

DENTINO
JURNAL KEDOKTERAN GIGI
Vol VI. No 2. September 2021

**REHABILITATION OF MASTICATION AND LACK OF SPACE TREATMENT IN
 NARROW EDENTULOUS WITH FIXED-FIXED BRIDGE
 (CASE REPORT)**

Rahmad Arifin¹, Fitriana Caessar Pertiwi²

¹Prosthodontics Department, Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin.

²Faculty of Dentistry, Lambung Mangkurat University, Banjarmasin Indonesia

ABSTRACT

Background: *Loss of posterior teeth can lead to disharmony in the curvature of the jaw. Antagonistic teeth and surrounding teeth will migrate to the edentulous causing reduced mastication function and TMJ disturbance. Several cases of narrow edentulous occurred due to tooth shifting caused by edentulous that was left empty for a long period. Creating a fixed-fixed bridge is aimed to restore the aesthetics, function, and comfort for patients which caused by the missing teeth. Fixed-fixed bridge consist of a retainer that function as a support to the abutment; a pontic that function to replace the missing tooth; and a connector that function to connect the pontic and the retainer. A narrow space for pontics can disrupt the aesthetic and functional aspects. Case Report:* A 24 year-old male patient was referred to Prosthodontic Clinic, Gusti Hasan Aman Dental Hospital with a complain of pain on the jaw joint and missing of left lower molar for about 5 years. Patient always masticate on one side after the left lower molar was missing. Extraoral examination found the patient to be in good condition, no enlargement of major salivary glands, the vital signs were good, but upon TMJ examination there was clicking sounds on the left side. Intraoral examination showed space narrowing resulted from mesial and distal drifting of 37 and 35 but not significant, therefore it was still possible to perform rehabilitation using fixed-fixed bridge with abutments on 37 and 35 with modification of pontic shape for 36 to resemble a premolar tooth with occlusal surface resembling a molar tooth. Treatment planning for fixed prosthetic using fixed-fixed bridge with porcelain fused to metal material on 35, 36, and 37 with ridge lap pontic type modification **Conclusions:** Treatment was successful to provide enough space for the pontic by modification of the shape and the size of the pontic.

Keywords: *Fixed-fixed bridge. lack of space, mastication.*

Correspondence: Rahmad Arifin, Faculty of Dentistry, Lambung Mangkurat University, Jalan Veteran No. 128B, Banjarmasin, South Kalimantan, email: rahmad.arifin@ulm.ac.id

INTRODUCTION

Loss of posterior teeth can lead to disharmony in the curvature of the jaw. Antagonistic teeth and surrounding teeth will migrate to the edentulous causing reduced mastication function and TMJ disturbance.^{1,3} Missing tooth can cause anatomical changes, both physiological and functional. Partially missing tooth cause structural changes in tooth curvature. If the integrity of the dental arch structure is disturbed, arch adjustments will occur until a new balance is obtained. Restoring the functions of teeth and achieving satisfactory aesthetic and functional result is a necessary goal of the treatment, this can be achieved by prosthodontic treatment.⁵

One of the types of dentures in prosthodontic treatment is fixed-fixed bridge. Fixed-fixed bridge is one of the most popular treatment

choice to replace a missing tooth. Fixed-fixed bridge is intended to restore aesthetic, function, and comfort for patients. It consist of a retainer that function as a support to the abutment, a pontic that function to replace the missing tooth, and a connector that connect the pontic and the retainer.^{3,5}

Several cases of narrow edentulous occurred due to tooth shifting caused by edentulous that was left empty for a long period. A narrow space for pontics can disrupt the aesthetic and functional aspects.⁵ There are several treatment choices to resolve the lack of space, including the help of diagnostic wax procedure, reposition with orthodontic, and creating a small pontic without considering the aesthetic.⁶ This case report is aimed to describe a treatment for lack of space on premolar tooth with narrow edentulous.

CASE REPORT

A 24-year-old male patient was referred to the prosthodontic clinic of Oral and Dental Hospital Gusti Hasan Aman with complain of pain on the jaw joint and missing of left lower molar for about 5 years. Patient had mastication difficulty. On history taking, the right upper molar was missing due to trauma, while the left lower molar was missing due to large cavity that was left untreated until it was extracted 5 years ago. Then, patient always masticate on one side after the left lower molar was missing. Extra-oral examination found the patient to be in good condition, no enlargement of major salivary glands, the vital signs were good, but upon TMJ examination, there was clicking sounds on the left side.

Intraoral examination found that 16 and 36 were missing. There was caries with superficial depth on 15, 17, 25, 26, 37, 46, and 47 and there was calculus on 34, 35, and 37. Panoramic radiographic examination showed that there was no third molar on both sides of mandibular (Figure 2). Narrowing space resulted from mesial drifting of 37 and distal drifting of 35, but it was not significant. Therefore, it was possible to perform rehabilitation using fixed prosthetic with fixed-fixed bridge denture with abutment on 37 and 35. There were no abnormalities on 35 and 37, no periodontal abnormalities, and the teeth were supported with good alveolar bone.

Based on subjective, objective, and supporting investigation, patient was diagnosed with edentulous ridge on 36. Therefore, treatment with the installation of fixed-fixed bridge using porcelain fused to metal material and ridge lap pontic type modification on 35, 36, and 37 was proposed. (Figure 1,2).



Figure 1. Intraoral examination found that 16 and 36 were missing. There were caries with

superficial depth on 15, 17, 25, 26, 37, 46, and 47.



Figure 2. Panoramic view.

In this case, the treatment was initiated with restorations of 15, 17, 25, 26, 37, 46, and 47, scaling to remove calculus on all regions, and a dental health education for the patient. Prosthodontic treatment began with diagnostic impression using alginate for study model. The study model was examined, then it was continued with the manufacture of diagnostic wax up and temporary crown (Figure 3).



Figure 3. Diagnostic wax up and temporary crown

The next step was the preparation of abutment teeth. In this case, 35 and 37 was prepared as the abutment according to Ante's law. It was performed on two visits, starting on 35. Preparation was carried out with consideration to the tilting of the preparation wall, the thickness, and finish line of the

preparation. Grinding was first performed on the occlusal surface as far as 2 mm or until the explorer can pass the reduced occlusal surface, then followed by the buccal surface as far as 1.5-2 mm, and the proximal surface 1.5 mm. To control the depth of the preparation on buccal and lingual surface, three guiding grooves were made based on the necessary thickness of preparation.

Preparation was performed with the consideration to make sure that one-third of the cervical part of the preparation was in line with the tooth axis and two-third of the incisal part followed the anatomy of the tooth's labial surface. Inclination angle of the preparation was 6° convergent and the finish line on the gingival margin shaped a chamfer (Figure 4). After the preparation, alignment molding was performed, then temporary crowns were placed on 35, 36, and 37 using temporary cement, zinc phosphate (Figure 5).



Figure 4. Preparations on 35 and 37 as abutments.



Figure 5. Insertion of temporary crown.

On the following visit, work-model impression was made to create porcelain-fused-to-metal crowns on 35, 36, and 37. Previously, the gingival margin of 35 and 37 was retracted using gingival cord dampened in adrenaline solution. The impression performed with double impression two step technique using putty coated with cellophane then it was remolded using light body (Figure 6A). On the upper jaw, impression was carried out using Alginate impression material. A bite registration was made using polyvynilsiloxane material placed on the occlusal surface, then the patient was asked to do central occlusion. Hereafter, the color for the porcelain-fused-to-metal crown was determined using Ivoclar vivadent shade guide and the A3 shade was selected (Figure 6B).



Figure 6. Double impression two step technique (A) and shade guide selection (B)

The next step was sending the study model to the laboratory to create a metal coping for 35, 36, and 37. On the following visit, the trial of metal coping was conducted on tooth 35, 36, and 37 (Figure 7A).



Figure 7. Try in coping on 35, 36, 37 (A); Porcelain fused to metal crown on 35, 36, and 37 (B)

The metal coping that has been trialed was sent back to the laboratory to be laminated with porcelain. On the next visit, the porcelain-fused-to-metal crown was inserted using zinc phosphate temporary cement. This was performed to allow the oral cavity to adapt before permanent cementing (Figure 8A). The crown was permanently attached at the next visit if the tissue appeared to have adapted well. (Figure 8B).



Figure 8. Try in PFM (A) and insertion PFM crown on 35, 36, 37.

At the first and second follow-up, the alignment of the fixed dentures appeared to be well positioned, the gingival margins of 35, 36, and 37 were not hyperaemic and not pale, there were no occlusion, articulation, masticatory disorders, and pain. After a dental health education to improve and maintain good oral hygiene, the patient was also instructed to clean and maintain his dentition. Patients were also explained that plaque control around fixed bridges would be more difficult than natural teeth so that the patient were encouraged to use interdental and under-the-pontic' cleaning aids daily. The patient was also instructed to chew on both sides and to come for a consultation if there were any complaints.

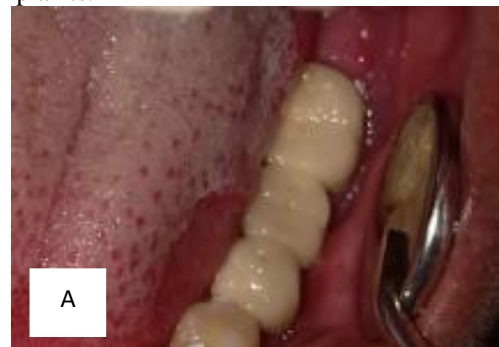




Figure 9. First (A) and second follow-up (B)

DISCUSSION

The migration of teeth is caused by imbalance of relative stability of teeth position. Relative stability is maintained by several factors including the balance between intrinsic and extrinsic forces. Intrinsic force come from the tongue and the lips, while extrinsic force come from habits, orthodontic devices, occlusal force of the teeth, and forces of the periodontal membrane. When there is a missing tooth due to caries, periodontal disease, trauma, or tooth extraction, the balance is disturbed and the remaining teeth will spontaneously move to achieve a new balance causing the teeth to migrate to mesial or distal direction and extrusion of antagonistic tooth to the edentulous space.^{4,9}

Replacing missing teeth aims to maintain the integrity of the stomatognathic system to prevent function alteration due to tooth movement. In this case, the patient desired a rehabilitation for his teeth mastication function. Patient desired a fixed denture for him to restore his mastication function to normal. According to intraoral examination, there were missing teeth on 16 and 36. The 16 did not get prosthodontic treatment due to the edentulous space that almost entirely closed, therefore it was not possible to created a prosthetic crown. There was also closing on edentulous area of 36, leaving an edentulous space around 7 mm due to mesial drifting of 37 and distal drifting of 35, however there was still adequate space left to make a modified pontic on the edentulous ridge of 36 with abutment on 35 and 37 according to Ante's Law.

The root surface area of potential abutment teeth must be assessed when treatment for fixed prosthodontics is planned. Ante suggested in 1926 that it was unwise to provide a fixed dental protheses when the root surface area of the abutment was less than the root surface area of the teeth being replaced; this has been adopted and reinforced by other authors as Ante's law. Ante's law states that the root surface area of all abutments must equal or exceed the root

surface area of the tooth being replaced. It is useful for determining the prognosis of fixed dental protheses. In this case, 35 and 37 were chosen as abutment teeth because the second molar and second premolar abutments have root surface areas that exceed the missing tooth (36).⁴

Some of the narrow edentulous areas occur as a result of the migration of the teeth into the edentulous space that has been left empty for a long time. This will affect the choice of pontic that will fill the edentulous space. A pontic is the artificial tooth of a partial fixed dental prosthesis (FDP) that replace missing natural teeth, restoring function and appearance. The narrow space for the pontic may interfere with the aesthetic and functional aspects.⁵ If such movement has already occurred, the space available for the pontic may be reduced and its fabrication could be more complicated.⁴ There are several choices of treatments to resolve the lack of space due to missing teeth, including diagnostic wax procedure, tooth reposition with orthodontic, increasing proximal contour of tooth, and creating a smaller pontic size without considering the aesthetic factors.⁶

The treatment for this case was the insertion of a fixed-fixed bridge denture with a porcelain-fused-to-metal crown to improve mastication function which involves the posterior teeth with a ridge lap pontic design.² This type of pontic can achieve a good clinical appearance because the shape is very similar to natural tooth as patients requested.⁸ The ridge lap pontic has a concave fitting surface that overlaps the residual ridge buccolingually, simulating the contours and emergence profile of the missing tooth on both sides of the residual ridge. Therefore, excellent hygiene habits must be developed by the patient. Patient must be taught efficient oral hygiene techniques, with particular emphasis on cleaning the gingival surface of the pontic. The shape of the gingival surface, its relation to the ridge, and the materials used in its fabrication influence ultimate success.⁴

One of the most popular kinds of bridges among dentists today is the PFM bridge. The most often used alloys are mix of palladium and silver. Other metals used include gold-platinum, or gold-palladium, and silver. The American Dental Association classification system divides metal alloys based on their noble metal content, namely high noble (60% with a minimum of 40% gold), noble (25%), and predominantly base metal (less than 25% noble). Based on these inherent strengths, the PFM bridge can be used to cover more than one edentulous site, used on natural teeth in conjunction with implants (though preferably not together), and used with stress breakers when indicated.¹⁰ In addition,

porcelain-fused-to-metal bridge is the most commonly used material because of its cheap cost, acceptable aesthetics, and higher endurance to occlusal forces compared to all ceramics restoration.⁷ The resulting retention quality is better because the preparation include all of the axial wall of abutment teeth and it is easier to ensure an adequate resistance shape of the abutment tooth during preparation.⁴

On the edentulous area, there was no contact of the missing tooth to the antagonistic teeth to facilitate mastication. Therefore, a modification of pontic shape was made on the narrow edentulous space which act as a foundation of the abutment teeth when there is a maximum occlusal force. The pontic as a replacement of the missing tooth will come in contact with the hard surface of the antagonistic teeth when food is being chewed and help with mastication.⁵ The pontic must be carefully designed and fabricated not only to facilitate plaque control of the tissue surface and around the adjacent abutment teeth but also to adjust to the existing occlusal conditions. In addition to these biologic considerations, pontic design must incorporate mechanical principles for strength and longevity, as well as esthetic principles for satisfactory appearance of the replacement teeth.⁴

Pontics have different shapes according to the operator and patient's judgement, based on the position of edentulous area, degree of alveolar bone resorption, patient's oral hygiene, and good communication between the dentist and laboratory technician to produce a design that is appropriate for the available edentulous space.^{1,8} Choice of pontics depend greatly on the aesthetics and oral hygiene. For aesthetic reasons, the anterior area needs extra attention, pontic must be adjusted to make it look like it came from the gingiva. Meanwhile, on the posterior area, the contour can be modified with less aesthetic design but achieve better strength to withstand occlusal forces.⁸

Posterior teeth of the lower jaw have the least aesthetic value and only the occlusal surface will appear when someone is talking or smiling.⁵ Therefore, in a case of lacking mesiodistal space for pontics because the distal part will not be clearly visible from the front, the lack of mesiodistal space for pontics can be resolved by making half of the mesial part of the visible pontic shaped like the original tooth and adjust the pontic shape on the distal part to fit the remaining space.⁴

In this case, narrowing of the edentulous area was found so that it was not possible to make a pontic for 36 with its original shape. To resolve this, the pontic was created with mesiodistal width resembling a premolar tooth and the occlusal part was shaped with four small cusps resembling the first

molar and adjusted to the patient's occlusion. The creation of cusps on the pontics was aimed to help with mastication function for the patient. The measurement in this case, distal gap of 34 to mesial 37 was 15 mm, divided by two into 7.5 mm to achieve approximately similar sizes for 35 and 36 according to Bolton's ratio of a premolar tooth size. The size of 35 was adjusted with a pontic of 36 with consideration to good occlusion to the antagonistic teeth. Adjustment of pontic size will achieve good aesthetic and functional needs. A well-planned preparation thickness, diagnostic wax up, and good communication with the dental laboratory can resolve the lack of space for molar tooth pontic in a narrow edentulous area.⁵

After placement and cementation of a fixed-fixed bridge, patient treatment continues with a carefully structured sequence of postoperative appointments designed to monitor the patient's dental health, stimulate meticulous plaque control habits, identify any incipient disease, and introduce whatever corrective treatment may be needed before irreversible damage occurs. Patients should be instructed in special plaque control measures, especially around pontics and connectors, and the use of special oral hygiene aids such as dental floss. Recall examinations are important for patients with extensive restorations and should be carried out by the dentist. Responsibility for follow up care should not be delegated to auxiliary personnel (although good cooperation with a dental hygienist will prove beneficial for success). Patients should attend recall visits at least every 6 months. Less frequent recall may lead to oversight of recurrent caries or the development of periodontal disease.⁴

At the time of the post-operative visit, the thing that must be considered is the condition of the denture. Indicators of fixed denture condition can be seen from the position of the teeth and surrounding tissues.¹² Upon follow-up, the position of fixed bridge denture was good, it was not detached, not lumping, no hyperemia or other signs of inflammation on the gingival margin and the surrounding periodontal tissue, patient had no complaint, felt comfortable and no difficulty with mastication. Education was provided to the patient to maintain good oral hygiene. Regular recalls were programmed during which oral hygiene maintenance and gingival margins stability were evaluated. The patient was satisfied with both esthetic and functional outcome. A missing tooth can cause anatomical changes which in turn will cause disturbances in mastication, aesthetic functions, and joint dysfunction. One of the treatment choices for a missing tooth is creating a prosthetic tooth. Prosthetic tooth in this case was fixed-fixed bridge denture

using porcelain-fused-to-metal material using a ridge lap pontic type. This type of denture is used for the posterior teeth because it is strong enough to withstand high occlusal force, has a porcelain lamination which give a good aesthetic, and can last for a long period. The edentulous space in this case had a narrowing size but it was not significant, therefore the mesiodistal size of the pontic made to replace the 36 was modified to resemble a premolar tooth size with cusps on the occlusal surface resembling a molar tooth. Treatment showed success in gaining space for pontic by modifying the shape and size of the pontic. Patient had no complain and felt satisfactory with the result of the fixed-fixed bridge denture treatment.

REFERENCES

1. Kazmi SMR, Iqbal Z, Muneer MU, Riaz S, Zafar MS. *Different Pontic Design for Porcelain fused to Metal Fixed Dental Prosthesis: Contemporary Guidelines and Practice by General Dental Practitioner*. European Journal of Dentistry. 2018; 12(3): 375-379.
2. D.Angel Fastina Mary, Dr. Keerthisashank, Dr. Venkatesh, Dr. Leslie Rani S. *Review on Pontics*. European Journal of Molecular & Clinical Medicine, 2020; 07(01): 3016-24
3. Sulistiawaty I, Dharmautama M, Machmud E, Cialy JS, Elvi. *Prosthetic Rehabilitation Using Adhesive Bridge and Fixed-fixed Bridge on the Maxilla and Telescopic Crown Overdenture on Mandible*. Journal of Dentomaxillofacial Science. 2016; 1(3): 210-212.
4. Rosenstiel, S. F., Land, M. F., Fujimoto, J., *Contemporary Fixed Prosthodontics*. 5th ed. Mosby Company. Missouri. 2016: 222- 34, 504-12.
5. Sinaga AP, Nasution H, Sitorus SM. *Penanganan Kekurangan Ruang Gigi Premolar pada Daerah Edentulous yang Sempit*. Jurnal Kedokteran Gigi Universitas Padjajaran. 2019; 31(1): 206-213.
6. Nagib MA, Abhinav A, Naeem A, Abhishek G, Kaushik P, Mariyam A. *All about dental pontics: bridging the gap – a review*. J of Sci. 2017;7(8):294-8.
7. Parnaadji R. *Rehabilitasi Estetik dan Fungsi Kunyah dengan Perawatan Complex Bridge*. Jurnal Universitas Jember. 2019;1(1).
8. Tiku YGS, Jubhari EH. *Selection of Pontic Design*. Makassar Dental Journal. 2019; 8(3): 135-141.
9. Teng F, Du F, Chen HZ, Jiang RP, Xu TM. *Three-dimensional Analysis of the Physiologic Drift of Adjacent Teeth Following Maxillary First Premolar Extractions*. Scientific Reports. 2019;9:1-11.
10. Jaha H, Gazzaz I, Ahmed T. *Types and Efficiency of Dental Bridge Supporting Implants*. International Journal of Scientific and Engineering Research. 2018; 9(10): 208.
11. Ray A, Shah K. *Avoiding and Managing the Failure of Conventional Crowns and Bridges*. Restorative Dentistry Journal. 2012; 1(1): 79.
12. Imen D, Jilani S, Anissa BM, Fethi T, Mpunir C. *Management of Primary Failures Relted to Fixed Metal Ceramics Bridge Prosthesis Made by Dental Students*. ACTA Scientific Dental Sciences. 2019; 3(12): 57-60.