Laser application in oral surgery

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Abstract

The increasing use of laser in oral surgery has led to undoubted operative advantages and a better quality of the outpatient operation compered with electro- and coldblade bistoury. Dental laser allows to obtain a more precise incision, a better recovery, bleeding reduction, shorter working times, post-operative edema reduction, lack of pain, wound sterility and a more aesthetic cicatricial process. It produces also a biostimulation of those cells involved in the recovery process reducing so the recovery times. It has a decontaminating effect of the germs present in the root channels, of parodontis and of the lesions caused by virus, bacteria or mushrooms.

INTRODUCTION

The present work is a short examination of the main lasers used in odontostomatology.

Although today there isn't any laser on the market capable to substitute mechanical instruments normally used in odontoiatry, the actual lasers are a valid aid and its increasing use has different applications in odontoiatry and for this we consider it an instrument which optimizes the working method.

The main use of laser in medicine is a surgical one. Its fundamental function is that of concentrating high energy to remove and destroy tissue. Laser has undoubted advantages as far as efficacy, quality and comfort are concerned. Examining the beneficial effects we can grouping them as follows:

- cutting capability particularly useful for those lesions whose removal concerns a wide area of the epithelium surface, in this case thanks to its selective action the healthy adjacent tissues are not damaged:
- Bleeding elimination with a good coagulative effect
- tissues vaporization without increasing their temperature
- quicker recovery
- reduction of drugs use in the post operative period
- lack of edema
- antalgic and anaesthetic effect

It emerges that the main advantages are the possibility of eliminating gingival tissue without anaesthesia, lack of bleeding, rapid and pain less recovery without swelling and problems for the patients, possibility of modeling the gum eliminating the uncontrolled proliferation, capillary and precapillary vasodilatation, interstitial liquid drain increasing, stimulation of the tissue regenerating process (cicatrization and so on); it has also an antiinflammatory action with stimulation of methablic process and activation of leucocytes for a quicker recovery of the wound. It has also an antibacterial action.

Laser performs a bio stimulation on the cells activeted in the recovery accelerating so the process. It has a decontaminating effect of the germs present in the root channels, of parodontis and in the lesions caused by virus, bacteria and mushrooms. Its aim is that of eliminating with selectivity necrotic or infected tissue in soft and hard tissues.

The main applications of laser are:

- Treatment of malignant and/ or benign lesions (mucous cysts, papilloma, fibroma)
- epithelial and / or connective takings of oral mucosa
- biopsy
- plastic surgery of oral cavity, (frenulumtomy, frenulectomy, gingivictomy, correction of fornix, gingivaplastics, cicatricial tissue and so on)
- treatment of parodontal pockets
- incision and drainage of abscesses
- treatment of ulcerative and/or inflammatory pathologies (aphtha, hyperkoratosis, lichen)
- removal of fistular areas
- treatment of infected root channels
- salivary calculosis
- hemangioma
- caries
- mordanting of enamel and dentine
- treatment of sulcus and splits
- dentine hypersensitivity

- capping of pulp
- opening of gingival sulcus before the imprint
- dental bleaching.

EXPERIMENTAL SETUP

Analysing the various lasers, those which are more used in odontoiatry are:

CO_2 Laser that emits a 10 mm wave-length, although very efficacious in cutting, can not be transmitted by an optic fiber and for this reason it can not be used in endodontis and parodonthology. It is a very good laser in oral surgery.

Diode Laser with a 810 nm and 980 nm wave-lenght, even if less bulky it hasn't much power and consequently it has no mechanic effect and it is not able to sterilize without damages. For this reason it is not very suitable to treat hard tissues and channels. It has a 2 mm. penetration depth. It is used in oral surgery, parodonthology, endodontis and for dental bleaching. It is utilized in endodontis for its bactericidal effect and for elimintion of dentine mud. In parodonthology it is used for parodontal pockets. In oral surgery guarantees a treatment without bleeding, shorter recovery times and minor post-operative pain. This laser has an aseptic and biostimulating action and is also used for the treatment of dental differences.

Er:Yag Laser usually called **Erbium** with an emission at 2,9 um. It has an effect on dentine and it is used instead of dental drill even if it doesn't substitute it completely.

Its main use is conservative care and allows to obtain particularly small cavities. It isn't transmitted by an optic fiber but by hollow tubes which are too expensive and fragile for a daily use. This allows to work even on tissues but it hasn't a sufficiently haemostatic action in comparison to Diode Laser. Its completely painless and can be used without anesthesia. In conservative care this laser is particularly suitable to prepare drills and occlusive surfaces. In oral surgery it is used in the treatment of hard tissues, in the surgery of sinuslift, in apicectomy and in the wisdom tooth extraction.

In the same family there is the **YSGG Erbiocromo (Er-Cr:YSGG)** with 2780 nm wave length , it has affinity with Hydrossiapatites and water and causes an explosion and the elimination of the carious tissue.

The Nd:Yag Laser called **YAG** with a 1064nm wave length has been until 1993 the best compromise capable to meet the requirements of odontoiatric activity. It is a fibred, haemostatic and pulsated (1500W) laser with crystal active matrix. It has accessible prices. This kind of laser is used successfully in surgery and endodontis for depth coagulation, thermic destruction of tumoral mass, vascular surgery, general surgery and ophthalmic surgery. Little surgical operations like frenulectomy and gingivectomy are realizable in very short time without anesthesia and suture with a really quicker recovery in comparison with traditional methods. The use of this kind of laser allows also the decontamination of infected channel in endodontis and decontamination of gingival pockets in parodonthology.

The Nd:YAP Laser called YAP with an 1,34μm emission. The necessity to have a YAG with features which could be well absorbed in the tissue water having so efficacy on soft tissues has led industries to develop a crystal (YAP) which has permitted to have a secondary Ray at 1,34 μm with a more than satisfying result.

The 1,34 μm YAP met perfectly the necessities of odonyoiatry and medicine. The crest power reached by YAP is 2600 W against 1500 W of YAG having so a better efficacy on soft tissues, the second generation of YAP lasers has allowed to create an automatic commutater of fibers to better the Endo/Paro specificity of the instrument.

Ktp laser emits a green light with a 532 nm.

	Wave-length	Therapeutic indications
LASER CO_2	9600-10600nm	SURGERY, PARODONTOLOGY, DENTIN HYPERSENSITIVITY
Nd:YAG LASER	1064nm	ENDODONTIC SURGERY, PARODONTOLOGY, DENTIN HYPERSENSITIVITY, BLEACHING
Er: YAG LASER	2940nm	CONSERVATIVE, ENDODONTIS, PARODONTOLOGY, SURGERY
Er: YSGG	2780nm	CONSERVATIVE, PARODONTOLOGY
DIODO LASER	830-980nm	ENDODONTIS,PARODONTOLOGY,SURGERY, BLEACHING
ARGON LASER	490- 520nm	CONSERVATIVE, RESIN POLYMERITATION

Fig. 1. Therapeutic indications of the lasers more used in odontoiatry.

wave-length that is well absorbed by haemoglobin and an impulse length variable between 1-50msec. The use of this laser with great spots allows to treat very well small and big face telangectasia without collateral effects and for this it is more accepted by the patients.Besides its fibre allows its use in the treatment of small skin lesions like: actinic Keratosis, seborrheic Keratosis, dermic nevus, verrucas and other superficial benign lesions.

ARGON Laser: has an emission frequency of 488-514nm absorbed by haemoglobin and melatonin. It is used for the polymerization of certain resins and photocoagulation.

Among the various applications of laser the one which in the last years has been considered of particular interest is the laser biostimulation (Low Level Laser Therapy).

Its action mechanism is of photochemical nature and offers also a wide range of applications: increase in blood vessels, stimulation of the bone reparation process, increase of osteoblastic activity, increase of osteoblastic differenzation increase of cells proliferation, facilitation of recovery process.

The main used lasers thank to which one obtains a biological effect are: Diodo laser used in a pulsed way and the Nd:Yag with 1,25W power used in a defocalized way.

The improvement of blood circulation obtained with the use of laser with the antibacterial action and the least invasivity let us hope in the use of laser for those treatment where it is necessary to obtain a biological stimulation.

CONCLUSIONS AND RESULTS

The various applications of laser in odontoiatry make it an indispensable instrument which betters not only the quality of the work but optimizes also the activity of the dentists. The advantages deriving from the use of laser are: quality of operation, a wide range of treatments, precision of the cutting line, a better recovery ,reduction of beeding, shorter operative times, more satisfaction of the patient, lack of pain, wound sterility, more haestetic cicatrizial process.

According to me dental laser can be considered a valid alternative to conventional surgical therapies offering many benefits with the least invasivity. In conclusion we can say that laser in odontoiatry is a versatile, painless, bactericidal and haemostatic instrument.

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