

Retrospective Evaluation of Root End Resection without Retrograde Filling

Retrograd Dolgu Yapılmadan Tamamlanan Kök Ucu Rezeksiyonu Vakalarının Retrospektif Olarak Değerlendirilmesi

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Abstract

Objective: The aim of the present study was to investigate the outcomes of cases completed without retrograde filling following root end resection made for periapical pathology.

Methods: This was a retrospective cohort study. The primary predictor variables included gender, age (>45 vs <45 years), and localization (maxilla, mandible, anterior, and posterior). The primary outcome variable was radiological assessment (success vs failure). Data were analyzed by chi-square test and descriptive statistics ($p < 0.05$).

Results: A total of 56 (21 males and 35 females) patients were included in the study. Overall, 37 (66%) patients were successful, whereas 19 (34%) failed. Gender, age, and localization did not significantly affect the outcomes. There were significantly less successful outcomes in the posterior dentition ($p < 0.05$).

Conclusion: It cannot be reported that retrograde filling after root end resection is unnecessary; however, successful outcomes might be obtained without retrograde filling.

Keywords: Root end resection, retrograde filling, periradicular inflammation

Öz

Amaç: Periradiküler patojenite nedeniyle yapılan kök ucu rezeksiyonu sonrasında retrograd dolgu yapılmadan tamamlanmış vakaların sonuçlarını retrospektif olarak değerlendirmektir.

Yöntemler: Bu retrospektif kohort bir çalışmadır. Ön değişkenler cinsiyet, yaş, >45 vs <45, lokalizasyon; üst çene, alt çene, anterior ve posterior olarak sınıflandırılmıştır. Sonuç değişkenleri; radyolojik muayeneye göre skorlanan başarılı veya başarısız sınıflandırmasıdır. Sonuçlar tanımlayıcı istatistik ve Ki-Kare testi ile değerlendirilmiştir. ($p < 0,05$)

Bulgular: 56 hastanın (kadın: 35, erkek: 21) 37'si (%66) başarılı, 19'u (%34) başarısız bulunmuştur. Hastaların yaş ortalaması 36,6'dır. Sonuçlara cinsiyet, yaş ve lokalizasyonun istatistiksel olarak anlamlı bir etkisi bulunmaz iken posterior bölgede bulunan dişlerde istatistiksel olarak anlamlı bir şekilde daha az başarılı sonuçlar gözlemlenmiştir ($p < 0,05$).

Sonuç: Kök ucu rezeksiyonu sonrası retrograd dolgu uygulamasının gereksiz olduğu söylenemez fakat retrograd dolgu uygulanmadığında da başarılı sonuçlar elde edilebilir.

Anahtar Kelimeler: Kök ucu rezeksiyonu, retrograd dolgu, periapikal inflamasyon

INTRODUCTION

Root end resection is a very common procedure. It is indicated when endodontic treatment fails or periapical cyst formation exists. The primary goal is to remove the etiological factor or cyst from the region, and at the same time, the operating field should be preserved from recontamination to obtain optimal conditions for wound healing. Etiological factors are typically intraradicular or extraradicular bacteria, chemical substances, or extraradicular physical factors (1, 2). Intraradicular factors are eliminated with root canal treatment, and owing to obtained sealing, the interaction with the extraradicular environment is eliminated.

Healing after root end resection is achieved by both bone healing and reattachment (3). Cement formation over the resected root end and healing of the periradicular tissue present a biological sealing in addition to physiological sealing (4-6). Failure in treatment commonly occurs due to insufficient sealing. In case of insufficient plugging in the root canal, retrograde filling acts as a barrier between the periradicular environment and inside of the root (7). However, the technique itself and its ability of filling is still controversial (8). Since every orthograde filling's success of sealing cannot be assured, there is still no consensus about the need for application of root end filling. In addition, there are still questions about the best method of obstruction of the canal, cavity preparation method, shape, and filling material (9). The aim of the present study was to investigate the outcomes of cases accomplished without retrograde filling following root end resection due to periapical pathology.

METHODS

This was a retrospective cohort study. Patients who underwent apicoectomy between 2007 and 2015 at the Oral and Maxillofacial Surgery Department, Dentistry Faculty, Marmara University, Istanbul, Turkey were enrolled in the study. Ethics committee approval was obtained from the Marmara University Local Ethics Committee, Istanbul, Turkey (approval no. 2017-86). Inclusion criteria were having undergone apicoectomy with the indication of periapical infection or cyst of a single tooth, accomplishment of root canal treatment prior to surgery, and at least 2 years since previous surgery. Retrograde filling applied cases and patients presenting with root fracture, endo-perio lesion, loss of sufficient bony support, and radiology records (before and after surgery) in the follow-up period were excluded from the study.

All procedures were performed under local anesthesia. A round bur was used to remove the bone overlying lesion at the root end after full thickness flap elevation. A 3 mm apical end was resected at an angle of 40°-60° to the longitudinal axis of the root. Irrigation of the operating field with an isotonic solution was performed several times following curettage of the lesion, and primary wound closure was implemented. All patients were prescribed 1000 mg amoxicillin and clavulanic acid (2x1), 400 mg ibuprofen (2x1), and chlorhexidine gluconate mouth rinse (3x1) after surgery.

The primary variables for statistical analysis were classified as gender, age (>45 vs <45 years), and localization (maxilla, mandible, anterior, and posterior). Radiological examinations were used for outcome variable evaluation and classified as success and failure. Periapical radiography was obtained for examination and used for the evaluation of healing. The scoring method as defined by Rud et al. (10) and Molven et al. (11) was classified as: 1, complete healing; 2, incomplete healing (scar tissue); 3, uncertain healing; and 4, inadequate healing. Complete and incomplete healing was classified as successful, whereas uncertain and inadequate healing as failure. Statistical analyses were made by SPSS software version 12.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics (mean, standard deviation, and frequency) were obtained, and the chi-square test was used to compare the groups (p<0.05).

RESULTS

A total of 56 (35 females and 21 males) out of 157 patients operated between 2007 and 2015 were enrolled in the present study. The mean follow-up period was 3 years and 2 months (1-8 years). The mean age was 36.6 years. Thirty-five teeth were in the maxilla, and 21 in the mandible. Twenty-one of them were localized in the posterior (premolar or molar), whereas 35 in the anterior (central, lateral, or canine). Seven of the 56 teeth were extracted after minimal follow-up period (2 years) (Figures 1-4).

There was no statistically significant difference between male and female patients regarding success parameter. There was no difference between age of less than 45 years and more than 45 years (p>0.05). While there was no statistically significant difference between the maxilla and mandible, the posterior tooth was significantly less successful (p<0.05) (Table 1).

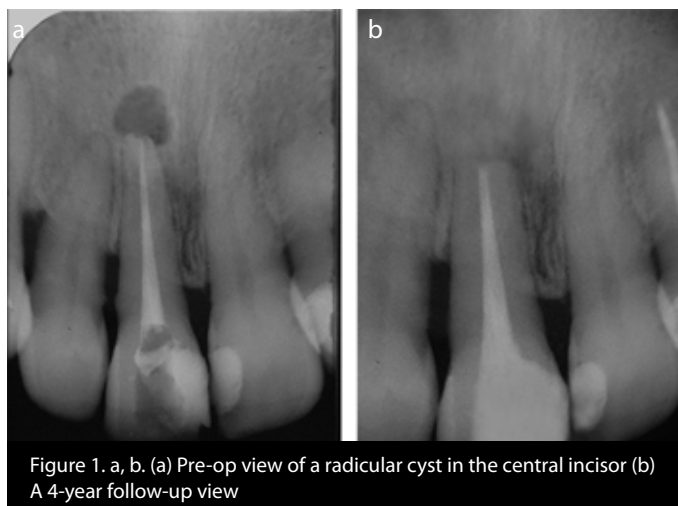


Figure 1. a, b. (a) Pre-op view of a radicular cyst in the central incisor (b) A 4-year follow-up view

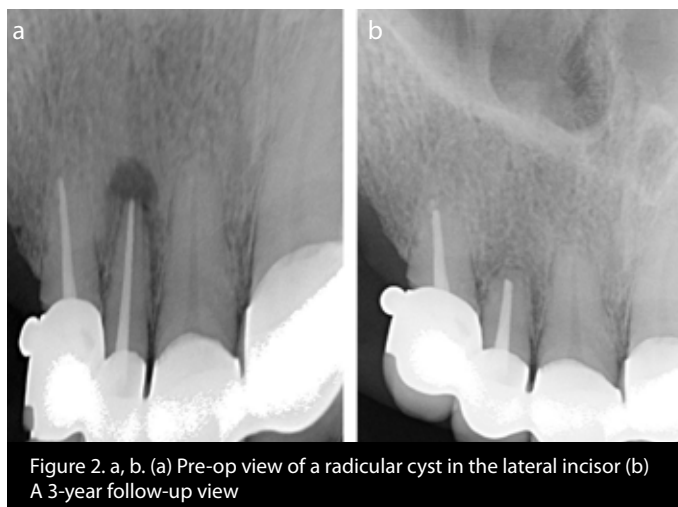


Figure 2. a, b. (a) Pre-op view of a radicular cyst in the lateral incisor (b) A 3-year follow-up view

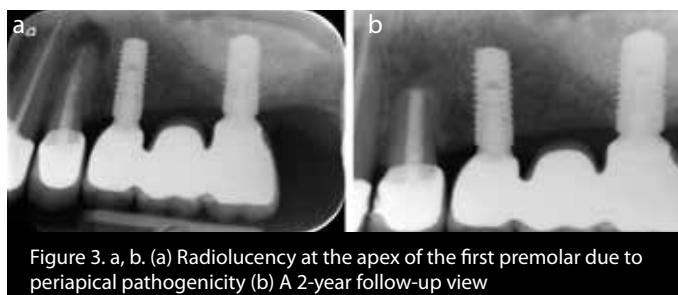


Figure 3. a, b. (a) Radiolucency at the apex of the first premolar due to periapical pathogenicity (b) A 2-year follow-up view

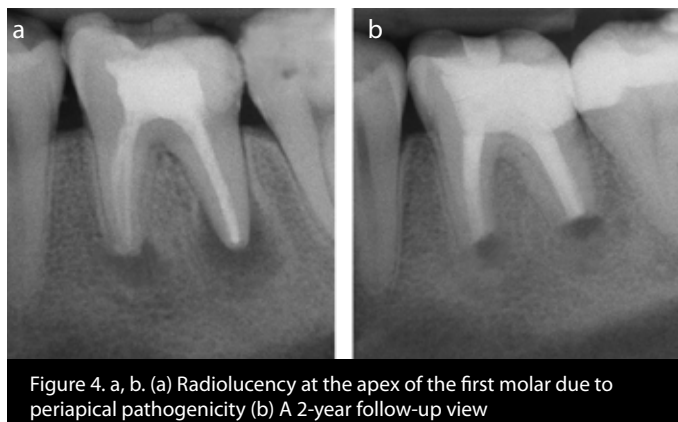


Figure 4. a, b. (a) Radiolucency at the apex of the first molar due to periapical pathogenicity (b) A 2-year follow-up view

Table 1. Description of data and correlation between predictor and outcome variables

	Success		Fail		Fail		Extracted	Total	p ⁺
	N	%	N	%	N	%			
Gender									
Male	21	37,5	13	62	5	3	8	38	p>0,05
Female	35	62,5	24	68,5	7	4	11	31,5	
Age (year)									
<45	48	85,8	32	66,5	10	6	16	33,5	p>0,05
>45	8	14,2	5	62,5	2	1	3	37,5	
Localization									
Maxilla	35	62,5	24	68,5	7	4	11	31,5	p>0,05
Mandible	21	37,5	12	57	6	3	9	43	
Anterior	35	62,5	29	83	4	2	6	17	p<0,05
Posterior	21	37,5	8	38	8	5	13	62	
Total	56		37		12		7	19	

+: Chi-squared test

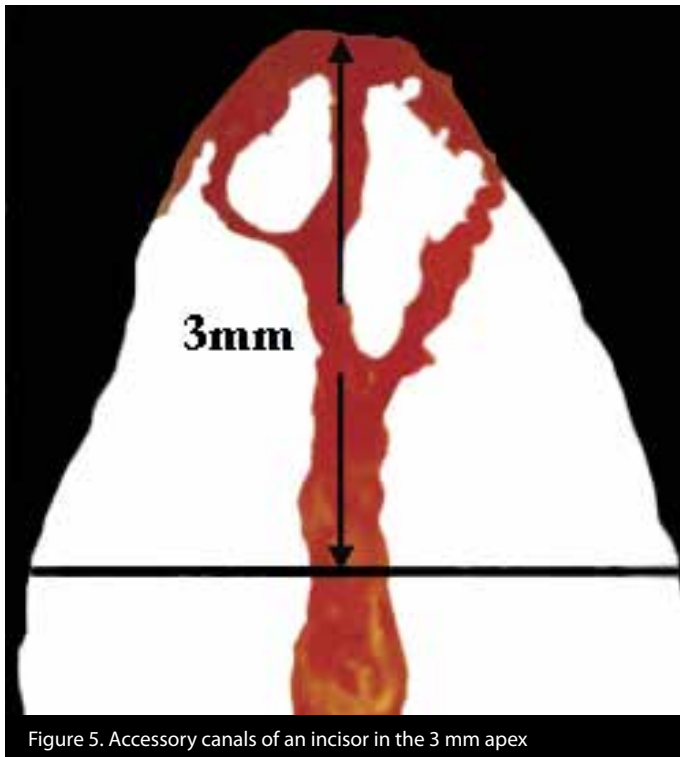


Figure 5. Accessory canals of an incisor in the 3 mm apex

DISCUSSION

Root end resection is indicated when consistent periapical pathology did not recover or decrease after root canal treatment, over flow of root canal sealer, or requirement of curettage of periradicular pathology (12). The primary goal of this procedure is to approach diseased tissue, remove it, and prevent recontamination of the periradicular region. There are still no evidence-based data supporting indication of retrograde filling after root end resection made for various indi-

cations. If it is not assured that the remaining root canal system is decontaminated, physiological sealing is guaranteed with retrograde filling (13). Some studies reported methylene blue dyeing of the region after resection and observing under an endodontic microscope as a method for assessment of isolation (14). However, it cannot be accepted as an objective assessment method of contamination applied during the procedure because it is made in the bacterial level (9). Therefore, performing retrograde filling is still controversial. Additionally, outcome success of apical sealing, its technique, used filling material, and the risk of vertical fracture during preparation are other controversial issues. Increasing expenses, requirement of additional instruments, and time consuming are some of the disadvantages of retrograde filling. The purpose of the present study was to investigate the success of cases accomplished without retrograde filling following root end resection.

Every individual tooth has its own complicated and different root canal anatomy. To achieve successful outcomes after root end resection, the anatomy of the apical one-third should be understood. Accessory or lateral canals are most commonly observed in 75% of the root's 3 mm apex. Therefore, during resection of the apical end, most of the micro-organism and accessory canals are extracted as well (Figure 5). After careful root canal treatment, apical sealing is expected to be achieved with intracanal filling. The cement layer covers the dentin surface at the end of the root and forms a biological plug in time. In this way, ossification occurs in the periradicular region due to discontinuation with the intraradicular region. In our study, in the assessment made at least 2 years later, 37 out of the 56 patients are classified in the category of full recovery or incomplete recovery according to the criteria defined by Rud et al. (10). Rapp et al. (15) reported that periapical bone healing is a process that is independent of retrograde filling. In a randomized controlled study made by Christiansen et al. (16), the cases accomplished without retrograde filling and retrograde filling with mineral trioxide aggregate (MTA) were compared in 68 patients after

1 year. Patients with retrograde filling showed a statistically significant improvement in the 1-year follow-up results (16). However, in the present study, only 1 year outcomes were assessed, and it is reported in the literature that in the long-term follow-up, the outcomes might change in 40%, and 50 of them might show complete healing in the long term (17-19). In our study, root end resection was completed without retrograde filling, and 66% of the cases showed periradicular healing.

It was reported that the application of retrograde filling increases the success rate of endodontic treatment (17-19). However, a very delicate approach is needed to achieve successful results after retrograde filling (20). It is recommended to prepare the apical cavity under a microscope, without applying excessive pressure and with very fine ultrasonic tips (21-22). If this procedure is not performed with sensitive instruments, microcracks and vertical fractures might occur in the long run (23). It is also proposed to use expensive materials such as micro-mirror, endodontic microscope, MTA (ProRoot MTA; Dentsply, Tulsa, OK, USA), or Super EBA (Bosworth Co., Skokie, IL, USA) (24). In our study, conventional surgical instruments and a round bur were used. The root end was resected at an angle of 40°–60° to the long axis of the tooth.

The anatomic variations in the apex of the root canal, instrumentations used to prepare the retrograde cavity (ultrasound tips and burs, among others), method of cavity preparation, filler material used therein, and isolation from the periapical tissues are factors related to successful outcomes (12, 24). Even if all these processes are done carefully and using the latest technology, successful results are not reported at high rates (9). Therefore, the efficiency of the retrograde filling might be questioned. There is no objective method to assist requirement of apical plugging or adequacy of root canal sealing. Furthermore, the intended apical sealing with retrograde filling is uncertain (25, 26). It was reported that healing after apicoectomy made by conventional methods is not related with retrograde filling (15, 27).

Stefopoulos et al. (28) reported that root end resection completed with MTA and without retrograde filling presents apical sealing. Reported reviews claiming retrograde filling's necessity advocated that horizontal accessory canals in the posterior dentition cannot be eliminated with conventional methods, remaining pulpal tissue can lead to relapse of infection, and periapical environment cannot be protected without retrograde filling (8, 24). In our study, there were significantly successful outcomes with the anterior tooth, whereas the posterior tooth failed significantly. Christiansen et al. (16) reported that patient's age, gender, and localization do not show statistically significant difference in treatment outcomes. In our study, gender, age, or localization of the tooth did not show statistically significant difference on treatment outcomes.

CONCLUSION

Less successful results were observed in the posterior region of the teeth, whereas age, gender, and localization were not effective in root end resection completed without retrograde filling. However, long-term successful results were obtained in approximately 66% of the cases included in the study group. This result does not support the argument of retrograde filling after root end resection is avoidable but shows that successful results can be obtained without it. It is necessary to conduct studies including more patients, considering other variables that may affect treatment outcome, and the results should be compared with retrograde filling cases.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Marmara University Faculty of Dentistry (Protocol No: 2017-86).

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author contributions: Concept – G.G., Y.O.; Design - Y.O.; Supervision - Y.O.; Resource - G.G., Y.O. ; Materials - G.G., Y.O.; Data Collection and/or Processing - G.G.; Analysis and/or Interpretation - Y.O.; Literature Search - G.G.; Writing - G.G.; Critical Reviews - Y.O.

Conflict of Interest: The authors have no conflict of interest to declare.

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