

Interdisciplinary management of co-existent mucosal fenestration and dehiscence in a maxillary central incisor with immature apex : A case report

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Abstract

Mucosal fenestration is a clinical condition wherein the root apex of an affected tooth is visible in the oral cavity due to loss of overlying alveolar bone and mucosa, while dehiscence results in denudation of the root surface due to loss of overlying alveolar bone including the marginal bone. A 25-year-old male patient reported with primary concern of defect in gums and discoloration in an upper central incisor. Examination revealed an intricate case of combined mucosal fenestration and dehiscence occurring concomitantly with an endodontic lesion in an open apex anterior tooth. Cone-beam computed tomographic scan, in addition to routine diagnostic aids, supplemented the diagnosis and facilitated meticulous treatment planning. Both conventional and surgical endodontic procedures were carried out. This was followed by periodontal plastic surgery and prosthodontic rehabilitation of the discolored tooth. Complete healing of soft tissue defect was seen in 6 months, while complete bony healing was seen at 12 months. The treatment thus aimed at correcting the pathology, handling the psychological concerns, and restoring physiologic function and aesthetics by reconstruction of the lost periodontium around the involved tooth.

Keywords: Bone graft, dehiscence, endodontic surgery, fenestration, guided tissue regeneration

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INTRODUCTION

Fenestration and dehiscence are pathologies that usually have a delayed presentation and are undiagnosed unless symptomatic. Dehiscence is characterized by the loss of facial or lingual alveolar cortical plate including the marginal bone, thus resulting in the denudation of root surface, and is seen typically as an oval-shaped defect extending apically from the cemento-enamel junction. Alveolar fenestration,

on the other hand, is characterized by a localized defect of the cortical plate (middle or apical third), which exposes the underlying root surface, but does not involve the marginal alveolar bone, thus appearing like a window.^[1] Mucosal fenestration includes further damage of alveolar fenestration defect and occurs when the overlying gingiva or mucosa also gets denuded to expose the underlying root surface into the oral cavity. There are a myriad number

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of causes that can lead to dehiscence and fenestration defects, some of which include root prominences, tooth malposition, tooth/jaw ratio, developmental anomalies, aberrant frenal attachment, mucogingival stress, calculus deposits at the root apex in the thin gingiva, chronic endodontic infections, endodontic–periodontic lesions, periodontal disease, traumatic occlusion, and iatrogenic reasons such as orthodontic procedures.^[2,3]

Mostly, studies have shown a higher prevalence of alveolar fenestration in the maxilla, while a higher prevalence of dehiscence is seen in the mandible.^[4] Compared to alveolar fenestration, mucosal fenestration is very rare. It was coined as gingivo-osseous pathologic fenestration by Serrano in 1971.^[5] Its presence has been reported mostly in the maxillary and mandibular anteriors, especially on the labial aspect, owing to extreme labial angulation of the roots of teeth. However, the combined existence of mucosal fenestration and dehiscence, to the best of our knowledge, has not been reported till date. In one report by Bains *et al.*,^[6] alveolar fenestration was seen to exist in a tooth with open apex.

Treatment approaches for mucosal fenestration have included endodontic treatment of the affected tooth followed by root-end resection, root-end filling, and mucogingival procedures. The later have ranged from full-thickness mucogingival flaps with guided tissue regeneration (GTR) to bone grafting and connective tissue grafts, free gingival grafts, or lateral pedicle flap surgeries.^[2,7] The following case report describes successful management of a rare case exhibiting combined mucosal fenestration and alveolar dehiscence in an immature tooth with periapical lesion utilizing multidisciplinary approach of periradicular and periodontal plastic surgeries.^[7]

CASE REPORT

A 25-year-old healthy male patient reported to the department of conservative dentistry and endodontics with the chief complaint of defect in the gums and a discolored left upper front tooth. The patient's history revealed trauma 10 years ago and an incomplete treatment in the upper front tooth from a private dental clinic. On clinical examination, the maxillary left central incisor (#21) was discolored with a mucosal fenestration defect seen on its labial surface, involving the apical third of the root. The defect measured 4 mm × 2 mm in diameter [Figure 1a]. The affected tooth was neither associated with any mobility nor communication of fenestration with the gingival sulcus. On transgingival probing for bone sounding, the suspicion of a dehiscence defect present along with the

mucosal fenestration in #21 arose. The affected tooth was exposed to an intraoral periodical radiograph (IOPAR). The IOPAR revealed incomplete root formation in #21 with an associated periapical radiolucency. Further, an attempt of previous endodontic treatment in the tooth #21 as well as a satisfactorily completed endodontic treatment in the lateral incisor (#22) [Figure 1b] was seen on the radiograph. The interproximal bone tissue between #21 and #22 was preserved suggestive of the lesion being limited to the buccal surface of the affected tooth. To confirm the possibility of dehiscence, a cone-beam computed tomography (CBCT; KODAK 9000 3D system, Carestream Health Ltd., NY, USA) scan was taken of #21 and #22 regions [Figure 1c and d]. The CBCT images revealed complete denudation of buccal cortical plate, root resorption, and an open apex with cylindrical canal in tooth #21. Diffuse periapical radiolucency was also seen in the #21 and #22 regions. The diagnosis of alveolar dehiscence with mucosal fenestration secondary to chronic endodontic infection was made, and the treatment was planned in different phases.

Written informed consent for root canal treatment and the surgical procedure was taken after explaining the entire procedure to the patient. Oral prophylaxis was performed with additional localized deep scaling and root planing of the exposed root surface to remove calculus deposits around #21. Curettage was done at the site of mucosal fenestration and along internal surface of the gingiva of #21. The patient was advised 0.2% chlorhexidine (Clohex 0.2% mouthwash; Dr. Reddys Laboratories Ltd., Hyderabad, India) mouth rinses twice daily.

On the day of endodontic procedure, the tooth (#21) was isolated under rubber dam (Coltène Whaledent, Langenau, Germany) and access cavity was reopened by removing the previously filled temporary restorative filling. The entire procedure was carried out under magnification (ADMETEC LOUPES, ×3.2). Working length was assessed radiographically by placing a gutta-percha cone, and circumferential filling was initiated using #40 K hand file (K files, Mani Inc., Japan) helping to remove the previously present radiopaque material within the canal [Figure 2a]. During root canal instrumentation, intracanal irrigation was carried out intermittently using 3% sodium hypochlorite (Hyposol Prevest Denpro Ltd, Jammu, India) solution followed by final flushing with 17% ethylenediaminetetraacetic acid solution (Prevest Denpro Ltd, Jammu, India). Root canal was further disinfected using 2% Clohex solution (Prevest Denpro, Jammu, India). Following completion of root canal instrumentation, calcium hydroxide dressing was given (Avuecal, prime

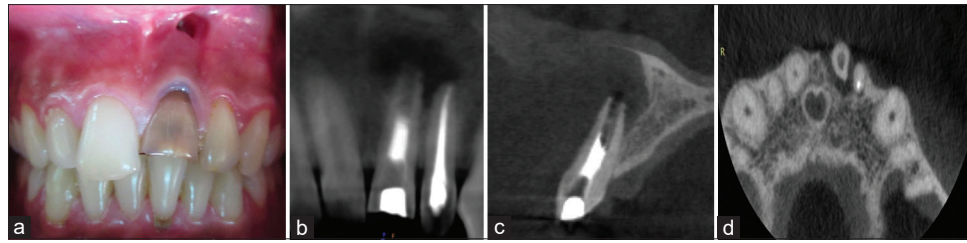


Figure 1: (a) Preoperative clinical photograph exhibiting discolored tooth #21 and associated defect. (b) Preoperative radiograph showing open apex, incomplete endodontic treatment, periapical lesion with the tooth #21, and acceptable endodontic treatment with tooth #22. (c and d) Cone-beam computed tomography scan revealing complete denudation of buccal cortical plate

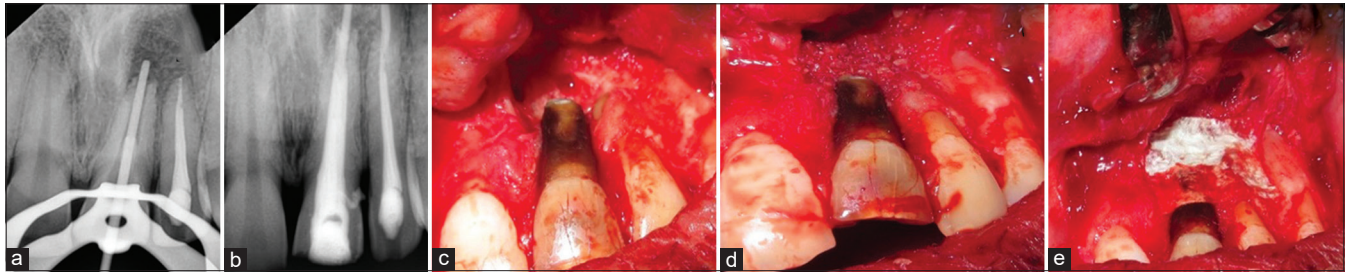


Figure 2: (a) Radiograph showing placement of gutta-percha to estimate the working length with too #21. (b) Postobturation radiograph of tooth #21 exhibiting over obturation. (c) Clinical picture of the site after raising a full-thickness trapezoidal mucoperiosteal flap. (d and e) Clinical picture of the site after filling the alveolar cavity with bone graft and placement of resorbable collagen barrier membrane

dental) and the patient recalled after 2 weeks. In the subsequent visit, obturation was done in #21 using rolled cone technique and AH plus sealer (De Trey Dentsply, Konstanz, Germany). The root canal filling was over extended periapically in #21 to facilitate localization of the root end [Figure 2b]. Access cavity was restored with composite resin (G-aenial Anterior, GC Corporation, Tokyo, Japan).

The patient was recalled the next day for surgery. Disinfection of the extraoral surface, teeth, and mucosal surfaces was done by swabbing with betadine (Belco Pharma, Bahadurgarh, Haryana, India). Local anesthesia was given via infiltration and anterior superior alveolar nerve block (lidocaine 2% and 1:100,000 epinephrine). First, a thin lining along the mucosal defect was removed followed by raising a full-thickness trapezoidal mucoperiosteal flap by giving two vertical releasing incisions and a sulcular incision [Figure 2c]. On reflection of the flap, it was clinically confirmed that there was dehiscence in #21, i.e., the labial root surface was completely denuded of bone and discolored. Osteotomy around #22 was carried out using a round tungsten carbide bur powered by a straight hand-piece under continuous saline and betadine irrigation till 3 mm of its root apex was exposed.

This was followed by complete curettage of the periapical lesion. Root-end resection was performed in both #21 and #22 under continuous saline and betadine irrigation using straight fissured tungsten carbide bur (SS White Carbide

Burs, USA) oriented perpendicular to the tooth axis. This was further followed by root-end preparation up to 3 mm into the root apex of #21 using Ultrasonic Pro Ultra Surgical Endo tips, SURG 1, 2 (Dentsply Tulsa Dental Specialties, USA), and the cavity was restored using mineral trioxide aggregate (MTA, Pro Root MTA, Dentsply Sirona, USA). The alveolar cavity was filled with demineralized freeze dried bone allograft (DFDBA, Tata Memorial Hospital, Mumbai) mixed with saline [Figure 2d]. A resorbable collagen barrier membrane (Tata Memorial Tissue Bank, Mumbai) was placed to cover the bone graft and labial surface of the root [Figure 2e]. Following this, the reflected flap was approximated and sutured using multiple interrupted technique by 4-0 mersilk suture (ETHICON, Johnson and Johnson Medical Devices, NJ, USA). The deepithelialized mucosal defect at the root apex was also approximated and sutured along the defect. Periodontal pack (Coe-Pack, GC America) was placed to cover the surgical site.

The patient was given postsurgical instructions and prescribed antibiotics, analgesics, and 0.2% Clohex mouthwash. A prefabricated crown was given to the patient initially as the patient was highly concerned about his esthetics. Follow-up appointments were scheduled after 1 week for suture removal and then at 3, 6, 12, and 24 months, respectively [Figure 3a-c]. Clinical examination showed complete healing of soft tissue defect, while radiographic evaluation showed significant bone healing at 6 months after which a definitive restoration (porcelain fused to metal crown) was placed on #21 [Figure 3d].

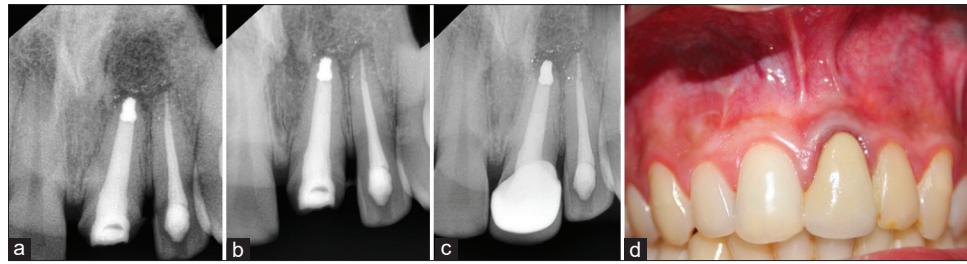


Figure 3: (a) Immediate radiograph postsurgery and placement of retrograde filling with respect to tooth #21. (b and c) Follow-up radiograph at 12 and 24 months' interval respectively (showing complete healing). (d) Clinical picture of completely healed surgical site and restoring the tooth #21 with porcelain fused-to-metal crown

DISCUSSION

Dehiscence is an alveolar bone defect which is symbolized by the absence of at least 4 mm of cortical bone apical to the margin of interproximal bone, while fenestration is an isolated alveolar defect with or without loss of overlying mucosa around the root apex, leading to its exposure without involving the marginal alveolar bone.^[8] The prevalence of fenestration is more in the maxilla, while the prevalence of dehiscence is more in the mandible.^[1,8,9] Many studies have reported geographical variations in the alveolar bone defects with overall prevalence ranging from 0.99% to 53.62% for dehiscence and 0.23% to 69.57% for fenestration observed in the skulls.^[9] Fenestration is more likely to be associated with maxillary first molars, maxillary second molars, maxillary canines, mandibular canines, and mandibular lateral incisors in the decreasing order while dehiscence is more commonly associated with mandibular canines, mandibular first premolars, maxillary canines, and maxillary first molars.^[1,8]

These defects often go unnoticed by the patient as well as the clinician, especially if they stand asymptomatic.^[10] The text in these lines signifies that the transgingival probing helps in diagnosis of dehiscence but not alveolar fenestration because alveolar fenestration occurs 4 mm apical to marginal interdental bone. Further, it is not possible to gauge fenestrations and dehiscence on conventional two-dimensional dental radiographs. In the present case, this limitation was overcome by the use of CBCT imaging. Clinical findings preferably should be corroborated with findings of CBCT as the latter reveals defects of both cortical and cancellous bone. CBCT thus acts as a reliable guide for determining treatment protocol and prognosis of the lesion.

Yoshioka *et al.*^[11] in their study evaluated and categorized periapical bone defects of the teeth with persistent lesions evaluated by CBCT as follows:

Type I: The defect was limited to cancellous bone with intact buccal/labial and lingual/palatal bone plates. Type

II: A bone plate defect was observed on the buccal or labial aspect, while the bone plate on the opposite side remained intact. Type III: A bone plate defect was observed on the lingual or palatal aspect, while the bone plate on the opposite side remained intact. Type IV: The bone defect showed penetration from the buccal or labial aspect to the lingual or palatal aspect and thus was a “through and through” bone defect. Type V: This type showed apical root protrusion from the buccal or labial bone surface and was accompanied with the Type II bone defect. Type V was further classified into three subcategories:

- Type V-1: Only the apical foramen protruded
- Type V-2: The apical one-third of the root together with the apical foramen protruded
- Type V-3: The whole root, including the apical foramen, protruded.

Based on the above classification of periapical lesions of bone defects assessed by CBCT, the case reported here was categorized as Type V-2 with Type II defect requiring both functional and esthetic corrections. The prevalence of Type V alveolar fenestration is significantly higher in the maxillary teeth (12%) than in the mandibular teeth (2%) and also differs between each tooth type.^[11] Treatment plan is determined based on the extent of osseous defect or root protrusion. For Type V-1 and V-2 cases, surgical exposure of the apex and its remodeling to include it within the surrounding bone tissue is the treatment of choice, while in Type V-3 cases where the whole root protrudes, extraction is recommended.^[11]

Cases of mucosal fenestration without any endodontic involvement may be effectively treated by only mucogingival surgery with soft tissue grafts;^[3] however, when it is accompanied by alveolar bone loss (dehiscence) and an underlying pathology, open flap technique with regenerative therapy is preferred along with endodontic treatment.^[12-15] Different mucogingival approaches have been reported in the literature, few of which include use of connective tissue graft taken from the hard palate before repositioning the mucogingival flap or packing bony defect with DFDBA,

in addition to the above-mentioned approach. GTR using connective tissue graft, DFDBA, and a nonresorbable or resorbable membrane can also be used to generate lost periodontium.^[2,3,12-15]

Concomitantly existing mucosal fenestration and dehiscence in a tooth are commonly associated with chronic periapical inflammation, which results in loss of vitality of the involved tooth^[3,12] as seen in this case. Sometimes, extreme osseous destruction may lead to complex pathology involving both pulp and periodontium, which poses a challenge for diagnosis as well as management.^[16] The associated etiological factors play a significant role in the establishment of a treatment plan.^[3] Mucosal fenestrations are considered an uncommon complication of pulpal-periradicular disease.^[10] For the correction of mucosal defect, an environment conducive for periapical healing needs to be established which in this case was achieved by endodontic treatment of the affected tooth. Root canal treatment of the teeth implicated in the periapical pathology served to eliminate the source of infection and obtain hermetic seal.^[15] Endodontic surgery consisting of periapical curettage to remove pathology, surgical remodeling of root apices by apicectomy to limit the root apex to within the bone, and root-end preparation and filling of teeth involved in the defect with MTA aimed at providing aseptic conditions for new bone formation.^[2,3,17]

Periodontal management included raising a full-thickness flap for debridement of the complete pathology and placement of DFDBA bone graft and resorbable barrier membrane (GTR) to restructure the lost periodontium by stimulating bone healing and regeneration.^[12,14] Use of DFDBA was preferred in this case as it is known to contain bone morphogenetic proteins (BMPs) such as BMP 2, 4, and 7, which stimulate osteoinduction. It also provides an osteoconductive surface which in turn promotes mesenchymal cell migration, attachment, and osteogenesis.^[18] Resorbable collagen membrane was preferred as a barrier membrane as it shows better blood perfusion and oxygen exchange, favors cell proliferation and differentiation, and omits the need for second surgery for removal.^[19] GTR therapy with resorbable collagen membrane has proved to be highly successful in managing endodontic-periodontal lesions, resulting in adequate bone growth and connective tissue attachment.^[7] GTR not only serves as a root coverage procedure but is also used as an adjunct to endodontic surgery for regenerating the attachment apparatus, i.e., cementum, periodontal ligament, and alveolar bone.^[20] Human prospective studies have concluded that use

of GTR in association with bone graft materials may promote the healing process of deleterious lesions as seen in this study.^[21]

Approximation of deepithelized mucogingival defect margins was done to restore lost esthetics as a part of the final periodontal management.^[12,14] Dawes and Barnes in their report had excised the epithelialized margins of the mucosal defect followed by their repositioning and suturing to treat a mucosal fenestration in relation to an upper first molar.^[10]

Our case is unique as both mucosal fenestration and dehiscence were present concomitantly in a nonvital immature tooth associated with a periapical lesion. The difficulty in its management could thus be attributed to several pathologic conditions existing together. The only approach to manage such a case afflicted by a myriad of pathologies would be a multifaceted treatment approach aiming at removing pathology, preventing reinfection, and recreating the lost periodontal integrity, thus restoring the tooth to function both physiologically and esthetically.^[3]

Treatment approach used in the management of this intricate case has shown appropriate clinical and radiographic results, which are in accordance with other studies reported in literature.^[12-15]

CONCLUSION

This case report elaborates an exceptional situation where a mucosal fenestration and dehiscence were noted in the maxillary left central incisor due to chronic periapical inflammation. It was treated successfully with a combination of endodontic (nonsurgical and surgical) and periodontal procedures. The adopted procedure is a viable treatment option in such cases.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will

not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Edel A. Alveolar bone fenestrations and dehiscence in dry Bedouin jaws. *J Clin Periodontol* 1981;8:491-9.
- Jhaveri HM, Amberkar S, Galav L, Deshmukh VL, Aggarwal S. Management of mucosal fenestrations by interdisciplinary approach: A report of three cases. *J Endod* 2010;36:164-8.
- Chen G, Fang CT, Tong C. The management of mucosal fenestration: A report of two cases. *Int Endod J* 2009;42:156-64.
- Yang Y, Yang H, Pan H, Xu J, Hu T. Evaluation and new classification of alveolar bone dehiscences using cone-beam computed tomography *in vivo*. *Int J Morphol* 2015;33:361-8.
- Serrano J. Gingivo-osseous pathological fenestration. *Oral Surg Oral Med Oral Pathol* 1971;32:697-700.
- Bains VK, Bains R, Gupta SJ, Mishra P, Loomba K. Management of dehiscence and fenestration alveolar defects around incisors using platelet-rich fibrin: Report of two cases. *J Interdiscip Dentistry* 2015;5:92-6.
- Lin GH, Chang LY, Lin WC, Lee SY, Lai YL. Interdisciplinary approach for treating a large through and through periapical defect using guided tissue regeneration: A case report. *Int J Periodontics Restorative Dent* 2014;34:1-8.
- Davies RM, Downer MC, Hull PS, Lennon MA. Alveolar defects in human skulls. *J Clin Periodontol* 1974;1:107-11.
- Rupprecht RD, Horning GM, Nicoll BK, Cohen ME. Prevalence of dehiscences and fenestrations in modern American skulls. *J Periodontol* 2001;72:722-9.
- Sawes WL, Barnes IE. The surgical treatment of fenestrated buccal roots of an upper molar--a case report. *Int Endod J* 1983;16:82-6.
- Yoshioka T, Kikuchi I, Adorno CG, Suda H. Periapical bone defects of root filled teeth with persistent lesions evaluated by cone-beam computed tomography. *Int Endod J* 2011;44:245-52.
- Uchida A, Takahashi K, Nakamura Y, Nakamura A, Suzuki K, Nishikawa H. A case report of endodontic surgery using GTR for a mandibular second premolar tooth whose root apex was exposed in the oral cavity. *J Jpn Endod Assoc* 2004;25:20-6.
- Lin YC, Lee YY, Ho YC, Hsieh YC, Lai YL, Lee SY, et al. Treatment of large apical lesions with mucosal fenestration: A clinical study with long term evaluation. *J Endod* 2015;41:563-7.
- Tseng CC, Chen YH, Huang CC, Bowers GM. Correction of a large periradicular lesion and mucosal defect using combined endodontic and periodontal therapy: A case report. *Int J Periodontics Restorative Dent* 1995;15:377-83.
- Jafri Z, Sultan N, Ahmad N, Daing A. An infrequent clinical case of mucosal fenestration: Treated with an interdisciplinary approach and regenerative therapy. *J Indian Soc Periodontol* 2019;23:168-71.
- Vishwas JR, Shaikh SY, Tambe VH, Ali FM, Mustafa M. Management of endodontic-periodontic lesion of a maxillary lateral incisor with palatoradicular groove. *Saudi Endod J* 2014;4:83-6.
- von Arx T. Apical surgery: A review of current techniques and outcome. *Saudi Dent J* 2011;23:9-15.
- Shigeyama Y, D'Errico JA, Stone R, Somerman MJ. Commercially-prepared allograft material has biological activity *in vitro*. *J Periodontol* 1995;66:478-87.
- Sbricoli L, Guazzo R, Annunziata M, Gobatto L, Bressan E, Nastri L. Selection of Collagen Membranes for Bone Regeneration: A Literature Review. *Materials (Basel)*. 2020;13:786.
- von Arx T, Cochran DL. Rationale for the application of the GTR principle using a barrier membrane in endodontic surgery: A proposal of classification and literature review. *Int J Periodontics Restorative Dent* 2001;21:127-39.
- Taschieri S, Del Fabbro M, Testori T, Saita M, Weinstein R. Efficacy of guided tissue regeneration in the management of through-and-through lesions following surgical endodontics: A preliminary study. *Int J Periodontics Restorative Dent* 2008;28:265-71.