

Periradicular Regenerative Surgery in a Maxillary Central Incisor: 7-year Results Including Cone-beam Computed Tomography

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Abstract

Introduction: A case of a symptomatic maxillary central incisor that underwent periradicular regenerative surgery with a successful long-term clinical and radiographic outcome is presented. **Methods:** A 52-year old woman was referred to the Endodontology Clinic, UCL Eastman Dental Institute and Hospital, London, UK, in 2004 for swelling and discoloration of the maxillary right central incisor. There was a history of trauma 21 years previously. The tooth was endodontically treated 5 years before the referral. At presentation, there was diffuse facial swelling/erythema and a periodontal probing depth of 11 mm on the midfacial surface with bleeding on probing and purulent exudate. Endodontic retreatment was completed along with subgingival debridement. Reassessment at 6 weeks showed persistent purulent exudate and a probing depth up to 13 mm facially. Periradicular surgery was performed for the purposes of surgical exploration, apical resection and root-end filling with mineral trioxide aggregate, and guided tissue regeneration using a bone xenograft and collagen membrane. Histopathology confirmed the presence of a radicular cyst. **Results:** Clinical and radiographic evaluation, including cone-beam computed tomographic imaging, at 7 years postoperatively showed a probing depth up to 3 mm and hard tissue formation apically, interproximally, and partly facially on the root surface. **Conclusions:** In this case of a combined endodontic-periodontic lesion in a maxillary central incisor, regenerative periradicular surgery led to the resolution of the defect, significant attachment gain, and a stable clinical and radiographic outcome after 7 years of follow-up. (*J Endod* 2014;40:1013–1019)

Key Words

Apical pathology, apical periodontitis, apical surgery, apicoectomy, combined endodontic-periodontic lesion, cone-beam computed tomographic imaging, guided tissue regeneration, periradicular surgery, radicular cyst, regenerative surgery

Endodontic surgery is indicated in cases of failure after endodontic treatment/retreatment or when orthograde treatment is not feasible. The application of tissue engineering principles in the form of guided tissue regeneration (GTR) has shown favorable outcomes mainly in apicomarginal defects (1, 2) but also in large periapical lesions and through-and-through lesions (3–5).

Cone-beam computed tomographic (CBCT) imaging is increasingly used in endodontic practice to aid in diagnosis, treatment planning, and follow-up based on high-resolution 3-dimensional evaluation. CBCT imaging is considered more accurate than conventional radiography in the assessment of root canal morphology (6) and root fractures (7) and the detection of apical pathosis (8).

We present a case of a symptomatic maxillary central incisor with a history of trauma that underwent endodontic retreatment followed by periradicular regenerative surgery with a successful clinical and radiographic outcome after 7 years of follow-up. To our knowledge, no case has been reported in the literature showing long-term results, including CBCT imaging, in this type of surgery.

Case Report

A 52-year-old woman was referred to the Endodontology Clinic, UCL Eastman Dental Institute and Hospital, London, UK, in 2004 with the chief complaint of swelling and discoloration of the maxillary right central incisor. There was a history of trauma 21 years previously at which time painless swelling developed. (Based on the history the patient gave, the tooth had most likely suffered concussion/subluxation; she was hit by her dog during a visit to the veterinarian.) The tooth was endodontically treated 5 years before the referral, but the swelling persisted. At presentation, there was diffuse facial swelling/erythema associated with the maxillary right central incisor but no tenderness to palpation (Fig. 1A–D). A probing pocket depth (PPD) of 11 mm was present on the midfacial surface with bleeding on probing and purulent exudate. Radiographic examination showed the presence of a dense root filling, which was underextended by approximately 1.5 mm, and suspicion of a root fracture apically. A diagnosis was made of previous endodontic treatment with a chronic apical abscess of the maxillary right central incisor and was classified as a combined endodontic-periodontic lesion. In addition, the patient was nervous about dental treatment.

Endodontic retreatment was completed along with subgingival debridement. Local anesthesia was administered by buccal infiltration of 2.2 mL lidocaine hydrochloride 2% and 1:80,000 epinephrine at the start of each visit, and rubber dam isolation was applied throughout the retreatment process. Access was obtained using the operating microscope, and the existing Thermafil (Dentsply Maillefer, Ballaigues, Switzerland) was removed. Chemomechanical preparation followed using K hand files (Dentsply Maillefer)

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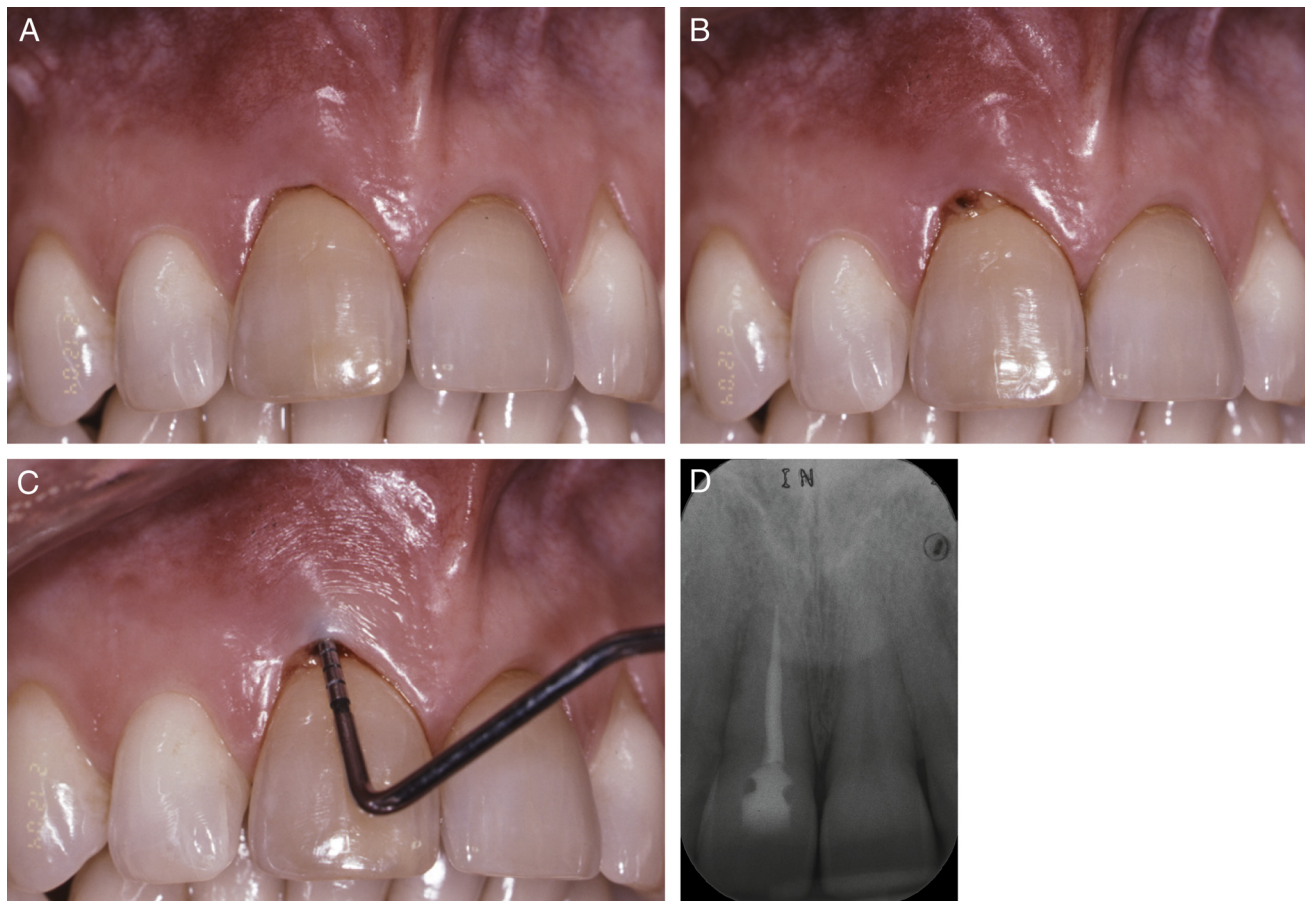


Figure 1. The maxillary right central incisor at presentation: (A) facial swelling and erythema, (B) exudate, (C) the periodontal probing depth, and (D) the periapical radiograph.

to ISO size 40 apically and a 0.5-mm step-back technique irrigating with 5% NaOCl, 17% EDTA, 10% iodine, and 2% chlorhexidine. Patency was maintained throughout (ISO size 6). Subgingival debridement of the root surface was performed using a piezoelectric ultrasonic unit (EMS Piezon; EMS Electro Medical Systems SA, Nyon, Switzerland). $\text{Ca}(\text{OH})_2$ was placed as the intracanal medicament, and obturation was performed during the third visit using a customized cone/cold lateral compaction technique (gutta-percha and zinc oxide/eugenol sealer); the master cone was customized apically by dipping it in chloroform, and accessory points were inserted and compacted laterally. This was followed by energized ultrasonic spreading in which further compaction was achieved with the application of ultrasonic energy (9), vertical compaction coronally with the use of Touch 'n Heat (SynbronEndo Corp, Orange, CA), and placement of intermediate restorative material (IRM; Dentsply DeTrey GmbH, Konstanz, Germany) in the canal orifice and IRM provisional restoration in the access cavity (Fig. 2A and B).

Reassessment after 6 weeks showed persistent purulent exudate, slight tenderness on palpation but no tenderness to percussion, mobility grade 1, and PPD up to 13 mm facially (Fig. 2C and D). Radiographic examination showed extensive periradicular bone loss associated with the right maxillary central incisor. The decision was made to proceed with exploratory surgery because there was suspicion of a root fracture. The tooth was splinted preoperatively using twist-flex wire bonded to the palatal surfaces of the maxillary anterior teeth (Fig. 2E). This was done for 2 reasons:

1. To provide stabilization during the healing phase in view of the anticipated extensive bone loss

2. In case the prognosis was determined to be hopeless, the root could be resected and the crown used as an immediate resin-bonded bridge to provide temporization postoperatively

The wire was accommodated relatively easily palatally because of the increased overjet and complete overbite in this case. (The incisal edges of the mandibular incisors were in contact with the palatal mucosa behind the maxillary incisors.) Periradicular surgery was performed under local anesthesia as follows (Fig. 2F–L):

1. Surgical exploration
2. Apical resection and root-end filling with mineral trioxide aggregate (MTA)
3. GTR using an anorganic bovine bone mineral and porcine resorbable collagen membrane (Bio-Oss/Bio-Gide; Geistlich Pharma AG, Wolhusen, Switzerland)

Local anesthesia was obtained by buccal and palatal infiltration of 8.8 mL lidocaine hydrochloride 2% and 1:80,000 epinephrine throughout the procedure. A full-thickness mucoperiosteal triangular flap was reflected at the base of the papillae, extending from the maxillary right lateral to the left central incisors; the vertical incision was placed on the distal side of the right lateral incisor. There was extensive periradicular bone loss associated with the maxillary right central incisor. No facial, apical, or interproximal bone was present (von Arx and Cochran Class IIb according to the von Arx and Cochran classification (10)), and the defect was extending to the mesial surface of the root of the adjacent lateral incisor. Granulation tissue was curetted and sent

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