

THE USE OF SEMICONDUCTOR LASERS IN MEDICAL APPLICATIONS

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Abstract: *In this paper we report on semiconductor lasers and their applicability in different fields. We focus on the use and future perspective of semiconductor lasers in medicine. A particular area, where a lot of research, recently was done, and significant progress was obtained, is related to the diagnosis and treatment of different kinds of cancer. Other applications are related to the dentistry, endoscopy etc.*

Keywords: *diode, lasers, medicine, application, light.*

A diode laser system is a semiconductor device that emits coherent radiation in the infrared or visible spectrum when current passes through it. Diode laser systems are used in different applications as medical diagnosis, optical fiber systems, therapies, and treatments. We mention that, low power diode lasers are used for soft tissue treatments. On the other hand, the higher power diode lasers are used in dentistry and medical aesthetics.

Lasers are a safe tool for medicine usage as they are precise and they do not harm, cut or burn tissues unless we use focusing lens for those purposes. In the last few decades people found a lot of applications of lasers in medicine. One of the most important application of lasers in medicine is related to the disease of the 21th century, cancer. Lasers are used for both diagnosis and treatment of it. Operations with lasers are very precise. Thus, they are used for cutting small areas and removing cancers. Their heat is used for activating medicines under the influence of light and diminishing tumors or precancerous growths especially those that produce bleeding or blockage in patient's body, for instance a tumor that blockade trachea. We mentioned that, the main advantages related to the laser therapy are that they are much more precise than scalpels, and as a result they cause less damage to healthy tissues, intervention are shorter, patience feel less pain and suffer less bleeding or scaring. After a complicate surgical intervention, lasers can be used to scale down the pain. On the other hand, the main drawbacks are the high price, the necessity of repeating treatment, following rigorously rules and training the personnel. There are clinical trials that try to use laser for curing brain and prostate cancer. A huge progress lately has had therapeutic endoscopy. Because of the use of medical lasers, nowadays, a lot of impossible previously interventions are meanwhile very common. Today doctors are able to control gastrointestinal bleeding, treat vascular malformations of the digestive tract. There are already some methods tested related to endoscopic photodynamic therapy of gastrointestinal cancers. Another huge improvement would be endoscopic laser fragmentation of large common bile duct stones, which is, today, at early stages of studying.

Although dentistry was the second medical discipline where lasers have been applied, at present it basically still remained as a field of research in using lasers. Especially in caries therapy – the most frequent dental surgery – conventional mechanical drills are still superior compared to most types of lasers, particularly CW or long-pulse lasers. Only laser systems capable of providing ultrashort pulses might be an alternative to mechanical drills as was recently shown in [1]. However, many clinical studies and extensive engineering effort still remain to be done in order to achieve satisfactory results. We should keep in mind that mechanical drills have improved over several decades until the present stage was reached, and that the development of suitable application units for laser radiation also takes time. Other topics of interest in dentistry include laser treatment of soft tissue as well as laser welding of dental bridges and dentures. In some of these areas, research has been very successful.

In conclusion, it tends to be presumed that now the laser medication is a quickly developing field of both research and applications. By concrete examples, is shown the beneficial influence of it in the development of science, technology and various branches of the economy. Finally, the medical lasers are part of revolutionary technology that has multiple benefits for both patients and doctors.

References:

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