Case Report

Treatment of extraoral submental sinus tract associated with large periapical lesion of traumatized lower central incisors teeth by periapical surgery and demineralized freeze-dried bone allograft

ABSTRACT

The purpose of present case report was to observe the effect of demineralized freeze-dried bone allograft (DFDBA) when combined with periapical surgery for the treatment of extraoral submental sinus tract associated with large periapical lesion of traumatized lower central incisors teeth. A patient complains of extraoral submental draining sinus tract since 6 months due to trauma of lower central incisors teeth 1 year back. Radiographical investigation showed large periapical lesion associated with lower central incisors teeth. The patient was planned for treatment by periapical surgery and DFDBA. The treatment process includes elevation of full-thickness flap, debridement of periapical lesion, root canal treatment, defect fill with DFDBA, and suturing of full-thickness flap at its original position. Complete resolution of extraoral submental sinus tract was achieved after 1 week, and periapical lesion was repaired after 1 year. Thus, DFDBA was effective for the treatment of extraoral submental sinus tract associated with large periapical lesion of traumatized lower central incisors teeth.

Keywords: Demineralized freeze-dried bone allograft, periapical lesion, periapical surgery, sub-mental sinus

INTRODUCTION

A sinus tract is an opening or communication of an enclosed area of inflammation/infection or abscess to an epithelial body surface or body cavity. A sinus tract of dental origin, usually the result of dental caries or traumatic injuries is formed by pulpal necrosis followed by the invasion of microorganisms into the periapical region causing an inflammatory periapical lesion of the affected tooth. The infection then progresses slowly, resorbing cancellous bone and spreading toward the cortical plate along the path of least resistance. Once the infection from offending tooth has perforated the periosteum, the tooth may become asymptomatic. After perforation of cortical plate, the infection may spread into a facial space, may develop into a cellulitis or may localize into an abscess, or may open either intraorally or extraorally. If the infection tracks out of jaw above the buccinator muscle attachment in the maxilla or below the mentalis, mylohyoid or buccinator attachments in the mandible, the sinus tract drains extraorally. If the perforation of the cortical plate is below the muscle attachments in the maxilla and above the muscle attachments in the mandible, the sinus tract is more likely to drain intraorally. The point of drainage depends in part on the length of the root and the position of the apex relative to the muscular attachments. Extraoral sinus tracts

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Received: 13-04-2017, **Revised:** 18-02-2019, **Accepted:** 30-04-2019, **Published:** 12-11-2019

Access this article online	
Website: www.njms.in	Quick Response Code
DOI: 10.4103/njms.NJMS_22_17	

How to cite this article: Singh AK, Saxena A. Treatment of extraoral submental sinus tract associated with large periapical lesion of traumatized lower central incisors teeth by periapical surgery and demineralized freeze-dried bone allograft. Natl J Maxillofac Surg 2019;10:260-6.

are more common in children and adolescents because the teeth are not yet fully erupted and the alveolar process is not fully developed and so roots are more deeply seated.[1] Intraoral opening of sinus tract is usually visible either on the facial attached gingiva or in the vestibule in case of mandible and in case of maxilla; opening is either on the facial attached gingiva, palatal mucosa, or in the vestibule. An extraoral sinus tract may open anywhere on the face or neck, usual locations are the angle of mandible, chin, and cheek. Mandibular teeth are implicated over maxillary teeth in a ratio of 4:1 with 50% of mandibular sinus tracts emanating from lower incisors or canines. It is not surprising therefore that the most common cutaneous sinus tract is seen in the chin or submental region.[2] Premolars will commonly point to the submandibular region while lower molars can point on submandibular skin or to the cheek. Maxillary incisors may point to the floor of the nose,[3] while canine teeth will commonly point to below the inner canthus of the eye. Maxillary premolars and molars may point to the cheek.[4]

Demineralized freeze-dried bone allograft (DFDBA) is the most widely used allograft material in periodontics, in part due to its availability, safety, osteoinductive, and osteoconductive properties. Osteoinductive property is due to the presence of bone morphogenetic proteins, which stimulate local cell cycles to produce new bone and osteoconductive property is due to freeze-drying process, which destroys cells while maintaining cellular morphology and chemical integrity. These two properties of DFDBA enhance periodontal regeneration and/or bone fill. Human histologic studies have shown that DFDBA can promote the formation of a new attachment apparatus on previously diseased root surfaces including new cementum, bone, and periodontal ligament.[5]

The aim of this case report was to observe the effect of DFDBA when combined with periapical surgery for the treatment of extraoral submental sinus tract associated with large periapical lesion of offending traumatized lower central incisors teeth.

CASE REPORT

A 45-year-old male patient had the complaint of pus discharge from the undersurface of chin region since 6 months. The patient gave a history of trauma of lower two teeth 1 year back. Extraoral examination reveals a fixed, nontender, erythematous nodulocystic lesion on the skin, below the lower border of chin. Digital palpation of this area feels a "cord" like tissue connecting the painless skin lesion to involve lower central incisors teeth. During palpation, the attempt was made to "milk" the sinus tract which produced a purulent bloody discharge that confirms the presence of a sinus tract [Figure 1]. During inspection, it appears that nodule and perilesional skin are slightly retracted below the level of the surrounding skin surface. There was no swelling or pain due to the presence of sinus tract which prevents swelling or pain from pressure buildup because it provides drainage from the periapical lesion of involved tooth. On intraoral examination, mandibular central incisors look black discolored [Figure 2]. Normal probing depth was present at the mandibular anterior teeth region. On percussion, both mandibular central incisors teeth were nontender. Vitality tests of both teeth were done by electric pulp tester (Foshan COXO Medical Instrument Co. Ltd., 21 Wufeng Si Road Foshan, Guangdong, China), cold test (ice cube), and hot test (hot end of ball burnisher) which showed no response and confirms that they are nonvital. Radiographic examination revealed a large periapical radiolucent lesion associated with the roots of mandibular central incisors teeth [Figure 3]. Radiograph with lacrimal probe or gutta-percha cone or sharp-tipped wire was not taken because offending teeth were easily identified. Since periapical lesion was large and associated with two traumatized teeth, periapical surgery was planned for their treatment. Before treatment, verbal and written consent was taken from the patient. This case report was approved by the Institutional Ethical Committee for human subjects and also conducted in accordance with the Declaration of Helsinki in 1975, as revised in 2000.

The patient underwent basic periodontal treatment of phase I therapy including scaling, root planing, and instructions for proper oral hygiene measures. Endodontic treatment including root canal treatment and restoration were planned at the time of surgery. The patient was instructed to do presurgical rinse by 0.2% chlorhexidine solution (REXIDIN® plus, INDOCO REMEDIES Ltd., Aurangabad, India.). The facial skin around the mouth was

Figure 1: Scab in submental region associated with sinus tract

cleaned with spirit (isopropyl alcohol, 70%) and scrubbed by 7.5% povidone-iodine solution (Betadine®, Win-Medicare, Pvt. Ltd., New Delhi, India). The intraoral surgical site was painted with 5% povidone-iodine solution (Povishield™, Microwin Labs Pvt. Ltd., Janakpuri, New Delhi, India).[6]

After proper part preparation, 2% lignocaine hydrochloride with 1:200,000 adrenaline bitartrate (LOX®, Neon Laboratories Limited, Andheri East, Mumbai, India) was administered to anesthetize left and right mental nerves. After the effectiveness of local anesthesia, a sulcular incision and two vertical incisions, distal to lower left and right lateral incisors were given. A full-thickness flap was elevated to access the root apices and the periapical lesion [Figure 4]. After elevation of the flap, the granulation tissue over and apical to the involved roots was removed and irrigated with normal saline solution (NS, ALBERT DAVID LIMITED, Meerut Road Ind. Area, Ghaziabad, India) [Figure 5]. After this, root canal treatment was completed, and apical root-end resection was done with round diamond bur at high speed, with sterile water coolant, removing approximately 3 mm of the root apices to completely clean the undersurface of root apices. A 3-mm deep root-end cavity was prepared and filled with light cure glass ionomer cement. Irrigation was done with 100 mg/mL of doxycycline solution for 5 min to remove the smear layer, to expose the collagen matrix, and to prevent the degradation of collagen by collagenase enzyme. The periapical defect was filled with DFDBA (Tata Memorial Hospital, Tissue Bank, Mumbai, India) [Figure 6]. Full-thickness flap was sutured at its original position with 3-0 black silk suture (Mersilk, Nonabsorbable Surgical Suture, Ethicon, Johnson and Johnson, Ltd., Aurangabad, India) [Figure 7]. Finger pressure was then applied for 5 min on the operated area to close adaptation of the tissue. Periodontal dressing (COE-PAK, Regular Set, GC America Inc., Alsip, Il, USA) was applied to protect the surgical area [Figure 8]. Immediate postoperative intraoral periapical radiograph was taken [Figure 9].

Antibiotic (amoxicillin 500 mg, 1 tablet every 8 h, for 7 days) and analgesic (nimesulide 100 mg, 1 tablet every 12 h,

Figure 2: Preoperative photograph showed discolored # 31 and 41

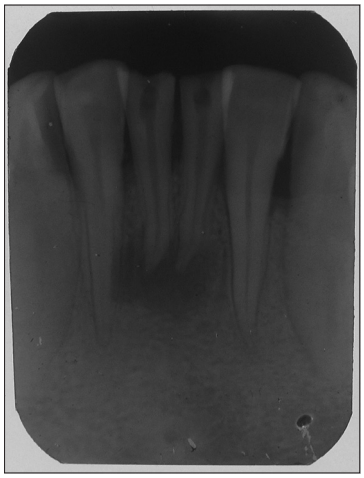

Figure 3: Initial radiograph showed large periapical radiolucency

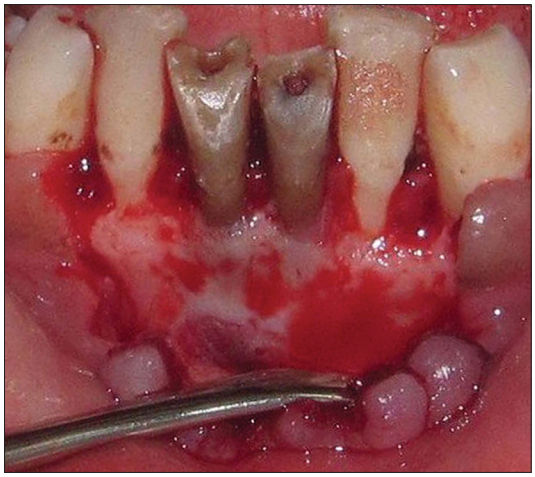

Figure 4: Full-thickness flap elevated to access the periapical lesion

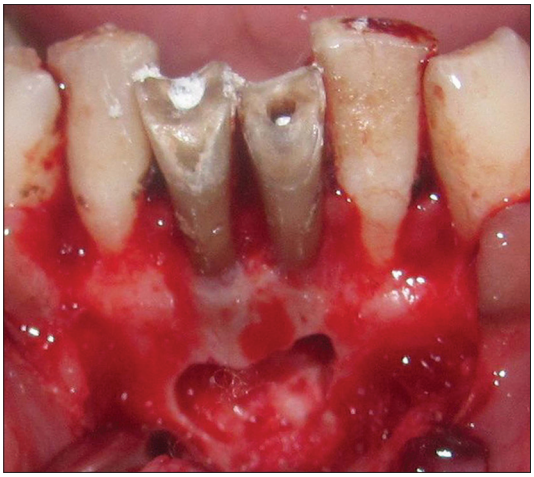

Figure 5: After debridement of periapical lesion

Figure 6: Periapical defect filled with demineralized freeze-dried bone allograft

Figure 7: Full-thickness flap sutured at its original position

Figure 8: Coe-Pak applied at the surgical site

Figure 9: Radiograph after periapical surgery

for 3 days) were prescribed. The patient was instructed to be extremely cautious during mastication at meals and no tooth brushing or chewing on the operated area for 3 weeks. After this period, the patient was advised to mechanical cleaning of the operated area using an extra soft toothbrush by coronally directed "roll" technique. Plaque control was obtained by 0.2% chlorhexidine rinse (REXIDIN® plus, INDOCO REMEDIES Ltd., Aurangabad, India.), twice daily during the first 2 weeks, and then application of 0.2% chlorhexidine gel (REXIDIN®-M Fort Gel, INDOCO REMEDIES Ltd., Mumbai, India) onto the operated area for another 2 weeks.

Sutures were removed 1 week after surgery [Figure 10]. Clinical and radiological follow-up was performed at 3 months, 6 months, and 1 year after surgery. Sinus tract was healed completely after 1 week [Figure 11]. The radiographical evaluation showed complete bone healing [Figure 12] and the tooth was asymptomatic with healthy periodontal tissues and normal probing depths after 1 year recall examination [Figure 13].

DISCUSSION

The sinus tracts are more frequently involve maxillary teeth (65%) than mandibular teeth (35%) and the majority of the sinus tracts have labial openings (94%). It is because mandibular teeth are embedded within a thicker cortical bone compared to maxilla and that lingual bone is more compact than the labial/buccal bone for both jaws. These characteristics related to upper jaw bone may explain the higher incidence of sinus tracts with labial openings in maxilla. The majority of sinus tracts were associated with posterior teeth (43%). The first molar teeth are the first erupted permanent teeth in the mouth, more susceptible to dental caries and therefore, are the most common teeth to undergo endodontic treatment or extraction. Consequently, the higher incidence of sinus tracts for posterior teeth may be naturally expected.[7]

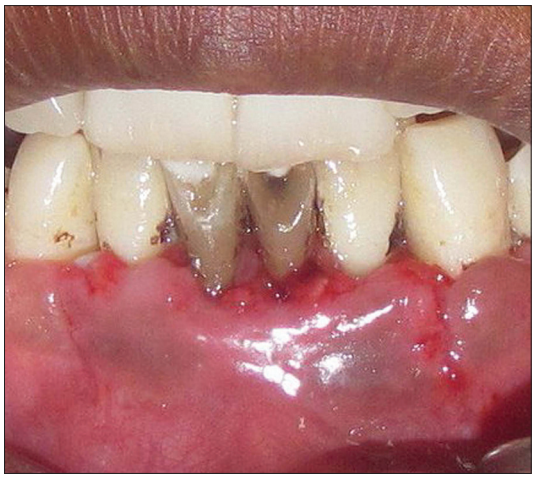

Figure 10: One week photograph after suture cutting

Figure 11: Sinus healed completely after 1 week

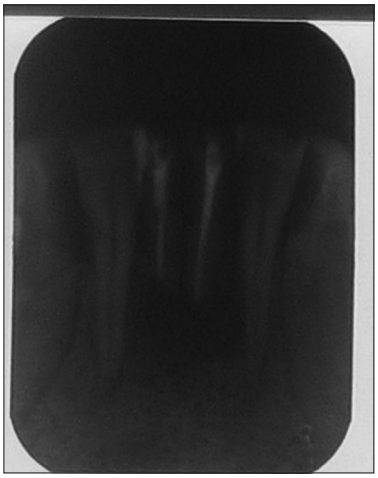

Figure 12: One year radiograph revealed repair of periapical lesion

Figure 13: One year photograph showed healthy periodontal tissue

The pattern of breakdown and repair of periradicular lesions was demonstrated by Fish. He described four reactive zones to the bacteria, which are zone of infection, zone of contamination, zone of irritation, and zone of stimulation. The central infection zone consists of microorganisms and neutrophils. Second contamination zone contains round cell infiltrate. Irritation zone contains osteoclasts and macrophages. Outer stimulation zone contains fibroblasts and osteoblasts that forming collagen and bone, respectively. Egress of microorganisms into periradicular region causes tissue destruction in the central zone of infection. As the toxicity of irritants is reduced in central infection zone, the numbers of reparative cells increase in periphery. Removal of irritants, proper debridement, and obturation permits reparative zone to move inward.[8]

The treatment of draining sinus tract includes nonsurgical methods and surgical methods. Numerous nonsurgical methods are decompression technique, aspiration-irrigation technique, intracanal medicaments, conventional root canal therapy, and apical perforation of root during root canal treatment. Decompression technique[9] and aspiration-irrigation technique[10] aid in decreasing the hydrostatic pressure resulting in shrinkage of the lesion. At the same time, the more conservative nonsurgical approach that can be treated by intracanal medicaments cannot be ignored. Calcium hydroxide is recommended as intracanal medicament because of its antibacterial properties, tissue dissolving ability, inhibition of tooth resorption, and indication of tissue repair by hard tissue formation.[11] Root canal therapy involves removal of etiological factors by proper bio- and chemo-mechanical preparation and three-dimensional obturation. Apically perforating the root of tooth during root canal treatment thus draining the pus through the orthograde approach, to creating an extraoral pathway for providing rapid relief to the patient in case of large sinus. Surgical methods include shoelace technique, surgical endodontic therapy, periapical surgery, and extraction for speedy disappearance of draining sinus tract in a very short period. Shoelace technique is one such

method, where the sinus tract is managed extraorally by inserting a gauge piece soaked in povidone-iodine to make a path for pus drainage.[12]

The decompression technique involves the placement of tubing to maintain drainage.[9] However, several disadvantages such as inflammation of alveolar mucosa, persistence of a surgical defect at the site, development of acute or chronic infection of the lesion, submergence of the tube, and patient cooperation limit the use of this technique.[13]

The aspiration-irrigation technique involves aspirating the fluid using a wide gauge needle attached to a syringe. The needle penetrates the lesion through the buccal mucosa, creating a buccal wound, and exits through the palatal mucosa creating a palatal wound that later act as a pathway for the escape of the irrigant. A disadvantage of this technique is the creation of the buccal and palatal wounds, which result in inflammation of the alveolar mucosa and cause discomfort.[10]

The healing of periradicular tissues after root canal treatment is often associated with formation and organization of a fibrin clot, granulation tissue formation, maturation, subsidence of inflammation, and finally, the restoration of the normal architecture of periodontal ligament. Hence, the treatment must be focused on the elimination of the source of the infection.[14]

Radiographic signs such as density change within the lesion, trabecular reformation and lamina dura formation confirmed healing, particularly when associated with the clinical finding that the tooth was asymptomatic and the soft tissue was healthy.[15] Some authors declared that a period of more than 2 years is able to determine the final treatment result of these lesions.[16] In the present case, the recession of the periapical lesion by periapical surgery with DFDBA was evident after 1 year.

The sinus tract in the present case report healed after 1 week of the periapical surgery, and there was no esthetic need for surgical intervention, possibly due to their position below the border of the chin and because of their recent development. Nevertheless, a fibrosis of the sinus tract trajectory is not uncommon, mainly in the older sinus tract. In these cases, fibrosis develops peripherally, spreading along the whole trajectory, and its surgical removal is necessary.[17]

Microbiological culturing of the sinus tracts showed a mixed assortment of both obligate and facultative anaerobic bacteria. The bacteria species identified were a typical representative of both endodontic abscesses and skin infections.[18] Cutaneous sinus tracts may be lined with either granulomatous tissue or epithelium.[19] Spontaneous closure of the tract should be expected within 5–14 days after root canal therapy or extraction.[20] Slight dimpling or cutaneous retraction and hyperpigmentation of the area are not uncommon and usually diminish with time. Surgical revision of the scar occasionally may be indicated to provide better cosmetic results. Failure of a cutaneous sinus tract to heal after adequate root canal therapy or extraction requires further evaluation, microbiological sampling, and biopsy. However, in this case, sinus tract lesion healed after 1 week with a minimal scar, unnoticeable by a patient and his social environment.

It is now believed that the activated macrophages in the periapical lesion are the reason for delayed healing of the lesions in the absence of bacterial antigens. The futuristic view of treating the periapical lesions include placement of biodegradable local sustained drug delivery points into the periapical lesion before obturating the tooth to deactivate the macrophages and enhancing the faster healing of the lesions.[21]

CONCLUSION

The observation of the present case suggests that when DFDBA combines with periapical surgery for the treatment of extraoral submental sinus tract associated with large periapical lesion of traumatizing lower central incisors teeth, it promotes a favorable environment for periapical repair as well as soft-tissue healing, that is resolution of sinus tract.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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