

Lasers in Dentistry

Dentistry has changed tremendously over the past decade to the benefit of both the clinician and the patient. New materials and technologies have improved the efficiency and predictability of restorative dentistry for clinicians. The computer has increased its influence in the dental field with digital radiography and photography, and CAD-CAM restoration fabrication. New techniques and philosophies have also benefited our patients by providing alternatives to aggressively prepared teeth and the use of aesthetic-compromising metal.

One technology that has become increasingly utilized in clinical dentistry is that of the laser. Initially introduced as an alternative to the traditional halogen curing light, the laser now has become the instrument of choice, in many applications, for both periodontal and restorative care. Although the laser offers many advantages over other modalities of treatment, probably the greatest impact it has made is the ability to be used for both hard and soft tissue, often times without the need for anesthesia. The following are just a few examples of the many applications of lasers in dentistry.

- ❖ **Gingival recontouring:** The application of the laser in gingival recontouring has become the treatment of choice for the aesthetic clinician as a means to optimize the smile design process since the mid 1990's. Prior to the use of the laser, tissue recontouring resulted often times in discomfort for the patient and lack of predictability for the clinician. The use of the laser, more specifically the Diode laser (Odyssey [Ivoclar], Continuum [HoyaConBio]), has provided a means to very predictably reshape and recontour the gingival tissue to optimize symmetry and maximize aesthetics. The hemostatic nature of the laser eliminates the need for retraction cord during restorative procedures and the minimal zone of necrosis of the actual laser "cut" provides a very stable final contour that will not change after the definitive restoration is placed. The "recontouring" is useful during anterior aesthetic reconstruction as well as a means to remove excess gingival tissue that compromises an ideal width to height ratio of anterior teeth. Often times, tissue recontouring combined with teeth whitening can change an unaesthetic smile into one that is dazzling! (see figures 1-14)
- ❖ **Frenectomies:** Whether it be as a result of a recommendation from an orthodontist or for aesthetic concerns, the use of the laser is ideal for both maxillary and lingual frenectomies. Since the laser seals both nerve endings and capillaries, post operative discomfort and bleeding is almost non-existent, and the need for post-operative suturing is eliminated as well. (see figure 15 & 16)
- ❖ **Periodontal treatment:** The use of lasers in periodontal treatment has been well documented over the past 10 years. When used in deep periodontal pockets with associated bony defects, the laser not only removes the diseased granulation tissue and

associated bacteria, it also promotes osteoclast and osteoblast activity, resulting in bone regrowth. (See figures 17 & 18)

- ❖ **Ovate Pontics**: The ovate pontic has become the choice of pontic design for both aesthetics and cleansability reasons. Success of the ovate pontic is a result of developing an ideal site into the gingival tissue. Since the ovate pontic actually replaces part of the natural tooth root form, it is imperative to establish a recess in the gingival tissue on the alveolar ridge to accept the pontic form. Utilization of the laser, as opposed to other methods such as electrosurgery or scalpel surgery, allows for immediate impression of the site for the definitive restoration. (see figures 19-23)

- ❖ **Hard tissue applications**: Recent advancements in laser technology has also allowed for the use in hard tissue applications. This is especially true with the Erbium-Yag laser (DElight [HoyaConBio]). This includes enamel, dentin, caries, and osseous tissues. The Erbium is also excellent as a soft tissue laser, performing procedures similar to that of the Diode listed above, but has expanded opportunities with the ability to actually “cut” or remove hard tissue as well. Although the laser has not replaced the high speed handpiece in most tooth preparations, it certainly has become a very useful modality to remove defective enamel and dentin, especially in incipient lesions. Ideal applications of lasers in restorative dentistry include class I, II, III, and V preparations. More often than not, these types of preparations can be performed without the need for anesthesia, so the marketing benefits of laser dentistry has more than established the it’s value, especially in pedodontic or adolescent-based practices. Although not as fast as conventional handpieces, the elimination of the time needed for anesthesia usually compensates for the lack of speed and often times the total time for preparation and restoration is shorter. (See figures 24-27).

As far as osseous applications, the benefit of the use of the Erbium-YAG is the ability to recontour osseous tissue without the discomfort and healing time commonly seen with traditional methods. In terms of aesthetic dentistry, the use of the Erbium laser in crown lengthening in the anterior has created an entirely new dimension in smile design. With soft tissue only removal, the extent of gingival tissue removal is limited by biological width, which requires a minimum of at least 2.5-3.0 mm between the free gingival margin and the osseous crest. If the requirement to optimize aesthetics violates this measurement, the only option is to remove osseous tissue to establish a healthy biological width. With traditional surgical methods, the healing time is usually 12-16 weeks to ensure osseous and soft tissue stability. With the Erbium laser, the gingival tissue is removed to the desired level, regardless of the biological width. Using a 400 um tip with a setting specific to osseous tissue, the laser is then placed parallel to the tooth surface and placed under the tissue. The osseous tissue is then recontoured to the ideal level to establish a healthy biological width. Although long term clinical studies are certainly indicated, anecdotal and short term clinical experience indicates that the osseous levels remain at the newly contoured level and many clinicians actually take definitive impressions for restorative at the time of osseous recontouring. (See figures 28-34)

As technology advances into dentistry, whether it is laser or another exciting venue, the options available to clinicians will continue to increase. Although the use of lasers in dentistry is relatively new, the future looks very bright. Admittedly, more long term clinical and scientific research needs to be done to validate anecdotal clinical experience and claims, but preliminary use and experience appears very positive. As with all new technologies and philosophies, proper

case selection and understanding of the contraindications and limitations is mandatory for predictable success.