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Quintessence

Therapeutic Laser in Surgical Procedures of Pediatric Dentistry: Case Reports

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ABSTRACT

Pediatric dentists are always looking for new techniques, materials, and technologies which may help children to experience better and faster treatments. Low-level laser therapy (LLLT) has been increasingly used in medicine and dentistry over the last few years as a nonsurgical tool for pain control and wound healing improvement. LLLT can benefit the dental treatment and improve the relationship between the dentist, the children, and their parents. This paper describes the success of two cases in which LLLT was used after surgical procedures in pediatric dentistry. Neither patient reported painful symptoms or the use of any medicine during the postoperative period, suggesting a satisfactory and uneventful surgical recovery. In addition, the follow-up examinations revealed an ordinary wound healing of the surgical sites.

Keywords: frenectomy, low-intensity laser therapy, pediatric dentistry, postoperative, supernumerary.

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Low-level laser therapy (LLLT) is a relatively new technique in dentistry, although it has been used in other health professions for decades. LLLT seems to be associated with accelerated wound healing and pain relief, which are considered tremendous therapeutic benefits to patients. However, further studies on mechanisms and recognition of the therapeutic window are needed to reach the treatment goals.[1]

Low-level lasers (LLL), such as He-Ne and Ga-Al-As, can penetrate in tissues due to their properties of low-density energy and wavelength. The therapeutic effects of the LLL are analgesic and anti-inflammatory, and tissue repair is also facilitated.[2]

The analgesic effect of LLL occurs due to several mechanisms that are not yet well understood. Laser therapy stimulates beta-endorphin production, which helps in diminishing the painful process, and inhibits the release of arachidonic acid, a substance released by injured cells.[1,3,4] The anti-inflammatory effects occur with acceleration of the microcirculation, which helps reduce edema and eliminate the intermediate catabolites. In fact, LLLT diminishes edema because it facilitates the balance of hydrostatic pressures of filtration and absorption.[3,4-8] LLLT also increases cell mitosis, vasodilation, and mast cell degranulation, accelerating tissue repair and increasing angiogenesis.[1,4,9]

Currently, LLLT is used in several dental disciplines, eg, for bone biostimulation, reversal of paralysis and paresthesia, and treatment of oral ulceration, herpes, neuralgias, and dental hypersensitivity. The use of laser is also indicated for treatment of systemic diseases which have oral manifestations, such as lichen planus and mucositis.[10,11] LLLT can provide more comfortable and faster postoperative recovery for patients after several kinds of surgery, such as tooth removal and maxillary sinus augmentation.[1]

Fig 1 Intraoral examination view showing an unerupted maxillary left permanent central incisor.

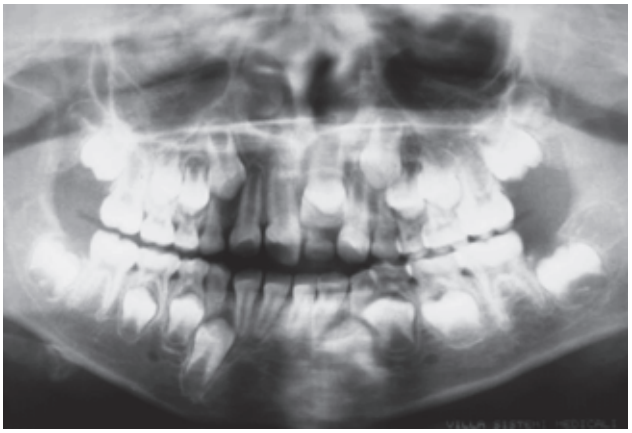

Fig 2 Panoramic radiograph confirming the presence of a supernumerary tooth in the maxillary anterior area.

Fig 3 Initial periapical radiograph to determine the position of supernumerary tooth.

Taking into account that pediatric dentists are always looking for new techniques, materials, and technologies which may help children to experience better and faster treatments, the objective of this paper was to describe the success of two cases in which LLLT was used postoperatively in pediatric dentistry.

CASE 1

A 7-year-old boy attended the Clinic of Pediatric Dentistry at Bauru School of Dentistry, University of São Paulo. The anamnesis, reported by the mother, and the extraoral examination did not reveal any abnormality. Intraoral examination revealed an unerupted maxillary left permanent central incisor (Fig 1). A panoramic radiograph showed the presence of a supernumerary tooth, which was located in the maxillary left incisor region (Fig 2). Periapical radiographs were taken to confirm the location of supernumerary tooth (Fig 3). The treatment plan included the surgical removal of the supernumerary tooth.

At the next appointment, local anesthesia (4% articaine with 1:100,000 epinephrine, 1.8 ml) was given and a mucoperiosteal flap was raised to access the supernumerary tooth. Enough bone was removed with a round bur to expose the impacted incisor. After removal of the supernumerary tooth, the area was sutured (Fig 4a).

In the immediate postoperative period, a 780-nm laser at 35 J/cm^2 (Twin Flex Laser Digital Evolution, MMOPTICS; São Carlos SP, Brazil) was used to irradiate the surgical area for 20 s (Fig 4b). This protocol was repeated 24 and 48 h after surgery. The suture was removed after 7 days. There was no hemorrhage, swelling, infection or postoperative pain. Additionally, the patient reported not needing to take any medication. The patient returned after 3 and 6 months for a follow-up (Fig 5), when the erupted maxillary left central incisor could be clinically detected.

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Fig 4a Intraoral view of the surgical site after removal of the supernumerary tooth and suture of the mucoperiosteal flap.

Fig 4b LLL irradiation on the surgical area in the immediate postoperative period.

Fig 5 Clinical aspect of the healed surgical site and the presence of the left central incisor six months after removing the supernumerary tooth and laser therapy.

CASE 2

A 9-year-old girl was referred to the Clinic of Pediatric Dentistry at Bauru School of Dentistry, University of São Paulo, with poor oral hygiene in the area of maxillary central incisors, resulting in a local biofilm accumulation and gingival inflammation. The patient's medical history did not reveal any systemic disease. Intraoral examination showed the presence of an abnormal upper labial frenum, resulting in local tension and tissue ischemia (Fig 6). The treatment plan was presented to the parents and included a frenectomy in order to eliminate the etiological factors of gingival inflammation and re-establish the normal anatomical characteristics.

Local anesthesia (4% articaine with 1:100,000 epinephrine, 1.8 ml) was given and an incision was made across the base of the frenum at its attachment to the incisive papilla. The dissection was carried down to the periosteum, and the incision was extended along both sides of the frenum to its attachment on the labial mucosa. After this procedure, suturing of the mucosa to the periosteum was performed around the surgical wound to provide local healing (Fig 7a).

In the immediate postoperative period, a 780-nm laser at 35 J/cm^2 (Twin Flex Laser Digital Evolution) irradiated the surgical area for 20 s (Fig 7b). This protocol was repeated 24 and 48 h after surgery. The patient was advised to return after 1 week for suture removal, and no hemorrhage, swelling, infection or postopera-

Fig 6a Intraoral anterior view showing the presence of abnormal maxillary labial frenum.

Fig 6b Intraoral examination showing the presence of abnormal maxillary labial frenum.

Fig 7a Immediate view of the surgical site after maxillary labial frenectomy.

Fig 7b LLLT on the surgical area during the immediate postoperative period.

Fig 8 Clinical aspect of tissue healing 1 week postoperatively.

Fig 9 Clinical aspect of the healed surgical site six months after the frenectomy and laser therapy.

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tive pain were detected (Fig 8). Periodic follow-up was performed monthly in order to assess the quality of the repair and wound healing. After 6 months, remarkable improvement in the oral hygiene was observed in the area of maxillary central incisors (Fig 9).

DISCUSSION

Pediatric dentistry's goal in delivering care to young patients is to provide optimal preventive, interceptive, and restorative dental care and surgical procedures in an environment that is as stress free as possible. This paper presents ideas for long-term treatment planning and shows the use of the therapeutic laser after surgical procedures (removal of a supernumerary tooth and frenectomy) in children, which provided a more comfortable postoperative period and quicker wound healing.

Supernumerary teeth are disorders of odontogenesis characterized by an excess number of teeth. The presence of a supernumerary tooth in the central position of the maxilla between the two central incisors is called mesiodens.[14] Several hypotheses have been suggested for the formation of supernumerary teeth, such as proliferation of the dental lamina and genetic factors.[15] The complications associated with mesiodens include: lack of eruption of permanent teeth, the deviation of the eruption path, rotations, retention, root resorption, pulp necrosis with loss of vitality, and diastema. Early detection of mesiodens is more important if such complications are to be avoided. The case presented here required only surgical treatment to remove the supernumerary tooth and to allow the eruption of the left permanent central incisor, without the need of orthodontic treatment to bring the impacted tooth into position.

An abnormal maxillary labial frenum is capable of retracting the gingival margin, creating a diastema, limiting lip movement, resulting in tissue ischemia, promoting poor oral hygiene, as well as resulting in a local biofilm accumulation and chronic inflammation.[12,13] In cases of a high smile line, the maxillary labial frenum also affects esthetics. When an abnormal frenum is present, frenectomy is advised.[15] The description of case #2 suggests that early diagnosis and surgical treatment of the maxillary labial frenum in school-age children is fundamental for eliminating etiological factors, re-establishing normal anatomic characteristics and preventing periodontal diseases.

In pediatric dentistry, the postsurgical recovery period must be as comfortable as possible. Therefore, surgical wound healing that is free of infection and with reduced inflammation and pain is extremely important for the success of surgical procedures.[1,4] Laser therapy has been recommended in such clinical situations because of the biological effects of the interaction between laser energy and injured tissues. Laser stimulates cellular activity and leads to the release of growth factors by macrophages.[16] It also induces keratinocyte proliferation, angiogenesis, and mast cell activation and degranulation, which may also accelerate wound healing. This acceleration is the result of a shorter acute inflammation phase and earlier commencement of the proliferative phase of tissue repair, when granulation tissue is produced.[17]

Several studies have analyzed the influence of laser energy on the biomodulation of inflammatory reactions and wound healing.[18] Variations in wavelength, power levels, irradiation method, and exposure time may yield different results. Normally, the prescribed doses for pediatric patients should be 1/3 of those prescribed for adults. Children older than 10 years can receive 1/2 of the adult dose. The dose depends on the type of procedure performed.[2-4,6,10,11,17]

In this study, the dose used was sufficient to provide the children with a comfortable postsurgical recovery. Parents did not report the use of anti-inflammatory drugs. Therefore, laser treatment showed excellent results, since patients did not take medication for pain relief. The use of analgesics is common in patients who do not get laser irradiation after oral surgery. Additionally, the dose used was satisfactory for good healing and producing an analgesic effect. Laser therapy is a simple, low-cost method which can be applied in conjunction with conventional treatments, thus improving the outcome of some pediatric dental treatments.

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