Incision and drainage of a vestibular space abscess by diode laser

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Fig. 1a


Fig. 1b


Fig. 1c

Figs. 1a–c_Extra-oral swelling of the left cheek, right side (a); front view (b); and left side (c).

_Introduction

Odontogenic infection in the orofacial regions causes tenderness, swelling, limited mouth opening and reduced function. In addition to this, the progressive infection may be life-threatening. The management of odontogenic infections entails rapidly eliminating the cause of infection; performing surgical drainage, which may be as simple as creating endodontic access for the removal of necrotic pulp or as complex as creating a wide incision for open drainage of accumulated pus and necrotic debris; administration of appropriate antibiotics; and supportive physical care. Typically, incision and drainage for the reduction of pus is performed using sharp dissection and retaining a Penrose or rubber tube drain until the infection has subsided. This normally takes about two to five days, depending on the severity of the infection.[1,2] There are some disadvantages of these procedures: bleeding during operation, the need for suturing, post-operative pain and oedema, early healing due to scar formation and discomfort from the inserted drain.

The properties of the diode laser provide advantages in soft-tissue surgery, such as producing precise surgical incisions with haemostasis, not requiring suturing, less post-operative swelling and pain, slower epithelial regeneration compared with traditional surgical wounds by producing necrotic tissue, and the promotion of good wound healing.[3–8] Therefore, the diode laser can be used to simplify the surgical phase of odontogenic infection management considerably, as shown in this case report, illustrating the clinical use and efficacy of the diode laser for incision and drainage as a part of the management of intra-oral space abscesses.

_Methods of laser incision and drainage

The surgical procedure was performed under local anaesthesia, 2% mepivacaine with 1:100,000 epinephrine. An 810 nm diode laser (320 diameter fibre optic, 4 W, continuous wave) was used to ablate the

Fig. 2_Intra-oral swelling at the vestibular area of the mandibular left premolar and molar.

Fig. 3_Generalised horizontal bone loss, complicated crown fracture, exposed pulp of the mandibular left first molar.

Fig. 4a_Diode laser incision and drainage. The diode laser (Fotona) with a wavelength of 810 nm.

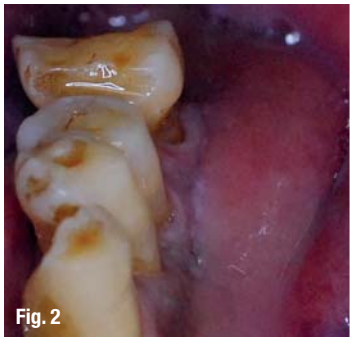
Fig. 2


Fig. 3

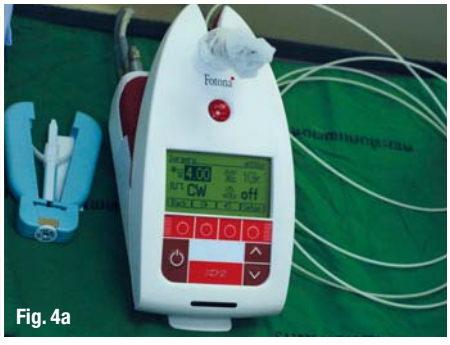

Fig. 4a

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Fig. 4b


Fig. 4c


Fig. 4d


Fig. 4e


Fig. 4f

Fig. 4b_Ablating mucosa with the diode laser; power setting at 4 W, continuous wave.
Fig. 4c_Blunt dissection using curved artery forceps.
Fig. 4d_Irrigation with a normal saline solution.
Fig. 4e_Coagulating the incisional margin with the diode laser; power setting at 2 W, continuous wave.
Fig. 4f_Finishing the surgical treatment without bleeding, suturing or a drain.

tissue from the most fluctuated oral mucosal area through the submucosal layer without perforating the periosteum, creating an incision of 1.5–2 cm in length.

Then, blunt dissection was performed. After irrigation with a normal saline solution, the incisional margins and submucosal layers were coagulated using the diode laser at 2 W, continuous wave. This aimed at maintaining soft-tissue tunnelling for pus drainage without placing sutures and inserting a drain. Amoxicillin, metronidazole, paracetamol and 0.12 % chlorhexidine mouthwash were prescribed. Three cases of vestibular space abscess were treated.

_Case 1

A 65-year-old male patient presented to the Department of Oral and Maxillofacial Surgery of the Faculty of Dentistry at Khon Kaen University in Thailand with swelling of and pain in the left cheek that had lasted for one day. The left submandibular lymph node was tender and movable with a diameter of 0.5 cm (Figs. 1a–c). The patient had normal mouth opening and the buccal vestibule of the mandibular left posterior teeth was swollen. It was soft in consistency, with normal mucosal colour and texture. There was a partial fracture of the mandibular left first molar, exposing pulp (Fig. 2). The tooth mobility was Grade I. In the radiographic examination, the panoramic radiograph (Fig. 3) showed that there was furcation involvement in the mandibular left first molar, with total bone loss of the distal root with a circumscribed periapical radiolucency of 2 x 4 mm in size, and 20 % bone loss of the mesial root. Other significant findings from the radiographic examination included 50 % horizontal bone loss of the mandibular left canine and premolars, extrusion of the maxillary left second and third molars, generalised bone loss with subgingival calculus of the maxillary right canine and premolars, normal condylar shape and position, and normal density of the maxillary antrum. The case was diagnosed as a vestibular space abscess secondary to a complicated crown fracture of the mandibular left first molar. The treatment was a combination of diode laser incision and drainage under local anaesthesia (Figs. 4a–f), extraction of the mandibular left first molar and antibiotic administration.

On day three after treatment, there was clinical improvement and the infection had subsided. The drainage via the laser incision remained intact. Irrigation with a 0.9 % normal saline solution was carried out (Figs. 5a & b). Then, the mandibular left first molar was removed by a simple extraction technique under local anaesthesia.

_Case 2

A 21-year-old female patient presented with swelling and pain in the region of the maxillary anterior teeth that had lasted for two days. She was undergoing orthodontic treatment. The extra-oral examination found a mild swelling of the philtrum. The intra-oral examination found a swelling of 1 x 2 cm in size at the labial gingiva, extending to the vestibule, that was soft in consistency, with tenderness on palpation. There were large tooth-coloured material fillings at the mesial surfaces of the maxillary left and right central incisors. The restorative filling of the maxillary right central incisor was significantly discoloured (Fig. 6a). The periapical film showed a well-circumscribed periapical radiolucency at the right central and lateral incisors of 1 x 1 cm in size and at the left central incisor of 0.3 x 0.3 cm in size (Fig. 6b). A vestibular space abscess was diagnosed. The treatment plan entailed root-canal treatment for the maxillary right incisors and the maxillary left central incisor, diode laser incision and drainage of the vestibular space abscess, and antibiotic administration. Diode laser incision and drainage (Fig. 6c) were performed at the first visit and antibiotics were administered. The patient presented again for follow-up visits one day and three days post-treatment. On day five after the operation, the incisional wound had almost completely healed and

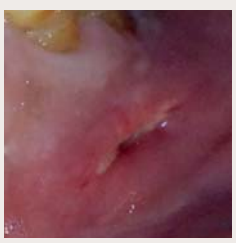
Fig. 5a

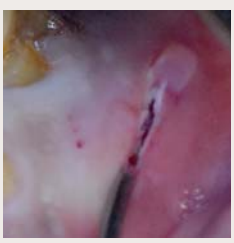
Fig. 5b

Fig. 5a_Laser incision with a thin coagulum three days post-treatment.
Fig. 5b_Irrigation at the area of laser incision with a normal saline solution.

irrigation was not required (Fig. 6d). The clinical symptoms had resolved completely.

_Case 3

A 27-year-old male patient presented with swelling and pain in the left cheek that had lasted for three days. The extra-oral examination findings were clinically within normal limits. The intra-oral examination found both swelling and shallowing of the vestibule of the mandibular left premolars and the first molar. There was an extensive carious lesion with pulpal exposure of the first molar (Fig. 7a).

The panoramic radiograph showed a well-circumscribed periapical radiolucency at the mandibular left first molar (Fig. 7b). The diagnosis was a vestibular space abscess. The treatment plan was the same as that of case 2. At the first visit, diode laser incision and drainage were performed (Fig. 7c) and antibiotics were prescribed. On day three after the operation, the laser wound was covered with a thin coagulum and irrigation could be performed (Figs. 7d & e).

Clinical symptoms, such as swelling and tenderness, had decreased. On day six after laser incision and drainage, all clinical symptoms had resolved completely. A small opening remained in the laser wound for irrigation (Fig. 7f).


Fig. 6a


Fig. 6b


Fig. 6c


Fig. 6d

Fig. 6a_Vestibular space abscess of the maxillary incisors.
Fig. 6b_Periapical film showing periapical radiolucencies of the maxillary incisors.
Fig. 6c_Immediately post-treatment with diode laser incision and drainage.
Fig. 6d_Laser wound on day five post-treatment.

_Discussion

When the blunt dissection was performed, the cases presented showed infection only in the superficial areas at a depth of less than 3 cm. In comparison with other types of lasers, such as the carbon dioxide,

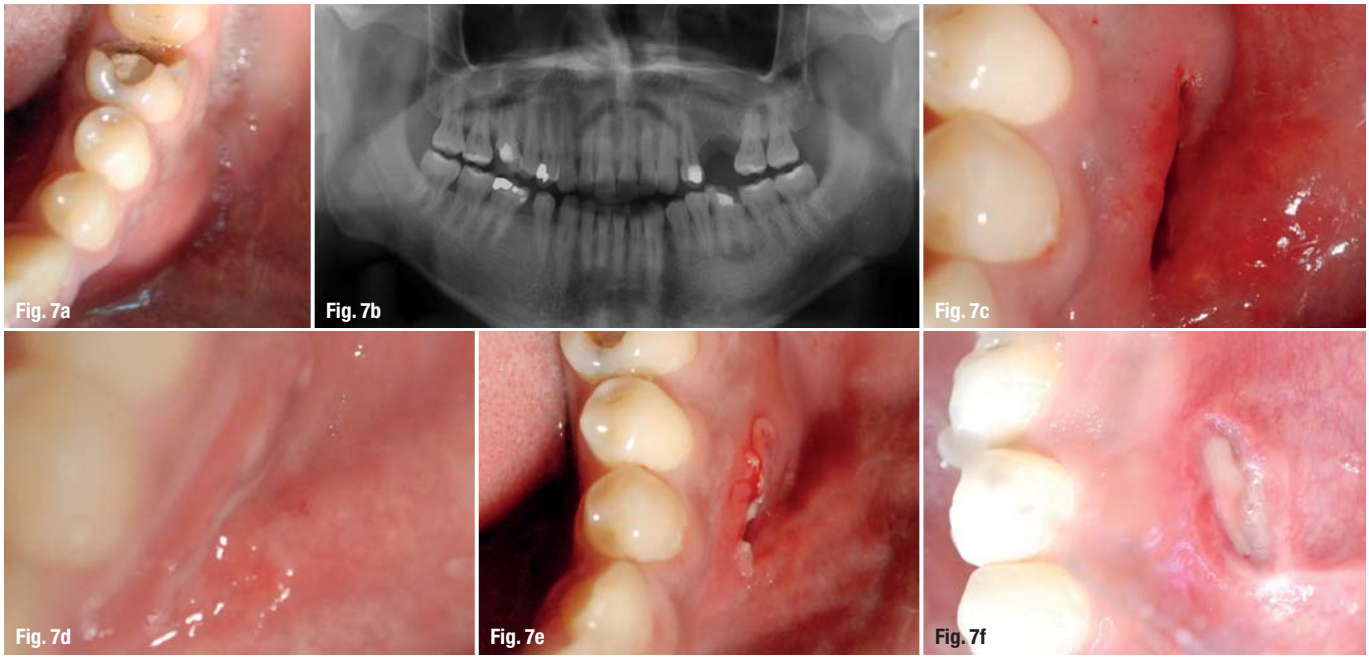

Fig. 7a_Swelling extending from the premolars to the first molar. Fig. 7b: Panoramic view.
Fig. 7c_Immediately post-treatment with diode laser incision and drainage.
Fig. 7d_Laser wound on day three post-treatment.
Fig. 7e_After irrigation with a normal saline solution on day three post-treatment.
Fig. 7f_Laser wound on day six post-treatment.

Nd:YAG and Er:YAG laser, the diode laser shows less water absorption, as well as moderate haemoglobin and melanin absorption. Therefore, this laser can provide moderate cutting with reasonable laser coagulation.[3, 5, 9] This enabled us to minimise initial bleeding on operation and delayed wound healing, thus allowing for the drainage of pus and exudate without requiring suturing and the insertion of a drain.

Regarding diode laser wound healing, Camillo et al. compared the wound healing of incisions made by scalpel and by a 808 nm diode laser at 4 W and 6 W in the oral tissue of rats.[4] They found the same level of inflammation and complete wound healing at 14 days in the scalpel and diode laser at 4 W groups, while inflammation in the diode laser at 6 W group was worse and took more than 14 days to heal completely. Therefore, they recommended a power setting of no more than 4 W for the diode laser when cutting soft tissue. Jin et al. studied wound healing in the buccal mucosa of guinea pigs following incision by diode laser compared with incision by scalpel.[10] They found that the diode laser was a good cutting device, but it resulted in more tissue damage and greater inflammation than the scalpel did in a period of five days post-treatment. After that period, there was no difference between the diode laser wound and the scalpel wound. Complete healing was observed 14 days post-treatment in both groups. In this case report, we used power settings of 4 W for ablation and 2 W for tissue coagulation. Wound healing was observed within no more than 14 days. Therefore, the results were considered to be similar to those of the studies mentioned.

_Conclusion

Incision and drainage by diode laser for ablation and coagulation were successful in treating vestibular space abscesses within a depth of 3 cm. The coagulative zone of the incision created by the diode laser provided adequate drainage without the need for inserting a drain. It is recommended that further studies be conducted on the treatment of odontogenic infection involving one or two spaces with a depth of 3–5 cm with diode laser incision and drainage without placing a rubber drain. The duration of wound healing in relation to clinical symptoms could also be observed in future clinical studies.

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