Diode lasers: The soft-tissue handpiece

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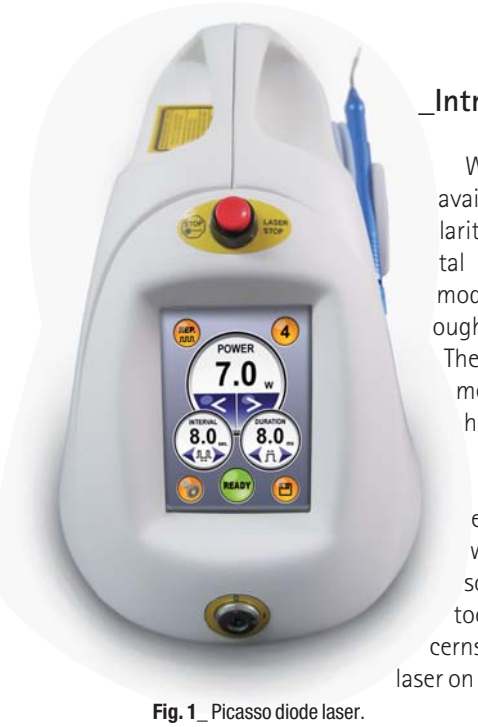


Fig. 1_ Picasso diode laser.

_Introduction

While dental lasers have been commercially available for several decades, and their popularity among patients is unparalleled, the dental profession has taken to this treatment modality rather slowly. Lasers have been thoroughly documented in the dental literature. They are an exciting technology, widely used in medicine, kind to tissue, and excellent for healing.

So why have they not been more widely embraced by the practising dentist? There was a perception in the profession that somehow the dental laser was not useful, too complicated, or too expensive. These concerns have changed with the arrival of the diode laser on the dental scene.

There is now a convergence of documented scientific evidence, ease of use and greater affordability that makes the diode laser a necessity for every dental practice.

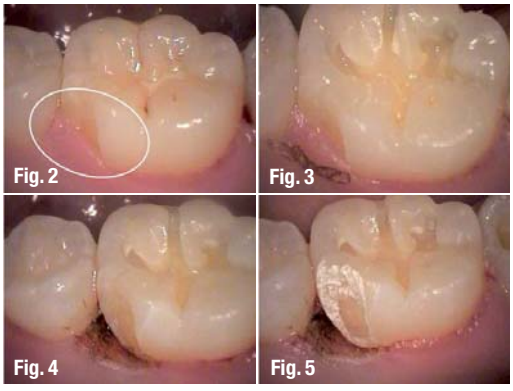
_The science in brief

LASER is an acronym for "light amplification by stimulated emission of radiation". Lasers are commonly named for the substance that is stimulated to produce the coherent light beam. In the diode laser, this substance is a semiconductor (a class of materials that is the foundation of modern electronics, including computers, telephones and radios).

This innovative technology has produced a laser that is compact and far lower in cost than earlier versions. Much of the research has focused on the 810 nm diode laser. This wavelength is ideally suited for soft-tissue procedures since it is highly absorbed by haemoglobin and melanin. This gives the diode laser the ability to cut precisely, coagulate, ablate or vaporise the target soft tissue.[1]

Treatment with the 810 nm diode laser (Picasso, AMD Lasers; Fig. 1) has been shown to have a significant long-term bactericidal effect in periodontal pockets. *Aggregatibacter actinomycetemcomitans*, an invasive pathogen associated with the development of periodontal disease and generally quite difficult to eliminate, responds well to laser treatment.[2,3]

Scaling and root planing outcomes are enhanced when diode laser therapy is added to the dental armamentarium. The patient is typically more comfortable during and after treatment, and gingival healing is faster and more stable.[4,5]



Figs. 2–6_Removal of gingival tissue covering the tooth. (Photographs courtesy of Dr Phil Hudson)

_Ease of use

Early adopter dentists thrive on new technologies. They enjoy the challenges that come with being the first to use a product. Most dentists, however, are not early adopters.

Over the past two decades, lasers have intimidated mainstream dentists with their large footprint, lack of portability, high maintenance profile, confusion of operating tips and complex procedural settings.

Fig. 6


Fig. 7

Figs. 7 & 8_Management of excess gingival tissue (ezlase).

Enter the diode laser. It is compact. It can easily be moved from one treatment room to another. It is self-contained, and does not have to be hooked up to water or air lines. It has one simple fibre optic cable that can be utilised as a reusable operating tip.

The units come with several presets, although after a short time the operator becomes so comfortable that they are rarely needed. The power and pulse settings are quickly adjusted to suit the particular patient and procedure.

One of the authors is a dentist who does not thrive on the challenge of brand new high-tech, "high-stress" technology. In fact, having tried many lasers in the past that promised to be user-friendly, they were found to be anything but. The 810 nm diode laser was a different experience: after a brief in-office demonstration, the laser handpiece felt comfortable enough to perform some simple clinical procedures. Further online training and lecture courses enhanced both clinical comfort level and competency.

_Affordability

Laser technology has always come with a high price tag. Manufacturing costs are high and cutting-edge technology commands steep prices, but diode lasers are less expensive to produce. Pricing for this technology has now reached under US$5,000. At this level, the diode laser becomes eminently affordable for the average practising dentist.

_Soft-tissue laser

The 810 nm diode laser is a soft-tissue laser. This wavelength is suited for soft-tissue procedures, since haemoglobin and melanin, both prevalent in dental soft tissue, are excellent absorbers. This provides the diode laser with broad clinical utility: it cuts precisely, coagulates, ablates or vaporises the target tissue with less trauma, improved post-operative healing, and faster recovery times.[6–8] Given its incredible ease of use and versatility in treating soft tissue, the diode laser has become the soft-tissue handpiece in the dentist's armamentarium. The dentist can use the diode laser soft-tissue handpiece to remove, refine and adjust soft tissue in the same way in which the traditional dental handpiece is used on enamel and dentine. This extends the scope of practice of the general dentist to many soft-tissue procedures.

The following procedures are easy entry points for the new laser user:

1.Gingivectomy, haemostasis and gingival troughing for impressions

The diode laser makes restorative dentistry a breeze (Picasso). Any gingival tissue that covers a tooth during preparation can easily be removed, as haemostasis is simultaneously achieved (Figs. 2–6). The restoration is no longer compromised due to poor gingival conditions and there is no more battling with unruly soft tissue and blood. Excess gingival tissue can readily be managed (Figs. 7 & 8) for improved restorative access for Class V preparation

Figs. 9–11_Removal of hyperplastic tissue (Ivoclar Vivadent).


Fig. 8

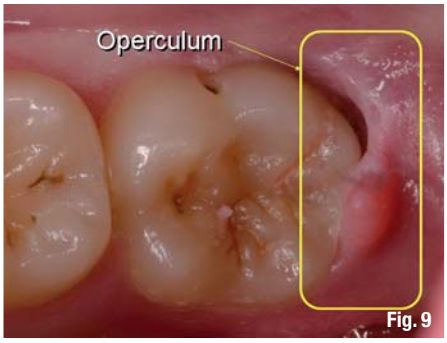


Fig. 9

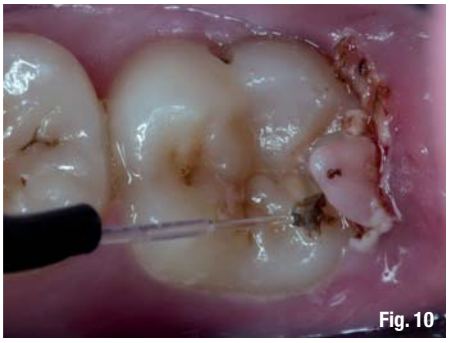


Fig. 10


Fig. 11


Fig. 12

Fig. 12_Frenectomy (ezlase).

(ezlase, BIOLASE Technology). Gingival troughing prior to impression taking (Picasso; Figs. 6 & 7) ensures an accurate impression, particularly at the margins, and an improved restorative outcome. Packing cord is no longer necessary.

2. Operculectomy, excision and/or recontouring of gingival hyperplasia, and frenectomy

These procedures are not commonly offered or performed by the general dentist. They are examples of the expanded range of services readily added to the general practice. The dentist becomes more proactive in dealing with hyperplastic tissue that can increase the risk of caries and periodontal disease (Figs. 9–11). In addition, a frenectomy has now become a simple and straightforward procedure (ezlase; Fig. 12).

3.Laser-assisted periodontal treatment

The use of the diode laser in conjunction with routine scaling and root planing is more effective than scaling and root planing alone. It enhances the speed and extent of the patient's gingival healing and post-operative comfort.[4,5] This is accomplished through laser bacterial reduction (Picasso), debridement and biostimulation (Figs. 13 & 14).

A. actinomycetemcomitans, which has been implicated in aggressive periodontitis, may also be implicated in systemic disease. It has been found in atherosclerotic plaque[9] and there has been recent data suggesting that it may be related to coronary heart disease.[10] The diode laser is effective at decreasing *A. actinomycetemcomitans*,[2,4] thereby indirectly improving the patient's cardiovascular health.

_Conclusion

The soft-tissue diode laser has become an essential mainstream technology for every general practice. Its science, ease of use and affordability make it simple to incorporate. The laser is now the essential soft-tissue handpiece for the practice. In fact, there is a case for having a diode laser in each restorative and each hygiene treatment room. Restorative dentistry becomes easier, more predictable and less stressful. Laser therapy expands the clinical scope of practice to include new soft-tissue procedures that keep patients in the office. The patient's gingival health is improved in a minimally invasive, gentle manner._

_contact laser

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Fig. 13


Fig. 14

Figs. 13 & 14_Laser bacterial reduction, debridement and biostimulation. (Photographs courtesy of Dr William Chen)

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