Removal of fibrous epulis with Er,Cr:YSGG laser: case report

G. OLIVI, M. COSTACURTA, P. MATURO, R. DOCIMO

ABSTRACT. Background Epulis is a benign tumour located in the area of the alveolar bone, periodontal ligament and marginal gingiva. A clinical case of Epulis, treated using an Er,Cr:YSGG laser in our Paediatric Dentistry division of the PTV Hospital, University of Rome “Tor Vergata”, is described. Case report A pink, sessile, broad-based lesion, elastic in consistency, was detected on the maxillary vestibular gum above the lateral right incisor. The lesion was removed with Er,Cr:YSGG laser (2780 nm) without anaesthetic infiltration, power ranged from 1.5 to 2.0 Watts at 20 Hz repetition rate under 20%-15% air-water spray. The histopathological examination confirmed the diagnosis of fibrous epulis. The immediate postoperative course was excellent, with no pain or need for anti-inflammatory or analgesic drugs. Wound healing was good after 1 week, and was completed after 1 month. The patient was followed up for 3-6 months, and checked again after 1 and 2 years to assess possible relapse. The Er,Cr:YSGG laser has several treatment advantages, fundamental in Paediatric Dentistry: it requires only topical anaesthesia, it has a high clinical safety, there is a short treatment time, no surgical sutures are required; no complications were encountered during or immediately following laser surgery, all resulting in excellent patient cooperation.

KEYWORDS: Er,Cr:YSGG laser, epulis, oral hyperplastic lesions.

Introduction

Epulis is a specific clinical term of topographic meaning (ἐπι over, οὖλον gums) but without specific histological characteristics; in clinical terminology it is used to describe benign tumours, circumscribed and located in the area of the gums or near the alveolar margin [Montagna et al., 2000].

According to the histopathological classification [Anneroth and Sigurdson, 1983], epulis are divided into three large groups:

1. granulomatous hyperplasia: epulis in pregnancy, pyogenic granuloma, angiomatous epulis, telangiectatic epulis, capillary hemangioma, hemangioma cavernosum;
2. fibrous hyperplasia: fibrous epulis, fissured epulis, fibroepithelial lesions, primary odontogenic fibroma;
3. giant cell hyperplasia.

The aetiology of epulis is multifactorial: irritative factors (chronic gingivitis, periodontal disease, defective dental fillings, poorly fitting dentures, poor oral hygiene, tobacco smoking), blood dyscrasias (anaemias, haemostatic alterations) and hormonal influences (during pregnancy, due to an increase in estrogen and progesterone levels) [Tamarit-Borràs et al., 2005]. The treatment aim is to remove the aetiologic factors and the surgical excision of the lesion [Tamarit-Borràs et al., 2005].

Materials and methods

In the case reported an Er,Cr:YSGG laser, 2780 nm (Waterlase, Biolase-Irvine, CA-U.S.) was used. This medium infrared laser works in pulse mode, at a fixed frequency of 20 pulses per second (Table 1) [Hadley, 2000] (0.6W power 140 microsec. pulse duration).

The Er-Cr laser has a close affinity with hydroxyapatite and water, so it can be used both on hard (tooth, bone) and soft tissues (mucosa, gum, pulp tissue) [Iaria et al., 2005]. Therefore considering the high water content of soft tissues, the therapeutic indications of Er-Cr laser on such area are several (Table 2).
The coefficient of water absorption of the 2780 nm radiation is slightly lower than 2940 nm radiation [Caprioglio et al., 2003] with a similar effective action on soft tissues. The adjustable air-water spray delivered through a handpiece produces a clean incision and vaporisation (cleaning effect) and avoids a rise in the temperature of the tissue (cooling effect) [Olivi and Genovese, 2004].

Case report
An 11-year old boy was seen in the Paediatric Dentistry division of the PTV Hospital, University of Rome “Tor Vergata”.

A clinical examination chart was completed with patient personal details, medical history, extra-intraoral clinical examination, x-rays and photographs. The patient’s dental history revealed pain and occasional gingival bleeding at the maxillary right lateral incisor area, when chewing or during home dental care. The intraoral clinical examination revealed a vestibular gingival neoformation above the maxillary right lateral incisor that extended from the central incisor to the deciduous canine; it was pinkish, sessile, wide-based, fixed but elastic in consistency, covered by apparently healthy mucous tissue (Fig. 1, 3, 4).

The lateral incisor responded positively to pulp vitality tests. Orthopantomography and periapical X-rays were within normal ranges (Fig. 2).

The clinical appearance was consistent with a diagnosis of a benign fibrous tumour with slight vascularisation, localised in the gingival area without involving the alveolar margin.

The treatment plan was outlined as follows: complete removal of the lesion by means of laser surgery, using Er,Cr:YSGG laser (Waterlase, Biolase-Irvine, CA-U.S.) with a minimally invasive approach.

The treatment plan was fully explained to the patient and parents, and all associated risks were outlined: a written consent form was signed by the parents in the presence of a witness.

Soft tissue anaesthesia was induced with topical 15% lidocaine spray, initial laser settings were at low power (0.5-0.75 Watts - 20 Hz) in defocused mode, slowly irradiating the area to induce analgesia, that means, a relative increase of the membrane potential of the sensitive nerve cells (hyperpolarisation), to avoid them being stimulated [Benedicenti, 2005].

The power was then slowly increased to 1.5-2.0 Watts - 20 Hz, with an air-water spray ratio of 20%-15%, gradually progressing to the contact mode with a clean, fast incision and excision of the neoformation (Fig. 5, 6).

The incision was carried out using a conical sapphire

<table>
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<tr>
<th>Parameters</th>
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<tr>
<td>Wavelength</td>
<td>2780 nm</td>
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<tr>
<td>Power output range</td>
<td>0.0 to 6.0 Watts</td>
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<tr>
<td>Pulse frequency</td>
<td>20 Hz</td>
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<tr>
<td>Pulse energy</td>
<td>0 to 300 mJ per pulse</td>
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<tr>
<td>Pulse duration</td>
<td>140 usec</td>
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<tr>
<td>Air</td>
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<td>Water</td>
<td>0-100%</td>
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<td>Delivery system</td>
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<td>Direct pulp capping</td>
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<td>Pulpotomy, pulpectomy</td>
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<td>Crown lengthening</td>
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<td>Gingivectomy, gingivoplasty</td>
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<td>Frenotomy, frenectomy</td>
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<td>Treatment of oral pathologies: fibroma, mucocele, epulis, lipoma, papilloma, Aphthous-herpetic stomatitis, hyperkeratosis lesions</td>
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<td>Removal of inflammatory tissue and foreign body</td>
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| Table 1 - Operative parameters of the Er:Cr:YSGG laser (Waterlase, Biolase-Irvine, CA-U.S.). |

| Table 2 - Therapeutic indications of Er-Cr laser on soft tissues. |

FIG. 1 - Preoperative full mouth view.
tip (T4-400 µm diameter) and then a 14 mm long quartz tip (Z4-400 µm diameter) was used for sulcus gingival curettage and control of the radicular cement.

The residual area was finally treated at 0.25 Watt, 0% water and 10% air to achieve haemostatic effect (Fig. 7); surgical sutures were unnecessary.

Treatment time required to complete the surgery was approximately 7 minutes. Post-surgical instructions to the parents and patient included proper home care and a chlorhexidine gel (0.2%) to apply to the wound (twice a day for one week) was prescribed.

The biopsy identified the lesion as removed by a laser, it was 1x0.8x0.4 cm in size, and stored in 10% formalin solution: the histological report confirmed a reactive papillary hyperplasia mainly at the fibrous stage, compatible with a diagnosis of fibrous epulis (Fig. 8).

Postoperative follow-up appointments after 1 week and 1 month aimed at evaluating healing and wound recovery. The patient was seen for further evaluation at 3-6 months and 1-2 years to assess possible relapse.

A week after the operation the surgical area had not healed completely (Fig. 9). The patient’s parents confirmed that there had been no postoperative complications or discomfort. No pharmacological treatment had been necessary.

At one month the tissue had healed completely with no scarring (Fig. 10); later follow ups (3-6 months, 1-2 years) failed to reveal any sign of relapse (Fig. 11).
Discussion
Laser surgical technique used in this case presented several benefits for paediatric patient:
- less local anaesthetic required: in this case only topical anaesthetic was used;
- no analgesic or post surgical anti-inflammatory medication were required;
- the laser’s bactericidal action and lack of collateral damage reduced the inflammatory reaction: no swelling or infective complication developed in this cases;
- no sutures were required;
- short operative time, a very important element of success in paediatric dentistry.
- secondary intention healing, with prevalence of regenerative over reparative healing without tensions and absence of scars
- safe use, that makes it possible to operate on non-cooperative patients.

The choice to use an Er,Cr:YSGG laser (medium infrared, λ 2780 nm) rather than a near infrared laser (λ 810 nm or 1064 nm), which interacts optimally with high content haematic tissue (haemoglobin), results from the versatility in the use of this wavelength; considering the slight vascularisation and fibrous nature of the lesion and the advantages of working on the gingival tissue and radicular cement without causing lateral or in-depth thermal damage, the Er,Cr laser works efficiently as a surgical laser.

Due to the low power setting used, to the fibrous nature of the lesion and to the absence of lateral or deep thermal damage of this laser wavelength, a good haemostatic control was achieved for the superficial thermal effect (photo-thermal induced coagulation) of the laser beam on the water content of the residual healthy gingival tissue.

Conclusion
The laser technique used in this study was an effective choice. The therapeutic success was due to the positive psychological approach and to the good intraoperative cooperation of the patient; the asymptomatic postoperative follow up without complications led to a better acceptance of this laser surgical treatment by the young patient and parents.

References