

# Lasers in dental Traumatology and Low Level Laser Therapy (LLLT)

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## Abstract

**BACKGROUND:** Dental trauma in children is a frequent and often complex clinical event in which laser-assisted therapy, particularly using Erbium lasers, can offer new treatment possibilities, improving the outcomes and reducing the associated complications. **REVIEW:** In particular, it is worth considering that the use of laser-assisted therapies is associated with a marked reduction in the use of analgesics and anti-inflammatory medications compared with conventional procedures. Laser anaesthesia is another interesting and challenging area. **CONCLUSION:** Given the paucity of data on laser assisted dental trauma therapy in the international literature and the absence of well-structured guidelines, this is an area ripe for scientific research.

## Introduction

Dental trauma in children is a frequent and often complex clinical event leading to injuries whose treatment can necessitate the involvement of specialists from different branches of dental science (endodontics, restorative dentistry, periodontics, oral surgery, and orthodontics), making dental traumatology a truly multidisciplinary discipline. As shown by the World Health Organisation's revised and extended classification of traumatic dental injuries, [WHO, 1992], these injuries can involve teeth, supporting structures, or gingival and oral mucosa [Andreasen et al., 2007].

Trauma to the teeth of children and adolescents can range from simple crown fractures, to re-implantation, root fractures and luxation injuries. In this setting, laser technology, either complementing or replacing traditional methods with a simpler approach, offers a series of advantages, throughout the therapeutic course. Laser-assisted therapy is minimally invasive, highly selective and, compared with conventional procedures and it drastically reduces the need for post-operative medications. For all these reasons, patient compliance is significantly improved. Laser treatment reduces post-operative sensitivity and, being an option for non-vital bleaching, can also be used in the correction of correct post-traumatic aesthetic defects. Another important attribute is the capacity of laser equipment to induce analgesia, thereby eliminating the need for local analgesia (LA).

Given the paucity of data on laser assisted dental trauma therapy in the international literature and the absence of well-structured guidelines, this is an area for scientific research. At present, however, even though this challenging technology is emerging as highly suitable for trauma-related problems, the existing dental trauma guidelines and protocols remain the gold standard [Flores et al., 2001; Andreasen et al., 2007].

**Epidemiology and Prevention.** Traumatic dental injuries in children and adolescents occur in a variety of situations. The majority are sustained during play (56%) while others are the result of sporting accidents (21%), road accidents (11%) or acts of violence (12%) [Andreasen et al., 2007] although, unfortunately, the latter percentage, concerning violence, is probably underestimated. The teeth most frequently affected, both in primary and in permanent dentition, are the maxillary central (50%) and lateral incisors (30%), although the type of lesion varies according to age.

Large-scale studies in the USA have confirmed the high incidence of dental trauma in the child population. Its prevalence in adolescent boys is twice that recorded in girls of the same age, while no gender difference have been observed in younger age groups [Glendor, 2008]. Given that about 20% of children suffer a traumatic injury to their primary teeth and over 15% to their permanent teeth [Andreasen et al., 2007], the importance of prevention in this field cannot be overstated. In this regard, there is a clear need for specific training programs, more continuing education conventions dealing with the prevention and management of traumatic dental injuries, as well as updated guidelines and, in general, a greater dissemination of knowledge on the topic.

**Types of lasers suitable for dental traumatology.** The therapeutic use of lasers has become standard practice in many medical fields, but dental traumatology is not yet one of them. There exist different types of laser [Martens et al., 2011] that can be used in the treatment of dental injuries and their specific properties make them suitable for different tissues and different procedures. In particular, each wavelength has a particular use, determined by its specific tissue-interaction and affinities.

Currently, paediatric dentists for the treatment of dental traumatic injuries favour two types of laser: the Er:YAG and the Er, Cr:YSGG. These are highly versatile lasers that can be used to treat both hard and soft tissues [Gutknecht et al., 2005; Olivi et al., 2007]. However, there is also a role for the KTP laser, the Nd:YAG laser, the diode laser and the CO<sub>2</sub> laser [Olivi and Genovese, 2011]. In addition, laser Doppler flowometry is emerging as a promising method, as yet in the experimental stages, for ascertaining the state of pulp revascularization (even though pulp testing in dental trauma is still a controversial issue).