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Case Report

Dentistry Section

Surgical Excision of Hypertrophic Tissue and Retrieval of Orthodontic Mini-implant using Diode Laser- A Rare Case Report

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ABSTRACT

Orthodontic mini-implants or transient anchorage devices can be used to shift difficult teeth. There is substantial evidence showing the effectiveness of Temporary Anchorage Devices (TAD) and their anchorage requirements. However, there are also reports of failures and complications like soft tissue inflammation, tissue overgrowth, peri-implantitis and mini-implant fracture. The present case report of 22 years old female patient, discusses a rare occurrence of tissue overgrowth over the mini-implant on right buccal mucosa in relation to 45, 46 regions. A 1.3×9 mm stainless steel mini-implant was used as an interim anchorage device. The tissue overgrowth was attributed to soft tissue inflammation around the mini-implant. Under adequate anaesthesia, the tissue was removed using a laser, and the mini-implant was retrieved using tissue forceps. After achieving hemostasis, simple interrupted sutures were placed. It is recommended to administer antibiotics, analgesics, and along with postoperative instructions. When used correctly, mini-screws are valuable tools that enhance the effectiveness of orthodontic treatment. However, there is a scarcity of case studies discussing the complications and side-effects of mini-implants. Clinicians should carefully evaluate both general and unique side-effects and complications at the insertion site. This case report demonstrates the successful removal of an orthodontic mini-implant following diode laser ablation of hyperplastic tissue.

Keywords: Anchorage devices, Complications, Soft tissue laser, Tissue overgrowth

CASE REPORT

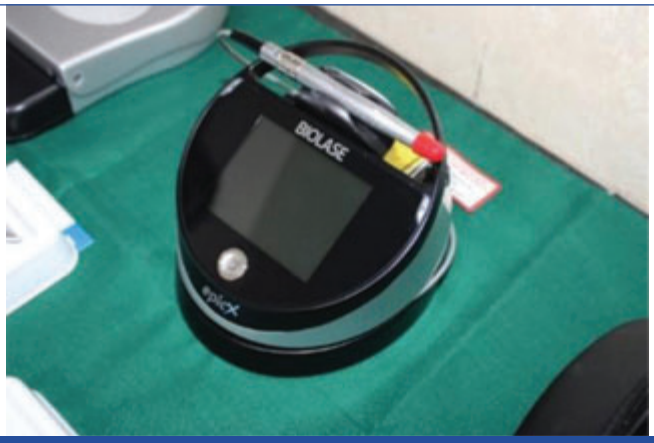
A 22-year-old female patient was referred from the Department of Orthodontics to the Outpatient Department of Periodontics with a chief complaint of painful and swollen gums in the 46-47 region for the past six months. The history of presenting illness revealed intermittent, dull, gnawing pain which aggravated on mastication in the right lower third of the face for past six months. The patient had been undergoing orthodontic treatment for the last two years.

On extraoral examination, facial asymmetry was observed, with a diffuse swelling in the right lower third of the face. Intraoral examination revealed a firm, fibrous, reddish, diffuse swelling measuring 3×2 cm on the buccal mucosa in the 46-47 region. [Table/Fig-1a]. Patient had Temporary Anchorage Device (TAD) placed in the alveolar bone in relation to 46-47 two years ago. The TAD had been worn for three years, achieving the intended anchorage. However, the patient developed hypertrophic tissue with pain and difficulty in mastication. Therefore, it was decided to surgically remove the hyperplastic tissue and the TAD implant using a laser.

The provisional diagnosis was a traumatic lesion, while the differential diagnosis included irritation fibroma, neurofibroma, peripheral giant cell fibroma, and benign and malignant neoplasms of the minor salivary glands. The TAD was used for retraction with specific anchorage requirements. A radiograph was taken to determine the exact position of the implant [Table/Fig-1-b]. The laser was chosen for its advantages of reduced bleeding and faster healing [1]. An informed consent was obtained from the patient, who was prescribed antibiotics and analgesics as prophylactic management for five days before the scheduled surgery.

[Table/Fig-1]: Preoperative view: (a) Intraoral; (b) Radiograph.

Surgical procedure: After five days, the extraoral swelling and inflammation subsided, and the surgical protocol was planned. On the day of the surgery, adequate local anesthesia was administered, maintaining a sterilised protocol and taking laser precautions. An incision was made in the hyperplastic tissue using a diode laser (BIOLASE) [2] [Table/Fig-2] with a power of 1 watt in continuous mode [Table/Fig-3]. The TAD site was identified and located, and the head of the TAD was exposed. Using artery forceps, the TAD was retrieved with a "pull-out" motion [Table/Fig-4a-c]. The excised tissue was placed in a 10% formalin solution and sent for biopsy analysis [Table/Fig-5]. After achieving hemostasis, the site was irrigated with saline. The surgical defect was closed with 5-0 Vicryl suture without tension to allow for secondary healing. A post-operative radiograph was taken [Table/Fig-6a,b]. Post-operative antibiotics and analgesics were prescribed, and the patient was scheduled for a follow-up appointment after one week.

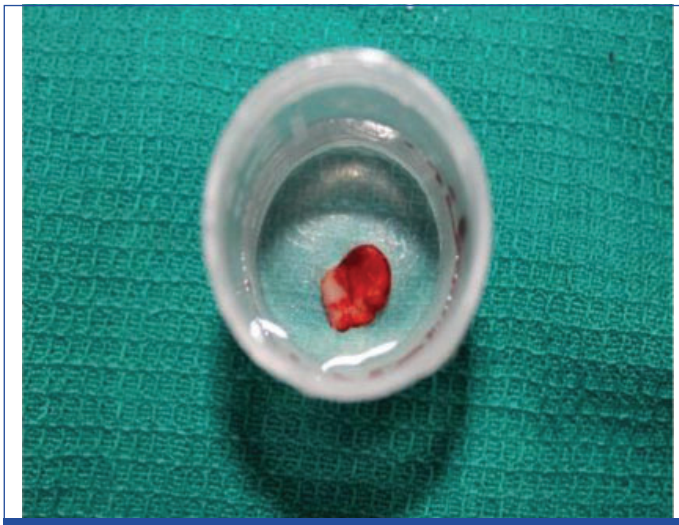


[Table/Fig-2]: Diode laser (Biolase-940 nm).

The results of the histopathological analysis revealed parakeratinised stratified squamous epithelium with short, blunt rete-pegs that appeared stretched and atrophic. The underlying connective tissue stroma exhibited numerous fibroblasts with plump, spindle-shaped

[Table/Fig-3]: 1 Watt Power.

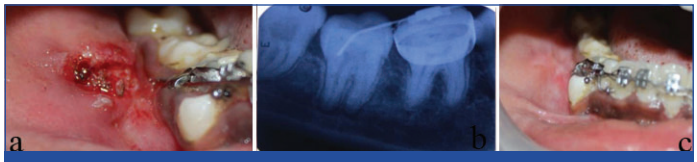
[Table/Fig-4]: Intraoperative view (a) Laser excision; (b) Exposure of implant head; (c) Retreived TAD.



[Table/Fig-5]: Biopsy.

nuclei and thick bundles of collagen fibers. Various sizes and forms of intravasated endothelial-lined blood vessels containing red blood cells were observed. Mild persistent inflammation with a cellular infiltrate was visible. These histopathological features confirmed the diagnosis of fibroepithelial hyperplasia, which is a reactive lesion due to trauma.

Postoperative pain was assessed using a visual analog scale, which indicated a pain level of 0 to 4 mm, signifying no pain. After one week of uneventful healing, the sutures were removed. The patient was scheduled for a follow-up appointment after one month and demonstrated uneventful healing [Table/Fig-6c].



[Table/Fig-6]: Postoperative view (a) Immediate postoperative; (b) Radiograph; (c) One month. postoperative.

DISCUSSION

Temporary Anchorage Devices are placed in the alveolar or extra-alveolar region for anchorage requirements [3]. There are various types of anchorage devices [4]. Mini-implants are preferred over the conventional method for effective tooth movement, and they can be removed after the treatment regimen [5]. Over time, mini-implants may lead to soft tissue inflammation, mini-implant fracture, or scar formation [6].

In this case report, the patient had developed tissue overgrowth over the head of the mini-screw and it was planned to surgically remove the hyperplastic tissue with a laser and retrieve the mini-implant. TADs are temporarily fixed to the bone, either in the alveolar or extra-alveolar region, for orthodontic anchorage requirements. The main advantage is that they can be removed once the treatment regimen is completed [7-10].

According to Papageorgiou SN et al., the overall failure rate for micro-screw implants was 13.5%. Implant failures were mostly related to the site of insertion, with the mandibular region being more common, rather than patient age, sex, or insertion side [11].

A similar study by Singhal D et al., reported the management of reactive tissue overgrowth due to the placement of orthodontic mini-screw implants. This case series illustrated the adverse effect of inter-radicular orthodontic mini-screw insertion, leading to peri-implant mucositis, a reactive pyogenic condition characterised by tissue overgrowth around the mini-screw head. Although mini-screw implants for orthodontic anchorage have a documented success rate of 83.3%, there is still a one in five chance of failure [12].

One of the disadvantages of the traditional method is the difficulty in achieving effective tooth movement in only one direction. Mini-screw implants are generally made of titanium or titanium alloy and are inserted through the gingiva or alveolar mucosa [13]. While generally considered a relatively safe therapeutic procedure, orthodontic mini-screw insertion has potential risks and side effects.

Pain, inflammation of soft and hard tissues, hypertrophy of the gingival tissues surrounding the mini-screw, and perforation of the walls of the maxillary sinus and nasal cavity were the most commonly reported adverse effects [14,15]. Lesions at the roots during mini-screw interradicular insertion were the most commonly reported complication. Inflammation of the soft tissue surrounding the mini-implant can cause additional problems over time. When mini-screws are inserted through non-keratinised or mobile gingiva, they can stimulate the soft tissues in the area and lead to tissue inflammation, minor infections, and peri-implantitis [6].

The most common complication associated with mini-screws placed on the palatal site is tissue overgrowth that covers the head of the mini-implant by the surrounding soft tissues [16]. Studies have reported soft tissue scars after mini-screw removal [4]. The removal procedure can sometimes result in a small, transient, full-thickness wound that heals through secondary intention. Mini-screws, particularly when placed in the maxillary buccal region, can lead to scar formation [6]. Therefore, proper post-operative care and removal techniques are necessary to facilitate favorable healing.

Laser treatment is preferred in these cases due to its advantages of reduced bleeding, decreased anaesthesia requirements, reduced pain perception, avoidance of medications, and rapid wound healing [1].

CONCLUSION(S)

If used correctly, mini-screws are considered valuable tools for improving and enhancing the quality of orthodontic treatment. There are very few documented cases of mini-implant failure. The successful retrieval of the mini-implant following the excision of the hyperplastic tissue was emphasised in this case report. To minimise difficulties and negative effects, it would be beneficial to have a comprehensive understanding of the biological and mechanical aspects of anchorage systems. Further research is needed to address the lack of evidence in this area.

REFERENCES

[1] Mizutani K, Aoki A, Coluzzi D, Yukna R, Wang CY, Pavlic V, et al. Lasers in minimally invasive periodontal and peri-implant therapy. Periodontol 2000. 2016;71(1):185-212.

[2] Azma E, Safavi N. Diode laser application in soft tissue oral surgery. J Lasers Med Sci. 2013;4(4):206.
[3] Creekmore TD. The possibility of skeletal anchorage. J Clin Orthod. 1983;17(4):266-69.
[4] Prabhu J, Cousley RR. Current products and practice: Bone anchorage devices in orthodontics. J Orthod. 2006;33(4):288-307.
[5] Huang LH, Shotwell JL, Wang HL. Dental implants for orthodontic anchorage. Am J Orthod Dentofacial Orthop. 2005;127(6):713-22.
[6] Giudice AL, Rustico L, Longo M, Oteri G, Papadopoulos MA, Nucera R. Complications reported with the use of orthodontic mini-screws: A systematic review. Korean J Orthod. 2021;51(3):199-216.
[7] Miyawaki S, Koyama I, Inoue M, Mishima K, Sugahara T, Takano-Yamamoto T. Factors associated with the stability of titanium screws placed in the posterior region for orthodontic anchorage. Am J Orthod Dentofacial Orthop. 2003;124(4):373-78.
[8] Costa A, Raffaini M, Melsen B. Mini-screws as orthodontic anchorage: A preliminary report. Int J Adult Orthod Orthognath Surg. 1998;13(3):201-09.
[9] Freudenthaler JW, Haas R, Bantleon HP. Bicortical titanium screws for critical orthodontic anchorage in the mandible: A preliminary report on clinical applications. Clin Oral Implants Res. 2001;12(4):358-63.
[10] Fritz U, Ehmer A, Diedrich P. Clinical suitability of titanium mini-screws for orthodontic anchorage-preliminary experiences. J Orofac Orthop. 2004;65(5):410-18.
[11] Papageorgiou SN, Zogakis IP, Papadopoulos MA. Failure rates and associated risk factors of orthodontic mini-screw implants: A meta-analysis. Am J Orthod Dentofacial Orthop. 2012;142(5):577-95.
[12] Singhal D, Ahuja A, Deepa D. Management of reactive tissue overgrowth due to the placement of orthodontic mini-screw implant: A case series. J Adv Clin Res Insights. 2020;7(4):63-66.
[13] Mecenas P, Espinosa DG, Cardoso PC, Normando D. Stainless steel or titanium mini-implants? A systematic review. Angle Orthod. 2020;90(4):587-97.
[14] Fäh R, Schätzle M. Complications and adverse patient reactions associated with the surgical insertion and removal of palatal implants: A retrospective study. Clin Oral Implants Res. 2014;25:653-58. Doi: 10.1111/clr.12152.
[15] Gurdan Z, Szalma J. Evaluation of the success and complication rates of self-drilling orthodontic mini-implants. Niger J Clin Pract. 2018;21:546-52. Doi: 10.4103/njcp.njcp_105_17.
[16] Ziebura T, Flieger S, Wiechmann D. Mini-implants in the palatal slope-a retrospective analysis of implant survival and tissue reaction. Head Face Med. 2012;8:32.

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