

Reconstruction with fibula transfer and implant supported overdenture for a mandibular defect: A multidisciplinary approach

Tri Ardi Mahendra^{1*}, Nina Ariani¹, Saraventi Mursid¹, Parintosa Atmodiwirjo²,
Kristaninta Bangun², Dwi Ariawan³

1. Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.

2. Division of Plastic and Reconstructive Surgery, Department of Surgery, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia.

3. Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.

Abstract

Ameloblastic Fibroma (AF) is a rare benign tumor of odontogenic origin. The large defect from the tumor ablation make reconstruction of the oral function a challenge. Lack of retention, functional and esthetic problem are commonly encountered during maxillofacial prostheses construction. Multidisciplinary approach is currently the standard of care for these patients. An 18 year old female with AF on right mandible underwent a partial mandibulectomy followed with fibula transfer and simultaneous dental implants placement. All disciplines involved, plastic surgeons, oral maxillofacial surgeons and prosthodontists, worked together since beginning in creating the best treatment for the patient. Implant supported overdenture with bar attachment was the treatment of choice for rehabilitation of patient's mastication and speech. Impression method was modified to accommodate the thick soft tissue around the implants.

The aim of this case report is to impart that multidisciplinary approach for mandibular defects is essential to achieve esthetics and functional rehabilitation.

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Introduction

Ameloblastic fibroma is a rare benign mixed tumor of odontogenic origin that usually occurs in the first two decades of life.¹ Ameloblastic fibroma are usually asymptomatic, and commonly found at mandibular posterior region.² Ameloblastic fibroma grows slowly and painlessly expanding the jaw. Radiographically presents as unilocular/ multilocular area of radiolucency with smooth outline. Histologically the epithelial component present as islands or cords of odontogenic epithelium with peripheral columnar or cuboid cell layer.³ Most ameloblastic fibromas are treated by conservative treatment, but some authors suggested radical surgical treatment because of its high recurrence rate as

well as the possibility of malignant transformation to ameloblastic fibrosarcoma.^{4,5}

Large defect as a consequence of mandibulectomy performed in ameloblastic fibroma cases cause problem for constructing a definitive maxillofacial prosthesis.⁶ Reconstruction of mandibular discontinuity defects with vascularized flap is currently the standard of care.⁷⁻⁹ One of the most commonly used donor site is fibula. The free fibula flap technique was first introduced by Hidalgo in 1989.¹⁰ Later on, this technique is perfected with simultaneous dental implant placement.¹¹⁻¹³ and even full dental reconstruction at the same time as the tumor removal.¹⁴

Common problems with post mandibulectomy prostheses are lack of retention, stabilization, and esthetics. Dental implants have been known as one key factor for creating improved retention, stability, masticatory support and esthetic of a prosthesis. It has been known that well vascularized free fibula flaps allows reliable and predictable restoration of dental implants¹⁵. Implantation is overall successful and

*Corresponding author:

Tri Ardi Mahendra
Department of Prosthodontics
Faculty of Dentistry Universitas Indonesia
Jl. Salemba Raya No. 4, Jakarta 10430 Indonesia
E-mail: tri.ardi.mahendra@gmail.com

osseointegration is observed in 99% of cases.¹⁶ Despite the improvement of fibular transfer technique, there are still a number of challenges for the prosthetic rehabilitation, i.e. poor maxillomandibular relationship, unfavorable curve of spee and crown height space.¹⁷

Literature shows that with proper indications, all types of prostheses, fixed or removable, can be used for rehabilitation. One study proposed implant retained removable denture with bar design which gives a good result at 2 year follow up evaluation.¹⁸ A fixed prosthesis also provides good results at 5.5 year.¹⁹ Another study shows reliable long-term results for mandibular reconstruction of continuity defects with fibula free flap and for both fixed and removable denture.²⁰

This report describe how the multidisciplinary approach is imperative for the succes of the rehabilitation and propose the idea for overcoming the thick soft tissue when constructing an implant supported maxillofacial prosthesis.

Case Report

An 18-years old female presented to the Department of Oral and Maxillofacial Surgery of Cipto Mangunkusumo National Hospital, Jakarta, Indonesia with chief complaint of swelling at her right lower jaw since 2 years before admission.



Figure 1. Patient presentation upon initial examination. (A) Swelling on the right mandibular. Note the asymmetry between the right and left side. (B) Hyperemia and swelling on the right mandibular region.

Clinically upon extra oral examination there were facial asymmetry, a 4x3x2cm mass with hard consistency and well defined border on the right mandible, no palpable regional lymph nodes and tenderness on palpation (Figure 1a). Intra orally, there were swelling from right mandibular first premolar to right third molar

mandibular with color similar with surrounding mucosa (Figure 1b) and no difficulty in mouth opening.



Figure 2. (A) Panoramic radiograph shows multilocular lesion on the right mandibular extended from right first premolar to mandibular ramus. (B) CT scan showing extension of the lesion.



Figure 3. (A) Preoperative incision outline, (B) Tumor ablation, (C) Bended mandibular plate.

Panoramic radiograph and CT scan imaging revealed a destructive multilocular radiolucent lesion in the right posterior mandible, extending from the right first premolar region posteriorly to the right ascending ramus mandible (Figure 2). Histopathologic examination showed islands of epithelial cells with peripheral layer consists of cuboidal or columnar cells bordering a small number of cells resembling a starry reticulum. The epithelial cells were immersed in cellular connective tissue with rounded and angled cells. The patient was diagnosed with ameloblastic fibroma.

A multidisciplinary team consisted of plastic surgeons, oral maxillofacial surgeons and prosthodontists were involved since the beginning before the ablative surgery. The patient's father was particularly concerned about the appearance and chewing ability of his daughter. Taking into account the patient's family wish, the treatment alternatives were discussed with the family and it was decided to perform a partial hemimandibulectomy from mandibular right central incisive to right third molar region mandibular, free fibular transfer and a removable bar implant supported prosthesis reconstruction. Preliminary impression were made using irreversible hydrocolloid (Aroma Fine Plus, GC,

Tokyo, Japan), diagnostic model were fabricated and surgical template for implant position were constructed from (Clear temporary splints sheets, Ultradent, Utah, USA).

An extraoral approach was utilized to access the mandibular defect. Incision line was put 1 cm parallel to the inferior border of the mandible (Figure 3a). Molding of reconstruction plate was done using the shape of external side of excised mandibular segment as template (Figure 3b and c). At the same time, fibula along with skin paddle was harvested while maintaining vascularization of the peroneal vessels.

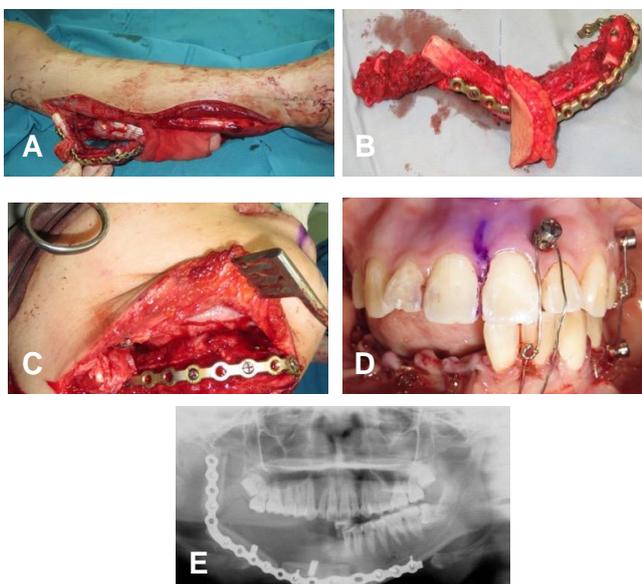


Figure 4. Mandible reconstruction using fibula (A) Molded fibula based on the prebended plate, (B) Fibula and skin paddle already disconnected, (C) Fibula segments transferred to mandible, (D) Fixation of the jaw, (E) Panoramic radiograph post operative.

Fibular bone osteotomy was done according to the shape of the molded reconstruction plate (Figure 4a). The fibula was divided into three segments sized 2.5, 4 and 6 cm for replacing mandibular symphysis, body and angle respectively (Figure 4b). Two dental implants were placed based on final teeth position (3.3x10mm, Straumann, Basel, Switzerland) at right mandibular central incisor and first molar region (Figure 4b and e).

After the desired mandibular shape was achieved, pedicle peroneal artery and vein that vascularize the fibula segment were cut. Fibula segments were then transferred to mandibular defect and fixated to the anterior part of the

mandibular defect (Figure 4c). Maxillomandibular relationship and occlusion was maintained using fixation screws. Arteries and veins anastomoses were performed to revascularize the fibular flap in its current location. Skin paddle was used to cover the intra oral soft tissue defect (Figure 4d). Postoperative evaluation was uneventful. The patient was instructed to have soft diet for 2 months.

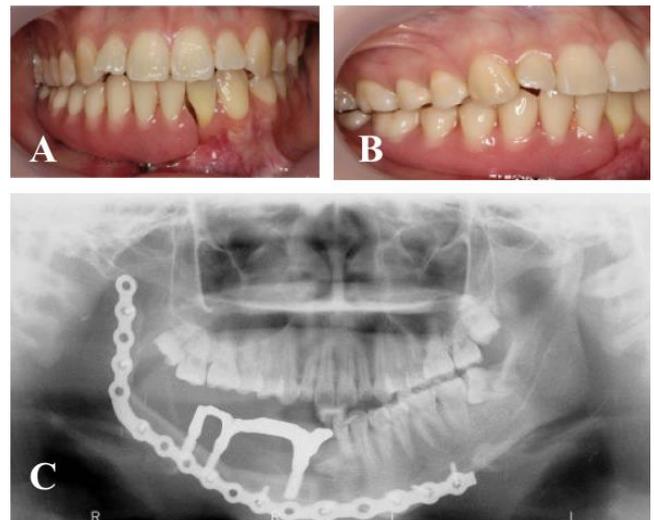


Figure 5. Final definitive prosthesis (A) Frontal view of the bar supported overdenture, (B) Lateral view of the bar supported overdenture, (C) Bar construction radiographically

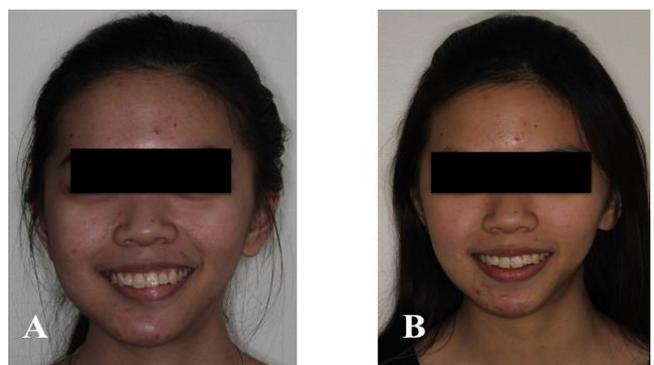


Figure 6. Patient presentation upon post operation. (A) Eight weeks follow-up visit after 1st surgery, (B) Eight months post operative and wearing final prosthesis.

The patient went for an 8 week recall after surgery. Tooth mobility along with gingival recession around mandibular left first incisor was observed and the tooth could not be salvaged. It was also decided to add one implant in the right mandibular premolar region to accommodate patient's request to be able to chew comfortably

until the most posterior tooth.

The prosthetic phase began 4 month after this last implant placement. There was unfavorable soft tissue thickness. Furthermore, the patient denied any connective tissue graft nor other surgical procedure after ablative surgery.

Implant level impression (Vinyl Polysiloxane, Exaflex, Tokyo, Japan) was made using individual tray (self curing acrylic, vertex, Netherlands). Due to the height of soft tissue, incision was made to access the implant platform and impression posts were used as healing abutments. Bar implant supported were constructed and after a verification of fit, good adaptation and sufficient inter occlusal space was available, the suprastructure was fabricated. After wax denture trial and occlusion verification, definitive prosthesis was fabricated and inserted. Occlusion and articulation was adjusted (Figure 5 and 6).

At 8 months follow up, the patient presented with adequate occlusal relationship, there was no complain nor inflammation. There was no tumor recurrence and panoramic radiograph shows stable peri-implant bone. Intra orally there were debris on the anterior abutment and posterior site and slight hyperemia on the posterior site but no sign of infection. Patient was instructed to maintain the oral hygiene more meticulously.

Discussion

This case illustrates the importance of a multidisciplinary approach and the importance of involving all disciplines including rehabilitation team at early stage to discuss and achieve the optimum result for the patient. Excessive operation and uncontrolled muscle contraction was two common risks for mandibulectomy/maxilectomy and the failure rate may increase without team work. Therefore it is advised to do a team meeting first and discuss all aspects.

Fibula transfer has become a gold standard for bony reconstruction of mandible and maxilla defect. Since 1989 this technique has been perfected involving dental implants placement. Now dental implant borne prosthesis has become routine alternatives for maxillofacial rehabilitation.

Dental implants on fibula transfer can be

placed immediately or delayed, both techniques has several advantages and disadvantages. Implant that placed immediately has less morbidity, reduce surgical time and do not require additional surgery. However immediate implant placement can lead to less precise implant placement and may jeopardize the bone vascularity.^{13,21}

On the contrary, with delayed implant placement, the patient should wait around 6-12 months after first surgery for rehabilitation. This waiting period have several benefits such as safer procedure, easier positioning of implant and also reduced possibility of infection²². Moreover, delayed implant placement does not disturb periosteal blood supply and therefore does not compromise bone graft consolidation.²³

At the 8 weeks recall, patient was advised to do a soft tissue thinning procedure, but patient refused to do more surgery and agree to add one more implant. This one implant was placed between the two previous implants as a intermediate abutment therefore providing more support during function.

Only few literatures focus on prosthetic issues for fibular transfer implant supported prosthesis. Some authors recommend fixed prosthesis because of their mastication performance, hygiene, esthetic and support superiority, but this type of prosthesis needs extra care for hygiene maintenance. However, a removable prosthesis has advantages of easier hygiene maintenance, compensating for local soft tissue defect, esthetic outcomes and lower cost.²⁴

Removable bar implant supported prosthesis has several advantages for this case and therefore chosen as treatment of choice. In this case the overdenture were supported by three implants, which will give biomechanical advantage over the two implants supported overdenture.

It has been known that fibula has shorter height compared to mandible and the reconstructed mandible can result in bigger prosthesis space and unfavorable crown to implant ratio. Double barrel techniques can be chosen to overcome this.^{17,25} However, use of double barrel technique comes with disadvantage such as the fibula length limit the use of double barrel to maximum 8cm defects.²⁵ Selecting longer abutment can compensate the large prosthesis space, but longer abutment can

result in undue loading forces and potential of excessive micromovements.²⁰

Conclusion

A multidisciplinary approach is the key of success for maxillofacial patients. It is important to visualize the outcome, discuss all aspects of the cases with all the disciplines involved then realized the treatment plan.

Fixed or removable prostheses have been reported to be utilized for dental rehabilitation in fibula transfer cases. In this case report we proposed the idea for a bar supported removable denture that requires fewer implants, facilitates occlusal adjustment, easier hygiene maintenance, broader force distribution, yet still provide a stable and esthetic functioning prosthesis for the patient.

Declaration of Interest

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