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Review Article

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Medical Lasers

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Laser

The term LASER stands for Light Amplification by Stimulated Emission of Radiation.

When referring to laser light it is important to distinguish it from general light. The light from the sun or a light bulb has multitude of wavelengths that individually, spread out in all directions.

Laser light, on the other hand, has a single wavelength that can be focused into a narrow beam, making it both powerful, as well as precise. Therefore, lasers can be used instead of sharp instrumentation for cutting and repair of bodily tissues. Laser light also emits a high amount of heat, which is known to cause protein denaturation and apoptosis. This gives lasers the ability destroys small areas of tissue, directly, in the case of tissue ablation and laser interstitial thermal therapy. Lasers may also be utilized in photodynamic therapy, using photosensitizing agents which potentiates the targeted heat intensity. Theodore H Maiman, a physicist at Hughes Research Laboratories in Malibu, Calif., constructs the first law in the second half of the 60s; the second medical laser was made. In this year, Nd: YAG lasers used in the field of endoscopy were used, followed by an arsenic element used in the field of ophthalmology. The retina was used to treat a dangerous patient. In the 70s, carbon dioxide CO_2 was released in the medical arena, which was successfully used by Eisen Kylan Plastic Paints. In the 1990s, this laser was updated in 1993, and at least lasers brought a great revolution in medical history. Dr Leon Goldman, a dermatologist and surgeon who is a pioneer in laser medicine, was the founder chairman of the American Laser Medicine Association. His medical application began with him, and for this reason he received the title of medical laser donor at the Opto-Elektronic conference in Munich, Germany in 1979 ser.

Lasers today have many uses in all areas of medicine. With all of these applications, the direct view is the same as the specific characteristics of laser light. After the first laser was made, the evolution of this branch was quickly followed by specialists, and the laser, as compared with other inventions, soon followed the evolutionary path. It can be said that after the discovery of penicillin, laser discovery made a major revolution in all medical sciences.

Classification of Medical Lasers

1. Based on the power of lasers
2. Based on tissue reaction (in medicine)
3. Based on wavelength
4. Based on the productive material

Laser Power Segmentation

A) High-Power Lasers (Hard)

Lasers those have therapeutic effects with increased kinetic energy in tissue and heat. These effects include necrosis, evaporation of carbonation, coagulation, or coagulation and cellulites. The capacity of this group is above half a watt.
High-power lasers are used in varying tissue density in surgery and cosmetics.

(B) Medium Power Lasers

Lasers that produce their own therapeutic effect without causing excessive heat and create light- induced effects in tissue. These types of lasers are in many cases replaced with low levels due to speed of the therapeutic effect, and length of treatment time has reduced. The power of this range of lasers is between 250 and 500 milli watts

C) Low-Power Lasers (Soft)

These lasers do not have the effect of heat on the tissue, however they cause optical reactions in the tissue through a stimulatory effect on cells. Examples include neon helium (He_Ne) lasers, argon diode, and krypton. The potentials of these lasers are usually below 250 milliwatts. These low-power lasers are used to treat diseases in ENT, urology, as well as orthopedic therapy. They are advancing the range of utility by studying the effects of low-power laser therapy on peripheral neurons for regeneration and pain relief.

Due to the use in each part of the tissue and its application in the field of work, the power of the laser is selected
For example, in order to rejuvenate the skin, the use of high-power lasers is used to inhale intracellular water, or to use a high-power laser to heat the skin to cut it.

2. Laser Classification Based on their Response to Tissues

A. Damage Reactions

They are based on the work of high-power lasers, with a high power of half watts and an increase in kinetic energy in the tissue resulting in a thermal effect that can reach 800° C.
These lasers, which have such an effect on the tissue, are used in surgery, high-power lasers, for which high heat causes evaporation, coagulation, and carbonization.

B. Photochemical Reactions

These are the basis for these low-power lasers. These lasers produce photochemical reactions without creating a thermal effect in their tissue. They react to specific molecules, known as photosensitizers.

C. Neutral Reactions

Which is the basis of diagnostic lasers. During these reactions, the tissue does not change, but the amount of reflex light or light passing through tissue is used for diagnostic tasks. In dentistry, these lasers are useful for measuring tooth decay.

Today, this series of lasers helps to diagnose diseases such as cancer, which aids in the performance of therapy. Lasers become helpful are reducing the time for pathologists to identify and analyze specimens, as well as surgical teams to determine locality of neoplasm's.

3 Division of Lasers Based on Wavelength

A) UV range: 100-400 nm
B) The visible light range: 400-700 nm
C) Near infrared light range: 700-1200 nm
D) Range of infrared light distances: more than 1200 nm

4 Division Based on the Material

A) Gas lasers
B) liquid lasers
C) Solid lasers
D) Semiconductor lasers
E) Eximer lasers

Transmission of Laser Radiation in the Body

Radiation through the Skin (External Method)

Through radiation of pathological sites, organs, nerves, arteries, and painful parts of the body can be reached to a depth of about 70-50 mm, especially the infrared spectrum.

Radiation Through the Mucous Membrane

For this purpose, an optical fiber is sent into the corresponding cavity through which the laser beam is used to reach the mucous membrane of the damaged region in this important method through infrared. Superficial tumors, for example skin cancers, are being treating with this method.

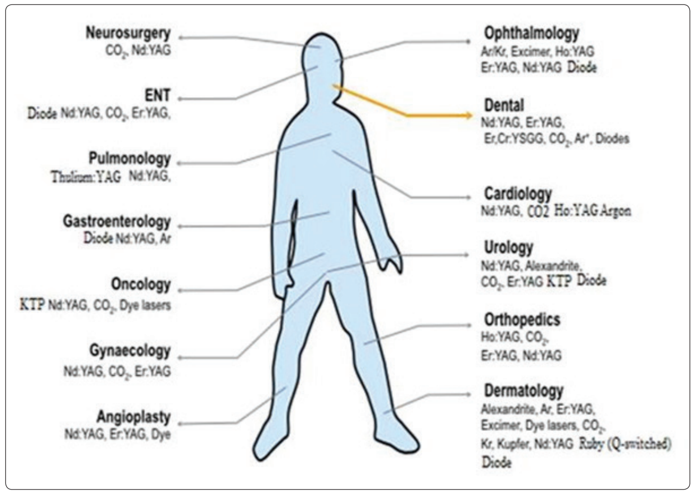
Radiation Through Intravenous

Due to the special angioquin that is often inserted into the upper limb vein and this laser beam is used from the red spectrum to the body, it is important to consider the dose of laser radiation that can be adjusted according to the type of reaction that is desired by the therapist.

Radiation through Acupuncture Points (Acupuncture)

This form is actually a special kind of laser therapy with irradiation of the upper extremity of the radiation through infrared, and to the body reached, it should be noted that the type of reaction can modulate the dose of the laser device.

The laser produced on the device by optical or fiber arms often reaches the target tissue and is therefore sterile because physical contact is not made, preventing transmission of microbes.



Applications	Active Medium	Wavelength	laser
Urology, Tattoo removal, Ophthalmology, Neurosurgery, Gynecology, Cosmetic Dentistry. Cardiovascular	Solid	1.064 and 1.320 micron	Nd:YAG
Urology, Pulmonology	Solid	0.532 micron	Frequency doubled Nd:YAG (Potassium-titanyl-phosphate): KTP
Dermatology	Solid	578 ,510 nm	Copper Bromide / vapour
Dermatology	Solid	694 nm	Ruby (Q-switched)
Ophthalmology	Solid	1045 - 1040 nm	Fiber lasers
Urology, Orthopedics, Cardiovascular	Solid	2.1 micron	Ho:YAG
Dermatology, Cosmetic Dentistry	Solid	2.94 1.54 micron	Er:YAG
Urology, Gynecology, Neurosurgery. ENT, Pulmonology	Solid	2000 - 1900 nm	Thulium:YAG / Thulim : silica fiber
Urology, Tattoo removal, Ophthalmology, Photodynamic Therapy, Dermatology. Cardiovascular	Gas	514 ,488 nm	Argon
Tattoo removal, Urology	Liquid	680 - 577 nm	Dye lasers
Tattoo removal, Urology	Solid	755nm	Alexandrite (Q-switched)

Urology, Dentistry, Surgery, LLLT Orthopedics,biology, Acupuncture	Semiconductor	980 - 630 nm	Semiconductor laser Diode GaAs GaAlAs InGaAlP
Urology, Gynecology, Neurosurgery. ENT,Pulmonology	Solid	2.1 micron	Ho:YAG
Ophthalmology, Cardiovascular	Excimer	350 - 190 nm	Excimer
Surgery, Urology, Dermatology, ENT. Cardiovascular	Gas	10.6 micron	CO_2 laser
Dermatology	Solid	600-585-577 nm	PDL
Biology, LLLT, Acupuncture	Gas	632/8nm	Helium Neon (He_Ne)

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