Pomeranian J Life Sci 2024;70(1):41-45 doi: 10.21164/pomjlifesci.949

Treatment of external cervical resorption – a case report with 4-year follow-up

Katarzyna Lewusz-Butkiewicz[A] ✉, Aleksandra Kulas-Bałaban[B], Kinga Kaczor-Wiankowska[C], Agnieszka Witek[D], Monika Szmidt-Kądys[E]

Pomeranian Medical University in Szczecin, Department of Conservative Dentistry and Endodontics, Powstancow Wlkp. 72, 70-111 Szczecin, Poland

[A] ORCID: 0000-0002-0402-3619; [B] ORCID: 0000-0003-3690-7256; [C] ORCID: 0000-0003-2201-8167; [D] ORCID: 0000-0001-8475-4632; [E] ORCID: 0000-0003-1096-9993

✉ katarzyna.lewusz.butkiewicz@pum.edu.pl

ABSTRACT

Root resorption is a process that results in the loss of dental hard tissues as a result of odontoclastic action. One of the types of external resorption is external cervical resorption, which usually manifests itself in the cervical aspect of the teeth. Clinically, external root resorption is usually asymptomatic. When external cervical resorption occurs, cervical cavitation, gingival contour irregularity, or pink discoloration of the overlying enamel can often be observed. This case report describes the clinical and radiologic diagnosis (cone beam computed tomography) and treatment of external cervical resorption according to the current guidelines of the European Society of Endodontology. After 4 years, the tooth remained functional and the esthetic effect was satisfactory.

Keywords: cone beam computed tomography; external cervical resorption; incisor; radiography; tooth resorption.

INTRODUCTION

Root resorption is a process that results in the loss of dental hard tissues as a result of odontoclastic action. In clinical practice, it is most commonly classified as external or internal resorption, depending on its location in relation to the root surface [1].

One of the types of external resorption is external cervical resorption (ECR), which usually manifests in the cervical aspect of the teeth. It is usually initiated at the cementoenamel junction (CEJ) and progresses due to damage to the precementum [2]. External cervical resorption is a dynamic process involving periodontal, dental, and, in later stages, pulpal tissues [3].

Clinically, external root resorption is usually asymptomatic. When ECR occurs, cervical cavitation, irregularity of the gingival contour, or pink discoloration of the overlying enamel can often be observed. In many cases, however, there are no clinical signs and the diagnosis is made by an incidental finding on a radiograph [4, 5]. In more severe cases, when the resorption process has involved the pulp, the patient may present with symptoms of irreversible pulpitis and/or apical periodontitis [2].

Periapical radiographs are essential in the diagnosis of ECR. The radiographic appearance of ECR is variable and depends on the size and nature of the lesion. It often appears as an irregular, asymmetric radiolucency through which the outline of the root canal can be seen [5]. However, they are known to provide limited information about the dentoalveolar anatomy due to their 2-dimensional nature, geometric distortion, and anatomical noise [5, 6]. Therefore, cone beam computed tomography (CBCT) is recommended by the European Society of Endodontology for the diagnosis of ECR. It shows the size of the resorption, the extent of the lesion, and its proximity to the root canal, and allows an appropriate treatment plan to be designed [2]. Patel et al. proposed a 3-dimensional classification of ECR based on periapical radiographs and CBCT findings (Tab. 1). This classification takes into account the height of a lesion, its circumferential extent, and its proximity to the root canal [2].

TABLE 1. A 3-dimensional classification for external cervical resorption according to Patel et al. [2]

Height	Circumferential spread	Proximity to the root canal
1. Supracrestal/ cementoenamel junction level	A: ≤90°	d: lesion confined to dentin
2. Subcrestal, extends into coronal 1/3	B: >90° to ≤180°	
3. Extends into mid-third of the root	C: >180° to ≤270°	p: probable pulpal involement
4. Extends into apical-third of the root	D: >270°	

The European Society of Endodontology has proposed a treatment and management of ECR based on the classification of Patel et al. [7, 8]. These treatment modalities include:

1) removal of resorptive tissue and restoration of the defect with a direct restoration – 1Ad, 2Ad, 2Bd and endodontic treatment in case of probable pulp involvement – 1Ap, 2Ap, 2Bp;

2) removal of resorptive tissue from the root canal access during endodontic treatment – 2Cp, 2Dp, 3Cp, 3Dp;
3) extraction of an endodontically treated tooth to allow restoration and/or recontouring of an otherwise inaccessible resorption defect, followed by replantation – 3Ad, 3Bd;
4) periodic check-up (untreatable teeth-2–4Dd, 2–4Dp);
5) extraction (untreatable teeth).

This case report describes the treatment of ECR according to the current guidelines of the European Society of Endodontology and a 4-year follow-up. Despite the many published case reports of ECR, there are few papers describing long-term observations [9].

CASE REPORT

This case report was written according to the Preferred Reporting Items for Case Reports in Endodontics (PRICE) 2020 guidelines [10]. In January 2019, a 22-year-old European female patient was referred to the Department of Conservative Dentistry and Endodontics at the University Dental Clinic in Szczecin, Poland, for treatment of pain and swelling of the gingiva of tooth 11 (right upper incisor). The patient was in good general health, was a non-smoker with no known allergies, and denied any history of trauma, orthodontic treatment, or teeth bleaching. Clinical examination revealed a grey shadow in the cervical aspect of tooth 11 with loss of hard tissue (Fig. 1). Periodontal examination (WHO-62 periodontal probe) revealed a probing depth of approx. 4 mm on the labial side. The tooth was not mobile and there was no previous filling. Sensitivity tests, including the electrical pulp test (Vitality Scanner 2006, KerrHawe, Bioggio, Switzerland) and cold test, were positive and the percussion test was negative. Oral hygiene needed improvement; the approximal plaque index (API) was 46% [11].

FIGURE 1. Preoperative intraoral photograph

A CBCT (Cranex 3Dx Soredex, KaVo Imaging, PA, USA) with a small field of view (FOV) of 40 x 40 mm and a voxel size of 0.125 mm was performed to evaluate the extent of hard tissue destruction of tooth 11 (Fig. 2). After analysis of the clinical and radiographic data, a diagnosis of ECR class 2Bd was made according to Patel et al [2]. The patient was offered a treatment plan in accordance with the European Society of Endodontology recommendation for class 2Bd ECR, which included flap reflection, resorptive tissue removal, and subsequent direct filling of the defect.

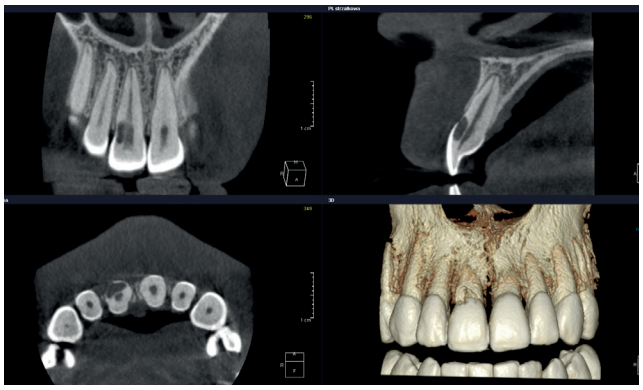

FIGURE 2. Preoperative cone beam computed tomography view of maxilla first right incisor with external ervical resorption

Due to poor hygiene, hygiene instructions were given and the procedure was postponed. Treatment was scheduled for 7 days later. At the next visit, oral hygiene had improved and was considered optimal, with an API of 20%. Due to the normal condition of the pulp (confirmed by cold and electrical sensitivity tests) and the normal periapical tissues, as well as the lack of direct contact between the resorptive defect and the pulp cavity, no indication for endodontic treatment of tooth 11 was found. After explaining the procedure to the patient, written informed consent was obtained. Under local anesthesia with 2% lidocaine with epinephrine (Xylodont 1:50000, Molteni Stomat, Krakow, Poland), an intrasulcular incision was made from tooth 12 to 21 to expose the resorptive cavity. In the next step, the resorptive tissue was removed with an excavator (Fig. 3). The cavity was filled with Biodentine (Septodont, St. Maur-des-Fossés, France), Single Bond Universal adhesive (3M ESPE, MN, USA) and Estelite Sigma Quick A2 (Tokuyama, Tokyo, Japan) according to the manufacturer's recommendations (Fig. 4 and 5). Finally, the flap was repositioned and sutured with 5.0 monofilament suture (Fig. 6). The sutures were removed 7 days after surgery, and normal tissue healing was noted (Fig. 7). No abnormalities were noted at 4 weeks and 6 months. Figure 8 shows the PRICE 2020 flowchart detailing the steps involved in the case report [10].

FIGURE 3. Cavity after resorption tissue removal

FIGURE 4. Resorption cavity restored with Biodentine

FIGURE 5. Resorption cavity restored with adhesive and resin composite

FIGURE 6. Intraoral photograph after flap reposition and suture

FIGURE 7. Intraoral photograph after 7 days

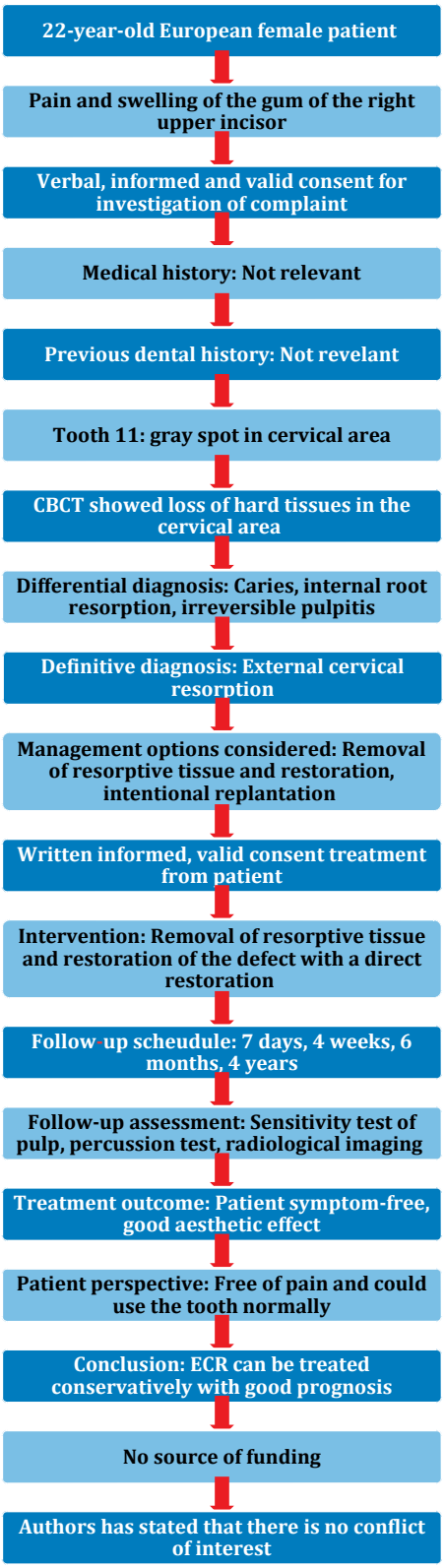

FIGURE 8. The PRICE 2020 flowchart

The patient did not attend a follow-up appointment 1 year after the procedure, but returned after 4 years (January 2023). The follow-up examination showed normal pulp response to sensitivity tests (electrical and thermal), no pathological tooth mobility, normal periodontium (probing depth was approx. 2 mm on the labial side), and a negative percussion test.

The esthetic result was satisfactory (Fig. 9). Control CBCT with 40 x 40 mm FOV and 0.125 mm voxel size showed no pathological changes (Fig. 10).

FIGURE 9. Intraoral photography showing a good esthetic result after 4 years

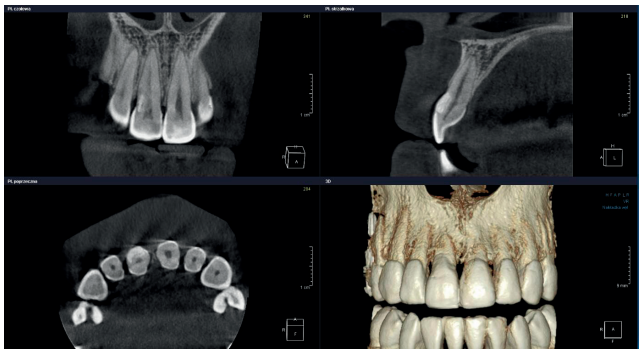

FIGURE 10. Control cone beam computed tomography showed no pathological changes after 4 years

DISCUSSION

The etiology of root surface ECR is unclear. Heithersay evaluated 257 teeth with ECR and postulated that orthodontic treatment, traumatic injury, internal bleaching, surgery, periodontal and restorative treatment are the major potential predisposing factors for ECR [4]. Other local predisposing factors considered are apical or periodontal inflammation, tumors, cysts, bruxism, impacted and hyperplastic teeth, and tooth replantation and endodontic treatment. Systemic risk factors include: hyperparathyroidism, hypoparathyroidism, Paget's disease, Goltz syndrome, Papillon-Lefevre syndrome, Turner syndrome, Stevens-Johnson syndrome, kidney disease, liver disease, and dietary habits [12, 13]. In some cases, the cause of resorption is unknown, and the process is called idiopathic invasive cervical resorption [2, 4]. In the case presented, the patient did not report any predisposing factors that could be associated with ECR. The teeth most commonly affected by ECR are the maxillary anterior teeth. The incidence is estimated to be 27–29% for maxillary incisors and 14–21% for maxillary canines [12, 13].

In 1999, Heithersay described the radiographic, clinical, and histopathologic features of ECR and classified ECR according to the extent of the lesion within the tooth. The proposed classification was based on conventional radiographs. Five classes were distinguished according to the severity of the process: class 1 – denotes a small invasive resorptive lesion near the cervical area with shallow penetration into the dentin; class 2 – denotes a well-defined invasive resorptive lesion that has penetrated near the coronal pulp chamber but shows little or no extension into the radicular dentin; class 3 – denotes a deeper invasion of the dentin resorbing tissue, involving not only the coronal dentin but also extending into the coronal third of the root; class 4 – denotes a large invasive resorptive process that has extended beyond the coronal third of the root [14]. The European Society of Endodontology Position Statement and the American Association of Endodontists & American Academy of Oral & Maxillofacial Radiology Joint Statement have recommended the use of CBCT for the evaluation and management of root resorption [15, 16]. In 2018, Patel et al. created a new classification for ECR based on CBCT, which was used in this study. This new classification was accepted by the European Society of Endodontology and treatment options were presented based on it [7].

Shemesh et al. described 12 cases (34% of the study group) of pink discoloration in ECR teeth and 1 case of gray discoloration and pulp necrosis [17]. Cervical resorption is independent of the pulp. Therefore, a pink spot seen in the crown area in some cases of cervical resorption is less likely to turn dark, as is usually the case with internal resorption [18]. In the clinical case described, the gray discoloration of the crown was accompanied by a vital asymptomatic pulp. The possibility of treatment failure of ECR described by Heithersay and Irinakis et al. was as follows for class 1 – 0.0%, 0.0%, class 2 – 0.0%, 17.1%, class 3 – 22.2%, 33.3%, and class 4 – 87.5% and 50.0% according to the Heithersay classification [9, 19].

According to Elias et al., universal adhesive systems are not more toxic than self-etching adhesives, whereas other authors found universal adhesive systems to be cytotoxic and genotoxic in living cells [20, 21, 22]. In another case report, the authors described the use of a universal adhesive system (Single Bond Universal, 3M ESPE, MN, USA) and the nanofilled composite Estelite Sigma Quick (Tokuyama, Tokyo, Japan) to fill the resorptive cavity. Pulp necrosis occurred after 2 and a half years [23]. The method presented by Kqiku et al. seems to be safer for the pulp. In the proposed procedure, the resorptive cavity was filled with white MTA (Pro Root, Dentsply, Konstanz, Germany), glass ionomer cement (Fuji IX, Fuji, Tokyo, Japan), and light-cured composite with a bonding agent (Artemis Enamel A2, Excite; both from Vivadent, Schaan, Liechtenstein). At the 4-year follow-up, the pulp responded positively to sensitivity tests [24]. In this study, Biodentine (Septodont, St. Maur-des-Fossés, France), Single Bond Universal Adhesive (3M ESPE, MN, USA) and Estelite Sigma Quick A2 (Tokuyama, Tokyo, Japan) were used to fill the resorption cavity. After 4 years, the esthetic effect was satisfactory and the pulp was vital.

CONCLUSIONS

The use of a biomaterial base should be considered in the treatment of ECR to avoid pulpal complications. External cervical resorption lesions that can be treated conservatively have a good prognosis. However, patients should be informed of the limited evidence regarding treatment outcomes, the possibility of late complications, and the need for follow-up.

REFERENCES

1. Patel S, Kanagasingam S, Pitt Ford T. External cervical resorption: a review. J Endod 2009;35(5):616-25.
2. Patel S, Mavridou AM, Lambrechts P, Saberi N. External cervical resorption – part 1: histopathology, distribution and presentation. Int Endod J 2018;51(11):1205-23.
3. Luso S, Luder HU. Resorption pattern and radiographic diagnosis of invasive cervical resorption. A correlative microCT, scanning electron and light microscopic evaluation of a case series. Schweiz Monatsschr Zahnmed 2012;122(10):914-30.
4. Heithersay GS. Invasive cervical resorption: an analysis of potential predisposing factors. Quintessence Int 1999;30(2):83-95.
5. Patel S, Foschi F, Mannocci F, Patel K. External cervical resorption: a three-dimensional classification. Int Endod J 2018;51(2):206-14.
6. Bender IB, Seltzer S. Roentgenographic and direct observation of experimental lesions in bone: I. 1961. J Endod 2003;29(11):702-6.
7. Patel S, Lambrechts P, Shemesh H, Mavridou A. European Society of Endodontology position statement: External Cervical Resorption. Int Endod J 2018;51(12):1323-6.
8. Patel S, Foschi F, Condon R, Pimentel T, Bhuva B. External cervical resorption: part 2 – management. Int Endod J 2018;51(11):1224-38.
9. Irinakis E, Haapasalo M, Shen Y, Aleksejuniene J. External cervical resorption – Treatment outcomes and determinants: A retrospective cohort study with up to 10 years of follow-up. Int Endod J 2022;55(5):441-52.
10. Nagendrababu V, Chong BS, McCabe P, Shah PK, Priya E, Jayaraman J, et al. PRICE 2020 guidelines for reporting case reports in Endodontics: a consensus-based development. Int Endod J 2020;53(5):619-26.
11. Lange DE, Plagmann HC, Eenboom A, Promesberger A. Klinische Bewertungsverahren zur Objektivierung der Mundhygiene. Dtsch Zahnarztl Z 1977;32(1):44-7.
12. Mavridou AM, Bergmans L, Barendregt D, Lambrechts P. Descriptive analysis of factors associated with external cervical resorption. J Endod 2017;43(10):1602-10.
13. Jeng PY, Lin LD, Chang SH, Lee YL, Wang CY, Jeng JH, et al. Invasive cervical resorption-distribution, potential predisposing factors, and clinical characteristics. J Endod 2020;46(4):475-82.
14. Heithersay GS. Clinical, radiologic, and histopathologic features of invasive cervical resorption. Quintessence Int 1999;30(1):27-37.
15. Patel S, Brown J, Semper M, Abella F, Mannocci F. European Society of Endodontology position statement: Use of cone beam computed tomography in Endodontics: European Society of Endodontology (ESE) developed by. Int Endod J 2019;52(12):1675-8.
16. AAE and AAOMR Joint Position Statement: Use of Cone Beam Computed Tomography in Endodontics 2015 Update. J Endod 2015;41(9):1393-6.
17. Shemesh A, Levin A, Ben Itzhak J, Brosh Y, Braverman E, Batashvili G, et al. External invasive resorption: Possible coexisting factors and demographic and clinical characteristics. Aust Endod J 2019;45(2):141-5.
18. Haapasalo M, Endal U. Internal inflammatory root resorption: the unknown resorption of the tooth. Endod Topics 2006;14(1):60-79.
19. Heithersay GS. Treatment of invasive cervical resorption: an analysis of results using topical application of trichloracetic acid, curettage, and restoration. Quintessence Int 1999;30(2):96-110.
20. Elias ST, Santos AF, Garcia FC, Pereira PN, Hilgert LA, Fonseca-Bazzo YM, et al. Cytotoxicity of universal, self-etching and etch-and-rinse adhesive systems according to the polymerization time. Braz Dent J 2015;26(2):160-8.
21. Lewusz-Butkiewicz K, Kaczor-Wiankowska K, Kulas-Bałaban KW, Szmidt-Kądys M. Treatment of external cervical resorption and its late complication: a case report. Iran Endod J 2022;17(1):48-51.
22. Sürmelioğlu D, Hepokur C, Yavuz SA, Aydın U. Evaluation of the cytotoxic and genotoxic effects of different universal adhesive systems. J Conserv Dent 2020;23(4):384-9.
23. Leite MLAES, Costa CAS, Duarte RM, Andrade AKM, Soares DG. Bond strength and cytotoxicity of a universal adhesive according to the hybridization strategies to dentin. Braz Dent J 2018;29(1):68-75.
24. Kqiku L, Ebeleseder KA, Glockner K. Treatment of invasive cervical resorption with sandwich technique using mineral trioxide aggregate: a case report. Oper Dent 2012;37(1):98-106.