Diode laser (810 nm) applications in clinical orthodontics

Authors_Prof. Deepak Rai, MDS; and Prof. Gurkeerat Singh, MDS

Dentistry has changed exponentially; osseointegration, dental bonding and kinetic energy tooth preparation are current clinical buzzwords. The arena of dental esthetics has expanded to cover more than just simply restoring compromised teeth, but involves revamping smiles in entirety.

Soft-tissue harmonization has become paramount to overall development of dentofacial esthetics.

The unique versatility and vast potential of dental lasers allows many procedures that enhance overall treatment success.

Thus, lasers have become an indispensable clinical tool in an orthodontist’s armamentarium.

Diode lasers allow safe fast efficient incisions with better field of visibility as there is minimal bleeding, and above that patient perceives a pressureless cut that often requires no suturing. This article will present clinical case reports where the diode laser has been used for the benefit of orthodontic patients.

Case report No. 1

Frenectomy for midline diastema correction

Labial thick and high attached frenum is commonly regarded as contributing etiology for maintaining midline diastema.

It is an accepted contemporary view that midline diastema first should be corrected with orthodontics and then frenectomy so that scarring that results after conventional scalpel based frenectomy doesn’t interfere with tooth movement.

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Case report No. 1

Fig. 1_Large midline diastema with thick frenum.

Fig. 2_Orthodontic closure of the diastema.

Fig. 3_High labial frenum.

Fig. 4_Diode laser frenectomy.

Fig. 5_Healed site after seven days.
Case report No. 2

Fig. 6. Labially erupting 43.
Fig. 7. Conventional scalpel surgery.
Fig. 8. AMD Picasso diode laser* 2.3 W, rep mode.
Fig. 9. Diode laser bloodless incision.
Fig. 10. Exposed #23.
Fig. 11. Orthodontic attachment bonded in dry field.
Fig. 12. #23 orthodontically extruded.

Case report No. 3

Fig. 13. Palatal 23 exposure.
Fig. 14. Orthodontic attachment for alignment.

With a diode laser the procedure can be done before complete closure or after as healing of laser wound doesn’t involve any scarring.5 The patient had large diastema (Fig. 1) and was treated with fixed appliances to first close the diastema (Fig. 2) followed by frenectomy (Figs. 3, 4). The healing was uneventful (Fig. 5).

Case report No. 2

Canine exposure in labial sulcus
Labially erupting canines are common malocclusion (Fig. 6).6,7 Conventional exposure with scalpel based method leads to extensive bleeding (Fig. 7) and the field of operation requires special hydrophilic moisture insensitive primers to bond orthodontic attachments.

The use of a 810 nm diode laser ensures easy exposure with minimal bleeding and least patient discomfort (Figs. 8–10). The clear bloodless field ensures fast predictable bonding (Fig. 11), thus enabling fast correction of malocclusion (Fig. 12).

Case report No. 3

Canine exposure on palatal aspect
Palatally impacted canines8 are difficult situation requiring surgical raising of an extensive mucoperiosteal flap, with sutures at the end and an extensive postoperative discomfort and swelling.

Diode laser allows exposure without any extensive flap (Fig. 13) and generally no sutures are required after the procedure. The patient experiences minimal pain or discomfort. In addition, a bloodless field ensures instant bonding of orthodontic attachment (Fig. 14).
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Case report No. 4

Gingival hyperplasia during orthodontic treatment. (Fig. 15)

Diode laser assisted gingivoplasty. (Fig. 16)

Healed site. (Fig. 17)

Case report No. 5

Palatal gingival hyperplasia with lingual appliance. (Fig. 18)

After diode laser gingivoplasty. (Fig. 19)

Case report No. 4

Gingivoplasty

Orthodontic fixed appliances are generally associated with issues of good oral hygiene maintenance.9 In many cases we notice gingival hyperplasia (Fig. 15). Such enlargement further impedes good hygiene and is commonly associated with bleeding.10,11 A diode laser can be used effectively in such situations (Figs. 16, 17).

Case report No. 5

Palatal gingival hyperplasia

Lingual orthodontic appliances are generally associated with gingival hyperplasia, preventing us from the access to gingival hooks to engage elastomeric attachments (Fig. 18).

It is difficult to sculpt gingiva around lingual braces with scalpel due to poor access and poor visibility.

Even electrocautery would not be indicated due to chance of sparking on contact with metal braces.12 A diode laser (2 W, repetitive mode) allowed us to sculpt the hyperplastic gingiva easily without any bleeding or discomfort allowing easy access to engage elastic attachments (Fig. 19).
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Case report No. 6

Fig. 20. Unerupted incisor with high frenum in 10 year old girl.

Fig. 21. RVG image showing tooth like mass.

Fig. 22. Diode 810 nm-assisted incision.

Fig. 23. Extraction of tooth like mass and orthodontic attachment bonded.

Fig. 24. Post-extraction RVG.

Fig. 25. Histological section: compound composite odontome.

Fig. 26. Erupted tooth.

Diode laser assisted removal of odontome in maxillary anterior region preventing eruption of permanent incisor

Patient was a 10-year-old girl with unerupted central incisor (Fig. 20). Radiovisigraphic evaluation suggested mesiodens (Fig. 21). Diode laser was used to give primary incision and simultaneous frenectomy at 2 W repetitive mode, followed by 2.3 W continuous mode, ensuring bloodless field of operation (Fig. 22). The tooth like mass was removed (Fig. 23) and orthodontic eruption appliance was bonded (Fig. 24). Histologic examination revealed it to be an odontome (Fig. 25). The tooth erupted in a few months with orthodontic active guidance (Fig. 26).
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Case report No. 7
Fig. 27. Laser assisted circumferential supracrestal fibrotomy.

Case report No. 8
Fig. 28. Orthodontic microimplant for anchorage.
Fig. 29. Inflammation around microimplant.
Fig. 30. Decontamination and biomodulation with laser at low power.
Fig. 31. Corrected malocclusion with healed site.

Case report No. 7
Laser-assisted circumferential supracrestal fibrotomy (LACSF) pericision
Control of tooth rotation correction in orthodontics from relapse is always a challenge. Permanent lingual bonded retention is essential. It is also suggested to do circumferential supracrestal fibrotomy to allow elastic fibres to reorganize favorably without causing relapse of correction.15–17
Conventional scalpel-assisted CSF is associated with bleeding and requires infiltration anaesthesia. The authors are trying diode laser at different settings of power and are currently evaluating success of this laser assisted circumferential supracrestal fibrotomy (LACSF) (Fig. 27).

Case report No. 8
Diode laser assisted salvaging of orthodontic microimplant
Extensive work is being done on use of lasers in salvaging osseointegrated dental implants.18 We tried using diode laser for orthodontic microimplant which is used for short term. The patient received two orthodontic microimplants for retraction (Fig. 28), the one on left side was rigid but showed some inflammation of tissue around the implant (Fig. 29).
A diode laser was used at 0.5 W to decontaminate and allow healing of tissue around microimplant. The implant survived and served its orthodontic purpose (Figs. 30, 31).

Case report No. 9
Vestibuloplasty in patient with mucogingival problem before undergoing lingual orthodontics
The patient had severe deep bite, associated with extensive mucogingival damage, with poor oral hygiene19 (Figs. 32, 33).
After initial scaling and root planning (Fig. 34), a diode laser was used to perform vestibular extension (Fig. 35). Lingual appliances were bonded and spaces were consolidated with good oral hygiene maintenance (Figs. 36, 37).
A diode laser can also be used as low level therapy during orthodontic tooth movement and especially during a situation where heavy orthopedic forces are applied as in rapid maxillary expansion. This is an area where the authors are guiding a postgraduate research project in their department.

The incorporation of lasers in routine orthodontic practice is the order of the day. The practices that embrace this technology will surely flourish and will have satisfaction of providing best dental care to their patients.

Reference

* AMD LASERS, www.amdlasers.com

Editorial note: This article first appeared in the international magazine of laser dentistry, Vol. 2, No. 4, 2010.