Jurnal Ilmu Kedokteran Gigi, Vol. 7(1) Maret 2026:39-47
E-ISSN:2580-0523, P-ISSN:2579-7239
© Author(s) 2026. doi:10.23917/jikg.v7i1.16375
https://journals2.ums.ac.id/jikg/index

Case report

TRANS-ALVEOLAR EXTRACTION TECHNIQUE OF RETAINED DENTAL ROOT FIRST LEFT MAXILLARY MOLAR USING LOCAL ANESTHESIA

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(Received: 15 February 2026/Accepted: 28 March 2026 /Published: 29 March 2026)

ABSTRACT

Background: Extraction of retained maxillary molar roots is often complex due to crown loss, deep root position, and morphological variations like trifurcations. These factors limit the effectiveness of intra-alveolar techniques, increasing risks of root fracture and tissue trauma. Trans-alveolar extraction offers wider access and better surgical control. **Objective:** This case report aims to present the clinical management of a retained root of tooth 26 using the trans-alveolar extraction technique. **Case Report: A** 58-year-old female patient presented to Soelastri Dental Hospital with a chief complaint of a remaining root fragment in the maxillary left molar region and requested extraction. Clinical intraoral examination revealed retained radices of tooth 26 without signs of inflammation, mobility, or tenderness on percussion and palpation. Panoramic radiographic evaluation confirmed the presence of retained root fragments embedded within the alveolar bone, with no associated periapical pathology. **Case Management:** The trans-alveolar extraction procedure was carried out under local infiltration anesthesia. A mucoperiosteal flap was elevated, followed by controlled removal of alveolar bone up to the furcation area. Root separation was performed to facilitate the removal of the radices. The socket was thoroughly debrided, sharp bony margins were smoothed, and primary closure was achieved with suturing. **Conclusion:** Trans-alveolar extraction is a reliable and effective surgical technique for managing retained root fragments associated with severely damaged teeth.

Keywords: Extraction, Trans-alveolar Technique, Retained Root Fragment

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INTRODUCTION

Basic health research in 2018 showed that tooth extraction is one of the most widely accepted dental treatments by the Indonesian people.[1] In clinical practice, root extraction often faces difficulties due to unfavorable anatomical conditions, fragile tooth roots, or their location hidden in the alveolar bone.[2]

The extraction of residual molar roots is a common oral surgery procedure, but it can be complex depending on the clinical and anatomical conditions of the teeth involved, such as loss of the clinical crown, subgingival or intraosseous root position, and variations in root morphology. Loss of the clinical crown results in the loss of a retention point for force application using forceps, making conventional extraction less effective. In this condition, extraction forces cannot be adequately controlled due to the absence of supragingival structures to act as mechanical anchors, increasing the risk of extraction failure and intraoperative complications.[3]

The depth of the remaining root position also plays a crucial role. In many cases, the remaining root is located subgingival to intraosseous, severely limiting visual and mechanical access. The use of an elevator in this situation is often performed blindly, which can increase the risk of complications such as bone perforation, root dislocation into surrounding anatomical spaces, or soft tissue trauma.[4]

Complexity increases because maxillary molars generally have three roots (trifurcation): the mesiobuccal, distobuccal, and palatal roots. These roots often exhibit divergent configurations, with each root having a different direction and curvature, preventing the distribution of conventional extraction forces evenly. This increases the risk of root fracture, particularly in the mesiobuccal root, which is generally smaller and curved, and makes it difficult to remove the root fragment intact. Based on these conditions, the trans-alveolar technique is a rational and recommended approach.[5]

There are several methods of extraction, namely intra-alveolar extraction or closed method and trans-alveolar extraction or open method.[6] The intra-alveolar technique is relatively easy to perform if the radices are still visible above the gingival margin or have a part that can be reached by dental forceps or elevators. In cases where the roots are below the gingival margin, fragile or embedded in the alveolar bone, extraction using the intra-alveolar technique often fails and actually

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increases the risk of alveolar bone fracture or the retention of root fragments.[7]

Trans-alveolar extraction is a tooth removal procedure that involves surgery, performed if there is difficulty in intra-alveolar extraction. Indications for trans-alveolar extraction are in cases of teeth with severe damage, fractured teeth, endodontically treated teeth, tooth ankylosis, root hypercementosis, tooth malposition, tooth impaction, teeth adjacent to vital structures, tooth root dilaceration, bone sclerosis, extraction of several adjacent teeth or all remaining teeth.[6]

The trans-alveolar extraction technique involves creating a full-thickness mucoperiosteal flap, exposing the alveolar bone, performing an osteotomy if necessary, and directly removing the roots. Although more invasive, this technique offers the advantages of better visualization, greater control, and a more certain success rate. Furthermore, this method allows the operator to perform debridement of pathological tissue around the roots, so that the risk of recurrent infection can be minimized.[7]

This case report aims to provide a comprehensive overview of the procedure for extracting remaining tooth roots using the trans-alveolar technique. Considering the complexity of trifurcated root morphology, high bone retention rates, and limited clinical access due to minimal remaining crowns, the trans-alveolar extraction approach is a rational choice. Therefore, this report is expected to serve as a reference for practitioners in determining the appropriate approach in similar cases in the future.

CASE

A 58-year-old female patient presented to Soelastri Dental and Oral Hospital (RSGM) with a chief complaint of tooth root and requested extraction. The complaint had been present for the past five years and was painless. The patient had never had a dental exam. She denied any systemic or allergic history and was not taking any medications or undergoing any other treatment.

Objective examination shows that there is a radices on tooth 26. Percussion (-), palpation (-), there is no tooth mobility. The patient's OHI is 3, which is included in the moderate category. The results of the vital signs examination include blood pressure 129/84 mmHg, pulse 97 x / minute, respiration 20 x / minute, and temperature 36°C. From these results, the patient's vital signs are in the normal category, so that extraction can be performed (Figure 1). Panoramic radiography of tooth 26 showed a residual

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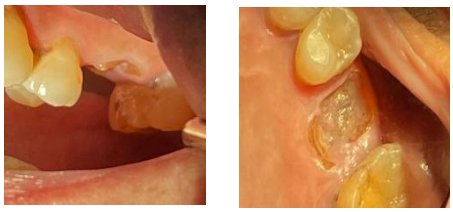
root without a crown with a trifurcation root configuration consisting of mesiobuccal, distobuccal, and palatal roots, and was in a subgingival to intraosseous position. The periodontal ligament and lamina dura were within normal limits; there were no signs of periapical lesions (figure 2). This condition indicates that there is no crown structure that can be used as a retention point for the application of the appliance with conventional extraction. Based on the examination carried out, the diagnosis is radices of tooth 26.



(a) (b)

Figure 1. Clinical appearance of tooth 26 before extraction: (a) Occlusal view, (b) Buccal view

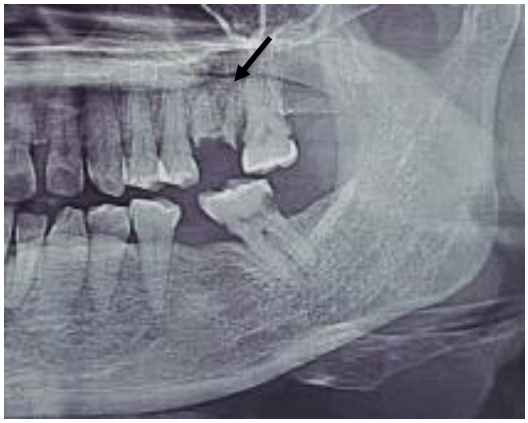


Figure 2. Panoramic radiographic view with magnification of tooth 26 (arrow)

CASE MANAGEMENT

The stages of treatment in this case are providing communication to the patient in the form of an explanation of the cause of the complaint experienced, the factors that cause the complaint, how to overcome the complaint, the treatment to be carried out, post-treatment complications, and filling out a medical action consent form. Performing anesthesia and tooth extraction using the Trans-alveolar Technique for tooth 26. The treatment plan procedure is expected to provide information to the patient about how the treatment will take place.

The patient's treatment phase began on August 3, 2025, to perform tooth extraction 26 with the trans-alveolar technique using infiltration anesthesia. After the patient signed the informed consent, treatment began with operator preparation, patient preparation, and preparation of the tools and materials used during treatment. Instruct the patient to sit in the dental unit at a 40- 60° angle to the floor, adjust the height of the dental chair so that the patient's upper jaw is parallel between the operator's shoulder and elbow, and rinse with 1% povidone-iodine solution. Asepsis of the work area by applying povidone-iodine using cotton pellets and tweezers to the area to be anesthetized in a circular motion from the inside out. The operator dried the area around the work area and applied a topical

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anesthetic in the form of benzocaine using a cotton pellet with tweezers and waited for 2-3 minutes until it felt numb. The operator does infiltration anesthesia in the mucobuccal fold in the buccal (mesial and distal) and palatal areas of tooth 26 with the bevel facing the bone at a 45° angle, if it touches bone, withdraw slightly and aspirate. If the result is negative, deposit 0.5 cc on each side. Check the anesthetic effect after waiting 2-3 minutes; the anesthetized area will be pale and feel numb.

The flap incision with a full-thickness triangular flap design using blade no. 15 begins by making an incision on the mesial part of the residual ridge of tooth 26 with 1 oblique incision, then continues with a horizontal incision on the residual ridge of tooth 26 to the distal part of tooth 27 (figure 4).

Figure 4. Triangular flap incision

Separate the mucoperiosteal flap from the bone using a raspatorium from the mesial of tooth 26 to the distal of tooth 27 until the bone is clearly visible (figure 5). Bone extraction was performed on the buccal side of tooth 26 using a round bone bur until the bifurcation area was visible while irrigating with saline. The tooth root was separated into 3 parts (mesial, distal, palatal) to facilitate the extraction of the tooth root using a bone fissure bur (figure 6a and b). Luxation of the tooth was performed using a bein from the buccal side of tooth 26 and exodontization of the tooth using extraction forceps. maxillary radices (figure 7).

Figure 5. Separating the mucosal tissue from the bone

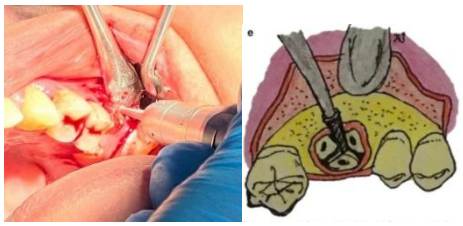

Figure 6. (a) Separating the tooth root into 3 parts (b). Illustration of the separation of the tooth root into 3 parts.[6]

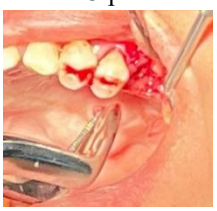

Figure 7. Tooth extraction with root extraction forceps.

Examine the socket of tooth 26 that has been extracted (Figure 8). Perform debridement using a curette to remove the remaining necrotic tissue. File the bone edges using a bone file in one direction over the entire alveolar bone area to smooth out

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the rough bone edges. Irrigate with sterile saline mixed with 10% povidone iodine. Control bleeding by applying gauze for 2-4 minutes, and before flap closure, apply a hemostatic sponge to the socket area to reduce bleeding. Suturing is performed with one simple interrupted suture on the oblique incision and two sutures on the horizontal incision using 3/0 silk thread (Figure 9). Instruct the patient to bite on a tampon soaked in povidone iodine.

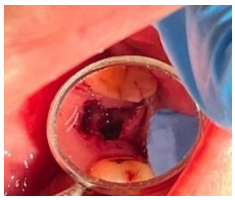

Figure 8. Tooth socket 26 after extraction

Figure 9. Suturing

The operator provides Information and Education Communication (IEC) to the patient after the extraction by instructing them to bite down on a tampon for 30-45 minutes. If the bleeding has stopped or the tampon fills with fluid, it can be replaced. Instruct the patient to avoid excessive activity such as sucking on the extraction site, gargling too hard, and not playing with the extraction site with the tongue. Avoid hot drinks and food for 24 hours, do not smoke or drink alcohol, and take prescribed medications according to the instructions. If there are complaints such as severe pain or bleeding that does not stop, contact the operator immediately. Instruct the patient to compress the extraction site with ice water or drink cold drinks to help the bleeding process stop quickly. The patient was prescribed the antibiotic amoxicillin 500 mg, 15 tablets taken 3 times a day after meals, methylprednisolone 16 mg, 10 tablets taken 3 times a day after meals to reduce inflammation, mefenamic acid 500 mg tablets, 10 tablets taken 3 times a day after meals or if it feels painful, oxyfresh gel is applied to the wound area to speed up healing.

A post-exodontic checkup was performed one week after treatment and suture removal. The patient experienced no pain or other complaints. Clinically, the socket was closed, and there was no gingival bleeding (Figure 10).

Figure 10. Clinical appearance during control

DISCUSSION

Oral and dental health is often not a top priority for some people. According to the Global Burden of Disease Study, dental

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and oral health problems, particularly dental caries, affect nearly half the world's population. Extensive, untreated caries can result in the complete loss of the tooth crown, leaving only the root or radices.[8]

Management of the remaining retained dental root is generally performed through extraction. Extraction is a minor surgical procedure to remove a tooth form it socket, which presents greater technical challenges than a complete tooth extraction.[9] Extraction of radices typically occurs as a result of failed previous extractions, extensive caries, trauma, or pathological resorption. The remaining root is often deeply embedded and lacks crown structure for support, making extraction difficult using intra-alveolar techniques. Additional conditions, such as ankylosis, hypercementosis, or alveolar bone sclerosis, also increase the complexity of the procedure.[10,11]

The trans-alveolar extraction method is an option for root cases that cannot be removed using the intra-alveolar extraction technique. This procedure begins with the creation of a mucoperiosteal flap, reflection of the mucoperiosteal flap to expose the surgical site, followed by a partial osteotomy to gain access to the root, and ends with the removal of the fragment using a special elevator or forceps. This technique provides better visibility, allows for a thorough socket debridement, and reduces the risk of retaining root fragments that could become a source of infection.[12,13]

Several studies show that trans-alveolar extraction has advantages compared to intra-alveolar extraction, including reducing the possibility of bone fractures and tissue injuries due to excessive force, and making it easier to control fragile fragments.[13,14]

This procedure also carries higher postoperative risks than simple extraction. Pain, edema, and trismus are frequently reported, especially if the surgery is prolonged or the osteotomy is extensive.[14] Other risks include alveolar osteitis, wound dehiscence, and nerve injury if the root is adjacent to vital structures. Alveolar bone loss can also hinder prosthetic rehabilitation if proper preservation techniques are not employed.[12,15]

Factors determining the success of this procedure include the anatomical condition of the teeth and alveolar bone, the position of the teeth (for example, the lower molar region with its close relationship to the inferior alveolar nerve), and adequate radiographic planning. Panoramic or CBCT examination 3D is recommended in high-risk cases to assess the relationship of the root to the surrounding structures.[11,14] Good

perioperative management, including pain control, infection prevention, and postoperative instructions, also plays an important role in reducing complications.[16]

Overall, trans-alveolar extraction is a safe and effective approach when performed with careful planning and atraumatic techniques. This approach focuses not only on successful root removal but also on preserving alveolar tissue and preventing postoperative complications.[15,]

REFERENCES

1. Kementerian Kesehatan Ri. Laporan Riskesdas 2018.
2. Pramesti IGAR, Puspitasari KMD. Prevalensi Kasus Gangren Radix Berdasarkan Jenis Kelamin Pada Pasien Di Uptd Puskesmas Selemadeg Timur I Tabanan Periode Januari-Maret 2024. Proceeding Of Bali Dental Science And Exhibition. 2025:848-856.
3. Sudiasih NL, Dewi NPDC. Tooth Extraction management using open method.Interdental J Kedokteran Gigi. 2025. https://doi.org/10.46862/interdental.v21i3.11122
4. Kang C. Data-Driven assessment in molar extraction difficulty. Frontiers in Medicine. 2025. https://doi.org/10.3389/fmed.2025.1654727
5. Ismail MRY, Rahman WIWA, Anuar A. Anatomical relationship between root apices of maxillary first molars and maxillary sinus floor using CT. Malays J Oral Maxillofac Surg. 2024;22(1):1-5. https://doi.org/10.4103/MJOMS.MJOMS_9_24
6. Bonanthaya K, Panneerselvam E, Manuel S, Kumar VV, Rai A. Oral and maxillofacial surgery for the clinician. Springer Singapore. 2021. http://doi.org/10.1007/978-981-15-1346-6
7. Handayani HD, Pinurbo RH, Mahyuza A. Ekstraksi Impaksi Gigi 38 Buccoangular. In Prosiding Dental Seminar Universitas Muhammadiyah Surakarta. 2023:76-83.
8. Kurniawati D, Cahyaningrum, DA. Knowledge, attitude and practice mengenai kesehatan gigi dan mulut mahasiswa S1 universitas muhammadiyah surakarta. *JIKG (Jurnal Ilmu Kedokteran Gigi)*. 2022;*5*(2): 1-8. https://doi.org/10.23917/jikg.v5i2.20561
9. Kartinawati AT, Asy'ari AK. Penyakit Pulpa dan Perawatan Saluran Akar Satu Kali Kunjungan: Literature Review. JIKG (Jurnal Ilmu Kedokteran Gigi). 2021;4(2):64-72. https://doi.org/10.23917/jikg.v4i2.15872
10. Benton PN, Haider N. Oral Surgery, Extraction of Roots. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
11. Gadhia A, Shah D. Oral Surgery, Extraction of Teeth. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023.
12. Menon VD, Veeraswamy R, Patil SR, Rao KA. Transalveolar extractions in different age groups: A clinical study. J Int Soc Prev Community Dent. 2020;10(5):553–8.
13. Rubaia'an MAB, Al-Sebaei MO, Abduljabbar FH, Al-Saleh MA. A minimally invasive technique for the retrieval of fractured root tips: A case series. Clin Cosmet Investig Dent. 2023;15:135–42. https://doi.org/10.7759/cureus.41458

14. Jeong M, Choi S, Kim HJ, Lee JH. Computer-guided root tip extraction and immediate implant placement: A clinical report. J Prosthet Dent. 2024;131(2):159–63. https://doi.org/10.1016/j.prosdent.2023.11.037
15. Rashid N, Al-Moraissi EA, Alam MK, Ismail SM, Khawaja N. Comparison of piezosurgery and conventional rotary instruments for third molar surgery: A systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2020;49(1):121–9. https://doi.org/10.1155/2016/8169356
16. Herrera-Barraza V, González-Gómez E, Vilchis-Rangel R, Cortés-Bretón Brinkmann J, López-Ruiz E. Complications post simple exodontia: A systematic review. J Clin Exp Dent. 2022;14(6):520–7. https://doi.org/10.17219/dmp/144596