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Use of laser technology in orthodontics: hard and soft tissue laser treatments

ABSTRACT

Aim Modern technology has perfected a new instrument that has become almost indispensable in modern dentistry, in accordance with the philosophy of minimally invasive therapy: the laser. The aim of this work is to evaluate the effectiveness and efficacy of laser technology to solve mucogingival problems associated with orthodontic treatment. Some laser wavelengths work both on hard and soft tissues (2780 nm, 2940 nm), other lasers, such as the 810 nm diode, have a very good surgical and haemostatic action on soft tissues and an important analgesic and biostimulating effect that can help the healing of both TMJ painful symptoms as well as the pain following active orthodontic treatment. Several cases connected to orthodontic therapy are presented. **Materials and methods** Different laser systems (diode laser at 810 nm; Er,Cr:YSGG laser at 2780 nm; Erbium:YAG laser at 2940 nm) were used, both for soft tissue surgery and enamel etching, and for biostimulating effect. These wavelengths were used with different parameters for each case, according to international current studies in view of minimally invasive therapy. **Results** The cases reported showed very quick and good healing of the laser treated tissues. These treatments, necessary for the orthodontic therapy or for its completion, become extremely simple, safe and rapid and the orthodontic specialist can perform them himself. **Conclusion** The laser technique is very effective in many operative and surgical procedures during orthodontic therapy. Further studies are however necessary to set the treatment protocols in orthodontic biostimulation.

Key words: Er:YAG, Er,Cr:YSGG, Diode laser, Orthodontics, Frenectomy.

Introduction

This study will present some of the possible uses of laser technology in the various branches of orthodontics, proposing techniques, comparisons of different wavelengths, and above all, results. Evidence based dentistry means not only experimental studies that confirm

the clinical efficacy of the techniques used, or retrospective studies that confirm the results or studies that compare traditional methods with laser technology, but also immediate and long-term visible results, such as those presented in the case studies that show the real advantages that can be obtained in daily practice.

By reporting some cases, this study purposes to show some of the advantages derived from the use of laser technology in a field where it has yet to be fully applied: orthodontic therapy.

At times the orthodontist must call in a specialist in oral surgery to solve mucogingival problems that interfere with the ongoing therapy or that complicate the therapy itself. Using the laser, the orthodontist can intervene quickly and easily with a minimally invasive treatment for oral and mucogingival surgery, with noticeable advantages in terms of operating time, healing, intra- and post-operative comfort, quality of the results, which allow a faster completion of the orthodontic therapy.

Many clinical situations can benefit from laser therapy either for a surgical procedure or for its analgesic and biostimulating effect before, during and after orthodontic therapy.

- Closure of an upper median diastema between incisors sometimes depends on the presence of a hypertrophic frenum (abnormal frenum) or a frenum with palatal insertion (anomalous frenum) [Linde et al., 2003; Huang and Creath, 1995].
- Problems of ankyloglossia with a short lingual frenum cause problems related to the low position of the tongue: atypical swallowing, disproportionate growth of the lower jaw in relation to the upper jaw, possible opening of diastema between the lower incisors, and even the possibility of an open bite [Garcia Pola et al., 2002; Queiroz Marchesan, 2004].
- Impacted teeth either at bone or mucogingival level, late in developing, are related to or can create orthodontic problems of crowding [Schindel and Duffy, 2007; Al-Nimri and Gharaibeh, 2005].
- The need to intervene on teeth not completely erupted, during orthodontic therapy, is caused by the presence of gingival tissue that prevents attachment of the brackets.
- Extreme dental crowding can cause gingival recession due to the lack of periodontal support (bone and gingiva) [Linde et al., 2003].
- The activation of arches and springs in fixed orthodontic therapy is often associated with pain in the first days.
- Orthodontic therapy in adults is sometimes necessary to solve problems of articulation and/or muscular problems that cause pain and limited functioning [Molina, 1994].

Aim of the study

Numerous wavelengths are proposed in the literature to obtain valid results in the clinical situations mentioned above [Sarver, 2005; Sarver, 2006; Kotlow, 2004; Fiorotti et al., 2004]. In our clinical practice we have looked in depth at the possibility of using three wavelengths: the 810 nm diode, the Erbium Chromium:YSGG 2780 nm and the Erbium:YAG 2940 nm.

- The 810 nm wavelength belongs to the near infrared