Use of diode laser in the treatment of gingival enlargement during orthodontic treatment

By Dr Carlo Fornaini

In recent decades, we have witnessed the substantial development and expansion of the use of fixed orthodontic appliances. While their application has many advantages, several problems related to the health of the soft tissue may sometimes appear during treatment. In fact, the use of fixed orthodontic appliances may provoke labial desquamation, erythema multiforme, gingivitis and gingival enlargement. Gingival enlargement is a very common complication during orthodontic treatment, but fortunately, it seems to be transitory and generally resolves after orthodontic therapy, even if sometimes incompletely. Gingival overgrowth induced by orthodontic treatment shows a specific fibrous and thickened gingival appearance, different from fragile gingiva with marginal gingival redness common in allergic or inflammatory gingival lesions.

Several clinical studies suggest that orthodontic treatment may be associated with a decrease in periodontal health, causing a hypertrophic form of gingivitis. However, the actual pathogenesis of gingival enlargement is not yet completely understood, although probably involves increased production by fibroblasts of amorphous ground substance with a high level of glycosaminoglycans. Increases in mRNA expression of Type I collagen and up-regulation of keratinocyte growth factor receptor could play an important role in excessive proliferation of epithelial cells and increased development of gingival enlargement, on the basis of some studies, in cases of poor oral hygiene status. However, there is no clear definition on its aetiology, although it is probably associated with the inflammatory response induced by the corrosion of orthodontic appliances, particularly those of nickel, linked to an inflammatory response considered a Type IV hypersensitivity and manifested as nickel-induced allergic contact stomatitis, even if its aetiology has not yet clearly been defined.

The treatment of these conditions is surgical. Histological and histochemical studies have demonstrated that the removal of the gingival papilla can promote the formation of normal connective tissue. Because the classic intervention performed by scalpel has some disadvantages, mainly linked to the discomfort for the patient (e.g. anaesthesia by injection and sutures), there has been great interest in the utilisation of laser technology.

Case report

A 14-year-old female patient was referred to our department by the orthodontics unit because, at the end of fixed orthodontic treatment, she had developed gingival enlargement in the upper arch (Fig. 1), probably related to the fast closure of the spaces associated with very poor oral hygiene due to bleeding during toothbrushing. Just after the removal of the appliance, a topical anaesthetic (EMLA, AstraZeneca) was applied to the gingiva (Fig. 2) and a gingivectomy was performed using a diode laser (XD-2, Fotona) according to the technique of removal of the interdental papillae (Fig. 3). The parameters used were as follows: a wavelength of 808 nm, 3 W in continuous wave, a 320 µm fibre in contact mode. The intervention had a duration of 375 seconds, and the patient did not feel any pain (Fig. 4). After the intervention, the patient did not take any kind of pain medication, and the healing process was completed in five days (Fig. 5).

Discussion

The first laser appliance was built by Maiman in 1960, and some years later, it was successfully employed in medicine and in oral surgery with several advantages. It may provide excellent incision performance with sealing of small blood and lymphatic vessels, resulting in haemostasis and reduced postoperative oedema. Furthermore, target tissues are disinfected as a result of local heating and production of an eschar layer, which results in a decreased amount of scarring owing to decreased post- operative tissue shrinkage, allowing one to avoid the use of sutures.

Diodes, the last generation of laser used in dentistry, have several advantages, such as reduced cost and size, and offer the operator the possibility to work both in continuous and chopped mode. Based on our experience, we can confirm that this technology may represent a new approach to the resolution of gingival enlargement during orthodontic treatment, with better comfort for the patient during and after surgery. 

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by Sleiman and investigated by Vera et al.—it also stipulates that when using the macro- or the micro- cannula of the negative pressure irrigation unit for chemical preparation, every five seconds a two-to-three-second pause should be made when no irrigant is added. It is during this pause that the partial vacuum is created by the cannula, which will draw out all the fluids, residues and gases from all the root canal system. Once the system has been drained, the partial vacuum established inside the root canal system in its entirety can attract a fresh portion of irrigant for a faster and cleaner preparation of the root canal system.

Clinical cases

In the images above, we present some of the typical cases demonstrating the cleanliness of the root canal system achieved as shown by the lateral and/or accessory canals visualised upon 3-D warm vertical condensation (Figs. 3–6).

The case of a failing root canal treatment with apical infection and an internal resorption in the apical area was referred to us (Fig. 7). After removing the previous filling, chemical preparation was performed, with the help of the partial vacuum, inside the system the chemicals were able to clean the resorption area without an aggressive effect on the periodontal ligament, this has led to a truly three-dimensional obturation. The 4-month follow-up image (Fig. 8) confirms a fast healing of both the apical area and the area of the resorption lesion.

Conclusions

Realising that a 100 percent disinfecion of the root canal space remains unattainable, we continue to strive for perfection in our attempts to develop viable clinical protocols that would allow lowering the inflammatory and/or bacterial load so that our patients’ bodies can heal. Based on the supporting research and testing as well as on a history of sustainably high treatment outcomes for both primary endodontic treatment and retreatment of vital and non-vital teeth, we would like to propose our irrigation protocol as a fast, safe, and, most importantly, evidence-based technique of chemical preparation.

The Sleiman irrigation protocol requires 6 percent (or 5.25 percent, if the 6 percent concentration is not available) NaOCl, 17 percent EDTA, distilled water or normal saline. For the best results it is recommended to use a negative pressure irrigation unit to introduce and remove the solutions in order to benefit from the partial vacuum force; however, it must be said that using other introduction techniques in combination with the Sleiman sequence of irrigants will also improve chemical preparation results and lead to a cleaner root canal space.

• Access cavity; manual files to locate orifices; manual files for initial scouting—NaOCl
• HZO
• Machine files for root canal preparation—EDTA
• HZO
• In between machine files—NaOCl
• HZO (cold for cryotherapy)
• Drying the root canal system—EndoVac

The whole irrigation procedure should follow the ‘5 sec introducing solution + 3 sec pause’ guideline to achieve the best effect of the partial vacuum. 

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