

# Lasers in orthodontics

In the first of a two-part series of articles, **Arun and Rita Darbar** discuss how laser treatment can enhance patient experience and save valuable time

As orthodontists continue to strive to provide high quality with demands on time and patients on the increase, we are constantly exploring ways to reduce treatment time without compromising on results. Laser technology has progressed in leaps and bounds following the development of the first dental laser in the 1960s. The effects of laser irradiation on inflammation, wound healing, immune response, tooth structure and composite materials have led to their application in orthodontics. Lasers are easy to use and the benefit to patients is discussed in this article for some of the applications. Like any technology, it is important to use the correct parameters and protocols for optimum results. Good basic laser education is advised for anyone wishing to introduce this technology safely and effectively into their practice.

## Pain management

Orthodontic movement is a result of a mechanical force that leads to compression and tension of the periodontal ligament<sup>1</sup> which initiates an inflammatory response. Following this, bone is remodelled on the compression side and deposited on the



**Figures 1a-b:** Case 1. Traumatic intrusion and pain management prior to orthodontic extrusion



**Figure 2a:** Case 2. Gingival hyperplasia pre op

**Figure 2b:** Case 2. Immediately post op

tension side. Pain usually starts 30 minutes after the application of force and generally lasts for about 48 hours. This is often managed with medication, analgesics and non-steroid anti-inflammatory drugs, however these are known to have some systemic side effects. Laser irradiation reduces pain,<sup>2-3</sup> does not have any side effects, is localised and has been shown to reduce pain by down regulating the pain-inducing enzymes such as the prostaglandins and by direct effect on the nerve fibres.<sup>4</sup> (see Figure 1).

## Accelerated tooth movement

This is desirable as longer treatment time leads to some of the undesirable effects of orthodontic treatment such as periodontal deterioration, risk of decalcification and root resorption<sup>5</sup>, not to mention the aesthetic implications for the patient. Some approaches that have been explored are magnetic fields<sup>6</sup>, mechanical stimulation by resonance<sup>7</sup> and low level laser therapy<sup>8</sup>. As laser irradiation is known to accelerate inflammation we can expect this to result in faster tooth movement<sup>9</sup>. Many experimental studies have been conducted and papers are being published concluding that treatment

time is reduced, however more multicentre randomised double blind studies are needed to quantify this claim.

## Debonding of ceramic brackets

Ceramic brackets can require a greater force and can sometimes cause enamel damage or can fracture upon debonding, therefore making the removal process longer. Laser energy can degrade the composite resin as it can penetrate through the bracket and reduce the amount of force needed to debond the bracket. This is used in our practice and not only is it easy to debond the brackets, some of which slide off without any force, but there is minimal amounts of composite to polish off<sup>10</sup>.

Laser etching of the enamel prior to bonding brackets has also been investigated,<sup>11</sup> however this has not proved to be superior to conventional methods and takes more time.

## Gingival recontouring

Often a partially erupted tooth can delay treatment. If the gingival margin is recontoured it enables correct bracket placement to commence orthodontic alignment of the tooth. Often a partially



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Dr Arun Darbar is a leading laser and aesthetic dentist based in Leighton Buzzard. He has been using lasers for over 20 years and holds advanced proficiency with the Academy of Laser Dentistry (ALD). Dr Darbar is an Accredited member of the British Academy of Cosmetic Dentistry and has won numerous awards including the Patient's Smile and Best Whitening case at The Smile Awards 2012.



**Figure 3a:** Case 3. Gummy smile

erupted tooth can also cause decalcification as the patient is unable to clean under an operculum or gingival hyperplasia during treatment<sup>12</sup>, which could curtail treatment as this leads to decalcification in the hard to clean areas. At completion of orthodontic treatment excess gingival tissue can also be removed within biological limits to improve aesthetics<sup>13</sup>. (see Figures 2-4)

### Exposure of partially erupted/impacted teeth

Delayed eruption of teeth can prolong treatment and often these cases need to be referred for a surgical exposure, which could add months to the total treatment time. By using a laser this could be done by the orthodontist and an attachment placed at the same visit, as a laser exposure has good haemostasis, is minimally invasive and often no need for sutures or a local anaesthetic. The mechanism of action of laser irradiation is that there is an increase in ATP production, increased blood flow and reduced oxidative stress<sup>14-15</sup>. If performed optimally the results are very predictable and healing time is considerably reduced. This can be done at the routine orthodontic appointment saving considerable time. Clinical cases treated in our practice are demonstrated in Figures 5-6.

### Fraenectomy

Following or pre closure of a median diastema, a fraenectomy may be indicated. The patient is conventionally referred to an oral surgery department to have this procedure with a local or general anaesthetic. Often a fraenum attachment can contribute



**Figure 3b:** Case 3. Post orthognathic surgery



**Figure 3c:** Case 3. Laser recontouring one week post op



**Figures 4a-b:** Case 4. Gingival recontouring for correct bracket placement



**Figure 5a:** Case 5. 16 year old with unerupted canine



**Figure 5b:** Case 5. Immediately post op



**Figure 5c:** Case 5. Bracket placement on day of exposure



**Figure 5d:** Case 5. Eight weeks later



**Figures 6a-b:** Case 6. Unerupted UL1 in a 14 year old



**Figure 6c:** Case 6. Space opened orthodontically



**Figure 6d:** Case 6. Laser exposure and bracket bonded



**Figure 6e:** Case 6. 10 days later



**Figure 6f:** Case 6. Tooth in arch 13 months later



**Figure 7a:** Case 7. Immediately post op



**Figure 7b:** Case 7. One day later



**Figure 7a:** Case 7. Gingival recession LR1

to gingival recession and this can be gently erased with the laser in a matter of minutes. The orthodontist can perform this procedure using a laser and a topical anaesthetic. Healing is quick and there is no need for sutures (see Figure 7).

## Oral pathology

Traumatic/apthous ulcers, herpes simplex and angular cheilitis are some of the oral pathologies that patients present with. These conditions can be treated effectively with laser therapy which is painless, localised, and free of any systemic side effects. Patient feedback is very positive with effect on the reduction in pain, faster resolution of the condition and longer periods between recurrence. This could be attributed to the effect on the immune response of low level laser therapy<sup>16</sup>. Cases treated in practice are indicated in Figure 9.

## Conclusion

Laser treatment has enhanced patient experience and saved considerable time. The patient experience is very positive and in most cases only a topical anaesthetic was used and generally most patients reported that they did not need to take any analgesics following the procedures. We believe that incorporating this technology could significantly benefit any orthodontic practice by saving valuable time.

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**Figure 7b:** Case 7. Laser fraenectomy on day



**Figure 7c:** Case 7. Healing 10 days later



**Figure 9a:** Case 8. Angular cheilitis treated on day



**Figure 9b:** Case 8. Two weeks later

• Dr Arun and Rita Darbar will be holding their next *Let's Talk Lasers* seminar on 10-11 November 2012. This will be a two-day course covering an introduction to lasers in general dentistry followed by an introduction to lasers in orthodontics. Both days will

include theory, hands-on and practical sessions. For more details please contact Nisha at Smile Creations Dental Innovations on 01525 383065 or email at [letstalklasers@aol.com](mailto:letstalklasers@aol.com). Spaces are limited so contact the practice ASAP if you would like to attend.

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