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Case Report

Dentistry Section

Role of PRF in Surgical Management of Periapical Abscess in a Child: A Case Report

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ABSTRACT

Dental trauma in adolescents frequently leads to pulpal necrosis and subsequent periapical abscess formation. Timely diagnosis and early intervention play a crucial role in tooth preservation and maxillofacial growth. This case report presents management of a 12-year-old child diagnosed with periapical abscess in mandibular anterior region, which developed secondary to dental trauma. Cone-Beam Computed Tomography (CBCT) aided in accurate diagnosis and assessment of lesion extent and cortical bone involvement. Non-surgical Root Canal Treatment (RCT) followed by surgical enucleation of the cystic lesion was done for affected teeth. Autologous Platelet Rich Fibrin (PRF) from patient's blood was applied to the bony defect to enhance healing and regeneration. Six months' follow-up revealed uneventful healing, resolution of symptoms, and radiographic evidence of bone regeneration. In conclusion, this case highlights the effectiveness of an integrated approach in managing periapical lesions in paediatric patients and improving clinical outcomes over time. PRF provides a scaffold that enhances healing and supports clinical outcomes.

Keywords: Adolescent, Bone regeneration, Dental trauma, Pulpal necrosis, Root canal treatment

CASE REPORT

A 12-year-old female patient presented to the Department of Paediatric and Preventive Dentistry with the complaint of pain and swelling in the lower anterior region of the jaw, persisting for approximately one month.

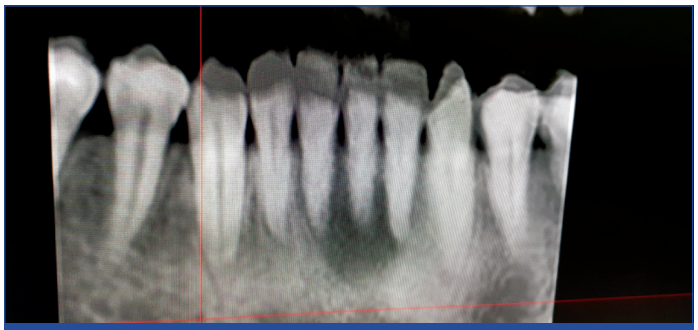
Her past medical history was insignificant. Upon further inquiry, the patient reported a history of trauma to the lower anterior teeth about one year earlier, resulting from a fall during play, which had remained untreated.

Clinical examination revealed a diffuse, tender swelling in the labial vestibule associated with teeth 31, 32, and 41 [Table/Fig-1]. The overlying mucosa was slightly erythematous but intact preoperatively. Pulp vitality testing indicated that the teeth were non-responsive. Mild tenderness to percussion was also elicited.

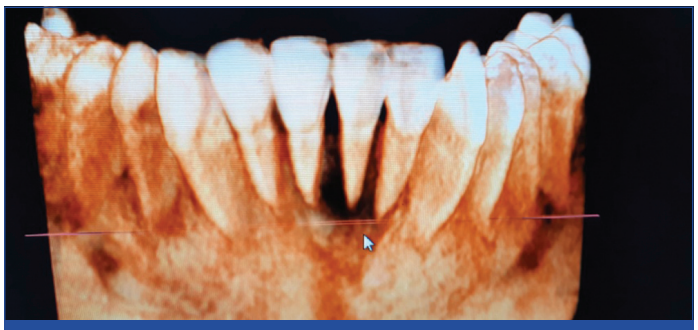
[Table/Fig-1]: Preoperative intraoral photograph showing diffuse swelling in the lower anterior gingival region in relation to the mandibular anterior teeth.

No sinus tract formation or purulent discharge was observed. Radiographic assessment demonstrated a well-defined radiolucency measuring approximately 1.5×2 cm at the apex of the teeth 31, 32, and 41, consistent with a chronic periapical abscess or cyst-like lesion [Table/Fig-2].

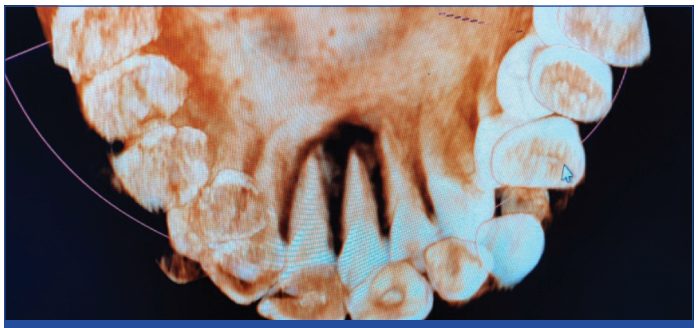
On CBCT analysis 3D reconstructed views (frontal and occlusal), a periapical radiolucent lesion was identified in relation to the mandibular central incisors, exhibiting thinning of the buccal and lingual cortical plates with no signs of perforation or root resorption [Table/Fig-3,4].



[Table/Fig-2]: Preoperative radiograph showing a well-defined radiolucency at the apices of teeth 31, 32, and 41.



[Table/Fig-3]: CBCT 3D reconstructed image (frontal view) showing a well-defined periapical radiolucent lesion in relation to teeth 31, 32, and 41, with cortical bone thinning.



[Table/Fig-4]: CBCT 3D reconstructed image (occlusal view) demonstrating the extent of the lesion in the mandibular anterior region, without evidence of perforation or root resorption.

Based on the clinical findings, radiographic evidence, and patient history a diagnosis of chronic periapical abscess secondary to trauma-induced pulpal necrosis was made.

The differential diagnoses considered included radicular cyst, periapical granuloma, and chronic periapical abscess. However, owing to the well-defined radiolucency and lesion size, a cyst-like periapical lesion was also considered for differential diagnosis. As the swelling was non-fluctuant and not associated with purulent discharge, incision and drainage were not indicated.

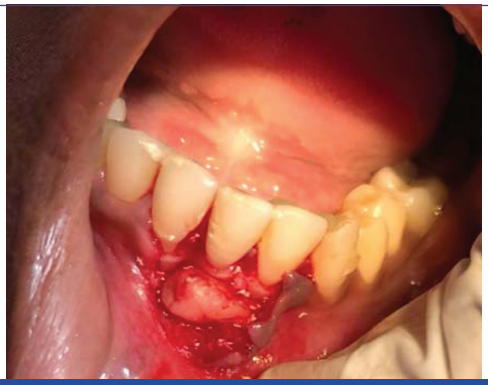
Non-surgical RCT was initiated to eliminate intracanal infection. Considering the lesion size (approximately 1.5×2 cm), cortical bone thinning, and the possibility of a cyst-like pathology with limited potential for resolution by endodontic therapy alone, surgical intervention was planned. A two-stage approach was adopted, comprising root canal therapy of teeth 31, 32, and 41 followed by surgical enucleation and placement of autologous PRF.

Histopathological examination was not deemed necessary, as the clinical and radiographic features were consistent with an inflammatory periapical lesion and the treatment approach would remain unchanged irrespective of the histological diagnosis.

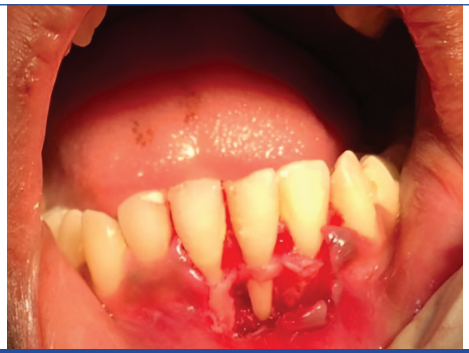
Endodontic treatment was initiated after administration of local anaesthesia. Access opening was done, working lengths determined, and biomechanical preparation was performed using rotary NiTi files, with irrigation using saline and 17% EDTA. During the subsequent appointment, canals were obturated using gutta-percha via the lateral condensation technique.

Surgical intervention was performed under local anaesthesia. A sulcular incision extending from tooth 31 to 41 with two vertical releasing incisions was placed, and a full-thickness mucoperiosteal flap was reflected to expose the bony defect [Table/Fig-5].

The periapical lesion was carefully enucleated, and the cavity was curetted and irrigated with saline [Table/Fig-6].

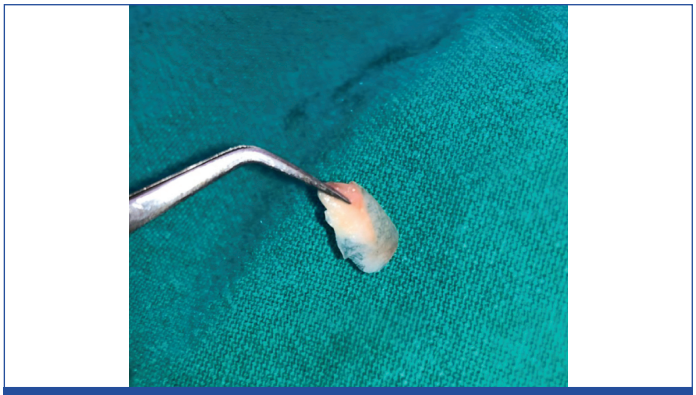


[Table/Fig-5]: Intraoperative view demonstrating the swelling in the lower anterior region in relation to teeth 31, 32, and 41 following reflection of the mucoperiosteal flap.



[Table/Fig-6]: Intraoperative mucoperiosteal flap reflection and lesion enucleation.

Autologous PRF, prepared from the patient's venous blood, was placed within the defect. Autologous PRF was prepared by centrifuging 10 mL of the patient's venous blood at 2700 rpm for 12 minutes following a standard protocol described by Choukroun J et al., and then placed within the bony cavity [Table/Fig-7] [1].



[Table/Fig-7]: Autologous PRF prepared by centrifugation from patients blood.

The flap was repositioned, sutured, and protected with a Coe pak to stabilise the flap, protect the surgical site, and enhance patient comfort during healing [Table/Fig-8,9]. Postoperative recovery was uneventful. The patient was prescribed antibiotics and analgesics including amoxicillin – clavulanic acid (25- 45 mg/kg/day in two divided doses every 12 hours) for five days and ibuprofen (10-15 mg/kg/ dose every 6-8 hours; maximum 40 mg/kg/day) for three days as per weight-based dosing recommendations for paediatric cases and returned for suture removal one week later followed by wire composite splint placement for additional support.

[Table/Fig-8]: Postoperative image showing the flap repositioned and secured with sutures to stabilise the surgical site.

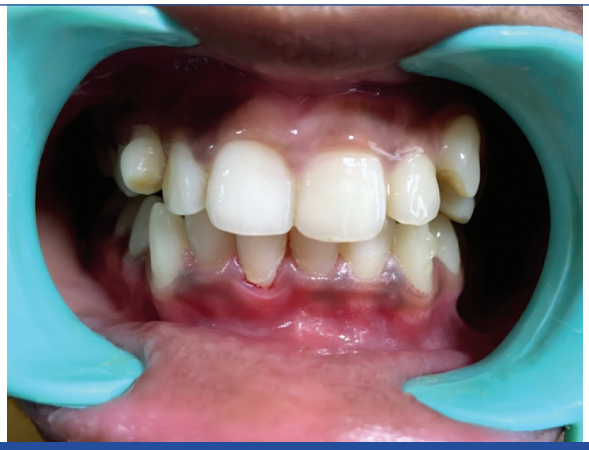
[Table/Fig-9]: Postoperative image showing Coe pak placed over the surgical site to protect and support healing.

Follow-up evaluations at one month [Table/Fig-10], three months [Table/Fig-11] and six months [Table/Fig-12] demonstrated clinically satisfactory healing, with progressive radiographic evidence of bone regeneration and complete resolution of the periapical radiolucency during the three months [Table/Fig-13], and six month follow-up visit [Table/Fig-14].

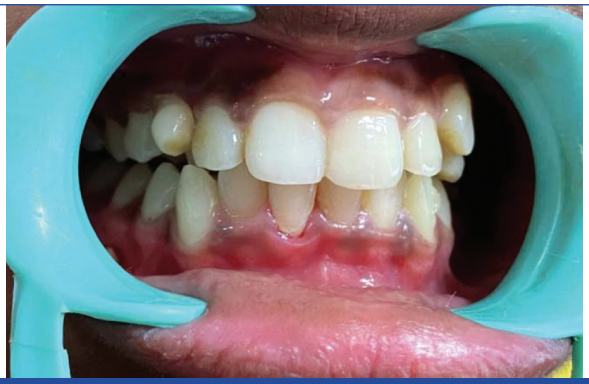
DISCUSSION

Dental trauma is recognised as a major aetiological factor in the development of pulpal necrosis and subsequent periapical pathology in children and adolescents, with anterior teeth being most frequently affected due to their prominent and exposed position within the dental arch [2]. Traumatic injuries can compromise the vascular

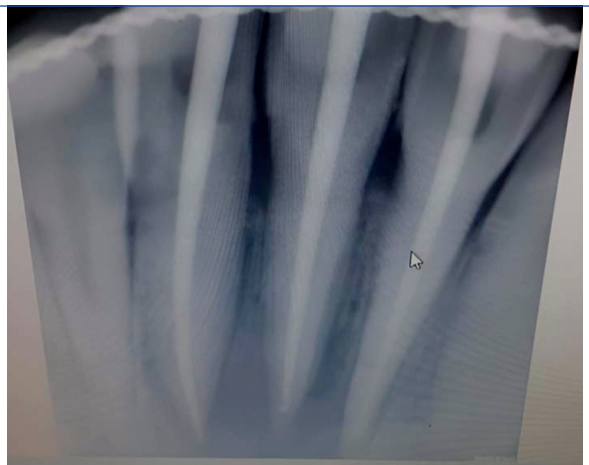
[Table/Fig-10]: Postoperative clinical image at 1 month showing initial healing of the surgical site.



[Table/Fig-11]: Postoperative clinical image at 3 months showing progressive soft-tissue healing and improved site appearance.

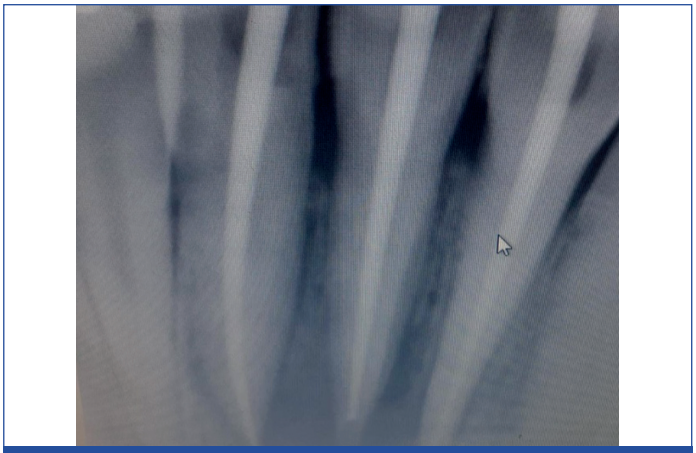


[Table/Fig-12]: Postoperative clinical image at 6 months showing complete soft-tissue healing and resolution of swelling.



[Table/Fig-13]: Postoperative radiograph after 3 months showing little evidence of healing and mild periapical radiolucency seen irt 31, 32, 41.

supply to the dental pulp, thereby predisposing the tissue to necrosis and, in the absence of timely diagnosis and appropriate intervention, resulting in the progression to chronic periapical lesions [3].



[Table/Fig-14]: Postoperative radiograph after 6 months showing complete healing and no evidence of periapical radiolucency.

The management of periapical abscesses in paediatric patients requires a carefully balanced approach that prioritises effective eradication of infection while preserving the integrity of the developing dentition. Non-surgical RCT remains the primary therapeutic modality for necrotic teeth associated with periapical pathology, with the aim of eliminating microbial infection and facilitating healing of the periapical tissues [4]. However, when large periapical lesions, particularly those associated with cortical bone thinning and cyst-like features, fail to resolve or are unlikely to resolve following root canal therapy alone, surgical intervention may be warranted to remove residual pathological tissue and promote healing [5].

Surgical enucleation is a widely accepted treatment option for such large periapical lesions, particularly those exceeding 1 cm in diameter or demonstrating a poor response to conservative endodontic therapy [6]. Complete surgical removal of the lesion aids in establishing a definitive diagnosis through histopathological examination and accelerates healing by eliminating chronically inflamed tissue that may otherwise hinder regenerative processes.

The introduction of regenerative techniques in dentistry, especially the application of platelet concentrates such as PRF, has significantly enhanced the outcomes of surgical endodontic procedures. PRF is a second-generation autologous platelet concentrate prepared without the use of anticoagulants, forming a fibrin matrix enriched with platelets, leukocytes, and growth factors including Transforming Growth Factor-beta (TGF-β), Platelet-Derived Growth Factor (PDGF), and Vascular Endothelial Growth Factor (VEGF) [1,7]. These bioactive components play a critical role in promoting angiogenesis, stimulating osteoblastic activity, enhancing collagen synthesis, and modulating inflammatory responses, all of which are essential for effective tissue regeneration.

In paediatric patients, the use of PRF offers distinct advantages owing to its autologous origin, thereby eliminating the risk of immunogenic reactions and disease transmission. Additionally, its minimally invasive and relatively simple preparation protocol enables safe intraoperative application. Several studies have reported that the use of PRF in periapical surgery results in improved bone density and volume, reduced postoperative pain and oedema, and accelerated soft-tissue healing [8,9].

In the present case, PRF was placed directly into the surgical defect following enucleation of the periapical lesion. The patient demonstrated uneventful postoperative healing, with progressive bone fill evident on radiographic evaluation at six months. This favourable outcome is consistent with previously published reports that highlight PRF as an effective bioactive scaffold capable of enhancing regenerative potential in the periapical region, particularly in growing patients where bone remodeling and healing are critical [10,11].

The combined therapeutic approach involving non-surgical RCT followed by surgical enucleation and adjunctive PRF application effectively addresses the underlying infectious etiology while

simultaneously enhancing the body's regenerative response to restore periapical tissues. This multidisciplinary strategy contributes to the preservation of natural dentition and supports both functional and aesthetic requirements in paediatric patients [11].

The PRF has been widely utilised to stimulate and accelerate both soft-tissue and bone healing due to its sustained local release of growth factors and proteins, closely mimicking the physiological processes of wound healing and tissue repair. PRF consists of a fibrin matrix polymerised into a tetramolecular structure, incorporating cytokines, platelets, leukocytes, and circulating stem cells, which collectively contribute to its regenerative properties [11].

Singh S et al., conducted a study evaluating the application of PRF in the surgical management of periapical lesions and concluded that while complete healing following periapical surgery typically requires approximately one year, the adjunctive use of PRF significantly accelerates healing, with bone regeneration occurring within approximately six months [11].

Aunmeungtong W et al., reported a case in which PRF was placed and covered with a collagen membrane, followed by sealing with white mineral trioxide aggregate. At one-year follow-up, the patient remained asymptomatic, and CBCT imaging revealed complete repair of the buccal alveolar bone. The authors concluded that regenerative endodontic treatment using PRF may yield favourable outcomes in necrotic immature teeth associated with periapical radiolucency [12].

Choukroun J et al., introduced PRF as a natural scaffold derived from an autologous preparation of concentrated platelets obtained from human blood. PRF has since been extensively utilised in clinical dentistry as a reservoir of various growth factors that contribute to tissue regeneration and healing [13].

Developed in France by Choukroun J et al., in 2001, the PRF preparation protocol was designed to concentrate platelets and cytokines within a fibrin clot. While platelets and leukocyte-derived cytokines play a significant role in the biological activity of this biomaterial, the fibrin matrix itself represents the key determinant of PRF's therapeutic potential. Cytokines are rapidly consumed during wound healing; therefore, the synergistic interaction between cytokines and their supporting fibrin matrix is of greater importance than cytokine concentration alone. A physiologic fibrin matrix such as PRF exhibits prolonged and controlled effects compared with fibrin glues enriched with cytokines, such as PRP, which produce short-term and less predictable outcomes. PRF undergoes a natural and progressive polymerisation during centrifugation, resulting in a homogeneous three-dimensional fibrin network that is more coherent than natural fibrin clots [13].

Thus, in the present case, the integration of endodontic therapy with surgical enucleation and PRF application not only facilitated effective elimination of the pathological lesion but also enhanced tissue healing and bone regeneration, which is particularly beneficial in paediatric patients.

CONCLUSION(S)

In the present case, a large periapical lesion resulting from trauma-induced pulpal necrosis was successfully treated through a combination of root canal therapy and surgical enucleation. The use of PRF as an adjunct facilitated improved healing and supported bone regeneration. This approach led to satisfactory clinical and radiographic resolution over a six-month follow-up period. These findings indicate that a combined surgical and regenerative strategy can be an effective option for managing similar cases in paediatric patients.

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