The diode laser as an electrosurgery replacement

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In 2008, Dr. Gordon Christensen wrote an article in JADA comparing the soft tissue cutting abilities of diode lasers to those of electrosurgery (radiosurgery) units.1 In comparing these two technologies against each other, he found that both dental lasers and the less expensive electrosurgery units have advantages and disadvantages, and he summarized with several key points:

1. Although there was considerable overlap in their uses and both technologies were effective, Christensen found that diode lasers were able to be used around metal (amalgam and gold) as well as with dental hard tissues and soft tissues (pulp), and that the clinician could use the laser with less anesthetization, and finally he mentioned that lasers were antimicrobial (antibacterial).

2. He stated that lasers did not harm dental hard tissues (bone) or soft tissues (pulp), and that the clinician could use the laser with less anesthetization, and finally he mentioned that lasers were antimicrobial (antibacterial).

3. The acceptance and use of lasers, especially the diode laser, was increasing in dentistry, and that lasers attract patients because of their recognized and accepted role within the field of medicine (LASIK eye surgery).

4. Electrosurgery units were “far less expensive than the expensive diode lasers” and he questioned whether “the advantages of the diode laser were significant enough to compensate for the additional cost.” There are two basic types of electrosurgical units that can be purchased in dentistry:

Monopolar, in which a single electrode is placed in the tissue and current flows from one electrode to the other, thus eliminating the need for a grounding pad. Bipolar units, because of the two wires, create less of a precise cut than the monopolar or diode laser.

Although electrosurgical units are inexpensive, require no safety glasses and can remove large amounts of tissue quickly, diode lasers have become much more common in dentistry, and that lasers attract patients because of their recognized and accepted role within the field of medicine (LASIK eye surgery).

Diode lasers, unlike their electrosurgical counterparts, show little interaction with metallic objects used intraorally. It is important to remember that due to the laser’s ability to reflect off mirrored surfaces and potentially cause eye damage, that all members of the dental team as well as the patient must use laser safety glasses for eye protection if they are within the nominal hazard zone (NOHZ) during laser operation. This zone is most often between 3 and 7 feet, but some diodes can have extended NOHZ ranges of 40 feet. Orthodontic patients will often exhibit gingival hyperplasia when brackets that can make it difficult to work on them. This overgrowth of tissue can be due to poor oral hygiene, space-closing mechanics, excess cement or a combination of factors. The diode laser can be used for gingivectomy to safely remove and contour the excess tissue and healing can be remarkable in a very short period of time (Figs. 2-4).

Ability to work around dental implants safely

Diode lasers in the range of 810-1,064 nm are well absorbed in hemoglobin, melanin (pigment) and to some degree water. (Fig. 1). These mid infrared wavelengths in the absorption spectrum offer the dental clinician the ability to ablate soft tissues precisely while controlling hemostasis, providing the clinician with an excellent view of the surgical site with a reduced reliance on sutures. Diode lasers have features that make them attractive as mentioned earlier, but they also have several advantages in function over electrosurgical units (Table 1).

Perhaps the greatest benefit of these lasers is that they allow the clinician to work safely around metals. The literature has shown that monopolar electrosurgery units can accidentally create catastrophic results when touching metal intraorally. Published reports have shown that contact for very short periods of time with the electrodes of a monopolar electrosurgical unit can cause both pulpal and periodontal problems, bone loss, severe intrasulcular burns, and that within three seconds of exposure to a dental implant electrosurgical unit can cause failure of osseointegration and loss of an implant.2

In clinical practice, with today’s emphasis on the more esthetically pleasing composite resins and newer porcelains, there are still many metallic materials used intraorally, including cast partial denture frameworks, gold, amalgam, orthodontic brackets and semi-precious alloys.

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Ability to work around dental implants safely

Various laser wavelengths that are available today can offer the clinician who needs to expose an implant during second stage surgery an alternative to traditional methodologies. The ability of the diode laser to ablate tissue, at times without the need for local anesthetic, while controlling hemostasis, provides the clinician a great view of the surgical site.

In addition, the diode wave length, like all laser wavelengths, provides for decontamination of the implant site through its antibacterial action. Bacterial reduction with the diode laser can lead to an almost sterile operative field (98 percent reduction of pathogenic bacteria). Finally, there is a growing body of evidence that suggests that lasers used at lower energy settings can have a biostimulatory effect on tissue, which may improve bone turnover, decrease postoperative discomfort, improve healing and shorten healing times while even improving early osseointegration.3

As an aside, there have been clinicians who routinely use monopolar electrosurgery units to expose implants. It is imperative to realize that although more expensive bipolar (two electrodes) electrosurgery units can be used safely around implants, that the more commonly purchased single electrode (monopolar) units may damage the implant surface during the process of decontamination and that the process of osseointegration with resulting implant failure with contact times as short as three seconds.4,5 Laser, in contrast, can be used safely with tremendous coagulation and re-duction in pain postoperatively for the patient6 (Figs. 5, 6).

Reduced need for anesthetic

Monopolar electrosurgery units do not have the ability to be used routinely without local anesthetic. In contrast, diode lasers can often be used either with low wattages or in pulsed modes to remove minor to moderate amounts of soft tissue with only topical anesthetics. Although at times this may not seem significant to the clinician, there are many instances where soft tissue acts as a barrier to ideal re-storative treatment, and if local anesthetic can be eliminated it becomes a big selling point to patients.

Many patients are looking for alternatives to local anesthetic, and when the occasion allows for the procedure to be completed without the patient being numb, there is overwhelming satisfaction of patients for this. Situations such as laser gingival

Table 1: Comparison of diode laser versus monopolar electrosurgery units

Diode versus Electrosurgery

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The diode laser has become the "surgical handpiece" in many dental offices. The advantages of being able to work around metals including dental implants, a reduced need for anesthesia, a reduced risk of recession postoperatively, the ability to reduce bacterial load on soft tissue, and to use the diode to photoablate vascular lesions have all provided dentists with a new alternative for soft-tissue surgery.

Laser surgery has two added benefits in that they do not require a pad to be placed under the patient for grounding, and they can be used safely with pacemakers. Diode lasers have found their place in dentistry. Once considered an application looking for a purpose, these small, cost-effective and reliable lasers have discovered their niche as the new go-to solution for many soft tissue problems in our daily dental practices.

References

Full list of references is available from the publisher.

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