of Laser Sciences has done in the experiment of breaking up gallstones, and using laser to stop bleeding, it has completely succeeded in saving a number of patients, accompanying cases of liver cirrhosis, and esophageal fibrosis, and these complications occur as a result of schistosomiasis and are considered national problems for which the laser has found a reasonable solution in tree, Anal where we use the thermal dissolution property and blood mixture to produce complete tissue destruction, and most of the work in this field has been done to destroy and removeHtheemionrflrahmoeidd atitsrsoupeh. y Professor Goldman L. and his colleagues at the University of Cincinnati in the United States of America, where they used solid state lasers and carbon dioxide lasers 2CO2 in their research. Dr. Strong says that laser surgery means minimal morbidity and complete recovery, leaving minimal scars, and excellent performance after Laser in cardiac surgery

Because laser technology is a promising new technology, it has sometimes been overhyped, and the real future of laser surgery will be determined when we reach a deeper understanding of the basic chemical and physical mechanisms by which light affects organs. In addition, the use of lasers with other technologies, such as fiber optics, allows thermal and nonthermal effects to be transmitted to parts of the body that were previously out of reach. For example, using fiber optic lenses and surgical tubes, surgeons can use lasers through the chest wall to treat two important chest diseases: spontaneous pneumothorax, where the lungs are filled with fluid, and spontaneous pneumothorax, In the first case, healthy people spontaneously rupture one of their lungs, allowing air to leak out. A laser can be used to seal the rupture, as surgeons Arakiyabashi and Pereira of the University of California, Irvine, discovered, without the need for traditional surgery. The same approach could help treat emphysema, which affects some 10 million Americans in various forms. The CO2 laser beam is directed through an opening in the chest wall to the fragile bubbles called bullae that cover large areas of the lungs. The heat of the laser causes these bubbles to disappear, the leakage site closes and the risk of further ruptures decreases. Thus, abou Those who suffer from emphysema - and whose severity of the disease prevented them traditional surgery - benefited and showed a noticeable from undergoing surgery. In chest surgery, the ionized argon improvement after performing this laser laser is also used, along with the formula laser, in the diagnosis and treatment of lung cancer with a light beam. The carbon dioxide laser is used in the revascularization of the heart muscle, while the YAG or argon laser is also used in the excision of the atheromatous plague, and is used in the removal of hemangiomas, or what is called a hemangioma (a blood vessel tumor). Scientists at the National Heart and Lung Institute in Debenda, Mary By developing a laser tool that allows for harmless measurement of blood circulation, it is expected that valuable new uses will be developed in the field of monitoring blood flow in trauma patients, as well as following up on the

response of blood vessel diseases in the legs to treatment, in addition to monitoring the effect of Blood circulation (4-4-2) Laser in Neurosurgery CO2 laser or YAG laser is used to remove brain and spinal cord tumors in the spine. CO2 laser is also used to remove meningiomas, correct congenital facial and skull deformities, remove glioma tumors, and relieve pain resulting from narrowing of the middle of the front of the brain. One of the advantages of the laser in these surgeries is the non-touch technology, so the meninges are not affected by the operation, and the recovery period required by patients is Y significantly reduced. One of the greatest uses of the laser in this field is its use to remove the pituitary gland through the bone sphenoid (5-4-2) Laser in Orthopedic Surgery CO2 laser is used in: -A joint surgery to remove bone fragments. B- Removing limescale deposits. T- Surgery of herniated discs. C- Synovial fluid biopsy. C- Arthrolysis. h-Arthroplasties. X- Removal of malignant bone tumors.The laser has been used successfully and has given the surgeon the ability to remove, in spinal surgeries, what is difficult to completely remove, such as a spinal cord tumor, as the part is reduced. Damage to the spinal cord or injury to the nerve roots emerging from it. Carbon dioxide laser is used to cut the back muscle in spinal cord surgeries and lift the vertebral discs, and the laser is used in back surgeries to cut the muscles so that spasms do not occur in them. Normal, thus reducing pain after surger Yy. Compared to the K device In recent years, carbon dioxide lasers have also been used in the replacement of damaged

In joints with artificial joints. Scientists have made great progress. Transferring the laser beam through arthroscopes into the joint, in a way that allows the cartilage to be shaped, and there are many experiments being conducted on the use of lasers in precise orthopedic surgeries. (6-4-2) Laser in cosmetic and orthodontic surgery It is used in: -A. Blepharoplasty or blepharoplasty. B-Breast augmentation. C- Removal of fatty tissue. C- Orthognathic surgery. Silhouette liposuction and shaping. C- In this type of application, carbon dioxide lasers and erbium lasers are used. Removing lip lines,Eeyespliedcrieamlloyvianl facelift and skin resurfacing operations. Laser .Lip lines Silhouette is a type of treatment used in cosmetic surgeries to remove fatty and cellular deposits. This Skin tightening technique originated and developed in France and has proven its effectiveness in smoothing and removal of pigmentation using X-rays to reshape the body, especially the legs. The technique of removing fat from the body and laser, and it is attached to a computer and massage equipment for the client, which makes him feel relaxed and relieves stress and nervous tension. This leads to the treatment of fatty deposits and the person gains Graceful shape. (5-2) Laser in Dentistry, The focus is currently on the uses of lasers in dentistry and their effect on the body until traditional drilling devices are completed, as the laser beam is characterized by its ability to disinfect and prevent the transmission of microbes that can be transmitted by current tools and devices. The laser has proven Master:successful in intraoral surgical operations, as it reduces the use of anesthesia, if not completely painful than surgical cuts with a scalpel, in eliminates it. In addition, the laser wound heals faster and is less addition to its ability to cauterize, which reduces and prevents bleeding during and after surgery. (1-5-2) Laser in removing caries, The ruby laser is used to treat teeth, where the beam is focused by a lens and directed to remove the area where tooth decay has occurred. The laser beam seems ideal for treating such cases because its high energy density can be focused on a small area and the black area absorbs it. The beam energy destroys the damaged part of the tooth without damaging the healthy areas. Pulses of a length of a fraction of a second are sufficient to destroy the affected area, and this short period of the beam's effect does not allow the entire tooth to heat up, in addition to the absence of Vibrations resulting from mechanical drilling, as with traditional caries removal methods, in addition to the lack of need for anesthesia with drilling, which is the case with laser. (2-5-2) Laser and dental fillings In the same way, a laser beam can be used to treat teeth, clean and fill diseased molars. Large and deep holes in damaged areas can be drilled by sending successive laser pulses. As for cavities located in areas that are difficult to reach directly - such as in the back of the tooth - they can be treated by transmitting the laser beam through flexible optical fibers. Dr. Sheldon Wonkar and other research scientists are conducting tests at New York University on materials that can be adapted and used as

dental fillings, by treating them with lase On the possibility of recurrent cavities around the filling. (6-2) Laser in skin diseases and burns The CO2 laser is generally used to remove cancerous tumors, but when ruby, nemium- Ig, or argon lasers are used to treat dark or black skin malignancies, all types are equally effective in removing tumors, but the difference occurs in the recovery time. Red (pigmented) birthmarks called wine-port stains absorb blue or green argon laser rays depending on their wavelengths, so the absorbed rays bring hundreds of excess blood vessels concentrated directly under the outer layer of the skin, where they remove their color. Although laser surgery in this case is preferable to excision and skin grafting, it has some special disadvantages, as heat may sometimes spread to other areas of the Y skin adjacent to the abnormal vessels, causing loss of skin color. Avoiding this severe damage has led to great progress in laser surgery.

In 1983, Anderson and Barish of Harvard University came up with the idea that shortening the exposure time to less than one-fifth of a second would damage the absorption area without affecting the surrounding tissues. Their explanation for this was that the duration of energy absorption and the resulting heat dissipation was shorter than the time it took for this heat to be transferred to the surrounding areas. Therefore, selective destruction of the dark areas to be removed required two con preferentially radial and sufficiently short radial pulses. (7-2) Laser in urinary tract: When tissues and cells absorb intense laser beams, they must dissipate their energy in some way. This dissipation may appear as heat, light, chemical reactions, glow, or waves. Doctors use all of these mechanisms—combined or separately—to diagnose and treat diseases. In its early days, the laser was described as a solution in search of a problem. Lasers are powerful enough to melt metals, but they can be pinpointed to a specific point to accomplish precise work. Among the cases that are candidates for shockwave treatment are kidney, ureter, and gallbladder stones. When surgeons direct short-pulsed beams through the urinary tract to the ureter by means of fiber optic endoscopes, they can break up the hard deposits accumulated there. The carbon dioxide laser or YAG laser is used to remove kidney stones as well as to remove cancers of the penis and prostate. The carbon dioxide laser or YAG laser and argon laser are used to remove bladder tumors. While the carbon dioxide laser is used in renal visceral surgery and partial nephrolithotomy. Treatment of anal fibroids, nephrectomy and urethral polyps Non-malignant testicles. YAG laser is used in the kidney resection process, which greatly reduces the amount of blood and maintains the remaining part at its maximum vitality. As for the argon and YAG lasers, they are used in treating bladder bleeding.

(8-2) Laser in internal medicine: Let us say that one of the most important achievements made by lasers was controlling intestinal bleeding. After part years Albert Whitman from New York used lasers to treat a 58-year-old patient. of his stomach was removed, no treatment was effective. He developed infections and required blood transfusions several times. The doctor inserted a laser beam into the patient's stomach, connecting it to an internal endoscope. After identifying the bleeding areas with the endoscope, the doctor focused the laser beams on them. This process took a few minutes. The matter did not stop there, as current research indicates the possibility of blood Yes Using lasers in dangerous and delicate tasks, such as the liver - such at. Vessels that may bleed severely during surgery to remove malignant tumors or treat wounds resulting from surgery. About accidents and other injuries, and recent studies on animals have shown that removing part of the liver with laser beams is easy and safe, with minimal bleeding, and no laser complications. It is also possible – by laser beams - to break up gallstones, as surgeons insert a laparoscope through a small hole in the abdomen, and using continuous thermal laser beams, the surgeon can separate the diseased gallbladder from the surrounding liver and pull it out through the small incision. When there are gallstones, they are broken up with shock waves and easily extracted from the gallbladder. Lasers are even used in pharmaceutical tablets and capsules, as the capsule can be punctured with a precise hole in its outer gelatinous shell using a laser, so that the capsule then releases a stable, equal dose of the drug into the blood over a long period.

Conclusion

The story of the laser began a long time ago, and may extend back to ancient myths expressing man's desire to obtain a decisive weapon whose ammunition is a beam of light, but the scientific history of lasers, It began in the mid-nineteenth century. In 1819, Hans Orsund, a professor of physics at the University of Copenhagen, organized the relationship between magnetism and electricity by observing the behavior of the compass needle. An electric current passes through it, then came the great magnetic step when it was placed near a wire when the, American scientist Charles Townes 1915-1964 emerged into the research arena. Townes began his research in 1951, and in 1953 he reached and requested the discovery of the maser. Around 1957 he began thinking about making a maser that could transmit infrared rays or light rays instead of waves. A theoretical study on the so-called optical maser (laser) in the minute, where he published in 1958 On July 7, 1960, the theory became a reality with the announcement by Weman of the success of the first practical branching out, as the fieldlaser made of synthetic ruby. Since then, the name "LASER" has been shining and, for countless applications, and the future still hides many applications in its folds. Lasers have developed at an amazing speed, and their use in medicine has developed to perform operations and apply new methods to treat diseases. They have proven highly efficient in surgery in general, and in precise surgeries in particular, and have become - today - widely used in most medical branches. I believe that laser technology is here to stay, and will develop at a balanced pace towards increasing the efficiency of CO, argon and YAG lasers and developing new devices such as, Older devices (such as ruby, copper, medical science, especially gold vapor and excimer lasers) are expected to have a bright and exciting future in when combined with fiber optic technology. Even for treatment with X-rays, Lasers are in their early stages now, and the discovery of new drugs that can focus on cancer cells and absorb laser wavelengths could open the door to a new technology. Develop rapidly, and to modern advanced lasers, and these lasers will, And modern drugs, To become more selective.

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