

ADVANTAGES OF LASER USAGE IN DENTAL IMPLANOLOGY

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Abstract: Implants have become an extremely successful therapeutic choice for the replacement of lost teeth. As dental implants become more common in the world, the question arises as to how to improve dental implantation treatment. Dental lasers have a lot of benefits in improving treatment, both in the surgical and the post-surgical and prosthetic phase in dental implantology. Lasers can be especially useful in dealing with complications from implant therapy and treatment of inflammatory changed peri-implant tissue. The advantages of using lasers in dental implantology are the same as for any other soft tissue dental procedure. The main aim of this research was to describe all advantages of the lasers that are used in dental implantology. We have made adequate literature research on Pub Med for articles relevant to our topic- lasers in dental implantology of articles published in the last two decades (2001-2021), and the type of articles were Clinical Trial, Journal Article, Randomized Controlled Trial, Review, Comparative study and English was chosen as the language and humans as the species. Kew words used for the research were: dental lasers, laser, dental implantology, advantages, benefits and their combination. Laser interventions provide numerous benefits to patients such as: reduction of post-operative complications, shortening of the post-operative time, less trauma during the intervention and in most cases there is no need for anesthetic agents' usage. Laser usage allows therapists better visualization of the surgical field by reducing bleeding, and often reducing the duration of a given procedure. By creating sterile conditions during and after surgery, complications and infections are significantly reduced. Another advantage of lasers is their use in patients on anticoagulant therapy using drugs such as aspirin and anticoagulants. Once access is made through the soft tissue, most common lasers used for hard tissues as alveolar bone are Erbium family lasers. An Erbium laser can remove bone tissue and start an osteotomy. But, laser technology has not yet reached the level when the entire osteotomy would be completed just with Erbium lasers. However, laser manufacturers are doing research to replace rotating instruments with erbium laser to fully perform the osteotomy. When the doctor needs to discover integrated implants, after the healing process is complete, sometimes the body of the implant is covered not only with soft tissue but also with newly formed bone of 2-3 mm thickness. After radiographic location of the implant, the soft tissue must be removed, very easy with laser usage. But like everything in life, the laser has certain disadvantages. Thus, laser devices and their consumables such as fiber optic cable are quite expensive, which is why the cost of such interventions is high. Working with lasers requires additional training. The use of lasers is also associated with the use of additional protective equipment, such as adequate glasses, the possession of which is inevitable. As a conclusion, it must be noted that numerous advantages of using laser light can hardly be ignored, such as precision, ease of use and greater success in therapy than conventional therapeutic procedures. However, full knowledge of this therapeutic tool is imperative to avoid the side effects and get the full benefits that are desired. Laser interventions provide numerous benefits for patients such as: reduction of post-operative complications, shortening of the post-operative course, less trauma during the intervention and in most cases no use of anesthetic agents.

Keyword: dental implants, benefits, advantages, laser

1. INTRODUCCION

Advances in the design and engineering of dental implants have grown exponentially over the last few decades. Thus, implants have become an extremely successful therapeutic choice for the replacement of lost teeth. In contemporary dentistry, dental implantology is widely practiced and studied in many dental specialties. As dental implants become more common worldwide, the modern dental science is directed towards improving of dental implantation treatment. (Deppe & Horch, 2007)

Nowadays, the role of dental lasers is thought to be of particular benefit in improving treatment, both in the surgical and the post-surgical and prosthetic phase in dental implantology. Lasers can be especially useful in dealing with complications from implant therapy and treatment of inflammatory peri-implant tissue. The different wavelengths of the lasers have unique features that facilitate the dentist's access to the implants as well as the comfort of the patients. (Fu & Wo, 2021)

Generally, the laser allows therapists better visualization of the surgical field by reducing bleeding, and often reducing the duration of a given procedure. By creating sterile conditions during and after surgery, complications and infections are significantly reduced. (van As, 2015)

The advantages of using lasers in dental implantology are the same as for any other soft tissue dental procedure. The numerous advantages of using laser light can hardly be ignored, such as precision, easy of use and greater success in therapy than conventional therapeutic procedures in modern dentistry. However, full knowledge of this therapeutic tool is imperative to avoid the side effects and get the full benefits desired. (Gupta et al, 2016)

Using laser lasers in dentistry, numerous interventions of hard and soft tissue in the oral cavity can be performed. Although lasers have not yet succeeded in replacing conventional instruments and techniques, their numerous advantages are why they have begun to be used more frequently. (Stübinger et al, 2010)

These advantages include increased haemostasis, minimal damage to the surrounding tissue, reduced swelling, reduced infection, and reduced pain postoperatively. Due to the haemostasis provided by lasers, there is the significant advantage of improved visibility during surgery. (Alshehri, 2016)

The main aim of this research was to describe all advantages of the lasers that are used in dental implantology. We have made adequate literature research on Pub Med for articles relevant to our topic-lasers in dental implantology of articles published in the last two decades (2001-2021), and the type of articles were Clinical Trial, Journal Article, Randomized Controlled Trial, Review, Comparative study and English was chosen as the language and humans as the species. Kew words used for the research were: dental lasers, laser, dental implantology, advantages, benefits and their combination.

2. ADVANTAGES OF LASER USAGE IN DENTAL IMPLANOLOGY

With the help of lasers, a completely new dimension is given to dental implantology. Their application achieves great benefits for both the dentist and the patient. The positive role of lasers can lead to a significant improvement in treatment, both in the surgical and post-surgical and prosthetic phase in dental implantology. Lasers can be especially helpful in dealing with the complications of implant therapy and the treatment of inflamed peri-implant tissue.

Laser is a device that emits laser light through a process of light amplification based on stimulated emission of electromagnetic radiation. The laser is characterized by focused light directed at a small point over a great distance. Laser light is not only used in dentistry. It is also used in the precision cutting industry, optical instruments, laser printers, barcodes, laser surgery, telecommunications, lunar distance measurement, etc. Laser technology stems from research into the interplay of light and matter since the early 20th century. (van As, 2015)

Nowadays, in the dental equipment market we are flooded with different types of laser devices that can be used in everyday dental practice. Modern dental lasers are in the wavelength range from 500 nm (nanometers) to 10,600 nm which places them in either the visible or invisible part of the electromagnetic spectrum. This range gives them many opportunities for use in dentistry. (Martin, 2004)

The increasing popularity of the lasers, with their hard tissue ablation capability, has added the potential for their use for osteotomy and decontamination of infected and ailing implant bodies. The different wavelengths of the lasers have unique features that facilitate the dentist's access to the implants as well as the comfort of the patients. Laser interventions provide numerous benefits to patients such as: reduction of post-operative complications, shortening of the post-operative period, less trauma during the intervention and in most cases no use of anesthetic agents. (Esposito,2012)

Dental lasers have numerous advantages when working on soft oral tissues. Using laser energy to make any incision has several advantages. First, by using lasers a sterile incision can be done and it is less likely to be infected. The laser cuts the tissue without causing a cascade of events leading to edema and inflammation. Because lasers seal lymph and blood vessels, there is a clinically measurable reduction in pain, swelling, and other post-operative complications. If the swelling is reduced, the sutures will not retract into the tissue or be less likely to reach extinction. Less analgesics and antibiotics (with fewer interactions) are needed as patients experience significantly less traumatic postoperative period. This applies to both small and large surgical procedures. (Kamel et al, 2014; Nevins et al, 2014)

Another advantage of lasers is their use in patients on anticoagulant therapy using drugs such as aspirin and anticoagulants. Some patients also use herbal remedies that can significantly change the coagulation time. The main question in patients on anticoagulant therapy is should their medication be discontinued prior to the procedure? The physician should be aware of each patient's individual circumstances and consult with their GP. Before any oral surgery, the patient's health history should be reviewed and updated. If there is a dilemma for the patient's treatment, appropriate laboratory analyzes should be performed. Patients receiving anticoagulant therapy will benefit more from the use of lasers in dental surgical procedures than healthy patients. (Romanos et al, 2013; Parker et al, 2020)

As noted before, lasers have excellent haemostatic properties that lead to reduced bleeding, so controlling intraoperative bleeding is not a problem. Laser treatment also results in reduced post-operative swelling and better tissue healing.

Once access is made through the soft tissue, the dentist will have to decide how it “will done the work” in the bone tissue. Most common lasers used for hard tissues as alveolar bone are erbium group of lasers. An Erbium laser can remove bone tissue and start an osteotomy. Laser ablation using a laser is less harmful to bone tissue than conventional methods, as this is a non-contact method and does not cause friction between the laser tip and the bone. Friction caused by bone cutting when using rotating instruments can overheat the bone and cause necrosis in the area of contact between the dental implant and the bone. (Stübinger et al, 2010; Parker, 2017)

Most of the authors noted that the increase in bone tissue temperature with the use of erbium lasers is minimal, as long as the dentist uses appropriate laser parameters and appropriately uses aqueous cooling spray. In this way controlled ablation without thermal damage is achieved. Studies show better healing and faster formation of new bone tissue when using erbium lasers versus conventional rotating instruments. (Monzavi et al, 2014, Parker et al, 2020)

But, laser technology has not yet reached the level when the entire osteotomy would be completed just with Erbium lasers. However, laser manufacturers are doing research to replace rotating instruments with erbium laser to fully perform the osteotomy.

When the doctor needs to discover integrated implants, after the healing process is complete, sometimes the body of the implant is covered not only with soft tissue but also with newly formed bone of 2-3 mm thickness. After radiographic location of the implant, the soft tissue must be removed. This can be achieved with any wavelength except the Nd: YAG laser due to its side effects on the implants. If the tissue is not so thick (1-2 mm) all the wavelengths except the Nd: YAG laser are successful. If the tissue is significantly deeper, the diode laser becomes too slow and ineffective. If the tissue is extremely vascularized, an erbium laser would be a bad choice, since bleeding can reduce visibility. For obese tissues, CO₂ laser wavelengths are most effective for rapidly removing tissue and maintaining excellent visibility in the surgical field. For any bone thickness, Erbium lasers can effectively and safely achieve implant detection. The bone and surface of the implant will remain intact. (Yeh et al, 2005)

Erbium lasers are a significant and potential therapeutic tool for approaching the ideal dental implant treatment. The Erbium lasers family which includes Erbium YAG (yttrium aluminum garnet) and Erbium chrome YSGG (yttrium scandium gallium garnet) as solid phase lasers. The wavelength of Erbium YAG lasers is 2940 nm, while the wavelength of Er: Cr YSGG lasers is 2780 nm. (Nevins et al, 2014)

Er: The YAG laser also acts bactericidal. According to a study published at the end of the last century, the survival rates of highly viable resistant bacteria in *P. gingivalis* colonies decreased significantly with an energy level of 7.1 to 10.6 J / cm². These findings suggest that the Er: YAG laser has high bactericidal potential even at low energy levels. (Parker, 2017)

In general, the laser gives therapists numerous advantages over classical surgical interventions, including

- Faster recovery
- Reduced chance of infection
- Decreased sensitivity
- Reduced number of visits after oral surgery
- Shortened intervention time
- Less postoperative pain
- Less bleeding
- Accelerated bone healing (Deppe & Horch, 2007; Gupta et al, 2016; van As, 2015)
- Reduced sound unlike the dental machine.

In implant dentistry, having a large amount of soft tissue is not a common problem. In fact, the most common issue is trying to preserve more soft tissue. However, some implant designs show characteristic results on a large volume of soft tissue. This tissue should be shaped to allow adequate impression and cementation of the crown. Maintaining a dry and clearly visible field is imperative. Lasers are a great tool for this purpose. (Esposito et al, 2012)

Dental lasers emit wavelength rays in the non-ionizing spectrum called thermal radiation. Based on this we can conclude that laser beams do not have an ionizing aspect and can not cause damage to the inherited characteristics of the cells. They cause only a thermal effect. (Monzavi et al, 2014)

Once more it must be noted that the advantages of the laser are numerous. Using lasers as a tool in dentistry can bring the following benefits:

- Laser interventions are painless and therefore the possibility of dental phobia in people with extreme fear is avoided. Also, the need to use anesthesia during interventions is not needed or minimized.

- Lasers also have an antiseptic effect. This enables their use in oral surgery and implantology, in endodontics and periodontology. Thus the bacterial presence and the possibility of secondary bacterial infection are minimized. (Papakoca & Petrovski, 2021)

Lasers during surgery interventions also reduce bleeding due to their physical characteristics. This enables greater visibility of the operative field by the doctor on the one hand and on the other hand enables reduction of the duration of the interventions.

At the end, it is important to be highlighted that, lasers have a number of other advantages that we will work on during the various interventions. But it must be noted that the laser is an integral part of modern implantology and periodontology. (Papakoca & Petrovski, 2021)

But like everything in life, the laser has certain disadvantages. Thus, laser devices and their consumables such as fiber optic cable are quite expensive, which is why the cost of such interventions is high. Due to the high cost, it is very difficult to offer these interventions to all clients and patients. Working with lasers requires additional training. Most often this training is part of the price paid for the laser and is performed by the manufacturer. However, it is necessary to follow additional training and development, for which it is also necessary to pay extra. The use of lasers is also associated with the use of additional protective equipment, such as adequate glasses, the possession of which is inevitable. For their own but also for the protection of the patient's eyes. (Kemal et al, 2014; van As, 2015)

3. CONCLUSION

The numerous advantages of using laser light can hardly be ignored, such as precision, ease of use and greater success in therapy than conventional therapeutic procedures. However, full knowledge of this therapeutic tool is imperative to avoid the side effects and get the full benefits desired. Laser interventions provide numerous benefits for patients such as: reduction of post-operative complications, shortening of the post-operative course, less trauma during the intervention and in most cases no use of anesthetic agents.

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