Case Report

https://doi.org/10.36377/ET-0208

A clinical and radiographic evaluation of treatment effectiveness in a case of chronic apical periodontitis with furcation involvement: case report

Magomed-Ali A. Gasbanov[1] ✉, Zurab S. Khabadze[1], David S. Tuntiya[2], David A. Babakhanov[1], Nikita A. Dolzhikov[1], Nadezhda A. Khachatryan[1], Khamzat A. Umarov[1]

[1] Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), Moscow, Russian Federation
[2] Private Practice, Moscow, Russian Federation
✉ magomed.gazmanov@gmail.com

Abstract

This case report describes the successful endodontic management of an 18-year-old male patient diagnosed with chronic apical periodontitis accompanied by isolated bone destruction in both the apical and furcation regions of mandibular molar #46. The patient presented with mild masticatory discomfort, a nonvital pulp, and radiolucencies detected in the furcation and periapical areas. Root canal treatment was performed using rotary instrumentation. This case underscores the role of meticulous chemomechanical preparation, irrigant activation, and coronal sealing in achieving predictable healing even in complex anatomical conditions involving accessory and interradicular canals. Early identification of these anatomic features and adherence to comprehensive endodontic protocols significantly enhance long-term treatment outcomes.

Keywords: apical periodontitis, furcation lesion, interradicular canal, endodontic treatment, irrigation, calcium hydroxide, sealing, CBCT, root canal anatomy

Article information: received – 13.02.2026; revised – 20.04.2026; accepted – 30.04.2026

Conflict of interest: The authors declare no conflict of interests.

Acknowledgements: There are no funding and individual acknowledgments to declare.

For citation: Gasbanov M.-A.A., Khabadze Z.S., Tuntiya D.S., Babakhanov D.A., Dolzhikov N.A., Khachatryan N.A., Umarov Kh.A. A clinical and radiographic evaluation of treatment effectiveness in a case of chronic apical periodontitis with furcation involvement: case report. *Endodontics Today.* 2026;24(2):425–429. https://doi.org/10.36377/ET-0208

Клинико-рентгенологическая оценка эффективности лечения хронического апикального периодонтита, осложненного фуркационным дефектом: клинический случай

М.А. Гасбанов[1] ✉, З.С. Хабадзе[1], Д.С. Тунтия[2], Д.А. Бабаханов[1], Н.А. Должиков[1], Н.А. Хачатрян[1], Х.А. Умаров[1]

[1] Российский университет дружбы народов им. Патриса Лумумбы, г. Москва, Российская Федерация
[2] Частная практика, г. Москва, Российская Федерация
✉ magomed.gazmanov@gmail.com

Резюме

В статье представлен клинический случай успешного эндодонтического лечения 18-летнего пациента с диагнозом хронический апикальный периодонтит, который сопровождался изолированным разрушением костной ткани в области фуркации и апекса нижнего первого моляра (зуб 46). Пациент предъявлял жалобы на незначительный дискомфорт при жевании, при обследовании выявлена некротизированная пульпа и радиолюцентные очаги в области фуркации и верхушек корней. Эндодонтическое лечение было выполнено с использованием ротационных инструментов и стандартного протокола обработки корневых каналов. Данный случай показывает важность тщательной хемомеханической обработки, активации ирригантов и надежной коронковой герметизации для достижения предсказуемого заживления даже при сложных анатомических условиях с вовлечением добавочных и межкорневых каналов. Ранняя идентификация таких анатомических особенностей и соблюдение комплексного эндодонтического протокола значительно повышают эффективность и долговременный успех лечения.

Ключевые слова: апикальный периодонтит, фуркационное поражение, межкорневой канал, эндодонтическое лечение, ирригация, гидроксид кальция, герметизация, КЛКТ, анатомические особенности корневых каналов

Информация о статье: поступила – 13.02.2026; исправлена – 20.04.2026; принята – 30.04.2026

Конфликт интересов: Авторы сообщают об отсутствии конфликта интересов.

Благодарности: Финансирование и индивидуальные благодарности для декларирования отсутствуют.

Для цитирования: Гасбанов М.А., Хабадзе З.С., Тунтия Д.С., Бабаханов Д.А., Должиков Н.А., Хачатрян Н.А., Умаров Х.А. Клинико-рентгенологическая оценка эффективности лечения хронического апикального периодонтита, осложненного фуркационным дефектом: клинический случай. *Эндодонтия Today.* 2026;24(2):425–429. https://doi.org/10.36377/ET-0208

INTRODUCTION

Apical periodontitis represents primarily an infection of the root canal system, characterized by inflammatory processes and the subsequent destruction of periapical and periradicular tissues. These changes arise from complex interactions between microbial agents and the host's immune defense mechanisms [1; 2]. The degradation of the periodontal ligament begins with the breakdown of the extracellular matrix, a process driven by metalloproteinases (MMPs) [3], and further intensified by periradicular inflammation and bone resorption mediated through proinflammatory cytokines [4].

Commensal oral bacteria, once gaining access to the dental pulp, can transform into opportunistic pathogens. Breaches in the natural dentin barriers – enamel and cementum – caused by caries, fractures, or trauma, open pathways for bacterial invasion into the pulp chamber and root canal system [5]. Communication between the dental pulp and the periodontal ligament may occur through the apical foramen, as well as via lateral or accessory canals located in both apical and coronal regions of the root. Even with careful case selection and adherence to proper endodontic protocols, treatment failures can still occur, frequently due to existing anatomical connections between pulpal and periodontal tissues [6].

Accessory canals develop as a result of localized disturbances in the formation of Hertwig's epithelial root sheath during odontogenesis. This anomaly is thought to result from the persistence of aberrantly positioned blood vessels extending toward the pulp, most commonly found in the furcation region [6].

These anatomical structures are often referred to as interradicular canals [7]. In 2018, Ahmed et al. introduced a novel classification system for accessory canals, providing a more precise framework for describing their anatomical location and morphology [8]. The term "chamber canals" in this context refers to small canals branching from the pulp chamber that typically open onto the external root surface, including the furcation area.

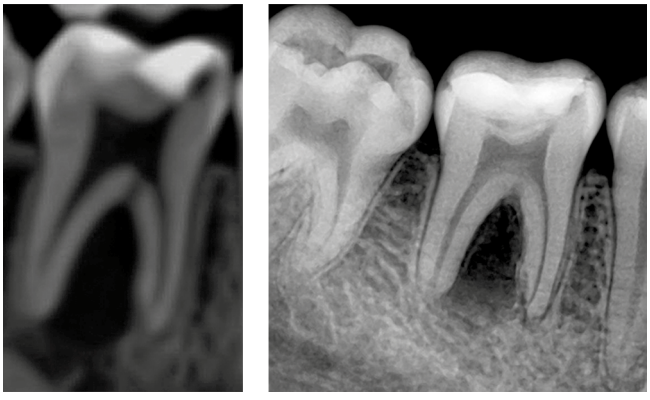
The objective of the present case report is to describe the management and subsequent healing of a chronic apical periodontitis case accompanied by localized destruction of both the furcation and apical bone regions.

CASE REPORT

An 18-year-old male patient with an unremarkable general medical history was referred to a dental clinic The patient reported experiencing nonacute pain in tooth #46, particularly when biting or applying masticatory pressure. Pulp vitality testing using carbon dioxide yielded no significant response, while percussion elicited a positive reaction. The average periodontal probing depth was measured at 2 mm.

Periapical radiographic examination revealed an extensive carious lesion located on the mesio-occlusal surface of the tooth, extending into the pulp chamber. Additionally, a distinct radiolucent area was observed in the furcation region, separate from the apical radiolucencies associated with both roots. There was no record of prior endodontic intervention on this tooth (Fig. 1).

Inspection of the pulp chamber floor under an operating microscope (Carl Zeiss Meditec AG, Jena, Germany) at variable magnifications showed an intact structure, with no evidence of furcation perforation or root fracture.



A **B**

Fig. 1. Isolated furcation bone and apical bone destruction in the furcation area of tooth # 46 on apical radiograph (*A*) and cone beam computed tomography (*B*) images

Рис. 1. Изолированная костная перегородка и разрушение апикальной кости в области перегородки зуба № 46 на снимках апикальной рентгенограммы (*A*) и конусно-лучевой компьютерной томографии (*B*)

The treatment protocol was as follows: coronal preparation of the root canal system was carried out using *Endoview* files (Russia) ranging from ISO sizes 13.03, 15.05, 20.06.

To enhance the efficacy of disinfection in the furcation area, it is recommended to employ an intracanal thermoactivation protocol using a 3% sodium hypochlorite solution: heating to 150°C with a heat carrier plugger (System-B or equivalent, tip size 30/04) at the level of the root canal orifices, without contact with the canal walls, following a three-cycle protocol (5 seconds of heating – 5 seconds of pause, three cycles, with solution replacement after each complete block). Following thermoactivation, without intermediate drying, passive ultrasonic activation is performed for 1 minute.

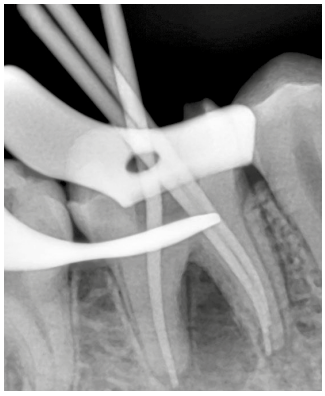


Fig. 2. Working length of the root canals

Рис. 2. Рабочая длина корневых каналов

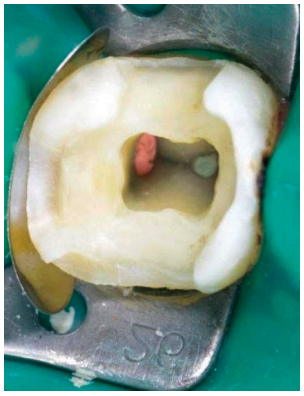
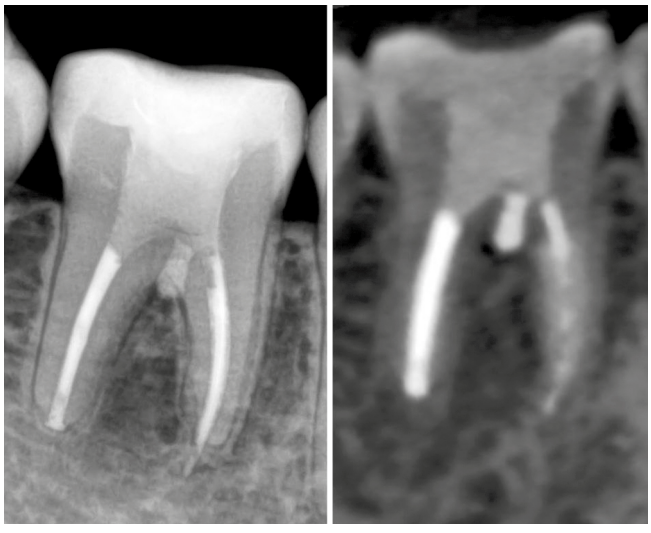


Fig. 3. Orifices of sealed root canals

Рис. 3. Отверстия в запломбированных корневых каналах



A **B**

Fig. 4. Apical radiograph (*A*) and cone beam computed tomography (*B*) images of healed bone destruction

Рис. 4. Снимки апикальной рентгенограммы (*A*) и конусно-лучевой компьютерной томографии (*B*) зажившей костной ткани

The treatment was not concluded by placing a calcium hydroxide-based intracanal medicament. As the patient remained asymptomatic, the canals were thoroughly dried and obturated. Root canal filling was carried out by means of the continuous wave condensation technique, employing gutta-percha cones and AH Plus sealer (Dentsply International Inc., York, PA, USA). The furcation canal was restored with MTA (Angelus, Brazil). Upon completion of the endodontic phase, the patient was referred for restorative management. The tooth was subsequently restored with a composite restoration (Fig. 3).

Complete healing of both the periapical and furcation regions was achieved within 12 months and was further verified by cone-beam computed tomography (CBCT) imaging performed 48 months after obturation (Fig. 4).

DISCUSSION

Numerous studies investigating interradicular canals in mandibular molars have reported varying findings, methodologies, terminological interpretations, and sample sizes [9].

Wolf et al. identified 9 interradicular canals (7.7%) establishing communication between the pulp chamber floor and the furcation region, using dye penetration techniques in extracted teeth [9]. The study examined 117 mandibular first molars by preparing access cavities, flooding the pulp chambers with methylene blue, and centrifuging the samples. On average, 4.2 slices per tooth (0.145±0.03 mm thickness) were obtained with a diamond band saw, and the presence of interradicular canals and diverticula was assessed under a light microscope at 125× magnification. Similarly, Perlich et al. detected 3 canals (4.8%) with scanning electron microscopy and 22 canals (64.5%) using light microscopy in the pulp chamber floors of 62 human molars [10]. Chouchi et al., employing micro-CT imaging on 57 extracted permanent teeth, identified furcation canals in 7% ($n = 4$) of first and 21% ($n = 12$) of second mandibular molars [11].

Furcation perforation represents a pathological communication between the root canal system and periodontal tissues or the oral cavity. Its etiology may include caries, resorptive processes, or iatrogenic causes such as improper bur angulation during access cavity preparation or canal localization [12]. Furcation involvement, by contrast, describes bone loss at the bifurcation or trifurcation of multirooted teeth secondary to periodontal disease [13; 14]. Comprehensive clinical evaluation, including magnification-assisted inspection, pulp vitality testing, and confirmation of the absence of prior endodontic therapy, can help rule out periodontal origin of furcation defects.

Successful endodontic therapy requires complete debridement and disinfection of the root canal system. Complex root anatomy often contributes to incomplete cleaning, allowing microbial persistence [15; 16]. Irrigation thus plays a critical role in achieving effective disinfection. An ideal irrigant must possess antimicrobial and antibiofilm properties and be capable of neutralizing endotoxins [17]. Activation techniques significantly enhance the irrigant's cleaning efficacy [18; 19].

Al-Jadaa et al. demonstrated that ultrasonic activation raises irrigant temperature in accessory canals to approximately 53.5±2.7°C after five minutes, which may improve disinfection efficacy [20]. The position or angulation of accessory canals showed no significant influence on this effect.

CONCLUSION

The combination of irrigant activation, effective canal instrumentation, and intracanal medication contributed to successful healing of both furcation and periapical lesions following endodontic treatment.

REFERENCES / СПИСОК ЛИТЕРАТУРЫ

1. Nair P.N. Pathogenesis of apical periodontitis and the causes of endodontic failures. *Crit Rev Oral Biol Med*. 2004;15(6):348–381. https://doi.org/10.1177/154411130401500604
2. Segura-Egea J.J., Martín-González J., Castellanos-Cosano L. Endodontic medicine: connections between apical periodontitis and systemic diseases. *Int Endod J*. 2015;48(10):933–951. https://doi.org/10.1111/iej.12507
3. Sorsa T., Tjäderhane L., Konttinen Y.T., Lauhio A., Salo T., Lee H.M et al. Matrix metalloproteinases: contribution to pathogenesis, diagnosis and treatment of periodontal inflammation. *Ann Med*. 2006;38(5):306–321. https://doi.org/10.1080/07853890600800103
4. Kawashima N., Stashenko P. Expression of bone-resorptive and regulatory cytokines in murine periapical inflammation. *Arch Oral Biol*. 1999;44(1):55–66. https://doi.org/10.1016/s0003-9969(98)00094-6
5. Prada I., Micó-Muñoz P., Giner-Lluesma T., Micó-Martínez P., Collado-Castellano N., Manzano-Saiz A. Influence of microbiology on endodontic failure. Literature review. *Med Oral Patol Oral Cir Bucal*. 2019;24(3):e364–e372. https://doi.org/10.4317/medoral.22907
6. Poornima P., Subba Reddy V.V. Comparison of digital radiography, decalcification, and histologic sectioning in the detection of accessory canals in furcation areas of human primary molars. *J Indian Soc Pedod Prev Dent*. 2008;26(2):49–52. https://doi.org/10.4103/0970-4388.41615
7. Anderegg A.L., Hajdarevic D., Wolf T.G. Interradicular canals in 213 mandibular and 235 maxillary molars by means of micro-computed tomographic analysis: an ex vivo study. *J Endod*. 2022;48(2):234–239. https://doi.org/10.1016/j.joen.2021.11.015 (Erratum in: *J Endod*. 2022;48(9):1200. https://doi.org/10.1016/j.joen.2022.06.012).
8. Ahmed H.M.A., Neelakantan P., Dummer P.M.H. A new system for classifying accessory canal morphology. *Int Endod J*. 2018;51(2):164–176. https://doi.org/10.1111/iej.12800
9. Wolf T.G., Wentaschek S., Wierichs R.J., Briseño-Marroquín B. Interradicular root canals in mandibular first molars: a literature review and ex vivo study. *J Endod*. 2019;45(2):129–135. https://doi.org/10.1016/j.joen.2018.10.019
10. Perlich M.A., Reader A., Foreman D.W. A scanning electron microscopic investigation of accessory foramens on the pulpal floor of human molars. *J Endod*. 1981;7(9):402–406. https://doi.org/10.1016/S0099-2399(81)80038-6
11. Chouchi D., Berberoglu A., Orhan K., Etikan I., Tümer H., Bagis N. The location and incidence of patent accessory pulpal canals in permanent molars with periodontal lesion by using micro-computed tomography. *J Med Imaging Health Inform.* 2021;11(1):85–88. https://doi.org/10.1166/jmihi.2021.3274
12. Huamán S.D., Brito Aragão M.G., Dias Moreno A.P., Mussolino de Queiroz A., Bezerra da Silva R.A., Garcia de Paula-Silva F.W., Bezerra da Silva L.A. Accuracy of conventional periapical radiography in diagnosing furcation repair after perforation treatment. *J Endod*. 2020;46(6):827–831. https://doi.org/10.1016/j.joen.2020.03.004
13. Zhang W., Foss K., Wang B.Y. A retrospective study on molar furcation assessment via clinical detection, intraoral radiography and cone beam computed tomography. *BMC Oral Health*. 2018;18(1):75. https://doi.org/10.1186/s12903-018-0544-0
14. Gusmão E.S., Picarte A.C, Ben Barbosa M.B., Rösing C.K., Cimoes R. Correlation between clinical and radiographic findings on the occurrence of furcation involvement in patients with periodontitis. *Indian J Dent Res*. 2014;25(5):572–575. https://doi.org/10.4103/0970-9290.147086
15. Gautam S., Galgali S.R., Sheethal H.S., Priya N.S. Pulpal changes associated with advanced periodontal disease: A histopathological study. *J Oral Maxillofac Pathol*. 2017;21(1):58–63. https://doi.org/10.4103/0973-029X.203795
16. Weinberg E.M., Pereda A.E., Khurana S., Lotlikar P.P., Falcon C., Hirschberg C. Incidence of middle mesial canals based on distance between mesial canal orifices in mandibular molars: a clinical and cone-beam computed tomographic analysis. *J Endod*. 2020;46(1):40–43. https://doi.org/10.1016/j.joen.2019.10.017
17. Shenoi P.R., Morey E.S., Makade C.S., Gunwal M.K., Khode R.T., Wanmali S.S. In vitro evaluation of the antimicrobial efficacy of chitosan and other endodontic irrigants against Enterococcus faecalis. *Gen Dent*. 2016;64(5):60–63.
18. Guo X., Miao H., Li L., Zhang S., Zhou D., Lu Y., Wu L. Efficacy of four different irrigation techniques combined with 60°C 3% sodium hypochlorite and 17% EDTA in smear layer removal. *BMC Oral Health*. 2014;14:114. https://doi.org/10.1186/1472-6831-14-114
19. Rico-Romano C., Zubizarreta-Macho Á., Baquero-Artigao M.R., Mena-Álvarez J. An analysis in vivo of intracanal bacterial load before and after chemo-mechanical preparation: A comparative analysis of two irrigants and two activation techniques. *J Clin Exp Dent*. 2016;8(1):e9–e13. https://doi.org/10.4317/jced.52585
20. Al-Jadaa A., Paqué F., Attin T., Zehnder M. Necrotic pulp tissue dissolution by passive ultrasonic irrigation in simulated accessory canals: impact of canal location and angulation. *Int Endod J*. 2009;42(1):59–65. https://doi.org/10.1111/j.1365-2591.2008.01497.x

INFORMATION ABOUT THE AUTHORS

Magomed-Ali A. Gasbanov – Assistant Lecturer, Department of Therapeutic Dentistry, Medical Institute, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0000-0002-0566-5242

Zurab S. Khabadze – Dr. Sci. (Med.), Professor, Head of the Department of Therapeutic Dentistry, Medical Institute, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0000-0002-7257-5503

David S. Tuntiya – Dentist, Private Practice, Moscow, Russian Federation; https://orcid.org/0009-0008-0921-700X

David A. Babakhanov – Laboratory Assistant, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0009-0003-1776-5712

Nikita A. Dolzhikov – Laboratory Assistant, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0009-0006-3781-363X

Nadezhda A. Khachatryan – Laboratory Assistant, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0009-0000-5588-9212

Khamzat A. Umarov – Laboratory Assistant, Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), 6 Miklukho-Maklaya Str., Moscow 117198, Russian Federation; https://orcid.org/0009-0002-2005-173X

ИНФОРМАЦИЯ ОБ АВТОРАХ

Гасбанов Магомед-Али Аликович – ассистент кафедры терапевтической стоматологии Медицинского института, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0000-0002-0566-5242

Хабадзе Зураб Суликоевич – д.м.н., профессор, заведующий кафедрой терапевтической стоматологии Медицинского института, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0000-0002-7257-5503

Тунтия Давид Сергоевич – врач стоматолог, частная практика, г. Москва, Российская Федерация; https://orcid.org/0009-0008-0921-700X

Бабаханов Давид Асимович – лаборант, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0009-0003-1776-5712

Должиков Никита Александрович – лаборант, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0009-0006-3781-363X

Хачатрян Надежда Артуровна – лаборант, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0009-0000-5588-9212

Умаров Хамзат Алимханович – лаборант, ФГАОУ ВО «Российский университет дружбы народов им. Патриса Лумумбы», 117198, Российская Федерация, г. Москва, ул. Миклухо-Маклая, д. 6; https://orcid.org/0009-0002-2005-173X

AUTHOR'S CONTRIBUTION

All the authors made equal contributions to the publication preparation in terms of the idea and design of the article; data collection; critical revision of the article in terms of significant intellectual content and final approval of the version of the article for publication.

ВКЛАД АВТОРОВ

Все авторы внесли равноценный вклад в подготовку публикации в части замысла и дизайна исследования, сбора данных, критического пересмотра статьи в части значимого интеллектуального содержания и окончательного одобрения варианта статьи для опубликования.