

# Oral rehabilitation following fasciocutaneous free-flap reconstruction: A retrospective study

Zain Uddin Ahmed, Joseph M. Huryrn, Ivana Petrovic, Evan B. Rosen  
Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, NY, USA

## Abstract

**Aim:** The aim of this study is to retrospectively, observe a consecutive series of patients with segmental mandibulectomy defects reconstructed with fasciocutaneous free flaps and mandibular resection prostheses, and to review treatment concepts for the management of such patients.

**Settings and Design:** Observational study done at Memorial Sloan Kettering Cancer Center, New York, NY, USA.

**Materials and Methods:** Records were reviewed of all patients who had fasciocutaneous free-flap reconstruction and fabrication of mandibular resection prostheses following segmental mandibulectomy between 2000 and 2017 at a tertiary cancer center. Mandibular resection prosthesis fabrication interval data, as well as follow-up interval data, were recorded.

**Statistical Analysis Used:** Descriptive statistics.

**Results:** Twenty-one consecutive patients had mandibular resection prostheses fabricated following segmental mandibulectomy and fasciocutaneous free-flap reconstruction during the study. The median time for mandibular resection prosthesis delivery following surgery was 9 months (range 4–41 months). There was a median of two follow-up visits (range 0–4) within the first 90 days of mandibular resection prosthesis delivery.

**Conclusions:** Oral rehabilitation with mandibular resection prosthesis following segmental mandibulectomy and fasciocutaneous free-flap reconstruction is an attainable treatment goal for the oncologic patient. Reviewing the proposed course of care is helpful for patient management.

**Keywords:** Fasciocutaneous free flap, mandibular prosthesis, mandibular reconstruction, oral rehabilitation, segmental mandibulectomy, soft-tissue free flap

**Address for correspondence:** Dr. Evan B. Rosen, Department of Surgery, Memorial Sloan Kettering Cancer Center, 1275 York Ave, New York, NY 10065, USA.  
E-mail: [rosene@mskcc.org](mailto:rosene@mskcc.org)

**Received:** 04<sup>th</sup> March, 2019, **Accepted:** 29<sup>th</sup> May, 2019

## INTRODUCTION

The surgical defects of the mandible can result in modification of facial contour, facial symmetry, as well as debilitation to speech, mastication, and deglutition.<sup>[1,2]</sup>

These postoperative esthetic and functional limitations can greatly impact patient quality of life.<sup>[3-5]</sup> Thus, the treatment of such defects often includes surgical reconstruction and oral rehabilitation with intra-oral prosthetics. The surgical reconstruction is done utilizing regional flaps, free flaps,

Access this article online	
Quick Response Code:	Website: <a href="http://www.j-ips.org">www.j-ips.org</a>
	DOI: 10.4103/jips.jips_97_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** [reprints@medknow.com](mailto:reprints@medknow.com)

**How to cite this article:** Ahmed ZU, Huryrn JM, Petrovic I, Rosen EB. Oral rehabilitation following fasciocutaneous free-flap reconstruction: A retrospective study. *J Indian Prosthodont Soc* 2019;19:221-4.

or a combination of both depending on the patient and surgeon factors. Influencing factors may include the extent of the primary disease, peripheral diseases, cost of treatment, and patient preference.<sup>[6,7]</sup> Osteocutaneous free flaps are commonly utilized for mandibular reconstruction as they can be shaped into the portion of the mandible that has been resected and present adequate osseous volume for the placement of dental implants. These free flaps have shown long-term stability and are considered the “workhorse” for mandibular reconstruction.<sup>[5]</sup> However, in patients contraindicated for osteocutaneous free flaps such as patients with renal insufficiency, cardiopulmonary failure, severe osteoporosis, or other complicating comorbidities, a fasciocutaneous free flap can be considered.<sup>[8,9]</sup>

Fasciocutaneous free flaps are selected based on the planned surgical defect and are intended to restore facial contours without the free transfer of bone. Following the use of a fasciocutaneous free flap for the reconstruction of an oral defect, the prospect of intraoral rehabilitation can be technically demanding due to postoperative altered anatomy and the resulting sensory deficits (i.e., loss of musculature and motor coordination of the residual mandible). To compensate for this, a mandibular resection prosthesis with or without a guide flange can be fabricated.<sup>[10]</sup> A guide-flange resection prosthesis can assist the patient to achieve a maximum intercuspal position and thus assist in mastication.<sup>[11-13]</sup>

Mandibular resection prostheses for patients with discontinuity defects of the mandible require commitment from both the patient and the provider to fabricate and at present, there is a paucity of information regarding the effort required for the fabrication of such prostheses. The purpose of this study was to retrospectively review a consecutive series of patients reconstructed with fasciocutaneous free flaps who had mandibular resection prostheses fabricated during a 17-year period at a tertiary cancer center and to review treatment concepts for the management of such patients.

## MATERIALS AND METHODS

A retrospective review was completed (IRB #16-1132) of patients who underwent fasciocutaneous free-flap reconstruction of the mandible as well as successful fabrication of a mandibular resection prosthesis at a tertiary cancer center between 2000 and 2017. Pediatric patients (under 18-year-old) and patients who had mandibular continuity (native or reconstructed) were excluded from this study. Patient records were reviewed to obtain patient demographics, tumor data, treatment

data, and mandibular resection prosthesis interval data. To better quantify immediate postoperative follow-up after prosthesis delivery, the number of appointments during the first 90 days in 30-day interval were recorded. All the data was compiled and analyzed using Microsoft Excel (Microsoft Corp., Redmond, WA, USA).

## RESULTS

During the study, 21 consecutive patients who had fasciocutaneous free flaps to reconstruct mandibular defects, as well as mandibular resection prostheses, were identified. Seventeen (81%) patients were male and four (19%) patients were female, with an average age of 66 years (range 46–84 years). Patient tumor and treatment data is presented in Table 1. About 76% ( $n = 16$ ) of patients had a primary diagnosis of squamous cell carcinoma. Approximately 53% of patients ( $n = 11$ ) had higher staged tumors (T3–T4), and approximately 33% of patients ( $n = 7$ ) had nodal involvement.

The two most commonly used fasciocutaneous free flaps were pectoralis major myocutaneous free flaps 43% ( $n = 9$ ) and rectus abdominis free flaps 38% ( $n = 8$ ). Radial forearm free flaps, anterolateral thigh free flaps, and latissimus dorsi free flaps were used in the remaining patients 19% ( $n = 4$ ).

The time to mandibular resection prosthesis delivery following primary surgery, as well as the time from the mandibular resection prosthesis delivery to last dental follow-up, is presented in Table 2. Following prosthesis delivery, the median number of follow-up appointments from 0 to 30 days was 1 visit (range 0–3), and the median number of follow-up appointments from 0 to 90 days was 2 visits (range 0–4).

## DISCUSSION

This study reports a series of 21 patients with oral cancer, who underwent segmental mandibulectomy with reconstruction followed by fabrication of mandibular resection prosthesis. The goal of this treatment is to both reconstruct the surgical defect giving the superficial shape to the mandible as well as improve the quality of life of the patient by providing esthetic and functional mandibular resection prosthesis. This review reports the timing of care as well as the follow-up required postdelivery of the mandibular resection prosthesis. The median time to deliver the prosthesis from the time of surgery was 9 months. Following the delivery of the prosthesis, patients presented with a median follow-up of 1 visit within

30 days. Patients followed up 0 times between days 30–60 and 60–90. Within this cohort, it was unusual for patients to return for multiple follow-up appointments within the immediate 90-day period following prosthesis delivery. This information may be helpful in assisting both patients and clinicians to set expectations for the course of care for mandibular resection prosthesis fabrication and follow-up.

Careful evaluation is recommended following prosthesis delivery as oncologic treatment-related sequelae, such

as trismus, tissue fibrosis, xerostomia, altered intraoral anatomy, or other soft-tissue changes can create challenges in providing stable mandibular resection prosthesis. Following segmental mandibulectomy [Figure 1], it is not uncommon for the patient to experience deviation of the residual mandible toward the surgical defect<sup>[14]</sup> [Figure 2]. This will create a malocclusion as the maxillary and mandibular arches will no longer be aligned and the patient will be unable to repeatedly achieve maximum intercuspation, and hence impair deglutition. Preoperative multidisciplinary planning with the surgical team may assist in assuring that mobility of the residual mandible is maintained and that adequate interocclusal, as well as vestibular space, is maintained for the fabrication of resection prosthesis. If the patient can be manually positioned into maximum intercuspation after completion of their oncologic treatment, the patient may be a candidate for the fabrication of mandibular resection prosthesis with a guide flange. Such prosthesis is retained by the remaining mandibular dentition and contains a vertical flange, usually either made of acrylic or metal. The flange engages the buccal surfaces of the maxillary dentition and on closure will guide the dentition into maximum intercuspation<sup>[10]</sup> [Figure 3]. The goal of such a prosthesis is to improve masticatory function by enabling the patient to repeatedly achieve a position, in which occlusal contacts can be generated.<sup>[11,15]</sup> These prostheses can be reliably fabricated by practitioners knowledgeable in the principles of removable prosthodontics often without the need for additional surgical procedures.

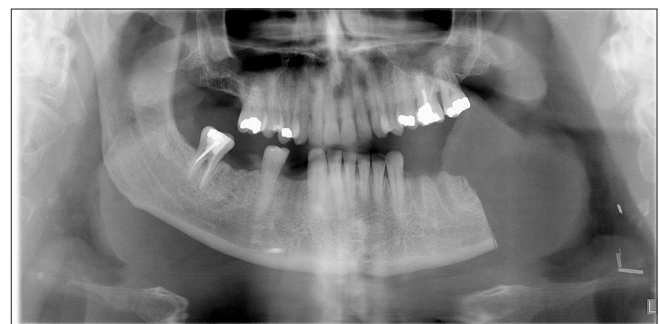
There were several limitations in this study. First, there is a relatively small group of patients in this cohort, as fasciocutaneous reconstruction is not the mainstay of mandibular rehabilitation at our tertiary cancer center. Collaborative studies from other centers would be helpful to better understand the generalizability of the results. In addition, this study was limited to patients that had mandibular resection prostheses fabricated at

**Table 1: Patient demographics**

Segmental mandibulectomy reconstruction with fasciocutaneous free flap and mandibular resection prosthesis (n=21)	
	% (n)
Clinical T stage	
T1	9 (2)
T2	29 (6)
T3	5 (1)
T4	48 (10)
Not applicable	9 (2)
Clinical N stage	
N0	57 (12)
N1	9 (2)
N2	24 (5)
Not applicable	9 (2)
Pathology	
Ameloblastoma	5 (1)
Osteoradionecrosis	9 (2)
Osteosarcoma	5 (1)
Spindle cell carcinoma	5 (1)
Squamous cell carcinoma	76 (16)
Site	
Buccal mucosa	5 (1)
Floor of the mouth	9 (2)
Mandible	24 (5)
Mandibular gingiva	9 (2)
Oropharynx	5 (1)
Retromolar trigone	38 (8)
Tongue	9 (2)
Fasciocutaneous free flap	
Anterolateral thigh	9 (2)
Latissimus free	5 (1)
Pectoralis major	43 (9)
Radial forearm	5 (1)
Rectus abdominis	38 (8)
Postoperative radiotherapy	
Yes	71 (15)
No	29 (6)
Postoperative chemotherapy	
Yes	19 (4)
No	81 (17)
Dentition status (mandibular arch)	
Dentate	76 (16)
Edentulous	24 (5)

**Table 2: Mandibular resection prosthesis delivery and follow-up**

	Median (months)	Range (months)
Time from surgery to mandibular resection prosthesis delivery	9	4-41
Time from mandibular resection prosthesis delivery to last dental follow-up	14	1-81



**Figure 1:** Panoramic radiograph following left segmental mandibulectomy



**Figure 2:** Retracted view of mandible deviating toward the defect side following segmental mandibulectomy



**Figure 3:** Mandibular resection prosthesis with guide-flange assisting patient to achieve maximum intercuspation with occlusal contacts on remaining dentition

the Dental Service of Memorial Sloan Kettering Cancer Center. As a result, additional patients who had resection prostheses fabricated elsewhere were not included in this cohort. Moreover, as this was a retrospective review, patient-reported outcomes and prosthesis function data were unavailable for a review. Future studies may be able to assess the patient and physician perception of prosthesis performance.

## CONCLUSIONS

Oral rehabilitation with mandibular resection prostheses with or without guide flanges following segmental mandibulectomy with fasciocutaneous free-flap reconstruction is an attainable treatment goal for the oncologic patient. Such prostheses, if collaboratively planned, may be reliably fabricated by the dental practitioner. Reviewing the proposed course of care is helpful for patient management before proceeding with prosthetic oral rehabilitation.

### Financial support and sponsorship

This study was financially supported in part by NIH/NCI Cancer Center Support Grant P30 CA008748. The Straumann Maxillofacial Dental Implantology Research Fellowship is supported in part by the Straumann SUPER Grant award. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Rogers SN. Quality of life perspectives in patients with oral cancer. *Oral Oncol* 2010;46:445-7.

2. Jackson RS, Price DL, Arce K, Moore EJ. Evaluation of clinical outcomes of osseointegrated dental implantation of fibula free flaps for mandibular reconstruction. *JAMA Facial Plast Surg* 2016;18:201-6.
3. Shpitzer T, Neligan PC, Gullane PJ, Boyd BJ, Gur E, Rotstein LE, *et al.* The free iliac crest and fibula flaps in vascularized oromandibular reconstruction: Comparison and long-term evaluation. *Head Neck* 1999;21:639-47.
4. Petrovic I, Ahmed ZU, Huryn JM, Nelson J, Allen RJ Jr, Matros E, *et al.* Oral rehabilitation for patients with marginal and segmental mandibulectomy: A retrospective review of 111 mandibular resection prostheses. *J Prosthet Dent* 2019. pii: S0022-3913(18)30910-7.
5. Disa JJ, Cordeiro PG. The current role of preoperative arteriography in free fibula flaps. *Plast Reconstr Surg* 1998;102:1083-8.
6. Caubet Biayna J, Iriarte Ortabe JI, Pueyo J. Reconstruction of a palatal defect with pedicled myomucosal flap of buccinator muscle. *An Otorrinolaringol Ibero Am* 1998;25:263-70.
7. Van Lierop AC, Fagan JJ. Buccinator myomucosal flap: Clinical results and review of anatomy, surgical technique and applications. *J Laryngol Otol* 2008;122:181-7.
8. Wei W, Qiu Y, Fang Q, Jia Y. Pectoralis major myocutaneous flap in salvage reconstruction following free flap failure in head and neck cancer surgery. *J Int Med Res* 2019;47:76-83.
9. Milenović A, Virag M, Uglesić V, Aljinović-Ratković N. The pectoralis major flap in head and neck reconstruction: First 500 patients. *J Craniomaxillofac Surg* 2006;34:340-3.
10. Joshi PR, Saini GS, Shetty P, Bhat SG. Prosthetic rehabilitation following segmental mandibulectomy. *J Indian Prosthodont Soc* 2008;8:108-11.
11. Nair SJ, Aparna IN, Dhanasekar B, Prabhu N. Prosthetic rehabilitation of hemimandibulectomy defect with removable partial denture prosthesis using an attachment-retained guiding flange. *Contemp Clin Dent* 2018;9:120-2.
12. Robinson JE, Rubright WC. Use of guide plane for maintaining the residual fragment in partial or hemimandibulectomy. *J Prosthet Dent* 1964;14:992-9.
13. Desjardins RP. Relating examination findings to treatment procedures. In: Laney WR, editor. *Maxillofacial Prosthetics*. Littleton: PSG Publishing; 1979. p. 69-114.
14. Agarwal S, Praveen G, Agarwal SK, Sharma S. Twin occlusion: A solution to rehabilitate hemimandibulectomy patient-a case report. *J Indian Prosthodont Soc* 2011;11:254-7.
15. Babu S, Manjunath S, Vajawat M. Definitive guiding flange prosthesis: A definitive approach in segmental mandibulectomy defect. *Dent Res J (Isfahan)* 2016;13:292-5.