



Application of Laser in medical field

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Abstract

In fifty years, laser technology has made great progress, and its many applications make it essential in everyday life. However, this technology is still open to numerous developments. Across multiple applications, there is particular focus in the field of medicine, for diagnosis for tailored therapies, and as a research tool in biology. Whereas its use is now well-demonstrated in ophthalmologic and dermatologic treatments, and surgery, one of the most fascinating aspects of laser technology in the field of biology emerged in the late 1990s with the development of devices able to perform fine dissections of biological tissues using a laser beam. Lasers have a wide and growing range of applications in medicine. In this paper medical applications of Lasers are discussed.

Keywords

Laser technology, biology.

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1. Introduction

Laser is a powerful source of light having extraordinary properties which are not found in the normal light sources like tungsten lamps, mercury lamps, etc. The unique property of laser is that its light waves travel very long distances with a very little divergence. In the medical field, lasers are diagnostic and therapeutic instruments that offer a whole range of solutions. The laser which enables for greater surgical precision is less invasive and promotes healing time or cure. This technique is generally much less traumatic than traditional surgical techniques.

2. Types of laser

There are many types of lasers available for research, medical, industrial, and commercial uses. Lasers are often described by the kind of lasing medium they use - solid state, gas, excimer, dye, or semiconductor.

Solid state lasers have lasing material distributed in a solid matrix, e.g., the ruby or neodymium-YAG (yttrium aluminum garnet) lasers. The neodymium-YAG laser emits infrared light at 1.064 micrometers.

Gas lasers (helium and helium-neon, HeNe, are the most common gas lasers) have a primary output of a visible red light. CO₂ lasers emit energy in the far-infrared, 10.6 micrometers, and are used for cutting hard materials.

Excimer lasers (the name is derived from the terms *excited* and *dimers*) use reactive gases such as chlorine and fluorine mixed with inert gases such as argon, krypton, or xenon. When electrically stimulated, a pseudomolecule or dimer is produced and when lased, produces light in the ultraviolet range.

Dye lasers use complex organic dyes like rhodamine 6G in liquid solution or suspension as lasing media. They are tunable over a broad range of wavelengths.

Semiconductor lasers, sometimes called diode lasers, are not solid-state lasers. These electronic devices are generally very small and use low power. They may be built into larger arrays, e.g., the writing source in some laser printers or compact disk players.

Low power diode lasers are used for soft tissue treatments. Higher power diode lasers are used in dentistry and medical

aesthetics.

3. Identification of blood group

In general, the technicians in laboratories are determining the blood group by using ABO blood testing method. This testing is under the basis of aggregation process of antigen and antibody. Here the antibody is a collection of toxins, bacteria, foreign blood cells and the cells of transplanted organ. In the way of manual analysis, we can able to get better results but in handling with wide range of samples, the examining person experience very tough job and may mislead to maintain the blood sample and records accurately. To avoid such a situation, here a new solution is proposed to recognize the blood group. In this new technique, the LASER source and photocell are used to analyse the ABO blood grouping (A, B, O) and Rhesus type testing (Rh +ve and -ve).

4. Laser Therapy

Laser Therapy treatment is a non-invasive therapy that makes use of intense beams of light of specific wavelengths to help reduce pain related to your injury. When it comes to therapeutic use, lasers are often referred to as Cold Lasers, Low-Level Laser Therapy (LLLT) or High Power Laser Therapy (HPLT). The Low-Level Laser Therapy utilizes red (and close to red) infrared light on areas of injury or wounds in order to mend the soft tissue and also to give relief from acute and chronic pain.

5. Laser treatment for eye tissues and diseases

The retina is a thin layer which covers the rear two-thirds of the inner surface of the eye wall. The anterior of the retina adjoins the ciliary body consists of ten layers. The most important components of the retina are the cones and rods, which enable the perception of light. The central part of the retina (the macula lutea or yellow spot) contains the cones and enables sharp and colour vision. The peripheral retina contains the rods and enables peripheral vision. The retinal neural fibres from the cones and rods are focused at the head of the optic nerve. In the past, argon and dye lasers were used for thermal laser therapy of the retina, but are no longer used except in exceptional circumstances. The blue light of an argon laser is aggressive to all layers of the retina and the resulting scotoma (blind area in the visual field) is much larger than the area requiring treatment. The energy level of argon green light is too low to be used for this treatment, making the use of blue light necessary if an argon laser is to be employed. Dye lasers are complicated, expensive and require demanding service. For this reason, thermal laser therapy of the peripheral retina currently employs frequency doubled

6. Laser scalpel in medicine for bloodless surgery of delicate organs

During the last decade, laser technology has become an effective weapon in the battle against disease. The laser has been recruited for surgery to zap trouble body wide, particularly in hard to reach or delicate areas with small operative fields, such as the eye, fallopian tube, or mouth. Laser surgery uses a laser light source (laser beam) to remove tissues that are diseased or to treat blood vessels that are bleeding. Laser beams are strong beams of light produced by electrically stimulating a particular material. A solid, a liquid, or a gas is used. Alternatively, the laser is used cosmetically; it can remove wrinkles, birthmarks, or tattoos. The special light beam is focused to treat tissues by heating the cells until they burst. There are a number of different laser types. Each has a different use and color. The color, or the light beam, relates to the type of surgery that is being performed and the color of the tissue that is being treated.

7. Some Cosmetic Uses of Lasers

Medical lasers are also widely used for various types of cosmetic surgery, including the removal of certain kinds of birthmarks. Port-wine stains, reddish purple skin blotches that appear on about three out of every one thousand children, are an example. Such stains can mark any part of the body but are most commonly found on the face and neck.

8. Conclusion

Now-a-days LASERs used in many applications because of its peculiar properties. In medical field different types of lasers are used in different application. Lasers also used in many fields such as engineering, industry, sensor, communications etc.

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