Healing of External Inflammatory Root Resorptions and Periapical Lesions without Surgical Treatment in an Operated Oblique Facial Cleft Case

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ABSTRACT

This paper describes an operated oblique facial cleft case with external inflammatory root resorption (EIRR) of the permanent maxillary left incisors and canine in a 12-year old patient. Due to the facial oblique cleft, the plastic surgery department operated on the patient five times and placed her on fixed orthodontic therapy. EIRR treatment of the maxillary left incisors and canine was performed using long-term calcium hydroxide therapy. The permanent root canal fillings of the lateral incisor and canine were performed using conventional gutta percha fillings. Because no sufficient apical barrier stop of the central incisor occurred, it was filled with Mineral Trioxide Aggregate (MTA); the canine crown fracture was restored using a carbon-covered fiberglass post and a light-cured composite resin. Examination after 42 months revealed good esthetics and no periapical pathology. (Eur J Dent 2010;4:208-214)

Key words: External inflammatory root resorption; Oblique facial cleft; Tessier classification.

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INTRODUCTION

The oblique facial cleft is an extremely rare congenital anomaly of the face; its incidence is reported to be 1.43 - 4.85 in 100, 000 births.[1] Tessier classification has been used to describe the facial clefts on a scale of 0 to 14, according to the localization of the clefts relative to the sagittal midline and the orbit.[2] The Tessier 3 cleft is characterized

by inferior displacement of the medial canthus, superior displacement of the alar base, cleft lip and palate, coloboma of the lower eyelid, nasolacrimal abnormality, disruption of the medial wall of the antrum, cleft of the inferomedial wall of the orbit, and telorbitism.[3]

Root resorption is described as a multifactorial process that results in the loss of the dentoalveolar complex. The causes may vary, depending on local or systemic factors. Systemic factors such as hormonal imbalance[4] and Paget's disease[5] have been cited in rare cases of tooth resorption, and there has been a reported complication of tooth resorption following an episode of Herpes Zoster.[6] Local factors include periapical inflammation, dental trauma, tumors and cysts, excessive mechanical or occlusal forces, orthodontic treatment, impacted teeth,[7] operations such as secondary bone grafting of alveolar clefts,[8] and intracoronal bleaching.[9] Root resorption types can be categorized mainly as internal and external; external inflammatory root resorption (EIRR) can be progressive unless treated.[10] This type of resorption occurs due to injury to the precementum or predentin associated with pulpal infection. The condition is generally asymptomatic in the earlier stages. However, with the progression of the resorptive process, involved teeth may become symptomatic, and periradicular abscess formation and increased tooth mobility may occur.[11]

The following case report presents the management of extensive EIRR in an operated oblique facial cleft patient.

CASE REPORT

A 12-year old girl with operated facial oblique cleft was referred to the Department of Pediatric Dentistry due to severe root resorption of the maxillary permanent anterior teeth. Her parents reported that her cleft was classified as Tessier 3 (Figure 1). It was revealed that the patient had undergone 5 plastic surgeries for the cleft between the ages of 2 and 11. It was also learned that of these operations, the last two involved the dentomaxillary complex. In the clinical examination, it was seen that she had been on fixed orthodontic treatment; in the periapical radiograph taken from the patient, periapical radiolucent areas involving the permanent maxillary left central and lateral incisors and canine, as well as root resorption of these teeth, were noticed (Figure 2). Electric vitality testing was performed on these teeth and no sign of vitality was obtained.

Previous radiographs of the patient were analyzed; in a panoramic radiograph taken one year before the Le Fort 1 osteotomy operation, it was noticed that there was no sign of pathology on the involved side (Figure 3). In the periapical radiograph taken 15 months after the same operation, an oblique resorption at the apical portion of the left central incisor, along with the loss of lamina dura of the left central and lateral incisors, was noticed (Figure 4). In the occlusal radiograph taken six months after the placement of a graft between the maxillary central incisors, extensive root resorption of the left central incisor and periapical radiolucency involving the incisors and canine was noticed (Figure 5).

After administering local anesthesia (Jetocaine, Lidocaine, Adeka İlaç Sanayi, Samsun, Turkey), endodontic therapy commenced. The root canals were instrumented and rinsed gently with a 2.5% sodium hypochlorite solution, followed by a physiologic saline solution three times weekly. The endodontic cavities could not be sealed with temporary cement due to extensive pus drainage. In addition, the patient complained of pain because of the pressure due to pus when the cavities were sealed. Therefore, they were packed with sterile cotton pellets after three cleaning and irrigation sessions during the first week. Afterwards, a reduction in drainage was observed and the access cavities were sealed with a glass-ionomer cement (Meron, Voco, Cuxhaven, Germany) after each treatment session. After one month, pus drainage of the left central incisor and left canine teeth ended and these teeth were filled with calcium hydroxide paste (Calcicur, Voco, Cuxhaven, Germany). Because the pus drainage from left lateral incisor persisted, a metranidazole solution for parenteral use (Biteral, Roche, Germany) was used as an irrigant solution every 5 days for 20 days. After that time, drainage ceased and the tooth was treated like the other tooth, as described previously. The patient was scheduled for monthly recall appointments; in the event that resorption of the root canal dressings was detected radiographically, the root canals were cleaned and refilled with calcium hydroxide paste.

Nine months after the treatment had begun, dentoalveolar resorption arrested and new bone formed at the resorption sites (Figure 6). In the clinical examination, no sign of mobility was detected. The conventional root canal fillings of the lateral incisor and canine were made using gutta-percha (Gutta Percha Points, Diadent, Korea); because no sufficient apical barrier formed on the central incisor, its canal was filled with mineral trioxide aggregate (MTA) (Angelus, Londrina, Brazil) and the endodontic access cavities were restored with a light-cured composite resin (TPH, Dentsply, Germany). Because the crown of the canine was fractured while the patient was eating, the tooth was restored using a carbon-covered fiberglass post (Reforpostmix, Angelus, Londrina, Brazil) and the light-cured composite resin (Figures 7 and 8).

After a consultation with her orthodontist, it was decided not to apply active orthodontic forces on the patient's three teeth. She was scheduled for recall appointments every three months. After 42 months, no clinical symptoms were obtained and no signs of pathology were observed using radiographs (Figure 9).

DISCUSSION

For better esthetic and function, management of facial oblique cleft includes plastic surgery and orthodontic treatment.[12] In the present case, the patient underwent two plastic surgeries involving the dentomaxillary complex. The panoramic radiograph of the patient taken before those operations revealed that the cleft was not responsible for the EIRRs. In the periapical radiograph taken 15 months after the Le Fort 1 osteotomy operation, an oblique resorption at the apical portion of the left central incisor was noticed.

The complications of dentomaxillary plastic surgery include marginal bone destruction, root resorption, and mechanical injuries to the teeth;[13] however, in the same radiograph, the loss of lamina dura of the left central and lateral incisors may be considered to be a sign of the pulpal vitality loss that subsequently leads to EIRR. Secondary bone grafting operations can also lead to iatrogenic root injuries.[8] However, in the present case, the contribution of the graft operation to EIRR is of concern because the resorptive process began prior to it.

Orthodontic treatment is also a factor that can result in root resorption. However, in the case of

Figure 1. The extraoral view of the patient.

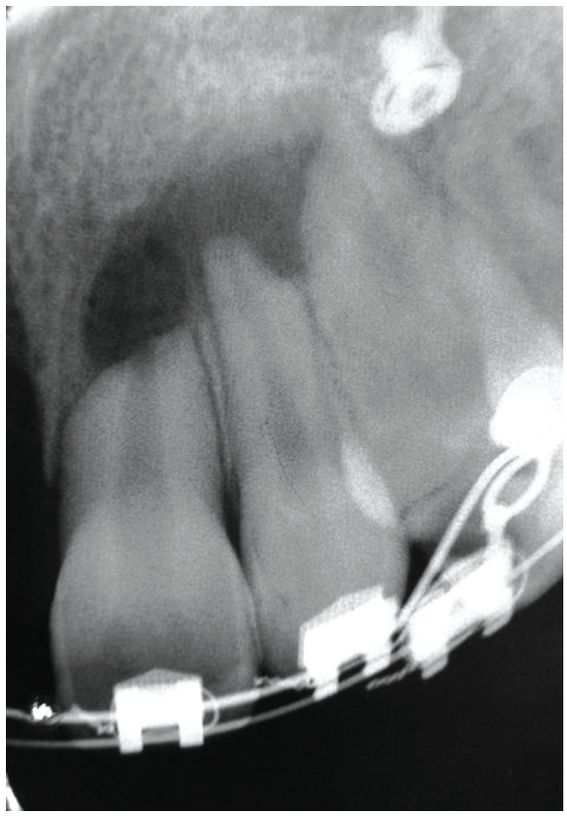

Figure 2. The periapical radiograph of the patient at referral time.

orthodontically-caused root resorption, teeth are vital unless high pressure capable of damaging the blood supply is applied. Therefore, no sign of pathological radiolucency, both in the root and in the surrounding bone or the loss of lamina dura, can be observed.[11]

In the treatment of EIRR, the elimination of bacteria from the root canal and dentinal tubules via endodontic therapy followed by an interim root canal dressing with calcium hydroxide is recommended in order to arrest the resorptive process.[14] Calcium hydroxide increases the pH of dentin and

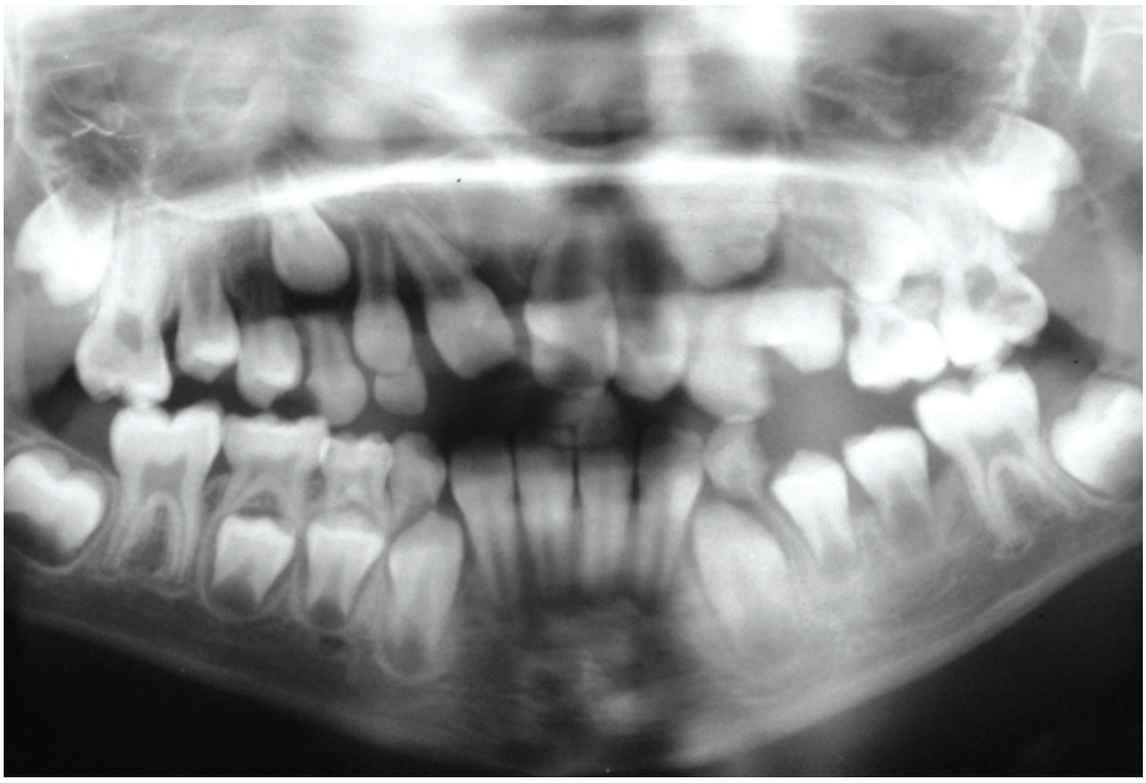

Figure 3. The panoramic radiograph taken 1 year before Le Fort 1 osteotomy operation.

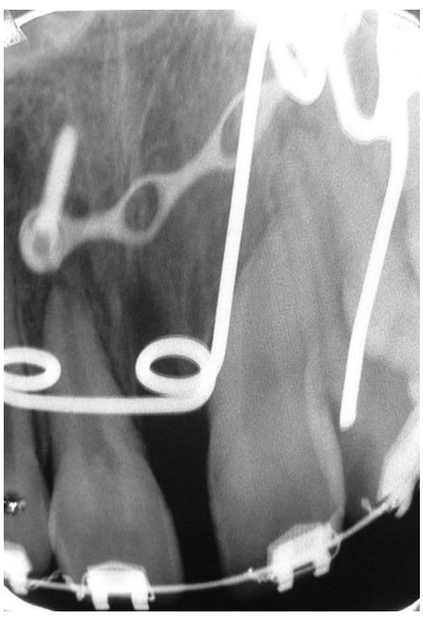

Figure 4. The periapical radiograph after 15 months from the Le Fort 1 operation demonstrating loss of lamina dura and an oblique resorption at the apical portion of the left central incisor.

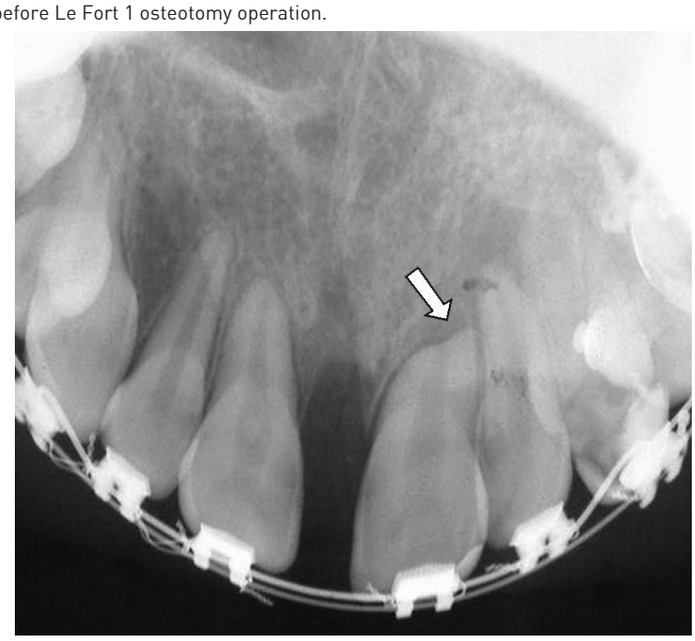

Figure 5. The occlusal radiograph after 27 months from Le Fort 1 operation shows a periapical radiolucency associated with the maxillary lateral incisor tooth and the loss of lamina dura at the distal aspect of the root of the central incisor (arrow). The extensive root resorption of the central incisor and slight root resorption of the lateral incisor can be seen.

therefore inhibits the activity of osteoclastic acid hydrolases while activating alkaline phosphatases.[15] Antimicrobial activity is also related to the release of hydroxyl ions which are highly oxidant and cause damage to the bacterial cytoplasmic membrane and DNA, and cause protein denaturation.[16] Calcium hydroxide has been shown to inactivate lipopolysaccharides, a cell wall component of Gram negative anaerobic bacteria, that stimulate TNF-alpha production and therefore have been implicated in the pathogenesis of periapical disease resulting from infected root canals.[17]

In general, leaving the canals open during the treatment sessions is recommended for no more than 24 hours.[18] However, in the present case, due to extensive pus drainage and the patient's complaining of pain due to pressure from the pus, the endodontic access cavities were sealed with sterile cotton pellets after three cleaning and irrigation sessions during the first week. The reduced but persistent pus drainage allowed the canals to be filled with calcium hydroxide. The main disadvantages of the prolonged treatment of calcium hydroxide include low patient compliance, unpredictability of apical closure, and susceptibility to coronal fracture.[19, 20] One of the problems encountered in the present case was the inability of the calcium hydroxide to eliminate pus drainage from the canine tooth. Therefore, metronidazole, which is active against anaerobic bacteria and Gram-negative rods, was used.[21]

An additional problem encountered in the present case was the insufficient apical plug formation of the central incisor which was consequently restored with Mineral Trioxide Aggregate (MTA). MTA has been recommended in cases where an apical plug is needed to prevent extrusion of the filling materials;[22] it allows for an adequate seal of the canal and prevents bacterial leakage.[23] The main disadvantage of its use as a permanent root canal dressing is its relatively higher cost. However, in cases where the root length is reduced, as in the present case, the use of MTA for apical closure also seals a great portion of the root canal.

Figure 6. Periapical radiograph taken nine months after commencement of endodontic treatment which included long term calcium hydroxide therapy shows evidence of periapical repair and resorption control.

Figure 7. Periapical radiograph taken following the completion of the root filling the maxillary central incisor with MTA and the lateral incisor and canine teeth with gutta percha and AH28. The canine tooth has been restored with a fiber glass post and composite resin.

It has been recommended that endodontically treated teeth with extensive coronal structure loss be restored with posts;[24] recently, fiber-reinforced resin posts (FRR) have been introduced to the dental market because of their lower modulus of elasticity, compared to metal posts, in order to decrease the risk of root fracture.[25] Historically, FRR posts have been made using carbon/graphite fibers due to their mechanical properties. However, they were black in color and created esthetic discomfort. Therefore, posts made of glass or silica fibers and are white in color or translucent were developed.[26] In this case, carbon-covered fiberglass posts were used in order to combine the esthetic properties of fiberglass posts with the mechanical properties of carbon- reinforced posts.

Figure 8. The intraoral view of the patient after the completion of the restorations.

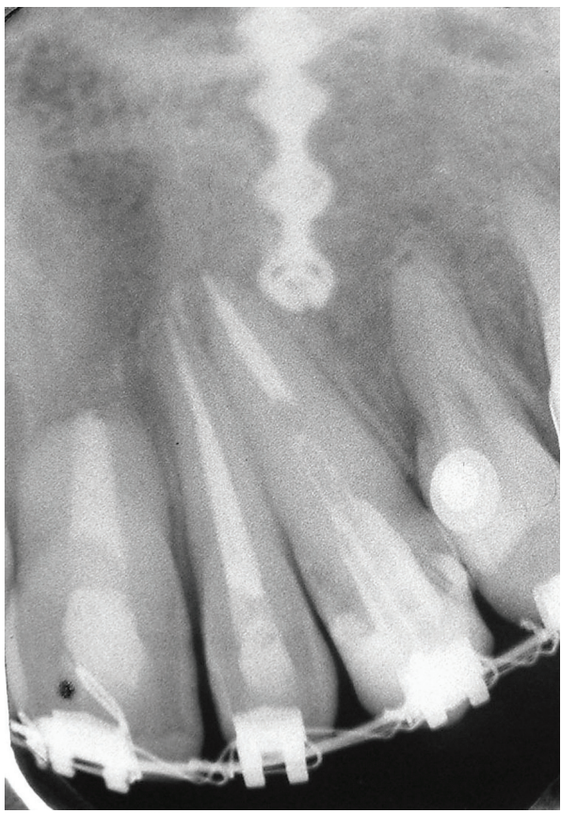

Figure 9. Periapical radiograph taken 42 months after completion of endodontic therapy shows evidence of favourable periapical healing and resorption control.

CONCLUSIONS

Regarding EIRR, teeth should be evaluated both clinically and radiographically in cases of operated oblique facial cleft. In addition, it should be considered that the treatment of EIRR is time consuming due to the various medications and methods.

REFERENCES

1. Kawamoto HJ. The kaleidoscopic world of rare craniofacial clefts:order out of chaos (Tessier classification). *Clin Plast Surg* 1976;3:529-572.
2. Tessier P. Anatomical classification of facial, craniofacial and latero-facial clefts. *J Maxillofac Surg* 1976;4:69-92.
3. Wenbin Z, Hanjiang W, Xiaoli C, Zhonglin L. Tessier 3 cleft with clinical anophthalmia: two case reports and a review of the literature. *Cleft Palate Craniofac J* 2007;44:102-105.
4. George DI, Jr., Miller RL. Idiopathic resorption of teeth. A report of three cases. *Am J Orthod* 1986;89:13-20.
5. Barnett F, Elfenbein L. Paget's disease of the mandible--a review and report of a case. *Endod Dent Traumatol* 1985;1:39-42.
6. Solomon CS, Coffiner MO, Chalfin HE. Herpes zoster revisited: implicated in root resorption. *J Endod* 1986;12:210-213.
7. Bakland LK. Root resorption. *Dent Clin North Am* 1992;36:491-507.
8. Gerner NW, Hurlen B, Bergland O, Semb G, Beyer-Olsen EM. External root resorption in patients with secondary bone-grafting of alveolar clefts. *Endod Dent Traumatol* 1986;2:263-266.
9. Andreasen JO. External root resorption: its implication in dental traumatology, paedodontics, periodontics, orthodontics and endodontics. *Int Endod J* 1985;18:109-118.
10. Andreasen J, Andreasen F, Andersson L. Textbook and color atlas of traumatic injuries to the teeth. UK, Blackwell Munksgaard, 2007.
11. Fuss Z, Tsesis I, Lin S. Root resorption--diagnosis, classification and treatment choices based on stimulation factors. *Dent Traumatol* 2003;19:175-182.
12. Darzi MA, Chowdri NA. Oblique facial clefts: a report of Tessier numbers 3, 4, 5, and 9 clefts. *Cleft Palate Craniofac J* 1993;30:414-415.

13. Kahnberg KE, Vannas-Lofqvist L, Zellin G. Complications associated with segmentation of the maxilla: a retrospective radiographic follow up of 82 patients. *Int J Oral Maxillofac Surg* 2005;34:840-845.
14. Finucane D, Kinirons MJ. External inflammatory and replacement resorption of luxated, and avulsed replanted permanent incisors: a review and case presentation. *Dent Traumatol* 2003;19:170-174.
15. Tronstad L, Andreasen JO, Hasselgren G, Kristerson L, Riis I. pH changes in dental tissues after root canal filling with calcium hydroxide. *J Endod* 1981;7:17-21.
16. Rafter M. Apexification: a review. Dent Traumatol 2005;21:1-8.
17. Barthel C, Levin L, Reisner H, Trope M. TNF-alpha release in monocytes after exposure to calcium hydroxide treated Escherichia coli LPS. *Int Endod J* 1997 30:155-159.
18. Pitt Ford T, Rhodes J, Pitt Ford H. Endodontics. Problem solving in clinical practice. London, Martin Dunitz Ltd., 2002.
19. Schumacher JW, Rutledge RE. An alternative to apexification. *J Endod* 1993;19:529-531.
20. Weisenseel JA, Jr., Hicks ML, Pelleu GB, Jr. Calcium hydroxide as an apical barrier. *J Endod* 1987;13:1-5.
21. Siqueira JF, Jr., de Uzeda M. Intracanal medicaments: evaluation of the antibacterial effects of chlorhexidine, metronidazole, and calcium hydroxide associated with three vehicles. *J Endod* 1997;23:167-169.
22. Torabinejad M, Watson TF, Pitt Ford TR. Sealing ability of a mineral trioxide aggregate when used as a root end filling material. *J Endod* 1993;19:591-595.
23. Shabahang S, Torabinejad M, Boyne PP, Abedi H, McMillan P. A comparative study of root-end induction using osteogenic protein-1, calcium hydroxide, and mineral trioxide aggregate in dogs. *J Endod* 1999;25:1-5.
24. Duret B, Reynaud M, Duret F. New concept of coronoradicular reconstruction: the Composipost (1). *Chir Dent Fr* 1990;60:131-141.
25. Boudrias P, Sakkal S, Petrova Y. Anatomical post design meets quartz-fiber technology: rationale and case report. *Compend Contin Educ Dent* 2001;22:337- 340.
26. Torbjorner A, Karlsson S, Syverud M, Hensten-Pettersen A. Carbon fiber reinforced root canal posts. Mechanical and cytotoxic properties. *Eur J Oral Sci* 1996;104:605-611.