

# Microvascular Flap in Oral Cavity Reconstruction : A Functional Evaluation

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## INTRODUCTION

Microvascular surgical techniques are indispensable for modern reconstructive surgery. In particular, they are extremely effective in covering expanded and three dimensionally complicated defects, and they have contributed greatly to the postoperative cosmetic and functional restoration of the oral cavity<sup>1)</sup>. These advances in reconstructive surgery have not only improved the results of ablative surgery, but have also facilitated rehabilitation.

The aim of the current retrospective study was to evaluate the long-term results of microvascular flaps used for the reconstruction of oral cavity with regard to sensory function, histological observation and performance status.

## MATERIALS AND METHOD

We performed microvascular flaps in 100 patients between 1988 and 1998. The patient age ranged from 24 to 81 years-old, and the average age was 60.2 years-old. There were 68 males and 32 females. Most cases were classified by TNM as squamous cell carcinoma of stage III or higher, and underwent ablative surgery including the neck dissection and microvascular reconstructive surgery at the same time (Table 1). The mean postoperative interval was 50 month, ranging from 1 to 120 months.

The measurements of sensibility involved the

determination of touch test (Semmes-Weinstein monofilament) and two-point discrimination, and the testing of thermal sensibility (Pain thermometer, UDH-104, UM Inc., Japan) and cutaneous blood flow (Laserflo BPM 2, TSI Inc., St. Paul, MN).

Histologic evaluation of biopsy specimens from microvascular flaps was made one month to 75 month after intraoral reconstruction. The hematoxylin and eosin stain, and Azan stain were used.

Interview procedure was conducted to ascertain the degree of articulation and mastication. The Performance Status Scale introduced by List<sup>2)</sup> was used assess functions following microsurgery (Table 2). This scale evaluated the functional recovery of oral cavity cancer patients by asking them a wide range of questions related to three general issues: dining together, clarity in conversation, and meal contents.

Patients	100	Type of Flap	
Male:Female	2.2:1	Rectus abdominus	6
Average Age	60.2	Forearm	94
Tumor Site		Timing of Reconstruction	
Tongue	48	Immediate	97
Gingiva	20	Secondary	3
Oral floor	12		
Buccal mucaosa	10		
Palate	10		

Table 1. Patients' Characteristics

### Eating in public

- 100 No restriction of place, food, or companion (eats out at any opportunity)
- 75 No restriction of place, but restricts diet when in public (eats anywhere, but may limit intake to less messy foods)
- 50 Eats only in presence of selectef persons in selected places
- 25 East only at home in presence of selected persons
- 0 Always eats alone

### Understandability of speech

- 100 Always understandable
- 75 Understandable most of the time; occasional repetition necessary
- 50 Usually understandable; face-to-face contact nessary
- 25 Difficult to understand
- 0 Never understandable; may use written communication

### Normalcy of diet

- 100 Full diet (no restrictions)
- 90 Peanuts
- 80 All meat
- 70 Carrots, celery
- 60 Dry bread and crackers
- 50 Soft, chewable (e.g., macaroni, canned/soft fruits, cooked vegetables, fish, hamburger, small pieces of meat)
- 40 Soft foods requiring no chewing (e.g., mashed potatoes, apple sauce, pudding)
- 30 Pureed foods(in blender)
- 20 Warm liquids
- 10 Cold liquids
- 0 Nonoral feeding (tube fed)

Table 2. Performance Status Scale for Head and Neck Cancer Patients

## RESULTS

Figure 1 shows the results of the SW-meter and the two-point discrimination obtained for the flaps and mucosa surface (healthy mucosa opposite the grafted region). In Figure 2, the values for thermal sensibility obtained from the different sites of measurements are listed, and the results of laser Doppler flowmetry of cutaneous blood flow are shown.

As the histological findings indicated, we conducted long-term chronological observations of grafted flaps. We expressed changes to the grafted

flap in numeric terms, classified by epithelial tissue and subepithelial connective tissue (Figure 3). It reveals that the flap tissue begins mucosa-like change about ten months after grafting.

The higher the score, the better the functional recovery, with a score of 100 representing normal functions. The Figure 4 shows the distribution of scores following microsurgery.

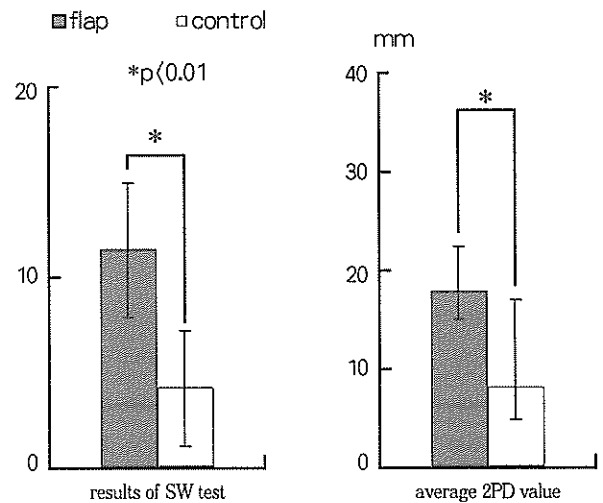


Figure 1. The measurements of SW test and 2 PD value are showed. As a control, we determine the function of the healthy region opposite the resected region.

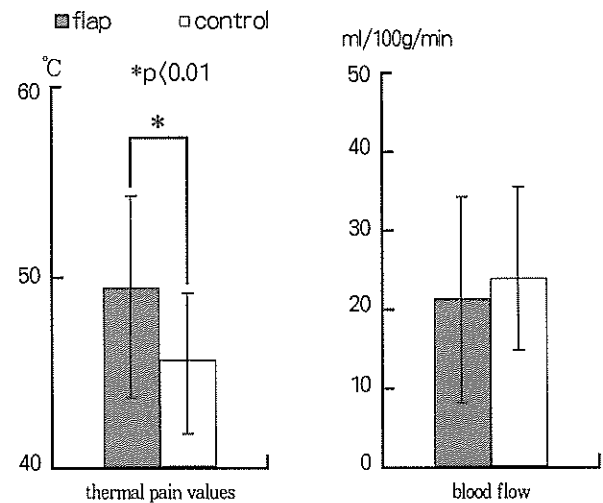


Figure 2. The measurements of thermal pain value and blood flow are showed. The blood flow through the oral cavity mucosa is higher than that through the skin.

		<i>Normal Skin</i>	Postope. 1M	Postope. 6M	Postope. 10M	Postope. 23M	Postope. 32M	Postope. 75M	<i>Normal Oral Mucosa</i>
Epithelium	Orthokeratization	+	+	+	+	-	-	-	-
	Cornified layer	++	++	+	++	-	-	-	-
	Stratum granulosum	++	++	+	+	-	-	-	-
	Melanin pigmentation	++	+	+	±	-	-	-	-
	Epithelial peg	+	+	±	+	+	-	-	+
	Acanthosis	-	-	-	-	+	±	±	+
	Parakeratinization	-	-	-	-	+	+	+	+
Connective tissue	Capillary	++	+	+	±	+	±	±	++
	Fibroblast	+	++	+	±	±	±	±	++
	Collagen fiber	++	+	±	+	±	±	±	-
	Hair follicle	++	+	±	±	±	-	-	-
	Sebaceous gland	++	+	±	±	-	-	-	-

++ : a lot, + : exist / normal quantity. ± : scanty, - : lack

Figure 3. Recording histological findings for the forearm on the left end axis, and those of the oral mucosa on the right end axis, we plotted histological findings for our subjects between the two axes.

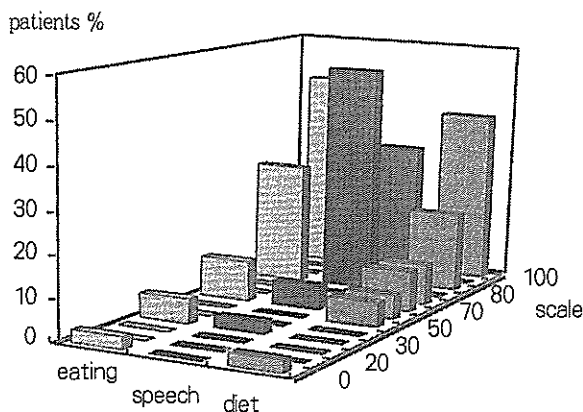


Figure 4. The distribution of scores following microsurgery is showed.

## DISCUSSION

The restitution of the cutaneous sensibility in microvascular flaps was incomplete after an interval of interval of 50 months, because temperatures near maximum were found during testing of thermal sensibility, and nonreproducible values for two-point discrimination were registered in most patients. The results of this sensory function suggest that the pattern of cutaneous sensibility and blood flow in

flaps is maintained or reestablished. In general peripheral nerve fibers have a good regenerative capacity. When the cut ends are left in connective tissue, the regenerating axons are rapidly caught within the scar. The basal lamina scaffolds of Schwann cells derived from the peripheral nerve are the effective pathway not only for the initial axonal elongation to skin but also the maintenance and maturation of regenerating axon<sup>9)</sup>.

Based on our histological findings, the mucosa-like change of grafted flaps is thought to result from an inflammation. Within the grafted flap, there is a possibility that histologically conflicting reactions — i.e., thickening and shrinkage — may be caused by such inflammatory change. Environmental factors acting on the grafted flap are thought to play an important role in the inflammation process. These environmental factors include moisture induced by saliva, bacterial floral change, mechanical and chemical stimuli associated with food ingestion, and *Candida* infection. Although it is genetically impossible for skin to change into mucosa, it is possible for the skin to resemble the mucosa very closely.

Finally, the Performance Status Scale introduced by List was used to assess functions following microsurgery. The patients underwent reconstruction by microsurgery more than one year ago. The rectus abdominis muscle flap were performed total tongue resection and mandible resection. One patient scored zero for dining together and contents of diet, but this patient received a rectus abdominis muscle flap, and the mandible had not yet been reconstructed. The scores of other patients were low due to the fact that reconstruction was insufficient, and one patient suffered from depression. The Performance Status Scale was used to conduct analyses by location of reconstructive surgery. All patients underwent surgery using a forearm flap to reconstruct the tongue, the gingiva, or the buccal mucosa. Some patients who underwent buccal mucosa reconstruction could not open their mouth sufficiently, so their scores were lower. The clarity of conversation recovered favorably in most patients, and the degree of recovery was generally related to

the time since surgery. Although 90% of the patients who underwent tongue reconstruction had an overall score of greater than 75, recovery was slower for those patients who underwent gingival reconstruction. This may be attributable to the loss of teeth and insufficient mandible reconstruction.

The success of reconstructive surgery can be an indicator of postoperative recovery. Reconstructive surgery is performed to improve the life quality of patients. The application of microsurgery has enabled morphological and functional recovery.

## REFERENCE

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