

Original Research

Evaluation Of Survival Of Microvascular Free Flaps For Mandibular Defects In Craniofacial Surgery: An Original Research

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ABSTRACT:

Introduction: We aim to evaluate the survival of microvascular free flaps for mandibular defects in craniofacial surgery.

Material and methods: We conducted a retrospective study among 178 cases. They type of the defect and the flap used were registered. The complications, survival and the Functional and aesthetic assessments were compared. The $p < 0.05$ was deliberated significant. **Results:** The rate of total flap necrosis involving the ilium and fibula was significantly higher than that of all other materials combined ($p < 0.05$). Regarding deglutition statistical analysis between pairs of soft-tissue-defect groups revealed there were significant differences ($p < 0.05$) between the none and the mucosal groups and also between the none and the through-and-through groups. Regarding speech, there was a significant difference ($p < 0.05$) between the none and the through-and-through groups. Regarding contour, there were significant differences ($p < 0.01$) between the none and the through-and-through groups and between the mucosal and the through-and-through groups. No significant difference was seen in the survival of the various flaps. **Conclusion:** We propose that when the bony defect is lateral, the ilium, fibula, or scapula should be chosen as the donor site, depending on the extent of the soft-tissue defect. When the bony defect is anterior, the fibula is always the best choice. When the soft-tissue defect is extensive or through-and-through with an anterior bony defect, the fibula should be used with other soft-tissue flaps.

Key words: Survival, Microvascular Free Flaps, Mandibular Defects, Craniofacial Surgery.

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INTRODUCTION

Mandibular reconstruction has been challenging reconstructive surgeons for many years, especially once the composite resection procedures for the tongue, jaw, and neck were developed.1 With the arrival of microsurgical free-tissue transfer, many reconstructive surgeons have adopted vascularized bone transfer as a means for avoiding these difficulties. Vascularized bone has developed desirable to nonvascularized bone grafts or alloplastic materials because of its high rate of bone survival and low rate of infection. Osseous flaps for mandibular reconstruction have been developed from

the rib, metatarsus etc. It is generally known that a single kind of osteocutaneous flap cannot resolve the variety of mandibular defects, so a suitable flap should be selected according to the type of bony and soft-tissue defects. Furthermore, double free flaps should be deliberated for cases in which defects are wide or recipient vessels are not readily available.2-5 Along with vascularized bone flaps, free soft-tissue flaps have been important in the progress of the mandibular reconstruction by reviving the use of biomaterials. Different from the regional musculocutaneous and axial cutaneous flaps previously used, free flaps of well-vascularized soft

tissue provide reliable primary wound healing, reducing the risk of plate exposure. Furthermore, new biomaterials used in the plate, such as titanium, have decreased the longstanding problems of implant loosening and fracture. However, few retrospective studies have compared the results of these options. We aim to evaluate the survival of microvascular free flaps for mandibular defects in craniofacial surgery.

MATERIAL AND METHODS

We conducted a retrospective study among 200 cases. They type of the defect and the flap used were registered. The complications, survival and the Functional and aesthetic assessments were compared. The $p < 0.05$ was deliberated significant. Complications encompassed total flap necrosis, partial flap necrosis, major fistula formation that required surgical treatment and minor fistula formation that

healed without surgical intervention. Survival included the success after minimum of three months and the restoration of the function. Function was assessed by the patient's abilities to swallow and speak, whereas aesthetics were assessed with regard to the restoration of the mandibular contour. Restoration of the mandibular contour was classified as satisfactory, acceptable, or unsatisfactory. To evaluate the postoperative results, points were assigned to each classification of deglutition, speech, and mandibular contour.

RESULTS

The total number of the cases studied was 178 between the years 2010-2020. Extent of the bony resection and the choice of the flap are shown in table 1.

Table 1: Extent of the bony resection and the choice of the flap

HCL Classification*	Rib	Radius	Ilium	Scapula	Fibula	Implant	Total
L	2	1	10	10	14	17	54
H	0	0	2	0	0	0	2
LC	4	0	11	30	9	16	70
HC	0	0	2	1	0	0	3
LCL	5	0	11	10	11	12	49
TOTAL	11	1	36	51	34	45	178

* From the HCL classification of reconstructible mandibular defects by Jewer and Boid.⁴¹ L, lateral segment without a condyle; H, lateral segment containing a condyle; C, central segment including both canines.

The rate of total flap necrosis involving the fibula was higher than that of all other materials (rib, radius, ilium, fibula, and implant) combined (determined by the chi-square test; $p < 0.05$). The overall rate of plate removal that resulted from the exposure or fracture of the late was 35.6 percent (16 of 45 cases). **Table 2**

Table 2: Complications observed

Complication	No. of Cases/Total No. of Flaps or Implants						Total
	Rib	Radius	Ilium	Scapula	Fibula	Implant	
Total flap necrosis	0/11	0/1	6/36*	2/51	5/34†	3/45	16/178
Partial flap necrosis	1/11	0/1	1/36	2/51	2/34	0/45	6/178
Major fistula formation	3/11	0/1	2/36	2/51	2/34	5/45	14/178
Minor fistula formation	2/11	0/1	2/36	6/51	5/34	4/45	19/178

* The rate of total flap necrosis involving the ilium was significantly higher than that of all other materials combined (determined by the chi-square test; $p < 0.05$).

† The rate of total flap necrosis involving the fibula was significantly higher than that of all other materials combined (determined by the chi-square test; $p < 0.05$).

There was no significant difference in the various sites and sites for the survival of the flaps. Regarding deglutition and the contour of the reconstructed

mandible, the LCL points are lower than those for other groups, although there was no statistical difference. Regarding speech, there were no

significant differences between pairs of bony-defect groups. Regarding deglutition, statistical analysis between pairs of soft-tissue defect groups (none, skin, mucosal, and through-and-through) revealed there were significant differences ($p < 0.05$) between the none and the mucosal groups and also between the none and the through-and-through groups.

Regarding the contour of the reconstructed mandible, there were significant differences ($p < 0.01$) between the none and the through-and-through groups and between the mucosal and the through-and-through groups. **Figure 1** Regarding speech, there was a significant difference ($p < 0.05$) between the none and the through-and-through groups. **Figure 2**

Figure 1: Reconstruction of the mandible for the various defects.

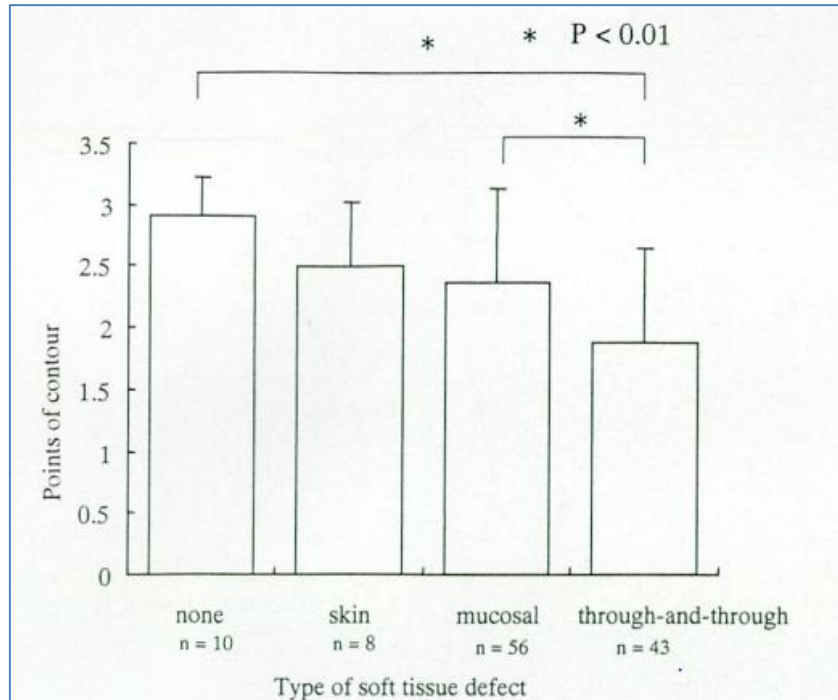
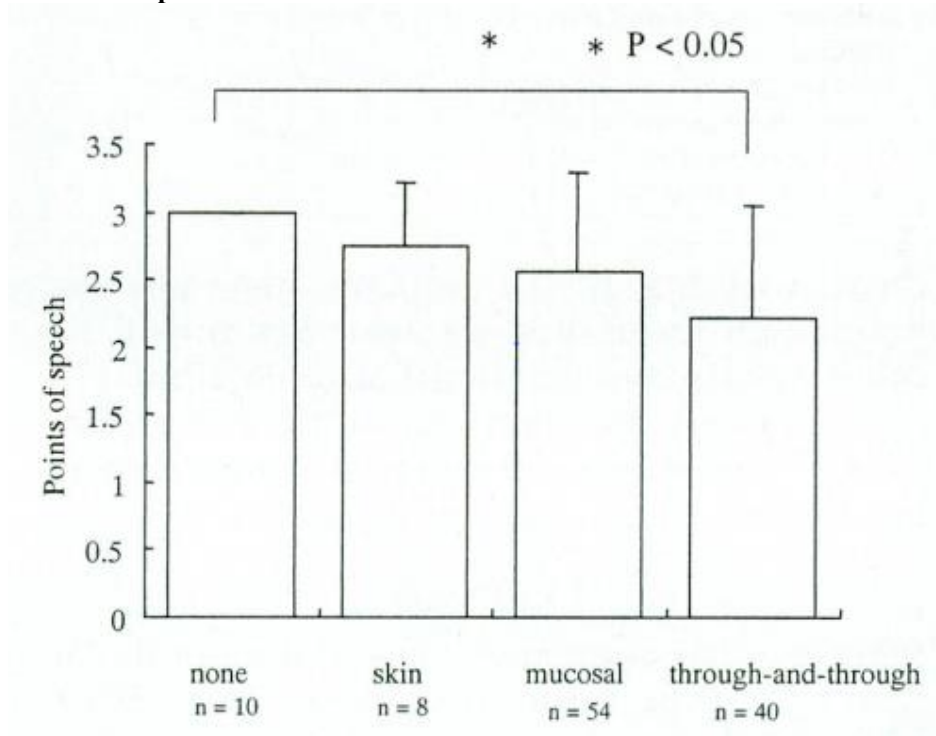


Figure 2: Points for the speech for the various defects.



DISCUSSION

In our study we found that in three cases, the cause of total flap necrosis involving the fibula was postoperative thrombosis resulting from secondary infection occurring in the dead space. Thus a double free flap transfer is frequently necessary when the soft-tissue defect is extensive.⁶⁻⁹ On the other hand, our data showed a small number of complications with the use of the scapula. Some authors report that the quantity and the quality of the scapula are low and it does not accept osseointegration. Nevertheless, there were no fracturing of the transferred scapula as a result of bone weakness, and at least one osteotomy was possible without devascularization. Another disadvantage of the scapular flap is that it requires repositioning the patient. However, double free flaps also require time, and the morbidity of the soft-tissue flaps accompanying the osseous/osteocutaneous flap must be deliberated.¹⁰⁻¹³ We propose that the composite scapular flap is better than a combination of the fibula and the soft-tissue flap for the patient whose mandibular defect is lateral or hemimandibular and whose soft-tissue defect is extensive or through-and-through.^{14,15} One of the advantages of the ilium is its large amount of bone with the ability to readily accept osseointegration. The ilium is easy to apply to the mandible as its shape resembles that of the hemimandible. Nevertheless, the skin flaps defective, although the internal oblique iliac crest osteomyocutaneous flap has been developed. The ilium, accompanied by the forearm flap, is a good choice for lateral mandibular construction as the two components can be sequentially linked.¹⁶ Functional and aesthetic results must be also deliberated in flap selection. Pliability of the skin used as the oral lining is one of the major factors affecting postoperative function. Some authors report that skin flaps accompanying the radius and the fibula are more pliable than those accompanying the ilium or the scapula. However, any skin flap used for intraoral reconstruction may lose its pliability, and post-operatively, there is little difference between flaps.^{17,18} From our data, there was no particular relationship between the survival and the choice of flap, although our results do not isolate the effect of the skin pliability from each donor site. The functional and aesthetic results of the implants were not inferior to those of the vascularized bones. According to Boyd et al.,⁶ the anterior defects fail more frequently than defects that do not cross the mid-line. Thus the use of the implants with free soft-tissue flaps is preferred in patients with lateral bony defects and whose prognoses are so poor that osseous-flap harvesting is contra-indicated by donor-site morbidity.

CONCLUSIONS

We propose that when the bony defect is lateral, the ilium, fibula, or scapula should be chosen as the donor site, depending on the extent of the soft-tissue defect. When the bony defect is anterior, the fibula is always

the best choice. When the soft-tissue defect is extensive or through-and-through with an anterior bony defect, the fibula should be used with other soft-tissue flaps. The goals of mandibular reconstruction are the restoration of oral function and the restoration of aesthetic contour and the survival. Improvement of reconstruction methods is an effective way to achieve those goals. Retrospective analysis of the available methods may suggest areas for methodological improvement.

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