

# Bicuspidization of Necrosis Mandibular Second Molar With Grade II Furcation Involvement A Case Report

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## ABSTRACT

Innovations in dental science and the higher patient expectations that appear when the periodontal disease affects the furcation area have led to a more conservative treatment approach to save teeth. Bicuspidization is a surgical procedure performed to separate the mesial and distal roots of molars with its crown portion, where both segments are then retained individually. This separation eliminates the existence of a furcation and facilitates an effective oral hygiene practice. This procedure will maintain the dentition with a hopeless periodontal prognosis. The objective was to describe the conservative management of a grade II furcation-involved molar, with good oral and general conditions, by bicuspidization procedure. The condition of the tooth and its supporting tissue were in accordance with the success factors of bicuspidization. A 59-year old female patient complained about her lower molar. The clinical examination showed the necrotic pulp in tooth 47. The radiographic view showed a radiolucency on the occlusal of teeth, spreading to the furcation area. Bicuspidization was performed to maintain the molar. The roots were separated mesial and distal. Prefabricated fiber post was used, and the crown was restored with porcelain fused to metal (PFM) in two smaller crown portions. This bicuspidization produces a satisfying result, as inflammation was not found, and both the occlusion and gingiva are in normal condition. Bicuspidization may be a suitable alternative to extraction and implant, which should be discussed with patients during the consideration of treatment options. The prognosis of the tooth with bicuspidization depends on the supporting bone, the restoration, and the patient's oral hygiene. This case report presents the successful bicuspidization.

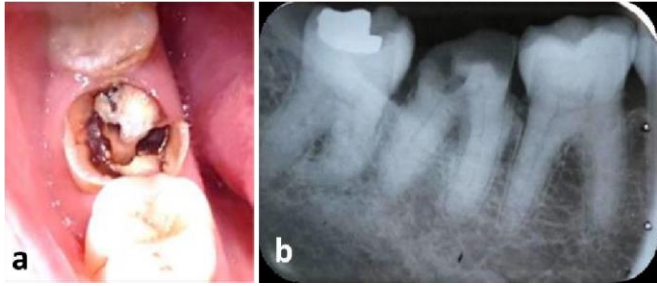
**Keywords:** bicuspidization, furcation involvement, endodontic surgery, oral surgical procedure, mandibula molar

## 1. INTRODUCTION

Patients in modern lives expect to maintain their functional dentition for a lifetime. Innovation and therapies performed to ensure retention of teeth vary in complexity. Losing attachment and radiographic evidence of bone loss in the bifurcation and trifurcation areas of multi-rooted teeth referred to as a furcation involvement with a variety of defect, i.e subtle loss of attachment furcation area, shallow to the advanced pocket with >10 mm depth, advanced bone loss to a clinical exposure of the furcation [1]. Root canal treatment should be performed in necrose teeth with Grade II or Grade III furcation following by bicuspidization to preserve the teeth and maintain the health of surrounding tissue. Here, it is bisected into two parts post root canal treatment, in which those parts formed to two units of single bicuspid molars that enable the patient to hygiene the area easily [2].

## 2. CASE REPORT

A 59 years old female patient referred to the conservative dentistry clinic at RSGM UGM Prof. Soedomo that complained of her lower molar. She had noticed that there was a big cavity for 3,5 years. Having an ameloblastoma history on her upper teeth and operated about one year ago, she also wore a partial denture on her upper teeth. A clinical examination showed the big and deep cavity of #47. The tooth was not sensitive to percussion and palpation, and the mobility was normal. The tooth did not respond to the vitality test that showed a necrotic pulp. Radiograph examination showed a radiolucency on the occlusal of teeth and spread to the furcation area. There was evidence of bone loss involving the furcation area, reveals a Grade II furcation involvement (fig. 1).

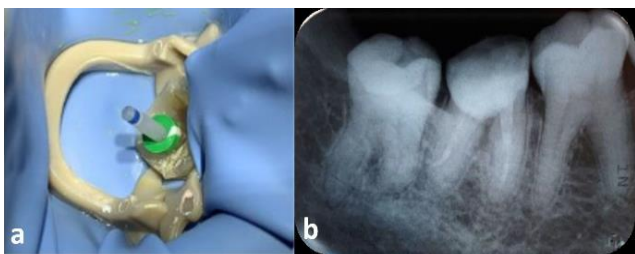


**Figure 1.** (a) clinical view of 47, a necrotic pulp with a small remaining crown; (b) radiograph shows a furcation involvement.

As the opening access completed and working length was determined. We performed biomechanical preparation in the mesial and distal root with the crown down method and irrigated with NaOCl 2,5% and normal saline. It is filled with Ca(OH)<sub>2</sub> for two weeks. On the next visit, we cleaned the canal, and we master cone fitting was confirmed with a radiograph. The canal was obtunded with a single cone method, and we took the radiograph to make sure that the canal was filled with hermetic form (fig. 2). A week later, post length was determined, then a prefabricated fiber post was inserted, and it built a core (fig. 3).



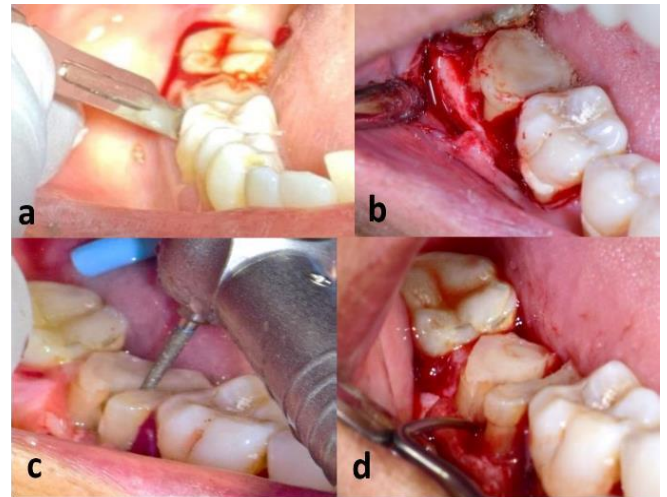
**Figure 2.** (a) Master cone fitting was confirmed with radiograph; (b) The canal filled with a hermetic result.



**Figure 3.** (a) insertion of the prefabricated post; (b) radiograph of the post fit inserted into the canal.

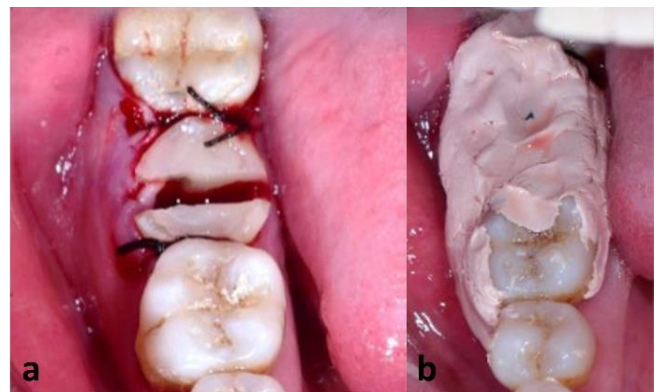
The following week, we planned a surgical procedure with bicuspidization technique. Under local anesthesia, the full-thickness flap was reflected with an envelope flap formed from the first premolar to the second molar. A vertical cut method was used to separate the crown of 47. A long shank straight fissure diamond bur was used to make a vertical cut towards the bifurcation area. Curettage was performed to remove chronic inflammatory tissues, and the working area was

irrigated adequately with sterile saline. The single molar was now separated into two cusps (fig. 4).



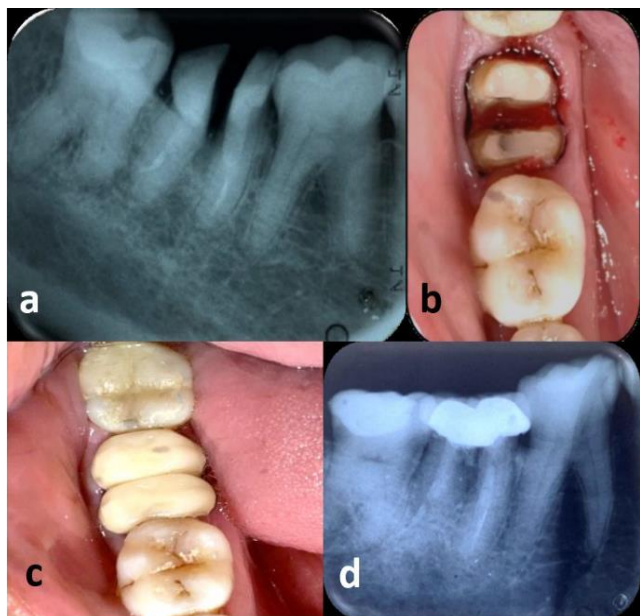
**Figure 4.** (a) an incision made; (b) an envelope flap was performed start from 46 to distal of 47; (c) vertical cut was made with a long shank fissure diamond bur; (d) the separated teeth was observed with a probe.

After the tooth was successfully separated, the Flap was repositioned and sutured. The periodontal pack was used to protect the operation wound. A dose of antibiotic, analgesic and anti-inflammation were given, then some post operated instructions were explained (fig. 5)



**Figure 5.** (a) the tooth has separated into two smaller parts, mesial and distal; (b) periodontal pack was used to cover the wound.

A week later, the patient came to have the follow-up of her tooth. All conditions were good, and the patient had no complaints. Then two weeks after surgery, the dissected portions were prepared for porcelain fuse to metal crown restorations, and a temporary crown crowned each part of the tooth. After a week, the temporary crowns were removed, then two premolars porcelain fused to the metal crown were cemented. The patient had been followed a week later (fig. 6).



**Figure 6.** (a) separated tooth was confirmed with radiograph; (b) the clinical view of the mesial and distal parts; (c) two premolar crowns were well cemented; (d) radiograph confirmed the crowns.

### 3. DISCUSSION

Clinical examination found that the patient had a pulp necrosis on her 47 teeth, which was initiated by the large cavity proximal area there. The growth conditions need to be optimal in order to develop a cariogenic biofilm below the interproximal contact point, i.e., from enamel extent to dentin. This ends at the pulpal inducing pulp necrosis following the loss of circulation, and then the infecting organisms would occupy the whole pulp space [3]. When the microorganism extends to the supporting tissue, it reduces the healing ability to deal with the inflammation. Meanwhile, pulp infection can spread through the lateral and accessory canals of apical foramina. This may cause a furcation breakdown and infrabony pocket, which conditions require combined therapy for healing [4]. This article describes the procedure for bicuspidization at the mandibular molar under conditions that support the success factors of bicuspidization [1].

That loss of attachment on horizontal probing and bone loss in the furcation area result in furcation involvement, which would prevent individual access to maintain hygiene in the molar area and facilitate professional debridement of roots. Furcation invasion is the most commonly seen phenomenon in relation to mandibular molars. Access to the molars furcation areas is difficult for the patient and clinician because of the posterior location of molars, the dimension and portion of furcation entrances, and the internal furcation surface that are frequently concave or irregularly contoured [5]. Furcation involvements are divided into three disparate groups as follows. Class I: incipient lesion. There is a slightly horizontal attachment loss in the furcation area. The examiner probe penetrates two millimeters or fewer from the entrance of the furcation. Class II: partial horizontal bone loss. The examiner

probe penetrates three millimeters or more from the entrance of the furcation, but there is no total attachment loss with a through and through the opening of the furcation. Class III is total horizontal attachment loss with a through and through opening the furcation. The inter-radicular bone is completely absent [6]. In this case report, furcation involvement in necrosis tooth 47 and partial loss of horizontal support in the furcation area confirmed the classification of Grade II furcation involvement.

Bicuspidization was usually performed in Grade II and III furcation involvement of mandibular molar, with the purposes to remove the irritants under the fornix and to get two single-rooted teeth crowned as premolar [7]. In literal meaning, bicuspidization or a molar bisection is splitting the mandibular molar vertically through the furcation without removing both halves and leaving two separate roots, where both segments are then retained individually and treated as bicuspids [5]. It differs from hemisection, where separation is made between two roots, then a root and the associated portion of the crown are removed. The treatment was preserved to maintain a portion of a diseased or injured molar by removing one or more of its roots [8][14]. If dental caries are limited to one root, a hemisection procedure can be performed. Yet, in the present case, the roots have inaccessibility to maintain the procedure [9], as in this case, the mesial and distal roots are endodontically treatable [10]. Hence, the bicuspidization method seemed to be the most applicable option [1].

Molar with periodontally compromised and furcation involvement comprises a more inferior survival rate compared to single-rooted one. That condition required higher effort and more complex treatment [11]. Various respective procedures include root amputation, hemisection, and bicuspidization. As the clinical and radiographic parameters were satisfactory (wide roots with adequate separation and periodontal support and moderate bone support around individual roots), bicuspidization was planned for the patient [12]. Endodontic surgery was performed, started with an envelope flap to open the buccal area. It is the technique for separating the crown of the tooth in bicuspidization because of some advantages such as less scary, easy, and fast with low morbidity [13] [14].

Farshchian and Kaiser (1998) revealed that where adequate bone support around furcation involved molars, the success rate chances would be higher. The success of bicuspidization depends on three factors. First, the stability and adequate bone support for the individual tooth sections. Second, the absence of severe root fluting of furcation and septum area. Finally, adequate separation of mesial and distal roots creates an acceptable embrasure for effective oral hygiene. Various studies suggested that this condition can be kept in a healthy state for up to 3-7 years [1][2]. Those conditions are suitable to the present case as there is no root fluting and has stable adequate bone support. Newell (1991) suggested that the advantage of bicuspidization is tooth retention. Meanwhile, the disadvantage appears to be the need for root canal treatment prior to the procedure. Failure in a root canal procedure can also lead to an entire procedure failure [2].





**Figure 7.** a week after the cementation as an initial assessment of early healing, good gingiva and good occlusion shown up, and the crowns have an excellent marginal adaptation

There are several other disadvantages associated with bicuspidization, i.e., pain, anxiety, and resistance from lateral excursive forces. To avoid periodontal destruction, a proper marginal adaptation would be needed. This lateral extrusion could be reduced by having a less steep cuspal inclination and eliminating the balance of incline contact [1]. This confirms the significance of accurate marginal adaptation of the final restoration. At the metal trial stage, the occlusal contacts were reduced in size and repositioned more favorably [5]. In line with the subsequent follow-up showing good bone healing, it suggests that the procedure was perfect for aiding in the recovery of the tooth [1]. At the first follow-up in a week after crown cementation, the treatment produced a satisfying result. The patient had no complaint with good gingiva, and good occlusion, no inflammation, and the crowns had an excellent marginal adaptation (fig. 6).

In an endodontic surgical procedure including bicuspidization, the patients usually followed up at 3, 6, 12 months, and every year thereafter. A routine examination should be performed on every recall visit, and then a periapical radiograph was taken. All the clinical data, including sign and/or symptoms or loss function, tenderness to percussion or palpation, subjective discomfort, mobility, sinus tract formation or periodontal pocket formation, postoperative complications, and presence or absence of restoration were recorded [16]. While evaluating the support formations, follow-up at one year is considered to be too short. Further clinical and radiological examination is conducted at annual intervals until healing is observed, and four years follow up is considered to be a suitable benchmark evaluation period. Hence, this present case still requires a further follow up of treatment outcomes over a longer period as an appropriate period for evaluation. The days' evaluation can only be used as an initial assessment of early healing in an endodontic surgery procedure [17].

#### 4. CONCLUSION

Bicuspidization may be a suitable alternative to extraction and implant and should be discussed with patients during treatment options. The prognosis of the tooth with

bicuspidization depends on the supporting bone, the restoration, and the oral hygiene of the patient. This case report presents the successful bicuspidization.

#### AUTHORS' CONTRIBUTIONS

MTS wrote the paper, TK performed the treatment, and the details of the case, MR and TER supervised, drafted, and did the critical revision of the article. All authors read and approved the final manuscript.

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#### REFERENCES

- [1] A.H. Muhammad, A. Abdulgani, and N. Watted, Bicuspidization of Mandibular Molar, in IOSR-JDMS, vol. 14(6), 2015, p. 77-85. DOI: <https://doi.org/10.9790/0853-14617785>
- [2] R. Kumar, S.A. Arora, S. Chhina and R.K. Mathur, Bicuspidization A Case Report, in J. dent Specialities, vol. 7(1), 2019, p. 33-35. DOI: <https://doi.org/10.18231/j.jds.2019.007>
- [3] T. Larsen, and NE Fiehn, Dental Biofilm Infections-an update, in APMIS, 2017, 125, p. 376-384. DOI: <https://doi.org/10.1111/apm.12688>
- [4] U. Das, S. M. Das, An Overview on Endo-Perio Interrelationship – A Multidisciplinary Approach, in IOSR-JDMS, 2018, 17(12), p. 15-21. DOI: <https://doi.org/10.9790/0853-1712091521>
- [5] M.Z. Kola, H.S. Al Madi, F.Y.I. Asiri, F.M.A. Al Olivi, A.H. Shah, Prosthetic Intervention for Periodontal Furcation Defects; A Hope for the Hopeless, in J. Adv. Med. Dent. Scie Res., vol. 3(1), 2015, p. 187-190.
- [6] A. Pilloni, and M.A. Rojas, Furcation Involvement Classification: A Comprehensive Review and a New System Proposal, in Dent J., vol. 6(34). 2018, p. 1-12. DOI: <https://doi.org/10.3390/dj6030034>
- [7] A.M. Nooruden, M.T. Joy, R. Sanjeev, and B. John, Conservative Management of Periodontally Compromised Tooth-A Case Report on Bicuspidization with Two Year Follow Up, in J. Odontol Res., vol. 3(1), 2015, p. 1-5.
- [8] P. Mishra, A. Sharma, and S.K. Mishra, Hemisection: A Conservative approach of Tooth Preservation, in J. Curr

- Res Sci Med, vol 2, 2012, p. 46-48. DOI: <https://doi.org/10.4103/2455-3069.184134>
- [9] M. Singh, and S.R. Chandar, Hemisection in an Era of Implant, in J. Dent. Sci. Vol. 3(5), 2018, p. 1-5. DOI: <https://doi.org/10.23880/oajds-16000181>
- [10] P. Eickholz, C. Walter, Clinical and Radiographic Diagnosis and Epidemiology of Furcation Involvement, in L. Nibali (ed), Diagnosis and treatment of Furcation-Involved Teeth, 1<sup>st</sup> Edition, John Wiley & Sons Ltd., 2018, p. 15, 20-21. DOI: <https://doi.org/10.1002/9781119270638>
- [11] F. Schewendicke, C. Graetz, M. Stolpe, and C.E. Dorfer, Retaining or Replacing Molars with Furcation Involvement: A Cost-effectiveness comparison of Different Strategies, in J Clin Periodontol, vol. 41, 2014, p. 1090-1097. DOI: <https://doi.org/10.1111/jcpe.12315>
- [12] A. Sharma, P. Mishra, M. Singh, and P. Singh, Bicuspidization: Conservation for Prevention, in Journal of Contemporary Medicine Surgery and Radiology, vol. 1(1), 2016, p. 3-4.
- [13] I. Tsesis, I. Beitlitum, and E. Rosen, Prevention and Management of Soft Tissue Complications in Endodontic Surgery, in I. Tsesis (ed.), Complications in Endodontic Surgery, Springer, Berlin, Heidelberg, 2014, p.67. DOI: [https://doi.org/10.1007/978-3-642-54218-3\\_6](https://doi.org/10.1007/978-3-642-54218-3_6)
- [14] J. Aqrabawi, Root Amputation: A Prudent Alternative to Tooth Extraction, in Adv. Dent & Oral Health. Vol. 2(2), 2016, p. 33-35. DOI: <https://doi.org/10.19080/ADOH.2016.02.555582>
- [15] S.E. Lieblich, Endodontic Surgery, in Dent Clin N Am, vol. 56, 2012, p. 121-132. DOI: <https://doi.org/10.1016/j.cden.2011.08.005>
- [16] M. Song, ,I. Jung, S. Lee, C. Lee, E. Kim, Prognosis Factors for Clinical Outcomes in Endodontic Microsurgery: A Retrospective Study, in J Endod, vol. 37(7), 2011, p. 927-933. DOI: <https://doi.org/10.1016/j.joen.2011.04.005>
- [17] J.S. Rhodes, Advanced Endodontics Clinical Retreatment and Surgery, 2006. Taylor & Francis. London. p. 196.