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RESEARCH ARTICLE

LASERS IN PROSTHODONTICS

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Abstract

Laser treatment in periodontal and oral surgery and in other disciplines in dentistry has replaced many traditional electrosurgical and scalpel procedures and is beginning to replace the dental handpiece. The successful construction of removable full and partial dentures mainly depends on the preoperative evaluation of the supporting hard and soft tissue structures and their proper preparation. Lasers may now be used to perform most preprosthetic surgeries. These procedures include hard and soft tissue tuberosity reduction, torus removal, treatment of unsuitable residual ridges including undercut and irregularly resorbed ridges, treatment of unsupported soft tissues, and other hard and soft tissue abnormalities. Stability, retention, function, and esthetics of removable prostheses may be enhanced by proper laser manipulation of the soft tissues and underlying osseous structure.

Introduction:-

The word Laser (Light amplification by stimulated emission of radiation) conjures in the mind's eye many aspects of what might be described as 'modern' life. The words 'powerful', 'precise' and 'innovative' complement our conception of the world in terms of technology, whereas patients often associate the words 'magical' and 'lightening quick' with the use of lasers in medical practice.[1]

Laser dentistry is the most exciting new frontier in dentistry today. Only 10 years ago procedures with a beam of light, which are routine today, would have been thought impossible. Safe, painless dentistry has long been the dream of dentists and patients, and in many clinical cases this is now being achieved by lasers. The advancement of laser dentistry has allowed us to fully serve our patients with their priorities each and every day. Lasers have virtually revolutionized many areas of dentistry, not only in making some procedures entirely or nearly pain free, but also in simplifying common procedure by reducing recovery time and time spent in the office. Procedures that may have been intolerable to some, previously, are now entirely reasonable.

The breakthroughs with lasers in patient care continue to be astounding. By using the least and minimally invasive procedures and procedures that are more effective, the benefit to our patients is huge. Less pain, less trauma, less time to heal. The clinician must be familiar with the fundamentals of laser physics and tissue interaction so that the proper laser device is used to obtain the treatment objective safely and effectively.

Compared with conventional techniques, laser treatment has many advantages.[2]

These advantages include[2]

1. Reduced overall treatment time due to less mechanical trauma and edema

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2. Decreased bacterial contamination of the surgical site
3. Reduced swelling, scarring, and wound contraction at the surgical site
4. Excellent hemostasis, leading to superior visualization of the surgical site

Lasers also may be used to treat the problems of hyperplastic tissue and nicotinic stomatitis under the palate of a full or partial denture and ease the discomfort of epuli, denture stomatitis, and other problems associated with long-term wear of ill-fitting dentures.

"A laser is a device that produces a very fine, intense beam of light that renders energy. When a laser comes in contact with tissue, it causes a reaction that can remove, vaporize or shape tissue, depending on what kind of laser being used. Because the laser beam is so narrow, it allows for a precision that is just not capable with other surgical tools."

Laser is a mechanism for emitting light within the electromagnetic radiation through a process called stimulated emission. The laser light emitted is usually spatially coherent, with the light emitted in a narrow low-divergence beam. This beam can be converted with optical lenses.

The common principle on which all laser work is the generation of monochromatic coherent and collimated radiation by suitable laser medium in an optical resonator. Most lasers are heat producing devices converting electromagnetic energy into thermal energy. New type of lasers have offered non thermal mode of tissue interaction.

The History And Development Of Laser Dentistry

Light has been used as a therapeutic agent for many centuries. It ranged from heliotherapy in Greece to the use of photo-chemotherapy in countries like India, Egypt and China. On the same lines, since the discovery of the "laser" in 1960s, the researchers began to study the feasibility of using different types of lasers for medicinal purposes. Significant research and advancements have taken place in the dental research for use of laser in the past 40 years. This chapter presents a brief historical overview of the range of experimental and clinical intraoral uses of lasers investigated over the years.

Laser wavelengths used in dentistry

A varied number of lasers are being put to use in dentistry today. On a broad basis they can be classified as follows:

Based on the type of laser medium used:
1. Gas
2. Solid
3. Liquid

Based on the type of delivery system:
1. Flexible hollow wave guide / articulating arms.
2. Glass fiber optic cable

Based on type of interaction with tissue:
1. Contact lasers
2. Non-contact lasers

Based on the type of application:

Soft tissue lasers: low power, about 1000mW

The three main types of soft tissue lasers are:
- Helium Neon (He-Ne)
- Gallium Arsenide (Ga-As)
- Gallium Aluminium Arsenide (Ga-Al-As)

Hard tissue lasers: high power, about 3 W or more

The three main types of hard lasers include:

Argon laser (Ar)

CO_2 laser

Nd: YAG laser

Current wavelengths in dentistry:
Numerous laser wavelengths are being used clinically in dental practices today. The specific parameters of how they are used depend on their individual tissue absorption characteristics, among other factors.

The soft-tissue surgical lasers are the most widespread. The Nd: YAG, CO_2 and diode lasers are the most prevalent, although the argon, Ho: YAG, Nd: YAP, Er: YAG and Er: YSGG are also used for these purposes.

The argon laser is used for composite polymerization and tooth whitening.

Caries removal, cavity preparation and enamel surface modification are the purview of Er: YAG and Er: YSGG lasers.

Diode lasers are used to perform pulpotomy as an adjunct to root canal treatment.

Experimental: Search for new wavelengths
Continued investigational use of lasers is a subject of research as follows:
1. Excimer laser for caries removal, enamel and dentin ablation, bone ablation and endodontics.
2. Argon, Nd: YAG, Ho: YAG and CO_2 lasers for desensitization of hypersensitive dentin.
3. Pulsed Nd: YAG for analgesia, tooth whitening and endodontics.
4. Nd: YAP laser for caries ablation and endodontics.
5. Ho: YAG for bone ablation and cartilage reshaping.
6. Low-level diode and helium neon lasers for biostimulation.
7. Erbium lasers for bone ablation.
8. CO_2, argon and Nd: YAG lasers for rendering enamel less susceptible to decay.

In short, since the invention of lasers in 1960, above 5000 citations of research over uses of various wavelengths of lasers have appeared in dental literature. This speaks volumes of dental research over the past 40 years in developing basic workable parameters as well as in investigating the numerous applications of laser in intra oral soft tissue surgery, hard tissue applications, dental materials, endodontics, and other uses.

Laser physics –mechanism of various lasers
Lasers are unique and versatile instrument that are being applied to myriad aspects of dentistry today. But a laser is more than a fancy scalpel. Very precise control of laser output allows the tuning of the space, time and wavelength to optimize the outcomes of specific clinical procedures.

Therefore, if one is to learn how to apply laser energy to obtain a desirable clinical effect, then one must understand the fundamentals of laser physics.

The word laser is an acronym for “Light Amplification by Stimulated Emission of Radiation”.

A brief description of each of these words offers an understanding of the basic principles of how a laser operates.

Light is a form of electromagnetic energy that travels in waves, at a constant velocity.

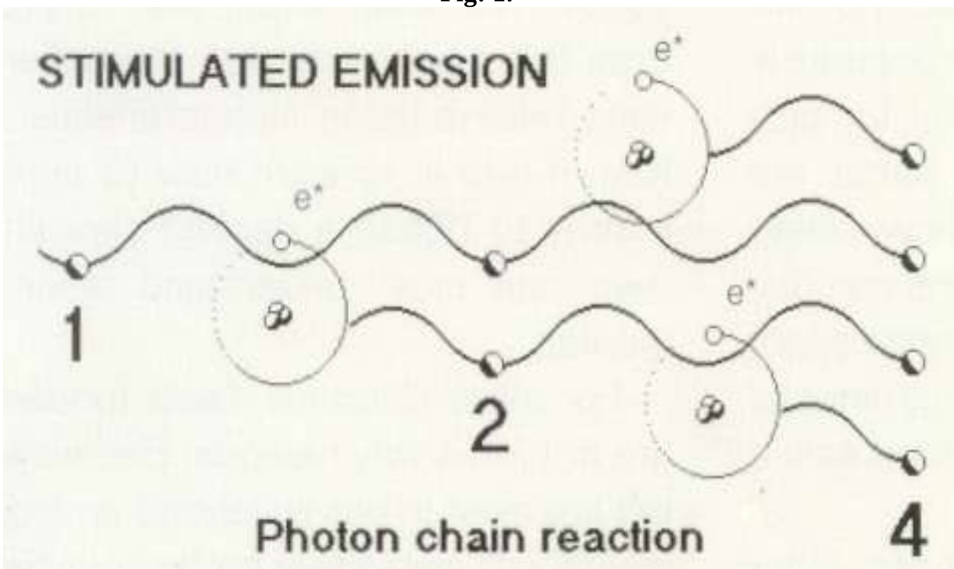
The basic unit of this radiant energy is called a photon, or a particle of light.

A quantum of light can be depicted as an electromagnetic wave with an electric field oscillating up and down in the plane of the page, there is also a magnetic field associated with the photon that moves in and out of the page.

Three measurements that can define the wave of photons produced by a laser:
1. velocity
2. Amplitude
3. Wavelength

Stimulated Emission:(Fig: 1)
The term "stimulated emission" has its basis in the quantum theory of physics, introduced in 1900 by the German physicist Max Planck and further conceptualized as relating to atomic architecture by Niels Bohr.

Fig: 1:-



Albert Einstein theorized that an additional quantum of energy traveling in the field of the excited atom that has the same excitation energy level would result in a release of two quanta, a phenomenon he termed stimulated emission.

This process would occur just before the atom could undergo spontaneous emission.

The energy is emitted as two identical photons, traveling as a coherent wave.

In stimulated emission, atoms in an upper energy level can be triggered or stimulated in phase by an incoming photon of a specific energy.

The incident photon must have an energy corresponding to the energy difference between the upper and lower states.

The incident photon is not absorbed by the atom. It actually vibrates the pair of energy levels with whom its energy coincides. The atom de-excites with the consequent release of photons of the same energy as the incident photon.

The stimulated photons have unique properties:
1. The emitted photon is in phase with the incident photon
2. The emitted photon has the same wavelength as the incident photon
3. The emitted photon travels in same direction as incident photon

As the likelihood of spontaneous emission decreases the conditions that favor stimulated emission are enhanced. If an atom is excited into a metastable state it can stay there long enough for a photon of the correct frequency to arrive. This will stimulate the emission of a second photon resulting in one photon in and two out. Hence there is addition of photons to the incoming beam by promoting stimulated emission at the expense of spontaneous emission. This is **amplification** of light!

The emitted photons all possess the same wavelength and vibrate in phase with the incident photons.

Properties of laser light:
1. **Monochromaticity** Laser light is one specific colour; in dental application the colour may be visible or invisible.

2. **Coherency** The light waves produced in the instrument are all the same. All the emitted photons bear a constant phase relationship with each other in both time and phase. Waves are identical in shape; that is all the peaks and valleys are equivalent.

Collimation (Fig: 2)
Refers to the beam having specific spatial boundaries, which ensures that there is constant size and shape of the beam emitted from the laser cavity.

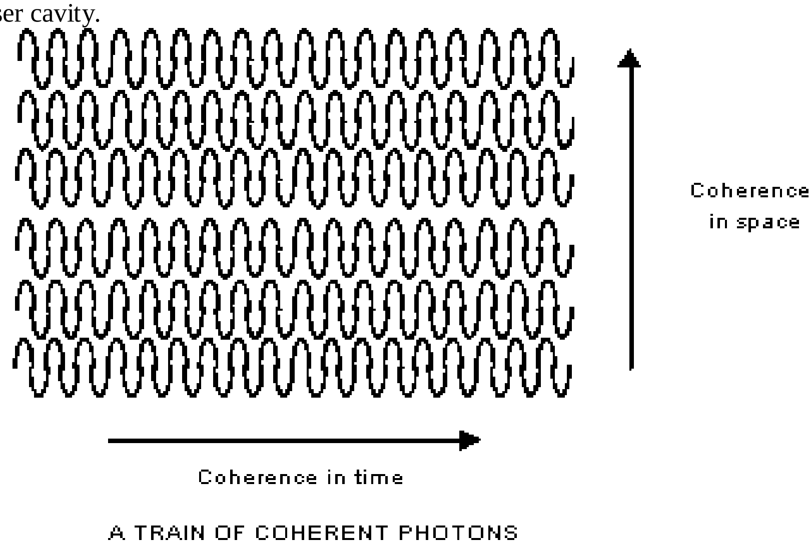


Fig. 2:-

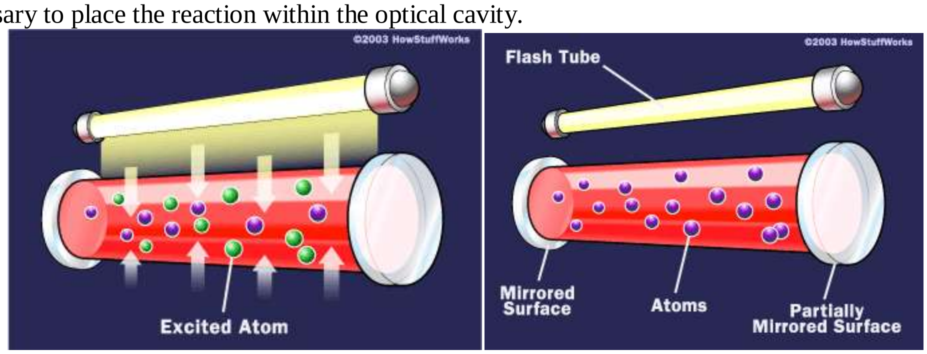
High irradiance
Because all the light is concentrated into a narrow spatial band light possesses high radiantpower per unit area (i.e. high irradiance)

Laser Components:
The basic components of a laser includes:

1. **Optical cavity:**
   - Lasing medium
   - Parallel mirrors
2. **Pump energy source**
3. **Cooling system**

Optical cavity: (Fig: 3)
Consists of two parallel mirrors placed on either side of the laser medium. The mirrors collimate the light, that is, photons exactly perpendicular to the mirrors re-enter the active medium, while those off axis leave the lasing process.

To contain and amplify the photon chain reaction that results from stimulated emission in a population of excited atoms it is necessary to place the reaction within the optical cavity.



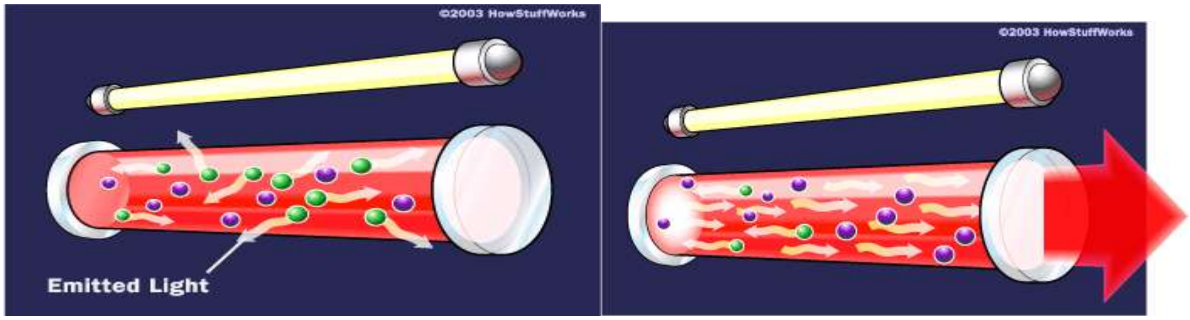


Fig 3:-

Lasing medium:
Contains homogenous population of atoms or molecules that are pumped up to the excited state and are stimulated to laser. The exact species of atom or molecule determines the wavelength of output beam. The active medium is suspended in the optical cavity as a gas, a liquid or distributed in solid state. (e.g; a crystal). The laser is named for the components of the active medium and their state of suspension.
E.g.: $co_{2\ gas}$ laser

Mirrors:
On either side of the lasing medium there are two parallel mirrors. In this configuration, photons bounce off the mirrors and re-enters the medium to stimulate the release of more photons. The mirrors collimate the light that is photons exactly perpendicular to the mirrors re-enter the active medium, while those off axis leave the lasing process.

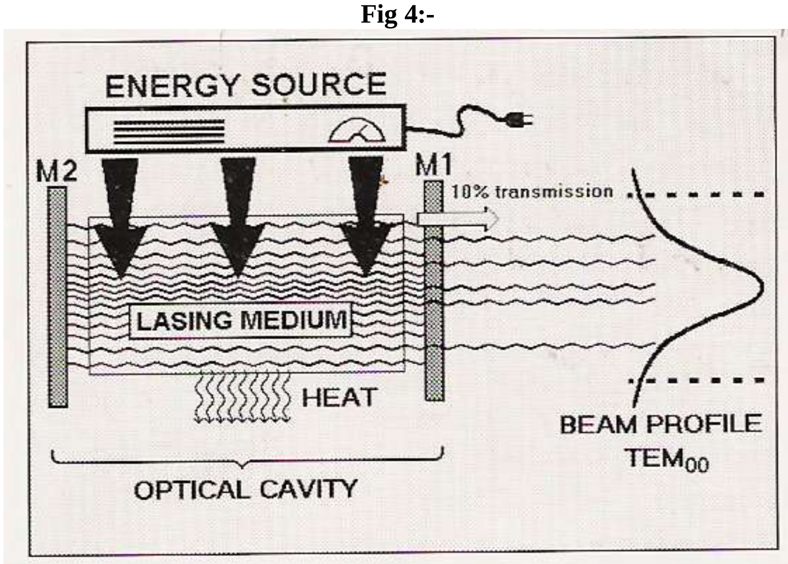
If one mirror is totally reflective (m2) and other mirror partially transmissive (m1), the light that escapes through (m1) becomes the laser beam. (Fig: 4)

Pump energy source:
Some form of energy is provided to continuously pump atoms up the excited state and maintain the population inversion and high intensity light circulation. This is provided by the pump energy source.

Cooling system
During the process of lasing some energy is converted into heat, it is necessary to provide some form of cooling.

Thus, stimulated emission within a optical cavity generates a collimated, coherent, and monochromatic beam of light.

Fig 4:-



Classification
1. Laser classification according to the potential hazards
2. Laser Classification according to the tissue penetration
3. Laser Classification according to the Lasing Medium

Laser Classification According To The Potential Hazards[26]
Laser classifications are based chiefly on the potential of the primary laser beam or the reflected beam to cause biologic damage to the eyes or skin. The ANSI Standard Z136.1–2000 documents the set standards for classification in the United States. OSHA and the American Conference of Governmental Industrial Hygienists also use this standard as a source. There are four general classes of lasers; the higher the classification number, the greater the potential hazard. The classes are differentiated by a combination of the output power of continuous emission lasers or energy per pulse for pulsed lasers and the amount of time that the beam is viewed.

Class I
Lasers in this category working under normal operating conditions do not pose a health hazard. These devices usually are totally enclosed, and the beam does not exit the housing. A CD player would be an example. The output power of a class I laser is measured in tenths of milliwatts.

Class II
Lasers in this category emit only visible light with low power output and do not normally pose a hazard because of the normal human blinking and aversion reactions. A supermarket bar code scanner, and some small laser pointers demonstrate this class. The maximum allowable output power of these devices is 1 mW. There are two subclasses: class IIa is hazardous when directly viewed for longer than 1000 seconds; class IIb has a dangerous viewing time of one fourth of a second, which is the length of time of an ordinary blinking reflex.

Class IIIa
Lasers in this category can emit any wavelength and have output power less than 0.5 W of visible light, or approximately 0.1 to 0.2 W in the other portions of the electromagnetic spectrum. In this class, when the laser light is viewed only momentarily (within the aversion response period or blinking reflex—one-fourth of a second), it will not harm the unprotected eye. These lasers have a caution label on them.

Class IIIb
These lasers can produce a hazard to the unprotected eye if viewed directly or viewed from reflective light for any duration. The output power can be no greater than 0.5 W of any electromagnetic radiation. Class IIIb lasers will not cause reflective hazards when using matted (not shiny) surfaces and do not normally produce fire hazards. An argon curing laser, only if set at less than 0.5 W, would exemplify this type of device. Low-level therapeutic lasers would be class IIIa or class IIIb, depending on the emission wavelength and the duration of exposure. Because these lasers usually have dental treatment time measured in minutes, eye protection must be used.

Class IV
This category of lasers is hazardous from direct viewing and may produce hazardous diffuse reflections. Any output power greater than 0.5 Wmeasured in either continuous wave or pulsed emission constitutes a class IV laser. These devices also produce fire and skin hazards. The lasers presently used in dentistry are class IIIb or class IV; therefore, they present the possibility of serious eye and skin damage. Class IV lasers also may ignite flammable objects (such as alcohol-moistened gauze) and may create hazardous airborne contaminants. It must be emphasized that the human blinking and aversion reflexes will not serve as eye protection when using dental laser instruments. Therefore, the appropriate laser safety glasses for the wavelength used must be worn while the laser is on.. Clearly, other factors such as the conditions under which a laser is used, the level of safety training of individuals using the lasers, and other environmental factors are important in determining the required safety control measures.

Laser Classification According To The Tissue Penetration

Soft Tissue Lasers
- Co2 lasers
- Diode lasers
- Neodymium laser

Hard Tissue Lasers
* Erbium Lasers

Classification According To The Lasing Medium[27]

Laser Type		Wavelength	Colour
Eximer lasers	Argon fluoride	193 mm	Ultraviolet
	Xenon Chloride	308 mm	Ultraviolet
Gas Lasers	Argon	488 nm	Blue
		514 mm	Blue-Green
	Helium Neon	637 nm	Red
	Carbon dioxide	20600nm	Infrared
Diode Lasers	InGaAsP	655 nm	Red
	GaAlAs	670-830 nm	Red Infrared
	GaAs	840 nm	Infrared
	InGaAs	980 nm	Infrared
Solid State Lasers	Frequency doubled Alexandrite	337 nm	Ultraviolet
	Potassium Titanyl Phosphate	532 nm	Green
	Neodymium:YAG	1064 nm	Infrared
	Holomium:YAG	2100 nm	Infrared
	Erbium,Chromium:YSGG	2780 nm	Infrared
	Erbium: YSGG	2790 nm	Infrared
	Erbium: YAG	2940 nm	Infrared

Advantages of Laser over the Other Techniques:

I. It is painless, bloodless that results in clean surgical field, and fine incision with precision is possible.
II. There is no need for anesthesia if at all anesthesia has to be administered, then it needs to be used minimally only.
III. The risk of infection is reduced as a more sterilized environment is created as the laser kills bacteria.
IV. No postoperative discomfort, minimal pain and swelling, generally doesn't require medication.
V. Superior and faster healing, offers better patient compliance

Disadvantages of Lasers:

I. Lasers cannot be used to remove defective crowns or silver fillings, or to prepare teeth for bridges.
II. Lasers can't be used on teeth with filling already in place.
III. Lasers don't completely eliminate the need for anesthesia.
IV. Lasers treatment is more expensive as the cost of the laser equipment itself is much higher

Laser-Tissue Interaction

Laser light can have four different interactions with the target tissue, depending on the optical properties of that tissue. Dental structures have complex composition, and these four phenomena occur together in some degree relative to each other.

The first and most desired interaction is the absorption of the laser energy by the intended tissue. The amount of energy that is absorbed by the tissue depends on the tissue characteristics, such as pigmentation and water content, and on the laser wavelength and emission mode. Tissue compounds called chormophores preferentially absorb certain wavelengths (fig. 5). Hemoglobin, the molecule that transports oxygen to tissue, reflects red wavelengths, imparting color to arterial blood. It therefore is strongly absorbed by blue and green wavelengths. Venous blood, containing less oxygen, absorbs more red light and appears darker. The pigment melanin, which imparts color to skin, is strongly absorbed by short wavelengths. Water, the universally present molecule, has varying degrees of absorption by different wavelengths.

Dental structures have different amounts of water content by weight. A ranking from lowest to highest would show enamel (with 2% to 3%), dentin, bone, calculus, caries, and soft tissue (at about 70%). Hydroxyapatite is the chief crystalline component of dental hard tissues and has a wide range of absorption depending on the wavelength.

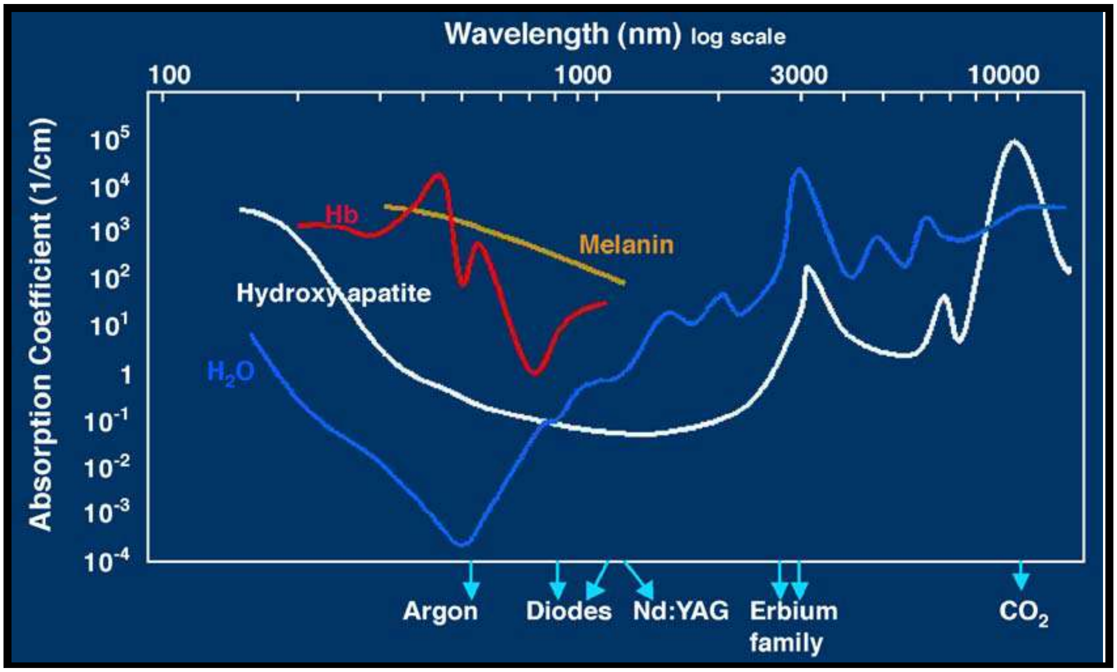
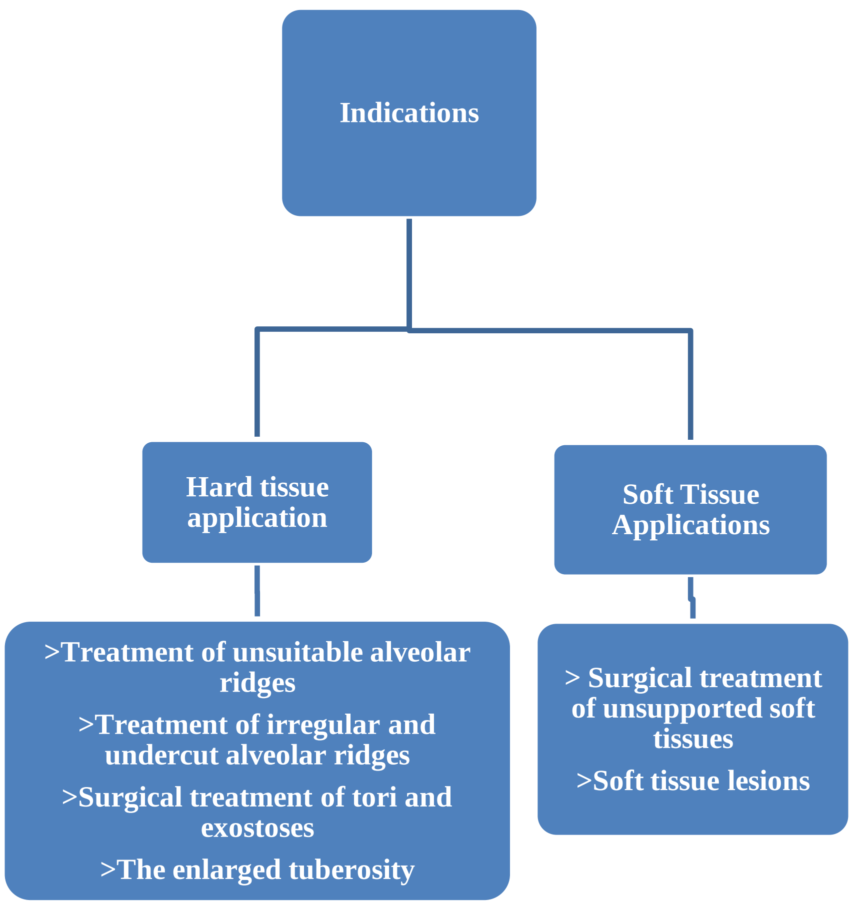


Figure 5:- Approximate absorption curves of different dental compounds by various wavelength of dental lasers.



Hard Tissue Application

Treatment Of Unsuitable Alveolar Ridges

Alveolar resorption usually is uniform in vertical and lateral dimensions. On occasion, irregular or excessive resorption occurs in one of the dimensions, producing an unsuitable ridge. As the available denture-bearing area is reduced, the load on the remaining tissue increases, which leads to an ill-fitting prosthesis, with discomfort that is not alleviated by soft linings.

Conventional surgical techniques include the use of scalpels to incise the soft tissue to obtain access to the underlying structures. Ronguers, bone files, and round burs in high-speed handpieces have been the treatment of choice to remove sharp bony projections and to smooth the residual ridge. Today, soft tissue laser surgery to expose the bone may be performed with any number of soft tissue wavelengths (CO2, diode, Nd:YAG). Hard tissue surgery may be performed with the erbium family of wavelengths.[30]

Treatment Of Irregular And Undercut Alveolar Ridges

There are many causes of irregularly shaped alveolar ridges. Two of the most common causes are dilated tooth sockets that result from insufficient compression of the alveolar plates after an extraction and nonreplacement of a fractured alveolar plate. Naturally occurring undercuts such as those found in the lower anterior alveolus or where a prominent premaxilla is present may be the cause of soft tissue trauma, ulceration, and pain when a prosthesis is placed on such a ridge. Soft tissue surgery may be performed with any of the soft tissue lasers. Osseous surgery may be performed with the erbium family of lasers.[30]

Surgical Treatment Of Unsupported Soft Tissues

Unsupported soft tissue frequently is found in the anterior maxilla opposite mandibular anterior teeth with an edentulous posterior mandible. During mastication, the upper denture oscillates, causing disproportionateresorption in the maxilla. The soft tissues are compressed, thus causing thedenture to become increasingly unstable. Pain is not felt until the anterior nasal spine is nearly exposed and subject to trauma from the denture base. Unsupported maxillary alveolar soft tissues are bulkier than those in the lower jaw that tend to prolapse in the lingual direction. Traditional surgery consists of removing wedges of soft tissue from the alveolar crest until the wound edges are closed easily. Any of the soft tissue lasers are able to perform this procedure.[30]

The Enlarged Tuberosity

Invasion of the intraalveolar space in the tuberosity area may prevent the posterior extension of the upper and lower dentures, thereby reducing their efficiency for mastication and their stability. Although enlarged tuberosities sometimes result from alveolar hyperplasia accompanying the overeruption of unopposed maxillary molar teeth, the most common reason for enlarged tuberosities usually is soft tissue hyperplasia. The bulk of the hyperplastic tuberosity may lie toward the palate. If undercuts are present, then osseous reduction may be required. Surplus soft tissue should be excised, allowing room for the denture bases. The soft tissue reduction may be performed with any of the soft tissue lasers. An erbium laser is the laser of choice for the osseous reduction.[30]

Surgical Treatment Of Tori And Exostoses

Prosthetic problems may arise if maxillary tori or exostoses are large or irregular in shape or the mucosal covering becomes ulcerated. These bony protuberances also may interfere with lingual bars or flanges of mandibular prostheses. Tori and exostoses are formed mainly of compact bone and, usually, it is a simple matter to cut them off the underlying alveolar bone.

Soft tissue lasers may be used to expose the exostoses, and erbium lasers may be used for the osseous reduction. A smooth, rounded, midline torus normally does not create a prosthetic problem because the palatal acrylic may be relieved or cut away to avoid the torus.[30]

The Use Of Lasers In Fixed Prosthodontics

Treatment Planning Considerations

The use of lasers in dental treatment often is adjunctive to the fabrication of fixed prosthodontics and, among many patients, this may be their first experience of such devices. Although an explanation of the use and benefits of laser treatment often enhances the patient's appreciation of the standard of care being delivered, care needs to be exercised so as to not engender expectations that are difficult to meet. Certainly, anything that expedites or controls the management of the case only can add to the patient–dentist relationship.[31]

Equally, for the dentist, it should not be forgotten that soft tissue manipulation always involves a period of healing; the precision and coagulative benefits of lasers often can allow restorative treatment phases to proceed with greater confidence, but the ability of tissue to respond to any form of surgery always must be treated with respect.

A thorough grounding of knowledge of the laser wavelength in its interaction with target tissue always must take precedence in the delivery of care to the patient. One of the essential elements of success in fixed prosthodontics is the care and accuracy of the component treatment stages, and the laser often can confer minimal collateral tissue damage through proper consideration of the use of minimal laser energy of the correct wavelength.

The final aspect of treatment planning is to guard against any claim or expectation that is unachievable. For example, employing a near-infrared wavelength laser such as a diode or Nd:YAG laser to perform a frenectomy with very fibrous target tissue might require so much incident energy that the risk of periosteum or bone damage is high. In such a case, it may be prudent to use a scalpel to sever the fibrous band first and then complete the procedure with a laser.[31]

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Gingival Management

Normal gingival tissue is moderately pigmented and predominately composed of collagenous tissue, with minor blood vessels. Inflamed gingival tissue demonstrates some disorganization of collagen structure, the bulk being representative of increased blood supply and intracellular watersuspended proteins. As such, both tissues respond well to most laser wavelengths; however, care should be exercised to establish the risk of unwanted damage to underlying structures. Gingival management is employed to remove excess or intrusive tissue relative to restorative margins, to enhance the aesthetics of a pontic space, or to establish increased clinical crown length electively.[31]

Indications:

1. Crown lengthening and upper labial frenectomy.
2. Elective procedure to establish greater clinical crown length before crown placement.
3. Elective procedure to establish greater clinical crown length before bridge placement.
4. Removal of gingival overgrowth before recementation of bridge.
5. Soft tissue management adjunctive to crown placement.
6. The use of a quartz fiber delivery laser wavelength as adjunctive to gingival cuff retraction during impression taking.
7. The use of an Nd:YAG laser in defining the emergence profile of abutment and pontic space in a combined natural tooth/implant–supported fixed prosthesis.

Removal Of Gingival Overgrowth Before Recementation Of Bridge

Following infiltration local anesthesia (2% lidocaine, 1:80,000 epinephrine), the excess soft tissue was excised (Fig: 6 and 7). The presence of coagulated blood products is transitory during temporary fixation of the bridge and is witnessed in the excellent tissue response at 1 week.

Preoperative radiographs and visual assessment are crucial to allow correct appraisal of the condition. Given that the gingival overgrowth was due, in large part, to the nature of the tooth fracture and the time interval, it was considered appropriate to remove the excess tissue with the laser, to reassess the accuracy of fit, and to recement the bridge with temporary cement to allow postsurgical soft tissue healing.

At 1 week, the healing of the tissue site was sufficient to allow accurate and correct placement of the abutment, and the bridge was fixed in place (Fig: 8 and 9). The lost filling was restored at the same visit. Adequate reappraisal of the prosthetic stability is necessary to safeguard against further breakdown.

Fig. 6:- Pre Operative view.

Fig. 7:- Lasers in use.

Fig. 8:- Post Operative View.

Fig. 9:- Bridge Cemented.

The Use Of A Quartz Fiber Delivery Laser Wavelength As Adjunctive To Gingival Cuff Retraction During Impression Taking

Contemporary use of retraction cords in the determination of finishing margins of crown preparations, although time-consuming, often is associated with inappropriate amount of force, resulting in crevicular bleeding and shrinkage of marginal tissue.

The 320-lm fiber and especially the 200-lm fiber used in the diode and the Nd:YAG wavelengths allows the delivery of subablative power levels to open the gingival crevice (100 mJ/10 pulses per second) and power levels to coagulate bleeding points (150 mJ/10–20 pulses per second) (Fig: 11). Often, the use of these power levels can be accomplished without additional anesthesia or with the use of topical gel (20% benzocaine). At this time, the impression can be taken to record sufficient marginal detail for the technician to establish correct finishing line for each crown. (Fig: 12)

Fig.10:- Preoperative view.

Fig. 11:- Laser gingival retraction.

Fig 12:- Post Operative view.

Lasers In Dental Implantology

Indication

1. Laser technology in implant dentistry
2. Significance, in the short- and long-term, of laser use in implantology
3. The potential benefits of using lasers to repair ailing implants
4. Impact can laser use have on the prostheses that are manufactured forimplant restorations
5. Laser use in peri-implantitis
6. Surface decontamination using laser applications

Surgical lasers can be used in a variety of ways with regard to implantology, ranging from placement, second stage recovery and gingival management, through to the treatment of peri implantitis. Within this range of usage, dependant on wavelength employed, exists the ablation of target tissue and the ability to reduce bacterial contamination. Whilst there is a general acceptance that lasers are capable of accurate cutting of materials and tissue, there is no evidence-based advocacy as to the use of any laser wavelength in producing a fully-prepared osteotomy site for the placement of root-form dental implants.

However, there are anecdotal reports of the use of erbium YAG and erbium YSGG lasers to establish a controlled incision of overlying gingival tissue and to initiate a breach of the cortical bone plate, prior to the use of conventional implant drills. Such techniques, although intrinsically correctly based on predictable laser-tissue interaction, run the risk of scepticism amongst practitioners more allied to a conventional surgical approach to implant placement

Significance, In The Short- And Long-Term, Of Laser Use In Implantology

One of the main reasons dentists cite for using lasers during implant recovery is that there is less postoperative pain, less bleeding, and faster healing; however, there also is the potential for obliteration of theattached gingiva if this technology is overused. It is important to maintainand preserve attached gingiva around implants whenever possible. This practice is especially true in the partially edentulous patient where the same bacteria reside in the implant sulcus as in the sulci of the natural teeth. The flora are different in the fully edentulous patients in whom no sulci exist except for those around the implants.

Although there is a hemidesmosomal attachment around the implant abutment to create a biologic seal, attached gingiva serves as a barrier to exposure of the implant body due to recession over time, just as around natural teeth. If the attached gingiva is violated during the second-stage procedure, then a graft or a soft tissue repositioning procedure may be needed to restore keratinized tissue around the implant abutment. [34]

Laser Safety in Dental Practice

Laser Hazard Classification According to ANSI and OHSA Standards

Class	**Description**
I	Low-powered lasers that are safe to view
IIa	Low-powered visible lasers that are hazardous only when viewed directly for longer than 1,000 sec
II	Low-powered visible lasers that are hazardous when viewed for longer than 0.25 sec
IIIa	Medium-powered lasers or systems that are normally not hazardous if viewed for less than 0.25 sec without magnifying optics
IIIb	Medium-powered lasers (0.5 W maximum) that can be hazardous if viewed directly
IV	High-powered lasers (> 0.5 W) that produce ocular, skin, and fire hazards

Conclusion:-

The dental community wants to find a method to remove infected dental hard tissues that is less noxious than today's rotary hand pieces. Much interest has been aroused in lasers as replacements.

Although there has been research done in laser dentistry since the development of the ruby laser in the early 1960s, only recently has clinical use grown. But with this growth, there hasn't been an equal flurry of research to substantiate the claim that the laser is a more efficient and better method of treatment for dental disease.

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