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Surgical Management Of External Cervical Resorption In Maxillary Central Incisor Using Biodentine

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Abstract:
External cervical resorption is a condition that leads to the loss of hard dental tissues, including enamel, cementum, and dentin. Despite being a severe condition, the underlying causes remain incompletely understood. The management of resorptions is depend upon their severity, location, and the materials employed. The therapeutic approach must aim to entirely remove the resorptive defect and repair it using a suitable filling material. Biodentine, a calcium silicate-based material, can be used to fill resorptive defects in the teeth. Moreover, biodentine exhibits several advantageous properties compared to MTA, including enhanced antibacterial characteristics, the ability to promote bioactivity- hard tissue formation, good handling property, self-adhesion to dentine, and a reduced setting time. This case report describes the successful management of external cervical resorption in the maxillary central incisor using non-surgical endodontic treatment and repair of the cervical defect using biodentine.

Keywords: *External Cervical Resorption, Biodentine, Maxillary incisor.*

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I. Introduction:

External cervical resorption (ECR) is a pathology characterized by the loss of hard dental tissues such as enamel, cementum, and dentin due to odontoclastic function [1, 2]. External cervical resorption typically develops in the cervical region of a tooth, just below the epithelial attachment [3]. It has the ability to penetrate the root dentin in multiple directions and to varying degrees. In extreme instances, ECR may progress to the middle and apical thirds of the root [3].

The concept of ECR was proposed by Heithersay in 1999, aiming to highlight the aggressive and penetrating nature of this type of injury based on the level of dental deterioration[2, 4].

Among the various identified causes, injury and stimulation from sulcular microorganisms in the adjacent marginal tissues is one of cause [5,6]. Additionally, traumatic injuries, orthodontic tooth movement, orthognathic and dento-alveolar surgery, periodontal treatment, and internal bleaching have been noted as predisposing factors for such type of lesions [7]. The prevalence of ECR is poorly reported, with prevalence rates ranging from 0.02% to 2.3%, according to some epidemiological and retrospective studies[7,8].

The clinical manifestation of ECR may differ based on various factors, including the severity of the condition, the type of tooth affected, and the stage of ECR [9]. In the early stages, it may not cause any symptoms [10]. However, in some cases, a "pink spot" might manifest in the cervical region of the tooth. A notable clinical characteristic of ECR is the loss of periodontal attachment accompanied by significant bleeding when probing the resorptive defect [1]. In more severe cases, resorption may lead to a perforation in the wall of the root canal, allowing access to the pulp. This condition can result in symptoms and/or indications of pulpitis and/or periapical periodontitis [1, 11].

The early identification of ECR is difficult because of the location of the resorption makes it easy to miss during visual examination so it can be easily misdiagnosed as a carious cavity. 2D radiographs are also inadequate diagnostic tools for ECR because of the masking effect caused by the relative radiodensity of the remaining tooth structure and overlying alveolar bone. Recently, cone-beam computed tomographic (CBCT) imaging has been used extensively to provide a more accurate diagnosis of ECR.

The management of ECR depends on its nature and lesion accessibility. The treatment objectives consist of excavating the resorptive lesion to terminate the process, repairing the defect, and monitoring for any recurrences [12]. Till date, various materials have been promoted to seal the resorptive defect such as mineral trioxide aggregate (MTA), glass-ionomer cement (GIC), calcium-enriched mixture (CEM) etc. More recently, other bioactive materials, including CEM cement, bioaggregate, Biodentine, EndoSequence Root Repair Material (ERRM), and EndoSequence BC Sealer, have also been suggested.[13] Among the various choices, a novel bioactive material known as Biodentine (Septodont, St. Maur-des-Fossés, France) presented as viable alternative as it act as a substitute of dentin.[13,14]

Therefore, the present case report was mentioning the successful management of maxillary left central incisor with external cervical resorption surgically using Biodentine.

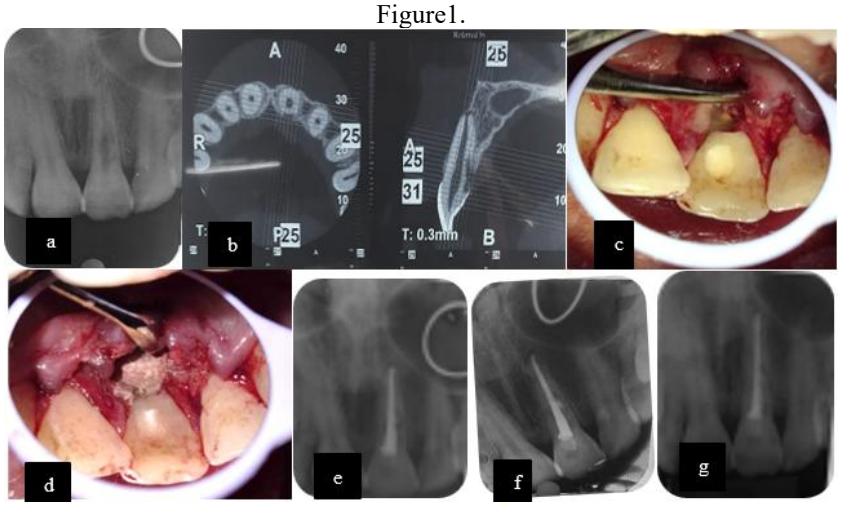
II. Case Report:

A 26-year-old female patient presented to the Department of Conservative Dentistry and Endodontics, with the chief complaint of discolored left central incisor (21). On clinical examination, tooth 21 was discoloured. The medical history of the patient was noncontributory. The patient had noticed color change of related tooth, and it has increased over the last 3-4 months. Past dental history revealed, that she had undergone trauma 6 years back and teeth remained untreated. The cold test and electric pulp test was negative. Periodontal probing depths were in physiological limit at all sites.

The preoperative radiograph (Figure1a) revealed an irregular, large radiolucent area in the cervical third of the external root surface at distal aspect of 21. On CBCT examination an irregular radiolucency was seen on the external root surface of palatal aspect of 21 at supra-osseous level (Figure 2b).

Based on the clinical and radiographic features diagnosis of irreversible pulpitis with external cervical resorption was made.

Figure1.



(a) Preoperative radiograph, (b) Preoperative CBCT, (c) Cervical resorption defect seen, (d) Sealing of defect with Biodentine, (e) Immediate postoperative IOPA radiograph, (f) 6 month follow up radiograph, (g) 12-month follow-up radiograph.

Management:

Patient was informed treatment planning as management of ECR with debridement, curettage, and restoration of the external resorption defect with flap surgery and consent was taken from the patient. Under local anesthesia, the access cavity were prepared. After working length determination, the root canals were biomechanically prepared i.e. cleaning and shaping with manual instruments using #K- files and irrigated with 3% NaOCl (Parcan, Septodont Healthcare India Pvt. Ltd., India) followed by normal saline and dried with paper point. Calcium Hydroxide dressing was placed after drying the canal for one week. In next visit calcium hydroxide was removed from the canal with normal saline by ultrasonic activation, irrigated first with 3% NaOCl followed by 17% EDTA solution, then an appropriate size of master gutta-percha cone was selected and confirmed radiographically. Obturation was done and confirmed radiographically.

In next visit surgical procedure was carried out under magnification (Magnifying loupes). A full thickness mucoperiosteal flap was raised with intrasulcular incision and papillae elevation. A large circular resorptive area was seen clearly from the surgical site containing granulation tissue (Figure1c). The resorptive tissues were completely removed with predominantly mechanical debridement. For chemical debridement 90% aqueous solution of trichloroacetic acid was used. Undermined enamel was removed and the defect was restored with Biodentine (manipulated according to manufacturer's instructions) and contoured as per external root anatomy (Figure1d). flap was kept at its original position and sutured with 3-0 silk suture material and the patient was instructed to report after one week for suture removal. Postoperative IOPA radiograph was taken (Figure1e). After suture removal, the patient was advised for regular follow ups.

Patient reported to the department at 6 month and 12 month. Follow up radiograph revealed complete healing of resorption defect.

III. Discussion:

ECR manifest mainly in the cervical region and it may invade root dentin in any direction and to a varying degree. ECR generally develops immediately apical to the epithelial attachment of the tooth.

ECR has also been referred to as invasive cervical resorption, supraosseous extracanal invasive resorption, peripheral inflammatory root resorption, and subepithelial external root resorption.

The exact etiology and pathogenesis of ECR have not been fully elucidated. But the resorptive process is the same for ECR as it is for any other type of resorption: a breach in the protective nonmineralized layers must exist to allow the clastic cells to bind the underlying dentine, and the same cells must be stimulated to perpetuate the process. The anatomic profile of the cementoenamel junction (CEJ) is variable, and the junction between the enamel and the cementum in this region is not contiguous in all teeth. This may lead to exposed areas of unprotected dentin, which are vulnerable to osteoclastic activity, in the cervical region of some teeth [15].

Mavridou et al [15] investigated the potential predisposing factors, of the 347 teeth examined, 59% were multifactorial. Orthodontic treatment was the most common appearing factor (45.7%) followed by trauma (28.5%), parafunctional habits (23.2%), poor oral hygiene (22.9%), malocclusion (17.5%), and extraction of neighboring tooth (14%).

ECR cases included 29% maxillary central incisors, 14% in maxillary canines, 14% in mandibular molars, and 14% maxillary premolars. ECR was less frequently seen in mandibular canines (3%), mandibular centrals (1%), and mandibular lateral (1%).

The histologic profile of ECR is similar to that of other forms of resorption with certain unique features reflecting the invasive nature of the process. Recently, histologic analysis has revealed that ECR lesion is a mechanism of a three-stage process. Initially, the ECR starts at the cementum apical to the gingival epithelium (i.e., the initiation stage). In the second stage of the resorption (i.e., the resorption phase), the resorptive lesion invades the tooth structure in a 3D manner towards the pulp space. However, the pulp is protected by a pericanalar resorption-resistant sheet which prevents the resorption lesion from penetrating into the pulp space. This layer has a thickness of 210μm and consists of predentin, dentin, and occasionally bonelike tissue. At the last advanced stage (i.e. the repair stage), bonelike tissue is deposited into the resorption cavity in which repair takes place [16].

Surgical access to the site of resorption is gained by raising a mucoperiosteal flap to allow visualization of the full extent of the defect. Once access has been achieved, the resorptive cavity is excavated. Fibrovascular granulomatous tissue is readily removed with a hand excavator. Once the resorptive tissue has been removed, the cavity may be treated with a 90% aqueous solution of trichloroacetic acid; this causes coagulation necrosis of the resorptive tissue without damaging the periodontal tissue. Biodentine proved to be suitable for restoring these defect [9] because it may combine acceptable esthetics with the ability to support PDL attachment. It can be a valid option since it acts as a substitute of dentin [17] and it induces the repair of the periodontium and new cementum formation [14].

IV. Conclusion:

Accurate diagnosis, appropriate case selection, and effective implementation can result in a successful outcome and the long-term preservation of the tooth. While this case report demonstrated a successful management of ECR using Biodentine as a restorative material for the repair of ECR defect.

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