

## CASE REPORT

# Management of extensive external apical root resorption leading to root perforation

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## SUMMARY

Resorption is both a physiological and pathological process which results in loss of hard tissues of the tooth, i.e., cementum and dentine and the surrounding bone. External resorption is much more common than internal resorption and can occur when tooth is luxated or avulsed. If remained unchecked, resorption can eventually lead to loss of the tooth. Timely management of the affected tooth can slow down the resorptive lesion and increase the prognosis of the survival of the tooth. This case report describes the surgical management of extensive external root resorption leading to perforation of apical one-third of the root area which was managed through root canal along with periapical surgery and bone grafting. A 6-month follow-up showed arrest of the resorptive defect and progressive healing as evident on the cone-beam computed tomography.

## BACKGROUND

Resorption results due to the damage to either the precemental (outer) layer or the predentin (inner) layer of the root resulting in osteoclasts invasion. Osteoclasts gradually resorb the damaged surface of the root resulting in resorption.<sup>1</sup> Internal resorption is pathological in nature and is caused by persistent pulpal inflammation due to caries, trauma or procedures resulting in excessive heat generation like crown preparation.<sup>2</sup> It is usually a chance finding and the tooth maybe discoloured in advanced lesions. Chronic pulpal inflammation damages the inner predentin layer as a result of which osteoclasts start resorbing the defect.<sup>3</sup> Pulp coronal to the lesion will be non-vital as it contains necrotic tissue and the tooth might be non responsive to pulp vitality testing. Radiographically, internal resorption is seen as ballooning out of the canal as evidenced by a well-defined radiolucency in the canal which does not change position with different angulations of the X-rays. In contrast, external resorption results due to damage to the external surface of the tooth, i.e. the cementum. Common causes include traumatic injuries, for example, luxation, intrusion avulsion and so on. The resultant trauma will result in necrosis of the periodontal ligament and cause resorption of adjacent tissues due to stimulation of osteoclasts.<sup>4</sup> Conventional two-dimensional (2D) radiography techniques have several shortcomings like superimposition of anatomical structures, lack of in depth detail and extent of lesion. The use of cone-beam CT (CBCT) nowadays helps to ensure the exact location and extension of the lesion with

anatomic accuracy. Management of root resorption involves either a non-surgical or surgical approach depending on the extent of the lesion. Preparation of root canal to remove the infective nidus is recommended in the start followed by orthograde restoration. A retrograde restoration is needed to seal off the leaky apex in the cases of perforating resorption. Traditionally it has been done with materials like polycarboxylate cements, zinc oxide eugenol-based cements, glass ionomer cements or composite resins.<sup>5</sup>

## CASE PRESENTATION

A 36-year-old, female patient presented to our dental clinic with the complaint of slight mobility in her upper left tooth. She explained that she noticed the mobility a month ago but it was not associated with any pain or discomfort. She did not recall any history of dental trauma. Her medical history was insignificant. On extraoral examination, there was no abnormality detected. While on intraoral clinical examination her upper left lateral incisor was mobile with grade I mobility and a slight discolouration. The tooth did not have any caries or previous restorations and oral hygiene was satisfactory.

## INVESTIGATIONS

Pulp vitality testing done on the upper left lateral incisor with cold test (Hygenic Endo-Ice Coltene) showed negative response. Periapical radiograph and orthopantomogram (OPG) (figure 1A and B) revealed ballooning of the pulp canal indicating internal resorption along with extensive external resorption resulting in perforation which was confirmed with CBCT figure 1C–E. Thus, on the basis of these investigations, the tooth was diagnosed as having chronic asymptomatic periapical periodontitis along with extensive external inflammatory root resorption with perforation of facial and proximal root surface at apical one-third area.

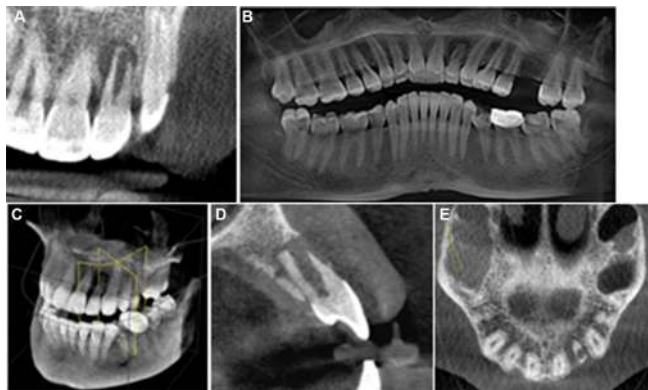
## TREATMENT

As the prognosis of the treatment remained guarded due to extensive root resorption and perforation, the first option given to the patient was extraction of the tooth followed by implant placement with an implant-retained crown. However, the patient was keen on saving her tooth so it was decided to endodontically treat the tooth followed by periapical surgery along with bone grafting to ensure osseous regeneration. A root canal was initiated and a straight line access was obtained (figure 2A).



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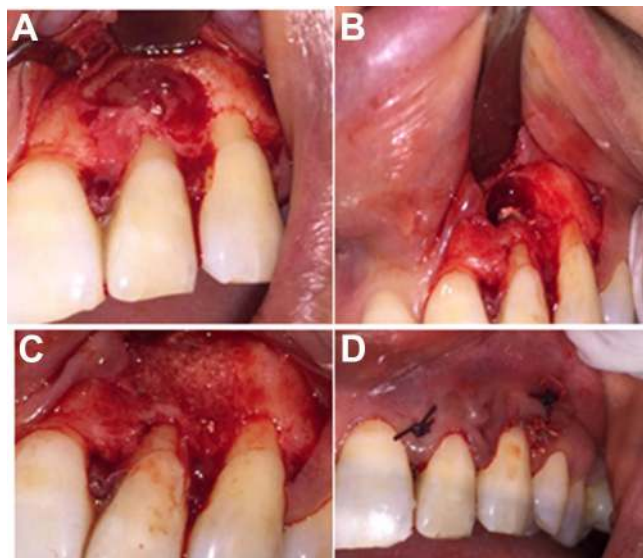


**Figure 1** (A) Pre-op periapical radiograph. (B) Pre-op OPG. (C) Pre-op CBCT 3D view. (D) Pre-op CBCT (sagittal section). (E) Pre-op CBCT (cross-sectional section). CBCT, cone beam CT; OPG, orthopantomogram; Pre-op, preoperative; 3D, three-dimensional.

Working length was established just short of the apical resorptive defect with the help of a radiograph and canal preparation was done initially with hand files and later on with nickel titanium (NiTi) rotary instruments (ProTaper Universal Dentsply). The canal was thoroughly irrigated with 2.5% sodium hypochlorite and lubricated with RC prep (RC-Prep). Intracanal medication (Metapex MetaBiomed) was placed at the end of the preparation. On follow-up visit after 1 week, the canal was obturated with gutta percha (Obtura Sybron Endo) after thorough irrigation and restored with a composite restoration (figure 2B). Periapical surgery was carried out in the same visit along with the bone grafting procedure. A papilla preservation flap was raised from the left upper central incisor till the canine. Due to perforation of the buccal bone, the root end had already been exposed. Access to the periapical region of the lateral incisor was made through the perforation and all the granulation tissue was removed. (figure 3A). Root end cavity was prepared with an ultrasonic instrument by giving a slanted incision and zinc oxide eugenol (Caulk Dentsply IRM) type of restoration was placed after achieving haemostasis (figure 3B). Bone grafting material, that is decalcified freeze-dried bone allograft (Rocky Mountain cancellous bone) was packed into the defect (figure 3C) and resorbable membrane (BioMend) placed over the defect which was later closed with 3/0 Vicryl (Coated Vicryl Plus Ethicon) sutures figure 3D). Haemostasis was achieved and the patient was discharged from clinic with a prescription of analgesics and antibiotics after taking a postoperative radiograph (figure 4).



**Figure 2** (A) Root canal initiated. (B) Obturation of the canal.



**Figure 3** (A) Periapical surgery, flap raised. (B) Removal of the granulomatous tissue. (C) Bone grafting. (D) Suture placement after closing the flap.

#### FOLLOW-UP AND OUTCOME

The patient was recalled in clinic after 10 days to remove the sutures and it was seen that the surgical site had healed uneventfully (figure 5). The patient was later called for a follow-up after 3 months and on this follow-up a new periapical radiograph was taken to assess the healing. On the 6-month follow-up, a new periapical radiograph and CBCT image were taken which showed new bone being formed at the palatal side (figure 6A and B).

#### DISCUSSION

The primary challenge in this case was that the tooth was located in the aesthetic zone and there was perforation at facial and proximal root surface at apical one-third area which constituted difficulty not only in placement of intracanal medication but also in obtaining good apical seal. Second, the crown-root ratio was compromised because of extensive root resorption at apical third and increased clinical crown height. Therefore, treatment plan was inclined towards extraction but the patient was willing to take a chance for salvaging her tooth despite of uncertain prognosis and outcome. Other challenges were high aesthetic demands and financial concerns of the patient.

Numerous case reports have suggested various modalities to treat perforating root resorption<sup>6,7</sup>; however, there is still lack of evidence regarding its definitive and predictable management. Even Cochrane systematic review reports no evidence regarding the significance of certain type of intervention in the treatment of external root resorption.<sup>8</sup> Eliminating bacteria from the root canal by endodontic therapy is likely to arrest the resorptive process. Once the process of inflammatory resorption has been arrested, healing can occur by deposition of cementum or bone. In this present case report, the management of a perforating external inflammatory root resorption of maxillary lateral incisor was done with an interim calcium hydroxide dressing first followed by endodontic therapy and later on by periapical surgery with concurrent bone grafting procedure. The patient was asymptomatic but reported slight mobility in her tooth so a CBCT was used in this case to ensure the location and extent of the lesion before proceeding with the treatment as in depth

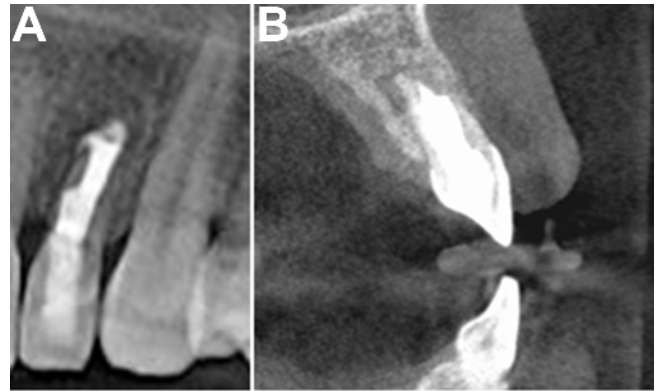


**Figure 4** Immediate postoperative periapical radiograph.

detail of the lesion was not possible from 2D radiography techniques such as periapical radiographs.<sup>9</sup> Moreover 2D techniques cannot detect apical shortening or external root radiolucencies as efficiently as the three-dimensional techniques. A follow-up CBCT also helped to assess the healing accurately which was done 6 months postoperatively. Intra canal medicament was placed after the first visit to ensure bacteria-free environment before carrying out the obturation. Root canal filling is recommended to be done first followed by the repair of the perforation on the same visit to ensure better control of the length.<sup>10</sup> In cases of large lesions, root canal treatment can be complicated



**Figure 5** Postoperative image after 10 days.



**Figure 6** (A) Post-op CBCT (coronal section). (B) Post-op CBCT (sagittal section). CBCT, cone beam CT; Post-op, postoperative.

by extensive haemorrhage, however fortunately in our case we did not experience any complications. The external communication through the apex was sealed with a retrograde restoration. Due to the compromised root length, conventional type of slanted root resection was preferred over the more contemporary perpendicular incision to preserve the crown–root ratio. Demineralised bone was used in this case which accelerated the healing process and acted as an osteoconductive material.<sup>11</sup> The osseous bone grafting along with the membrane resulted in guided bone regeneration as penetration of epithelial type of cells is restricted. Favourable bone healing is expected with this kind of technique after endodontic surgical procedures.<sup>12</sup>

Non-surgical repair of root perforations have a success rate up to 72% according to a recent systematic review.<sup>13</sup> However, success can be achieved in surgical cases as well by the addition of freeze-dried bone allografts for guided tissue and guided bone regeneration especially in cases of large osseous defects.

### Learning points

- ▶ Accurate diagnosis and timely treatment of the lesion was of colossal importance in this case for a good prognosis.
- ▶ The extent of the lesion, remaining tooth structure and expertise of the clinician were some other well-known factors which could have affected the prognosis of this case.
- ▶ The remaining tooth structure was although compromised due to the extensive resorption, however chance was taken to see if the tooth survives as the patient was highly motivated.
- ▶ A thorough follow-up is advised in these cases.

**Contributors** RG: planning of the case and execution of the clinical procedure. ST and MHH: assisted the procedure; did case report writing, data acquisition and formatting. All authors: conception of this idea.

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