MANAGEMENT OF ENDODONTIC FAILURE IN LOWER ANTERIOR TEETH BY APICECTOMY IN AN ADOLESCENT PATIENT

Abstract

Endodontic failure may occur due to the persistence of periapical pathology despite adequately performed root canal treatment. When nonsurgical retreatment is not feasible, surgical endodontic intervention becomes necessary. Apicectomy is a conservative surgical procedure aimed at eliminating periapical pathology while preserving the natural tooth. This case report presents the surgical management of an apical inflammatory cyst associated with endodontic failure in a 13-year-old male patient who reported pain in the lower anterior region of the jaw. The patient had a history of traumatic occlusion and prior root canal treatment involving the mandibular incisors. Clinical and radiographic examination revealed a persistent inflammatory radicular cyst associated with teeth 31 and 41. The treatment plan included surgical enucleation of the cystic lesion followed by apicectomy and retrograde filling of the involved teeth. The surgical procedure comprised apical root resection, thorough periapical curettage, and retrograde sealing. Postoperative follow-up demonstrated satisfactory clinical resolution and progressive radiographic healing of the periapical region. This case underscores the role of apicectomy as an effective tooth-preserving surgical option for managing persistent periapical lesions in adolescent patients when conventional nonsurgical retreatment is not indicated

Keywords: Endodontic failure; Apicectomy; Periapical pathology; Lower anterior teeth; Adolescent patient; Surgical endodontics.

Introduction

Endodontic therapy aims to eliminate infection from the root canal system and preserve the natural dentition; however, treatment failure may occur despite adherence to accepted clinical protocols. Persistent periapical pathology following root canal treatment is commonly attributed to residual intraradicular infection, inadequate canal disinfection, missed anatomy, microleakage, or the presence of extraradicular biofilms and cystic lesions[1–3]. In such situations, nonsurgical retreatment is considered the first line of management; however, surgical endodontic intervention becomes necessary when retreatment is impractical or unlikely to resolve the pathology[4].

Apicectomy, a well-established surgical endodontic procedure, involves resection of the apical portion of the root along with curettage of the periapical lesion, followed by retrograde sealing of the root canal system. This procedure is particularly indicated in cases of persistent periapical disease associated with adequately obturated canals, obstructed canals, or failed retreatment [5,6]. Advances in microsurgical techniques, magnification, ultrasonic root-end preparation, and biocompatible retrograde filling materials have significantly improved the success rates of apicectomy, making it a predictable treatment option for endodontic failures[7]. Management of endodontic failure in the **lower anterior region** presents unique challenges due to esthetic concerns, thin cortical bone, and proximity to vital anatomical structures. In **adolescent patients**, treatment planning requires special consideration of ongoing

craniofacial growth, tooth preservation, psychological impact, and long-term functional outcomes [8]. Conservative surgical intervention is therefore preferred to maintain tooth integrity and alveolar bone continuity. This article describes the surgical management of endodontic failure in the lower anterior teeth of an adolescent patient by means of apicectomy, emphasizing clinical decision-making, surgical technique, and treatment outcomes. The report highlights the role of apicectomy as a tooth-preserving treatment modality in young patients when conventional endodontic approaches fail.

Case Report

A 13-year-old male patient presented with complaints of pain and swelling in the chin region for a duration of two weeks. The patient had a history of traumatic occlusion involving the mandibular anterior teeth, with non-vital teeth 31 and 41 associated with a periapical lesion. Root canal treatment of the mandibular central incisors had been performed six months earlier. The patient remained asymptomatic initially; however, symptoms developed during the follow-up period.

Clinical examination revealed a localized swelling in the labial sulcus area in relation to teeth 31 and 41. The swelling was tender on palpation, with no associated sinus tract or discharge. Radiographic investigations including intraoral periapical radiograph (IOPAR), Orthopantomogram (OPG), and Cone Beam Computed Tomography (CBCT) were advised. Imaging revealed a well-defined periapical radiolucency associated with the apices of teeth 31 and 41. CBCT evaluation demonstrated a large unilocularcystic lesion measuring approximately 2 cm×1.5 cmsize in the mandibular anterior region.

Based on clinical and radiographic findings, a diagnosis of persistent periapical pathology secondary to endodontic failure was established. Surgical intervention was planned, and the

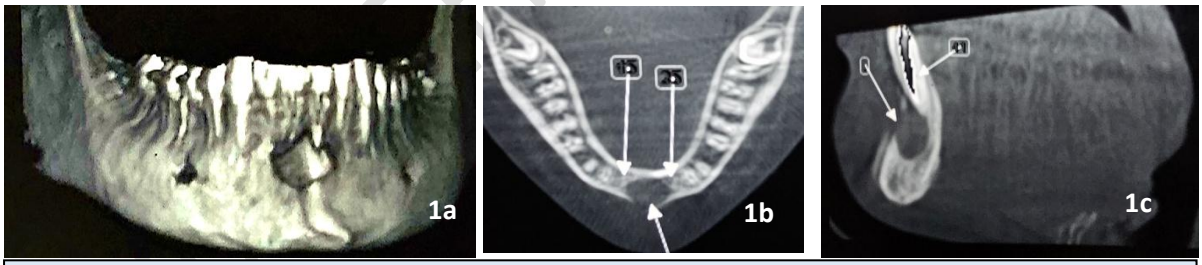

Figure 1a: CBCT preoperative 3D view of the lesion in relation to the periapical region of root canal treated 31 and 41, 1b: axial view,1c: sagittal view

patient was prescribed antibiotics prior to the procedure.

Under local anesthesia, two vertical releasing incisions and a crevicular incision were placed to elevate a full-thickness mucoperiosteal flap, exposing the periapical region of teeth 31 and 41. The Pathological tissue was completely enucleated, followed by meticulous curettage and the root ends were resected about 3mm with a surgical straight carbide bur at shallow angle.Haemostasis was achieved by means of gauze packing. Retrograde cavities were prepared and sealed using mineral trioxide aggregate (MTA). The bony cavity was

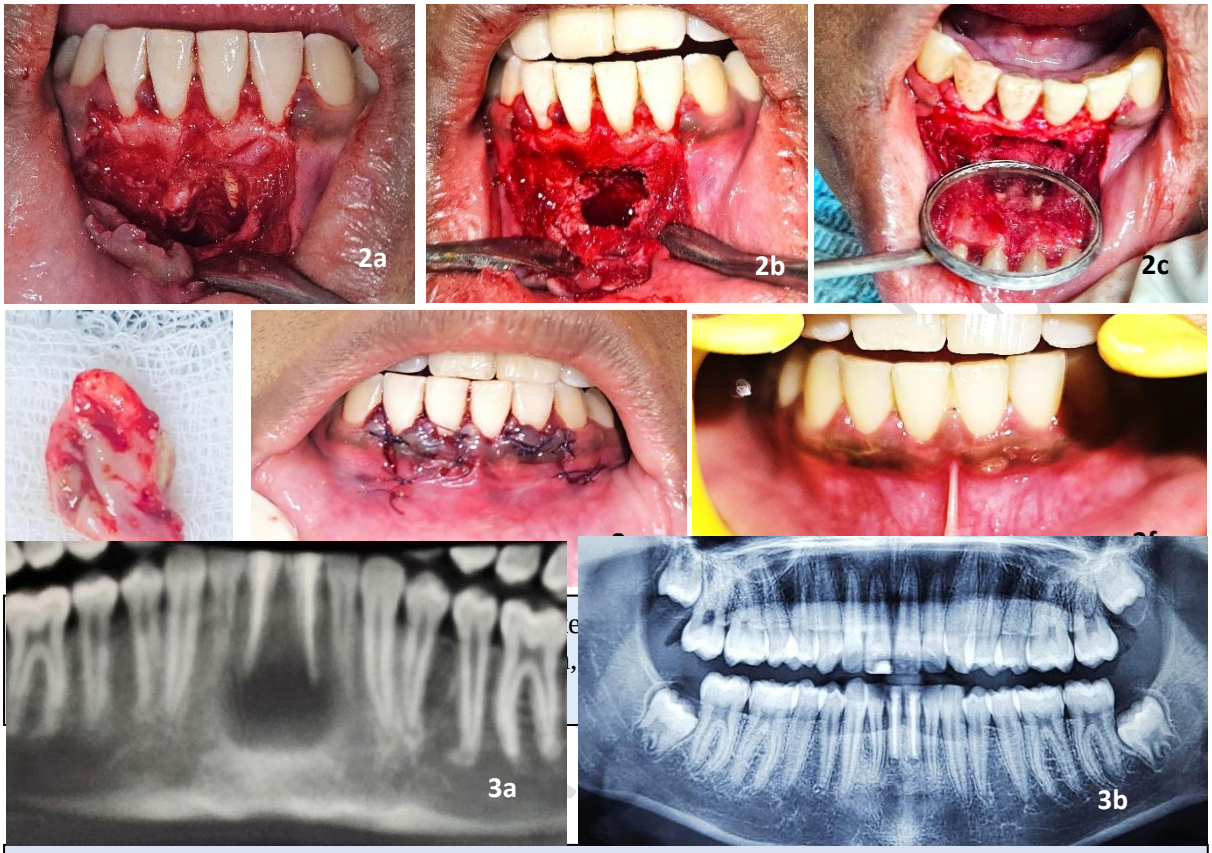

Figure 3a: CBCT Preoperative panoramic view of unilocular radiolucency in relation to the root apex of 31 and 41 , 3b: Six-month postoperative follow-up radiograph demonstrates bone deposition at the surgical site.

thoroughly irrigated. A hemostatic agent (Surgicel) was placed in the surgical site, and the flap was repositioned and sutured with 3-0 Vicryl. Postoperative medications and instructions were given to the patient. The excised tissue was sent for histopathological examination, which confirmed the diagnosis of an infected periapical cyst. No tenderness, swelling and sinus were detected at the follow up visits at one week, three months, and six months postoperatively. Six month follow up OPG showed complete resolution of the lesion with satisfactory periradicular healing and bone regeneration.

Discussion

Persistent periapical pathology following root canal treatment remains a common cause of endodontic failure, even when treatment appears radiographically adequate. Microbial persistence within apical ramifications, lateral canals, or extraradicular biofilms has been identified as a key etiological factor contributing to post-treatment apical periodontitis.[9–11]In the present case, the presence of a large cystic periapical lesion despite prior endodontic therapy indicated that nonsurgical retreatment alone would have limited predictability.

Although nonsurgical retreatment is generally considered the first-line approach for failed endodontic cases, surgical endodontic intervention becomes essential when retreatment is impractical due to adequately obturated canals, anatomical complexities, or obstructed canal systems.[4]Apicectomy allows direct access to the periapical pathology, facilitating complete removal of infected tissue while simultaneously addressing the apical portion of the root canal system. The favorable clinical and radiographic outcomes observed in this case support the effectiveness of surgical endodontic management in such scenarios.

Management of endodontic failure in adolescent patients presents additional considerations, including preservation of natural teeth, maintenance of alveolar bone integrity, and minimization of psychological and functional impacts.[12] Extraction and prosthetic replacement in growing patients may lead to long-term esthetic and occlusal complications, making conservative surgical procedures such as apicectomy a preferred treatment option. In the mandibular anterior region, where cortical bone is thin and esthetic demands are high, precise surgical technique is crucial to ensure optimal healing.

Advancements in endodontic microsurgery have significantly improved the prognosis of apicectomy. Modern surgical principles—including limited root-end resection (approximately 3 mm), ultrasonic retrograde cavity preparation, and the use of biocompatible retrograde filling materials—have contributed to higher success rates compared to conventional techniques.[5,13,14] Mineral trioxide aggregate (MTA), used as the retrograde filling material in this case, is well documented for its excellent sealing ability, biocompatibility, and capacity to promote periapical healing and cementogenesis.[15,16]These properties likely contributed to the favorable bone regeneration observed at the six-month follow-up.

According to the systematic review by Mahmoud Torabinejad et al., endodontic surgery showed a higher success rate in the short term (2–4 years) compared with nonsurgical retreatment (77.8% vs 70.9%). However, at longer follow-up (4–6 years), nonsurgical retreatment demonstrated a higher success rate than endodontic surgery (83.0% vs 71.8%)[4].

Histopathological confirmation of the lesion as an inflammatory cyst further justified the surgical approach, as true cystic lesions may exhibit limited healing potential following nonsurgical retreatment alone.[17] Complete enucleation combined with apicectomy ensures elimination of the pathological tissue and reduces the risk of recurrence. The absence of postoperative complications and satisfactory radiographic healing in this case highlight the predictability of apicectomy as a tooth-preserving treatment option in adolescent patients.

Conclusion

Apicectomy is an effective and conservative treatment option for managing persistent periapical pathology when nonsurgical retreatment is not feasible. In adolescent patients, this approach enables preservation of natural teeth and supporting structures, leading to favorable clinical and radiographic outcomes when performed with appropriate surgical technique and biocompatible materials.Overall, this case reinforces the role of apicectomy as a viable and effective treatment modality for managing persistent periapical pathology in young patients when conventional endodontic approaches fail.

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