

Point of Care

The Point of Care section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's responses were provided by speakers at the Academy of Laser Dentistry's 12th Annual Conference and Exhibition, to be held April 6–9, 2005, in New Orleans, Louisiana.



Question 1 Is there a role for lasers in the treatment of peri-implantitis?

Background to the Problem

Peri-implantitis is a condition associated with progressive peri-implant bone loss. Bacteria may penetrate the peri-implant tissues, and if the infection is left untreated, advanced bone loss may lead to implant failure. Many treatment methods have been recommended for peri-implant bony lesions, but solid evidence for successful management is scant: only 2 clinical studies on the surgical treatment of peri-implant bony defects involving larger groups of patients have been published.

The early stages of mucositis as well as peri-implantitis can be treated with different antimicrobial agents (e.g., chlorhexidine digluconate, citric acid). In more advanced alveolar defects surgical treatment is also required. Adequate removal of bacteria from the implant surfaces is a prerequisite for new bone formation. Successful decontamination of implant surfaces by chemical or mechanical means (or both) enables some peri-implant bone regeneration to occur.

Evidence of the therapeutic effects of the local application of tetracycline fibres around failing implants is inconclusive. Systemic administration of antibiotics may not be desirable or effective because of pharmacologic limitations (i.e., bacteria resistance, ineffective dosage, etc.). The use of curettes and ultrasonic instruments for decontamination has been criticized because they cause damage to the implant surface. As for air-powder abrasive instruments, they should be used with extreme caution because patients face an increased risk of emphysema, especially when the instruments are used in the decontamination of deep alveolar bony defects. This treatment method may also damage the surface of hydroxyapatite-coated implants.

In recent years, lasers have been used to decontaminate implant surfaces. The essential points concerning the effectiveness and safety of different lasers used for this treatment are briefly outlined below.

Surface Decontamination Using Laser Applications

Soft and hard lasers can be used to decontaminate implant surfaces.

Soft lasers: Significant antimicrobial effects have been demonstrated when peri-implant pockets are irrigated with toluidine blue followed by irradiation with a diode soft laser (905 nm for one minute). The toluidine blue sensitizes the bacterial cell membrane to laser light.

Hard lasers: The application of the contact Nd:YAG (neodymium:yttrium aluminium garnet) laser leads to



Figure 1: Deep infrabony peri-implant defect.



Figure 2: Decontamination of the implant surface using the defocused beam of the CO₂ laser.



Figure 3: Augmentation of the lesion with bone grafting material Bio-Oss (Osteohealth Co., Shirley, NY).

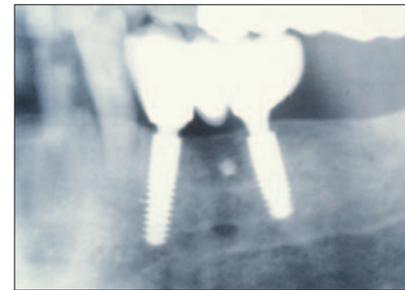


Figure 4: Radiological examination 3 years after surgery shows complete new bone fill in the treated peri-implant lesion.

adequate decontamination of the implant but may cause significant melting and crater-like formation of the implant surface. A significant temperature increase at the implant surface during Nd:YAG laser irradiation has been reported. Therefore, the application of the contact Nd:YAG laser for peri-implant surgery is contraindicated.

The CO₂ laser may be useful in the treatment of peri-implant lesions because of its bactericidal effect. With the CO₂ laser, there is no significant increase in the surface temperature of the implant or any alteration to the implant surface pattern (as viewed using scanning electron microscopy). Access flap surgery and final implant surface laser irradiation should be used for implant decontamination immediately before bone augmentation procedures (Figs. 1–4).

Diode lasers (980 nm) do not damage titanium surfaces even when they are used in high-power settings at the level of the hard lasers. They can be used for the removal of peri-implant gingival overgrowths and to decontaminate implant surfaces before bony augmentations. The advantage of this type of laser is that it comes in small, reliable delivery units. The use of diode lasers with 810 nm wavelength and at a high-power setting may damage the implant surface, and for this reason such a laser must be used with special care to successfully treat peri-implantitis.

A bactericidal effect has been observed with the erbium:YAG laser, but some authors have reported damage to the implant surface after irradiation. Some negative effects on implant surfaces have also been reported after frequency-doubled Alexandrite-laser irradiation.

In conclusion, lasers play a valuable role in implant surface decontamination, a necessary step in the treatment of peri-implantitis. Knowledge of laser–tissue interaction is important to prevent complications. ♦



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Dr. Romanos will be presenting 2 sessions at the ALD conference: "Laser Oral Surgery for General Practitioners" (April 8) and "Lasers in Modern Implant Dentistry" (April 8).

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Question 2

What are the advantages of laser soft-tissue surgery?

Background to the Problem

In addition to being a component of periodontal treatment regimens, soft-tissue surgery can also include separation of an overpowering labial frenum, excision of an irritation fibroma caused by an ill-fitting denture, uncovering of an impacted canine or management of herpes labialis. The most common soft-tissue procedure is the exposure of gingival margins during either placement of Class V fillings or preparation of crowns. The extent of the surgical site and the location of the target tissues may be different, but the clinical consequences remain the same. Before any incision of the well-vascularized soft tissues, the primary concern is always hemostasis. Moreover, the healing reactions of various soft-tissue wounds are complicated by the presence of countless microorganisms in a warm, moist medium, the saliva. For these reasons,

hemostatic agents such as sutures and medications such as antibiotics and analgesics are commonly needed.

Solution

Compared with conventional blade surgery, laser soft-tissue surgery (LSTS) is more precise for the removal of target tissues, causing very little collateral damage to the surrounding nontarget tissues. The procedure leaves a well-defined, confined wound with all the related advantages: much better hemostasis during and after surgery and much less chance of postoperative pain, swelling and infection. Subsequent healing is usually uneventful, scarring is minimal to nonexistent, and there is usually little or no need for antibiotics or analgesic. Furthermore, the possibility of bacteremia is diminished because of the reduction in local bacteria and blood vessel coagulation.^{1,2}



Figure 1a: Short frenum before laser treatment.



Figure 1b: Separated frenum immediately following laser surgery.



Figure 1c: Photo at one-year recall. Follow-up care was uneventful.



Figure 2a: Lump of tissue inside cheek before laser treatment.



Figure 2b: View of inside cheek immediately after laser excision.



Figure 2c: At the 5-day recall, there is no bleeding, pain or swelling.

The case of a 23-year-old woman with an underdeveloped lingual frenum (Fig. 1a) illustrates the precise nature of LSTS. Not only was the patient unable to chew properly, but the short frenum was directly interfering with her speech. The only reason for years of procrastination was her fear of the recommended hospital stay. A diode laser (SmilePro 980, Biolitec, Inc., East Longmeadow, Mass.) with an output of 980 nm infrared laser energy was used. Only the lingual frenum was separated; the surrounding tissues were left untouched. Complete hemostasis was achieved during and after the procedure, and no sutures were required. The patient was pleasantly surprised at the simplicity of the procedure and was amazed at the immediate result (Fig. 1b). Follow-up care was equally uneventful: there were no reports of bleeding, discomfort, swelling, scarring or relapse, and no medication was required (Fig. 1c).

In another case, a 53-year-old woman presented for removal of a nagging lump of tissue on her cheek (Fig. 2a). Because of the proximity of the lump to the oropharyngeal opening, postoperative swelling was a significant concern. Given the fibrous nature of this irritation fibroma, a DELight Er:YAG laser (Hoya ConBio Medical and Dental Lasers, Fremont, Calif.) with an output of 2940 nm was used. The nodule was removed with minimal to no bleeding (Fig. 2b). There were no reports of postoperative bleeding or pain, and, most important of all, there was no swelling (Fig. 2c). The specimen was sent for biopsy, and the diagnosis was confirmed. (Despite the clinical advantages, laser surgery is not encouraged where malignancy is

suspected. The possibility of further spreading or stimulating the malignancy is presently not well understood.)

The more conservative laser treatment allowed both patients to be treated in a dental clinic instead of a hospital. The laser ablation and coagulation were limited to the epithelial and the immediate submucosal area by the use of water as the major coolant. The end result is a clean and precise surgical wound. The time required for the laser surgery and postoperative care was a fraction of the time that would have been required for conventional procedures, and both patients were able to resume their normal activities immediately, without any discomfort or bleeding. ♦



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The author has no declared financial interests in any company manufacturing the types of products mentioned in this article.

Dr. Yung's session at the ALD conference, titled "The Use of Water as Coolant in Er:YAG Laser Soft-Tissue Surgery," will be held on April 8.

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Question 3 What are the advantages of laser frenectomy in children?

Background to the Problem

Recently I suggested to a parent that her 3-year-old child would benefit from revision of the lingual frenum. The mother's first response was, "Why was this not suggested by my child's physician?" When I asked the mother if she had tried breast-feeding the infant, she replied that she had tried, but the child had not been able to nurse adequately and the mother had suffered quite a bit of discomfort. After a few weeks, she had reluctantly given up and had started the infant on bottle-feeding.

Among the pediatricians with whom I have discussed this scenario, many have felt that anatomic abnormalities of the frenum do not contribute to any significant problems and that revision of the tongue is unnecessary. Indeed, some have even suggested that the frenum stretches and the problem resolves itself.

Ankyloglossia or tongue-tie is an anatomic abnormality in which the insertion of the frenum, the tissue holding the tongue to the floor of the mouth, attaches so closely to the tip of the tongue that it restricts the tongue's functional movements (Fig. 1). Left untreated, it may contribute to a variety of problems in infants, such as inability to latch on to the mother's nipple. This may result in the infant being unable to gain weight or to sleep for periods of longer than 1 to 2 hours.^{1,2} The child's ineffective sucking may cause

soreness and mastitis in the mother, which may eventually force her to give up breast-feeding. In older infants, ankyloglossia can cause gagging and difficulty eating because the restriction of tongue movement means that the tongue is unable to clear food from the roof of the mouth.

If ankyloglossia is not treated in infancy (Fig. 2), the restriction of tongue movement in older children and adolescents may contribute to malocclusion, caries and speech disorders.

Recently, the American Academy of Pediatrics concluded that tongue-tie is a significant clinical entity and should be treated as early as possible to minimize breast-feeding problems.³

Treatment of the Problem in Infants

Initial examination of the frenum should be performed when the infant is only a few days old. After the birth, a physician or nurse lactation consultant should examine the tongue for mobility. A grooved tongue director (available through Miltex, York, Penn.) (Fig. 3) allows excellent viewing of the frenum area, without the examiner having to place his or her fingers into the oral cavity. If ankyloglossia is diagnosed, laser treatment can be performed to correct the frenum.

The following procedure⁴⁻⁶ can be completed in a few minutes in the dental office. The infant is swaddled in a



Figure 1: Newborn with complete ankyloglossia.



Figure 2: Untreated ankyloglossia in an infant.



Figure 3: Grooved tongue director.



Figure 4: The infant is swaddled in a blanket in preparation for the frenectomy.



Figure 5: Laser glasses protect the infant during the procedure.



Figure 6: Lasing of frenum (DELIGHT Er:YAG laser, Hoya ConBio Medical and Dental Lasers, Fremont, Calif.).

blanket to restrain movement and laser glasses are used to protect the infant's eyes (Figs. 4 and 5). The frenum is rubbed with topical gel (20% TAC; Universal Arts Pharmacy, Hialeah, Fla.) for 1 minute. The erbium laser is set to 30 Hz and 80 mJ, and the frenum is lasered in a noncontact mode (Fig. 6). The procedure takes about 20 seconds to complete. The advantages of the laser include local rather than general anesthesia, no need for sutures (in most cases) and little or no bleeding. There appears to be little or no postoperative discomfort for the infant. Infants who have undergone the procedure are returned to the mother and are able to nurse immediately; typically, the mother reports disappearance of the discomfort associated with nursing.

Conclusions

Abnormal attachment of the lingual frenum is truly a quality-of-life issue. Revision of abnormal attachment of the lingual frenum in an infant is one of the most satisfying procedures a dentist can provide. Laser treatment is safe and is easily completed in the dental office. Not only does the frenectomy serve to treat the child's nursing problems, but it also has a positive impact on both the mother and the father. ♦

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Question 4

How does the use of a laser improve cosmetic outcomes in restorative dentistry?

Background to the Problem

Dental lasers have become important tools for achieving optimal clinical and esthetic results in restorative dentistry. Dental lasers can be used in the surgical treatment of both hard tissue and soft tissue. The extent of the interaction of laser energy with tissue is generally determined by the specific wavelength of the laser emission and the optical characteristics of the target tissue.¹

This article focuses on the carbon dioxide (CO₂) laser (10,600-nm wavelength), a soft-tissue laser. Laser light of this wavelength has a high affinity for water, and since human cells are composed chiefly of water, absorption of the CO₂ laser light by the tissues is very high. It is this absorption characteristic that makes the CO₂ laser suitable for precision cutting, ablation and coagulation of small blood vessels. The advantages of laser surgery include relatively bloodless procedures with excellent field visibility, enhancement of infection control and elimination of bacteremia, lack of mechanical tissue trauma, quicker healing, less postoperative pain and

edema, less scarring and tissue shrinkage, microsurgical capabilities and prevention of tumour seeding.²

The indications for soft-tissue application of the CO₂ laser in cosmetic restorative dentistry include, but are not limited to, gingivectomy and gingivoplasty, frenectomy, vestibuloplasty, crown lengthening, removal of gingival pigmentation, removal of aphthae, exposure of second-stage implants and edentulous ridge surgery (including creation of an ovate pontic bed). In particular, use of a laser makes it easy to prepare and correct an edentulous ridge to accept an ovate pontic in cases where the available space is reduced and the distance from the alveolar crest to the ridge surface is greater than 3 mm.

Placement of an ovate pontic requires preparation of a concave gingival recipient site into which the pontic can be inserted.³ The prepared recipient site should mimic the presence of the marginal and interdental papillae and the emergence profile of a natural tooth. The use of a laser in appropriate preparation of an edentulous ridge is described in the following section.



Figure 1: Preoperative photo of unesthetic bridge.



Figure 2: The bone should be sounded to ascertain tissue thickness.



Figure 3: Immediate postoperative view of the ablated tissue.



Figure 4: Provisional bridge in place.



Figure 5: One month after treatment, the tissues have healed well.



Figure 6: Final bridge in place.

Management of the Problem

The following sequence is appropriate for creating an ovate pontic form in an edentulous ridge with alveolar sufficiency (Fig. 1).

1. Complete a master diagnostic model establishing the proposed incisal dominance, width to length ratios, emergence profiles and occlusal scheme. From this model, create a polyvinyl putty impression to serve as a stent for provisional fabrication.
2. Provide local anesthesia and sound the bone with a periodontal probe to ascertain the thickness of tissue over the alveolar crest. It may be necessary to do this in both the coronal–apical and buccal–lingual directions. It is important to have at least 3 mm of tissue over the ridge before proceeding (Fig. 2).
3. Outline the surface of the ridge with an art pencil to mark the proposed shape of the emergence profile of the pontic from the tissue. Ablate the tissue with the CO₂ laser (approximately 4-W continuous beam), using a back-and-forth motion, as if applying paint with a paint brush, to achieve the desired depth and shape (triangular shape 1–2 mm deep) (Fig. 3).
4. Fabricate the provisional bridge, making sure that resin fills the newly created pontic bed. Finalize the provisional bridge, making certain that the tissue side is highly polished and is not exerting pressure on the tissue (Fig. 4).
5. Take a final impression and instruct the laboratory technician to follow the guidelines established in the provisional

bridge. The tissue side of the final prosthesis must be made of highly glazed porcelain and should exert no pressure on the ridge.

6. Encourage the patient to maintain good oral hygiene and to rinse the area 4 times a day, for 3–4 days, with 0.12% chlorhexidine gluconate mouth rinse. Good oral hygiene will help the healing process (Fig. 5). The final effect is a pontic that has a natural emergence profile (Fig. 6). ♦



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The author has no declared financial interests.

Dr. Beers' session at the ALD conference, titled "Cosmetic Emergence Profiles," will be presented on April 8.

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