Diode lasers are also useful when it comes time to seat the implant. It is imperative to remember that due to the absorption properties, excess cement or a combination of factors. The diode laser can be used for gingivectomy to safely remove and recontour 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

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 with the need for local anesthesia, while controlling hemostasis, provides the clinician a great view of the surgical site. In addition, the diode wavelength, like all laser wavelengths, provides for decontamination of the implant site through its anti-bacterial actions. Overtreatment 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 turn out to be of benefit for the elderly or those suffering from poor health and comfort, improve healing and shorten healing times while even improving early osseointegration. 12

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, potentially degrading the osseointegration with resulting implant failure with contact times as short as three seconds. 13,14 Lasers, in contrast, can be used safely with tremendous coagulation and re-duction in pain postoperatively for the patient 11 (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 recontouring of the implant retained crowns onto the abutments (Figs. 7-12).

Table 1: Comparison of diode laser versus monopolar electrosurgery units

<table>
<thead>
<tr>
<th>Cost</th>
<th>Safety</th>
<th>Precision</th>
<th>Waste</th>
<th>Repairs</th>
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</thead>
<tbody>
<tr>
<td>Diode Laser</td>
<td>Lower</td>
<td>High</td>
<td>Minimal</td>
<td>Small</td>
</tr>
<tr>
<td>Electrosurgery</td>
<td>Higher</td>
<td>Low</td>
<td>Significant</td>
<td>Large</td>
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The diode laser as an electrosurgery replacement

By Glenn A. van As, BSc, DMD

In 2008, Dr. Gordon Christensen wrote an article in AADA comparing the soft tissue cutting abilities of diode lasers to those of electrosurgery (radiosurgery) units. 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 (analogum and gold) as well as with dental implants.

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 anesthetically, 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 the patient must be grounded with a grounding wire to the surgical site. The laser units, because of the two wires, need for a grounding pad. Bipolar units, due to 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 dental operatories in the four years since Christensen’s article was published. The primary reasons for their increased popularity are that diode lasers have a small footprint, are reliable and durable lasers, and are portable. Where a few short years ago, diode lasers could cost in the range of $10,000 to $15,000, they are now cost effective and can be purchased for less than $2,900.

Advantages of the diode laser over electrosurgery

Ability to work around metals introrally

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 tissue 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 incidentally create catastrophic results when touching metal introrally. Published reports have shown that contact for very short periods of time with the electrode of a monopolar electrosurgical unit can cause both pulpal and periodontal problems, bone loss, severe intraoral burns 15,16, and when within three seconds of exposure to a dental implant electrosurgical units can cause failure of osseointegration and loss of an implant. 17

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.

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 wear laser safety glasses for eye protection if they or an assistant are within the nominal ocular hazard zone (NOHZ) during laser operation. This zone is 5 feet from the surgical site with a reduced NOHZ ranges of 40 feet. Orthodontic patients will often exhibit gingival hyperplasia when in brackets that can make it difficult to work on them. This overgrowth of tissue can be due to poor oral hygiene, space-closure mechanics, excess cement or a combination of factors. The diode laser can be used for gingivectomy to safely remove and recontour 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

In addition, the diode wavelength, like all laser wavelengths, provides for decontamination of the implant site through its anti-bacterial actions. Overtreatment 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 turn out to be of benefit for the elderly or those suffering from poor health and comfort, improve healing and shorten healing times while even improving early osseointegration. 12

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crown troughing for tissue management around endodontically treated teeth, exposure of partially erupted canines for orthodontic brackets and gingivectomy, and crown and root fractures. These procedures can be completed using only topical anesthesia.

Ability to do gingivectomies and crown troughing with less recession

While et al, have mentioned that laser gingivectomies are the most common soft-tissue procedure done with diode lasers, and when combined with esthetic postoperative care, the simple recontouring of tissue can take a good case and make it great.

A key difference from electrosurgery ablation of soft tissue is that alterations to the symmetry of the soft-tissue contours in the maxillary anterior teeth can be safely and precisely completed on the same day as the preparation and impressions of these teeth. The risk of recession and exposure of margins can be far less with a diode laser than with other techniques, particularly when nadir equate magnification (e.g., 4.0X loupes) and cautious settings (0.5-0.9 W continuous wave) are used for the recontouring.

When biological width is respected, and adequate attached and keratinized tissue exists, then judicious recontouring of the gingiva on the same day as the preparations can yield stunning results (Figs. 17-19).

The diode laser has become a popular technology as an alternative for tissue management compared to the traditional methodologies of placing a single or double retraction cord in the sulcus. The diode laser can be used in almost all instances to produce gingival retraction as an alternative to cord with excellent results both in terms of gingival retraction and margin delineation for the laboratory.

Unlike electrosurgical units where recession can be an issue, as can postoperative pain, diode lasers offer the clinician the ability to precisely remove overheating, inflamed tissue while creating a gingival trough that is not likely to cause damage to bone, connective tissue or pulpal tissue. Lasers can burn harder and deeper for a longer period of time compared to the traditional methods where the laser is not always in contact with the tissue.

Vascular lesions called venous lakes or hemangiomata can occur on soft tissue-areas including the lower lip, buccal mucosa and palate. These lesions can be difficult to treat with traditional methods where significant bleeding may occur. The diode wave-lengths are rapidly absorbed by hemoglobin and therefore can be used to coagulate and eradicate these aesthetically undesirable purplish lesions often with only topical anesthesia. Literature has shown that the diode laser can be used in almost 100 percent of cases to eliminate these lesions, most often in only a single session lasting only a couple of minutes (Figs. 20-22).

Anti-bacterial capabilities of lasers

Many articles in the literature have demonstrated the tremendous ability of all lasers with respect to the reduction of bacterial and even fungal infections. The excellent antibacterial capabilities make lasers effective and desirable in many areas in the oral cavity where the use of postoperative infection may be reduced. Electrosurgical units do not typically possess the same ability to provide bacterial reduction as lasers do. Particular interest is now occurring with the role of lasers in endodontic, periodontic and peri-implantitis cases where there is need to reduce bacterial loads without such a great reliance on antibiotics.

Although more research is needed on how the bactericidal capabilities of the diode laser might be beneficial in these areas, there is no doubt that all lasers can help healing through decreasing the risk of infection through laser light alone (Figs. 25-29). In addition, growing research has demonstrated that the risk of high bacterial loads in peri-implant pockets and in particular in endodontic situations may be reduced by lasers.

This latest research has implications for improving traditional methodologies locally where used, and in helping to reduce the potential greater systemic health risks. The role of lasers continues to be researched today, but present research has shown that diode lasers can be used safely within root canals with minimal fear of developing iatrogenic complications when conservative settings are used.

Conclusion

The diode laser has become the “magic wand” 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 post-operatively, the ability to reduce bacteria, and to use the diode to photocoagulate vascular lesions have all provided dentists with a new alternative for soft-tissue surgery.

Lasers have two added benefits in that they do not require a place 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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