Cancer of the buccal mucosa and retromolar trigone

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Great advances in the treatment of cancer of the buccal membrane and retromolar trigone have occurred as a result of precise staging by modern radiological technologies and intimate cooperation among head and neck surgeons and microvascular reconstructive surgeons. In this article, the oncologic principles, surgical approach, techniques for resection and reconstruction, and postoperative management issues are discussed.

Squamous cell carcinoma (SCC) of the buccal mucosa and retromolar trigone is a common malignancy of the head and neck in Taiwan. The possible etiology include betel quid chewing, cigarette smoking, and alcohol consumption. Approximately 85% of the patients with oral cancer in Taiwan are regular users of betel quid. Leukoplakia and erythroplakia may appear on the surface of areas of submucosal fibrosis and then become invasive SCC. It is common that invasive SCC is surrounded by leukoplakia and erythroplakia, presenting surgeons with a dilemma in determining a good surgical margin. SCC arising from buccal membrane and retromolar trigone tend to spread superficially and may involve adjacent anatomic sites such as the mandibular or maxillary gingiva relatively early. They may further involve the bone of the mandible or maxilla. The incidence of metastasis to regional lymph nodes is approximately 40%, with half of them being clinically occult. However, distant metastasis is rare. As in all cancer of the upper aerodigestive tract, SCC arising from buccal membrane and retromolar trigone are notorious for having a second primary SCC generally in the upper aerodigestive tract. The incidence of multiple primary SCC varies from 3% to 35%, depending on the study cited.

Anatomy of buccal membrane and retromolar trigone

The buccal membrane includes all of the mucosa of the inner surface of the cheek from the mouth angle (lips) to the attachment of the mucosa of the upper and lower alveolar ridges and the pterygomandibular raphe, which is a continuation of the retromolar trigone. Because no distinct barrier exists separating the buccal membrane and retromolar trigone, SCCs arising from these areas tend to invade one another. However, SCC arising from the retromolar trigone tends to involve the bone of maxilla or mandible early, which is a late occurrence in the SCC of the buccal membrane.

The buccal mucosa is important for holding food against or between the primary masticators. The buccal membrane, along with the upper and lower lips, helps to retain saliva within the oral cavity. In the event of loss of the buccal or lip function, the patient may drool food and become unable to chew efficiently. The buccal membrane is elastic and redundant for full mastication during opening and closing of the mandible. The buccinator muscle lies beneath the buccal membrane and retromolar trigone are notorious for having a second primary SCC generally in the upper aerodigestive tract. The incidence of multiple primary SCC varies from 3% to 35%, depending on the study cited.
provide contrast. Special coronal reconstructions of dedicated mandible CT scans (dental CT scan) are particularly useful in imaging the mandible, especially in assessing cancer invasion or measuring the angle or distance between individual teeth to determine the mandibulectomy site. Magnetic resonance imaging (MRI), with its superb soft tissue resolution, is reserved for cases with masticator space or infratemporal fossa invasion. The depth of cancer invasion is difficult to decide clinically. If the buccal membrane lesion can be moved over the cheek skin, then the cheek skin may be preserved during surgery. However, if CT or MRI reveals any evidence of involvement of the platysma muscle or the superficial aponeurotic system, then resection of the involved cheek skin becomes inevitable. The same situation applies to invasion of the gingival and preservation of the mandible. If a lesion just touches or abuts the mandible, and can be moved over from the underlying bone, then a marginal mandibulectomy is adequate. Segmental mandibulectomy is only indicated for gross invasion of the cortex or infiltration of bone marrow. However, in SCC of the retromolar trigone, because only limited soft tissue exists above the mandible, invasion of the mandible is common and the likelihood of segmental mandibulectomy increases. Another approach is simultaneous medial mandibulectomy and marginal mandibulectomy, which deprives the mandible of blood supply and may give way to osteoradionecrosis when patients subsequently undergo radiation therapy.

Treatment goals

The goal of the surgeon is to completely remove the primary tumor of the buccal membrane and the retromolar trigone and/or its regional nodes, while preserving or restoring the function and cosmesis for the patient.

Resection principles

Resections depend on the extent of the tumor’s superficial spread and infiltrative depth. Generally, a 1.5- to 2-cm superficial resection margin is adequate. However, the depth of the resection can vary significantly. Generally, for buccal cancer involving only the superficial mucosa, part of the buccinator muscle must be included as a deep margin. Cancers involving the buccinator muscle, platysma muscle, or superficial aponeurotic fasciae should include these structures in the specimen. For deeper lesions involving the platysma muscle or superficial aponeurotic system, resection of the skin of the cheek becomes inevitable. Finally, for buccal membrane cancer penetrating through the cheek skin, a generous 2- to 3-cm skin surface margin around the buccal cancer is mandatory.

Marginal mandibulectomy is reserved for lesions that abut the mandible or have eroded the cortex, and it can take the form either of a horizontal marginal mandibulectomy for buccal and gingival involvement or of a vertical posterior marginal mandibulectomy for retromolar trigone and masticator space involvement. In cases of extensive cortical invasion or bone marrow infiltration, a segmental mandibulectomy to include all the marrow space in the hemimandible is required, because there is no barrier in the marrow space once it is involved. That is, a segmental mandibulectomy is required from the paramidline to the subcondylar area. Moreover, for retromolar trigone cancer with invasion of the masticator space, besides regular posterior marginal mandibulectomy, an inferior maxillectomy to remove maxillary tuberosity, floor of the maxillary sinus, and part of the pterygoid plate is required. If the cancer extends upward to involve the infratemporal fossa, a separate preauricular infratemporal approach involving partial removal of the zygoma may be included to achieve superior exposure.

Preoperative preparation

The preparation for surgical exposure begins in the outpatient clinic. Patients are instructed to follow a strict preoperative oral hygiene program by using dental floss and 0.1% chlorohexidine oral solution to gargle after every meal. Special dental consultation should be organized in cases of periodontitis or extensive dental caries.

Oral flora specific intravenous antibiotics are administered preoperatively. Preoperative Doppler monitoring of the donor vessels should be performed and venous puncture in these vessels should be forbidden if reconstruction with a free flap is planned.

Surgical technique

The patient should be placed supine on the operating table with the neck hyperextended. The eyes should be protected with lubricant and taped with cotton pads. The entire neck and face up to the eyes should be prepared and draped in sterile fashion. Typically, general anesthesia is established through nasoendotracheal intubation. If necessary, especially in patients with trismus, fiberoptic-guided intubation can be employed. Generally, tracheostomy is preserved for larger posterior lesions that require resection of the oropharyngeal mucosa and a big flap to cover the defect, which may result in significant postoperative edema and swelling of oropharynx.

The appropriate unilateral or bilateral neck dissection is performed. Various methods of skin incision may be used for neck dissection and should be incorporated into the approach used for oral tumors. Generally, a Conley incision is used in the oral and upper lip-splitting approach while a lower cheek flap is coupled with a Crile incision.

Approach

**Per oral approach (Figure 1)**

This approach is reserved for smaller T1 or T2 lesions, which are easily accessible. The small buccal membrane cancer is exposed via a side-mouth gag or a self-retaining retractor. If further exposure is needed, an Army-Navy retractor can be placed in the region of oral commissure.
Appropriate resection can be performed with a 1.5- to 2-cm superficial margin around the lesion. The resection depth depends on the invasion of the buccinator muscle, including whether it is superficial, involved, or through the muscle, as described previously.

Upper or lower cheek flap approach

The cheek flap (labiomy) approach may be upper (Figure 2) or lower (Figure 3), depending on the precise location of the tumor. It is particularly useful for patients with severe trismus or posteriorly located tumor such as retromolar trigone cancer. The lower lip is grasped and stretched and then an incision is made in the midline to split the lip. Electrocautery, with the cutting current, is used to incise the lip via the mucosa and underlying musculature until it meets the mandible. The skin incision then extends laterally along an upper neck skin crease. Subsequently, the mucosal incision turns laterally along the buccogingival gutter, leaving approximately 5 mm of buccal mucosa to the mandible to facilitate closure. All of the soft tissue attachments of the cheek are raised from the mandible until it meets the buccal tumor. The mental nerve can be preserved, especially in small or anteriorly located lesions. Appropriate resection can then be performed based on the principles described in the section on resection principles.

Lower lip splitting and marginal mandibulectomy approach (Figure 4)

This approach is best employed for patients with posterior retromolar trigone cancer who also present with trismus. This approach may also be combined with a posterior marginal mandibulectomy (Figure 5A) for horizontal ra-
mus or with vertical mandibulectomy (Figure 5B) for ascending ramus of mandible invasion by cancer. A midline lower labiotomy with lower cheek flap development is performed. The cheek flap is reflected until it meets the buccal tumor. The buccogingival mucosa incision is carried down to the mandible and exposes its lateral cortex. Appropriate mucosal incision, 1.5- to 2-cm around the lesion of the buccal membrane or retromolar trigone is performed before any ostectomy. The tumor is elevated off the underlying soft tissue until it meets the mandible. A marginal mandibulectomy can be performed with a power saw to include the alveolar process and buccal plate of the mandible. This will require the bone to be cut in an oblique fashion. Such oblique cutting enables mandibular osteotomy to include the buccal plate and the alveolar process of the mandible. The soft tissue tumor and mandibulectomy specimen then can be removed in one piece.

Paramidline mandibulotomy ± marginal mandibulectomy (Figure 6)

Further exposure of the retromolar trigone, mouth floor, and soft palate can be achieved via a paramidline mandibulectomy. Paramidline mandibulotomy is performed via an upper straight vertical osteotomy at least 15 mm in length between the lateral incisor and canine, connecting with an inferior notched osteotomy. The tip of the lower notched osteotomy points toward the symphysis. The paramidline mandibulotomy can be performed anterior to the mental foramen and can preserve cheek skin sensation. After mandibulectomy, the two segments of mandible are retracted to expose the mylohyoid muscle on the lesion side, and the mylohyoid muscle is transected. The approach can preserve the geniohyoid and genioglossus muscles. The mandible segment on the lesion side is swung laterally to expose the mouth floor, retromolar trigone, soft palate, tonsil, and tongue base. Appropriate resection can be performed under direct vision in this approach. In cases of simultaneous medial mandibulotomy and marginal mandibulectomy, the vascularity of the mandible is best preserved by retaining the attachment of the cheek soft tissue to the mandible bone, or by using muscle fiber from the free soft tissue flap to wrap the nude mandible and thus prevent osteoradionecrosis.

Upper lip splitting (Figure 2)

Upper lip splitting can involve only an upper lip split or can extend to a full Weber Ferguson incision. In an upper lip splitting approach, the philtrum of the upper lip is grasped, stretched, and divided from the vermilion border up to the columella. The incision may further turn laterally along the nasal vestibule and then follow the ala of the nostril along the lateral aspect of the nose. The incision then continues downward to expose the anterior aspect of the maxilla by dividing the orbicularis oris muscle. A mucosal incision then is conducted along the gingivobuccal sulcus, leaving 5 mm of mucosa attached to the maxilla to achieve better closure. The upper cheek flap then can be elevated off the anterior surface of the maxilla to the maxillary tuberosity (Figure 7). Next, the inferior maxillectomy is performed with a power saw. The maxillectomy may include part of the anterior surface of the maxilla, the maxillary sinus floor and maxillary tuberosity. A curved osteotome is used to
separate the posterior aspect of maxillary tuberosity from the pterygoid plate.

Segmental mandibulectomy (paramidline to subcondyle) (Figure 8)

Segmental mandibulectomy is indicated in cases of gross cortical invasion or evidence of bone marrow infiltration of the mandible. After a lower labiotomy with cheek flap development to the anterior edge of the parotid gland and masseter muscle, a paramidline mandibulotomy is performed with a power saw between the lator incisor and the canine. The mandible segment on the lesion side is then swung laterally. The mouth floor mucosa and mylohyoid muscle are divided. Appropriate mucosal incision around the superficial tumor of buccal membrane and retromolar trigone can be performed at this stage. Then, the masseter muscle is detached from the ascending ramus of the mandible up to the scaphoid fossa. Stretching the divided mandible laterally allows the stylomandibular ligament and pterygoid muscle to be released from the inner aspect of the mandible. The inferior alveolar neurovascular bundle is identified before entering the lingual and inferior alveolar canal and is ligated and divided. The segment of mandible is further retracted down to expose the coronoid process and the temporalis muscle is detached. The segment of mandible thus is left attached only to the condyle. A malleable retractor is inserted beneath the mandible at the level of the scaphoid fossa to protect the internal maxillary artery from iatrogenic injury. Final osteotomy is then performed with a power saw at the base of the condyle to remove the hemimandible. The soft tissue tumor and resected mandible segment can be removed in one piece.

Reconstruction

The aim of reconstruction in the buccal and retromolar trigone mucosal defect is to restore the function and appearance of the area with surgical defect. Reconstruction of buccal defects with local tissue yields the better outcome when it is available in adequate quantity. In rare instances, the surgical defect after buccal cancer resection can be closed primarily. Patients with buccal cancer in Taiwan usually have a betel quid habit, producing extensive submucosal fibrosis, which prevents any kind of mucosal advancement or rotation. However, local tissue is not the best choice for reconstruction when the tumor is advanced, the defect is big, and the area has been radiated. The anticipated defect should be analyzed for size and missing parts. Risk factors, including advanced age, smoking, obesity, alcoholism, and previous radiation are evaluated for predicting the occurrence of postoperative complication. Most reconstruction options, including simple skin grafting and local flaps to free flap transfer may be familiar to the reconstructive surgeon. The reconstruction method is selected based on the patient’s general condition, the prognosis of the disease, the size and component of the defect, and the reconstructive method available; it is performed at the same sitting. The success rates of microsurgery in several large series have been reported as high as 96% to 99%.

General reconstructive surgical consideration

The patient is placed in a supine position with silicone gel padding for preventing pressure sores and peripheral neuropathies. The lower extremity is elevated and protected with compression boots or elastic bandage to prevent deep vein thrombosis. The patient’s core temperature should be monitored and protected with compression boots or elastic bandage to prevent deep vein thrombosis. The patient’s core temperature should be monitored and protected with warm blankets and air conditioning. The systemic blood pressure is better kept above 110 mm Hg, especially when the arterial anastomosis is finished and the vessel clamp is released, to keep the flap adequately perfused.

Reconstruction technique

Skin graft

Split thickness skin graft can be applied to cover smaller buccal defects. Proper anchorage and pressure is essential for successful outcomes. However, in betel nuts chewers, the submucosal fibrosis provides a poor vascularity tissue bed, which limits the use of split thickness skin graft in larger lesions.
Pedicled buccal fat pad flap (Figure 9)\textsuperscript{17}

This specific type of reconstruction is particularly useful for small to moderate size defects, and is ideal for defects located posteriorly.\textsuperscript{17}

The buccal fat pad can be exposed safely through an intra-oral approach. We prefer a horizontal incision beginning 5 mm above the second molar, cutting through the buccinator muscle, and extending 2 cm posteriorly. The buccal fat pad has a loose surrounding fascia; once this overlying fascia is incised, the buccal fat pad easily pops out. When developing the buccal fat pad, it is important to dissect and stay on this fascial plane and avoid disturbing the supplying vascular pedicles. Branches from the internal maxillary artery and superficial temporal artery run into the buccal fat pad in the posterior and superior directions; they are easily preserved. However, the facial artery comes from below and is vulnerable to injury during the resection. Some small arterioles and veins are readily visible within the buccal fat pad and should also be carefully preserved. After dissecting the buccal fat pad from the surrounding tissues, the flap is grasped with a vascular forcep, gently pulled out from its bed, and advanced into its new position through either direct rotation or tunneling under the mucosa. Finally, the buccal fat pad is sutured in place and left uncovered, and an appropriate bolster or splint is applied for immobilization and protection.

Mucosal defects over the buccal and retromolar trigone area with a diameter up to 5 cm can be adequately covered with a buccal fat pad flap. Mucosal defects exceeding 5 cm in diameter increase the suture tension, and thus flaps other than buccal fat pad should be considered in such cases.

The epithelialization is generally complete within 15 to 20 days. Patients can take a liquid or soft diet on day 7 after surgery. It is important for patients to begin open-mouth exercises soon to prevent unnecessary buccal contracture.

Regional flap

Some regional myocutaneous flaps, such as platysma myocutaneous flap, nasolabial flap, temporalis muscle flap, and forehead flap, can provide coverage for small to medium defects.

Free flap

Recipient site preparation

A green-tower template was tailored according to the buccal mucosal defect, with a V-shape cut for the direction of the pedicle route after tumor resection. This tailored template was taken to be sterile and used for donor flap skin paddle design. The buccal and/or trigone defect was irrigated and coagulated. One or two Jackson–Pratt suction drains were placed in the neck in the most dependent part to better clean the microsurgical operation field with irrigation and suction. There are 4 sets of recipient vessels available for end-to-end microsurgical anastomoses on each head and neck area. There are also external carotid artery and external and internal jugular vein available for end-to-side anastomoses. The most commonly used recipient vessels are the superior thyroid artery and vein because they have the convenient location and size matching to most donor flaps.\textsuperscript{27} The facial artery and vein are the second most commonly used recipient sites. The transverse cervical vessels are the other choice when the patient has local recurrence. The superficial temporal vessels are quite useful in patients who have had previous radiation or in patients with a neck dissection, because the temporal area was usually spared of radiotherapy. The superficial vessels are usually small and surrounded with dense fibrotic tissue. The dissection of these vessels is better performed under microscopy. If end-to-end anastomoses are not possible, end-to-side anastomosis of the external carotid artery and/or internal jugular vein is the alternative for the pedicle. The use of end-to-side internal jugular vein has been reported to have a superior outcome to the external jugular vein end-to-end fashion.\textsuperscript{28} In the case of previous neck dissection, the thrombosis rate for internal jugular vein may be up to 25%.\textsuperscript{29,30} The contralateral superior thyroid vessels and facial vessels may be used in the patients that have been radiated or who have had previous neck dissection. The vein graft may be needed in these cases; however, it can be avoided with careful preoperative planning and preservation of a longer donor pedicle.

Donor flap selection

Free flap transfers play a dominant role in head and neck reconstruction because there is a robust blood supply of the flap, free inset to fit the defect, and wide availability of different tissue. The common free flaps for head and neck reconstruction include radial forearm flap,\textsuperscript{31-42} rectus abdominis myocutaneous flap,\textsuperscript{40-43} anterolateral thigh perforator/myocutaneous flap,\textsuperscript{44-53} and fibula osteoseptocutaneous (OSC) flap.\textsuperscript{41,42,54-58} Other free flaps reported in head and
neck reconstruction were latissimus dorsi myocutaneous flap, iliac osteocutaneous flap, scapular osteocutaneous flap, omentum, jejunum flap, colonic flap, and lateral arm flap.

**Dissection of radial forearm flap**

The nondominant hand is usually selected for the donor site. The pulse of the distal radial artery is palpated at two points, and a line is drawn between these two points as the axis of the radial artery. The skin paddle is designed as the template with its axis parallel to the distal radial artery. The selected forearm is placed under tourniquet to provide a bloodless operative field. Flap dissection begins at the radial margin in the subcutaneous plane above the fascia and continues toward the flexor carpi radialis tendon and brachioradialis tendon. Because the concomitant veins of the radial artery have adequate venous drainage, the cephalic vein, as well as the branches of the superficial radial nerve and the frequently occurring thenar branch of the antecubital nerve, is preserved. Flap elevation proceeds to ligate the distal end of the radial artery and two concomitant veins without injury to the deep layer of the conjoin forearm fascia (Figure 10). The ulnar margin is then incised and elevated to reach the pedicle. The pedicle is dissected out with meticulous ligation of the small branches of radial vessels with bipolar coagulation or hemoclips. The pedicle, with a strip of superficial layer of conjoin fascia, septocutaneous perforators, and frequently the lateral antecubital nerve, is elevated in continuity with the skin paddle.59,60 The skin incision is extended from the proximal flap margin to the required length. The brachioradialis is hooked laterally and the pedicle is traced proximally to the bifurcation of the ulnar artery. The radial artery and two concomitant veins are free from surrounding tissue 2 cm in length. The pedicle is then divided and the flap is transferred to the recipient site for further inset. The forearm fascia and the deep layer of the conjoin tendon are well preserved (Figure 11). The donor site defect is closed directly (<3 cm in width) or with a skin graft (>3 cm in width).60 A split thickness skin graft revealed a 98.4% take rate, and a full thickness skin graft a 84% take rate, respectively.60 The suprafascial dissection of the radial forearm flap may avoid impairment of range of motion and strength of the donor hand.60

**Dissection of anterolateral thigh flap**

The left thigh is usually selected as the donor site. A line drawn from the anterior superior iliac spine to the lateral border of the patella is the axis of the flap. A 5-cm circle around the midpoint of this line is the most common location of the myocutaneous perforators. The pencil ultrasound Doppler is used for mapping the locations of the perforators. Preoperative color Doppler may be helpful in the planning of this flap.61 The maximal flap territory is 20 × 40 cm.52 The pedicle length is 6 to 20 cm.52 The skin paddle of the flap is designed as the template with the proper direction of the pedicle. The skin incision is made at the medial border of the flap. The incision is deepened to the subcutaneous tissue and fascia. Either myocutaneous or septocutaneous flap...
perforators are identified. The rectus femoris muscle is medially retracted with fishhooks, and the pedicle descending branch of the lateral circumflex femoral vessel is then exposed. The connection between the perforators and the pedicle is identified and dissected (Figure 12). In cases of the perforators entering the transverse branch of the deep femoral vessel, the dissection of the pedicle should trace more proximally. The intramuscular dissection, usually 2 to 6 cm in length, may be continued in the myocutaneous perforators and only skin paddle required (Figure 13). This is a so-called perforator flap dissection. Only one perforator may nourish the entire anterolateral thigh perforator flap. The anterolateral thigh flap may be thinned to 3- to 5-mm thickness if necessary.50,52,62,63 The anterolateral thigh flap may be applied to large buccal and cheek through-and-through defect (Table 1). The perforators may be included in part of the vastus lateralis muscle together without intramuscular dissection as the anterolateral myocutaneous flap. The anterolateral thigh myocutaneous flap may be thinned to 3- to 5-mm thickness if necessary.50,52,62,63 The anterolateral thigh flap is dissected without foot flexion and extension muscle component to increase the flexibility of the flap inset according to the technique described by Wei et al.64-66 The leg is under sterile tourniquet. The skin incision is made at an anterior aspect to identify the septocutaneous perforators. The dissection proceeds to separate the peroneus longus and brevis, extensor digitorum and hallucis longus muscle from the fibula septum. The interosseous membrane is divided away from the fibula periosteum. The posterior skin incision is made. Care should be taken to preserve the lesser saphenous vein and sural nerve. The flap is elevated with division of the soleus muscle. The osteotomies at both ends are made with an electric saw. The fibula bone is pulled laterally to expose the medial components. The flexor hallucis longus fascia and muscle is divided, and then the pedicle peroneal vessels are dissected from distal to proximal. The posterior tibialis muscle is divided. The pedicle is traced proximally with further skin incision until the bifurcation posterior tibia vessels. The pedicle is divided and the osteotomies are performed at the back table. A rule template is cut with appropriate length, angle, and segments for the precise osteotomies and septocutaneous perforator location (Figure 15).

## Flap inset

The donor flap is elevated and transferred to the recipient site after division of the pedicle. There are two methods to inset the flap. First, inserting the flap before

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**Table 1** The common free tissue transfers for variable buccal mucosal defect after tumor ablation surgery

<table>
<thead>
<tr>
<th>Mucosal &amp; trigone defect</th>
<th>Mucosal &amp; muscle defect</th>
<th>Cheek through &amp; through defect</th>
<th>Composite mandibular/maxillary defect</th>
<th>Radial forearm flap</th>
<th>ALT perforator flap</th>
<th>ALT myocutaneous flap</th>
<th>Rectus abdominis myocutaneous flap</th>
<th>Fibula OSC flap</th>
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<tr>
<td>+ (≤10 cm)</td>
<td>+ (≥10 cm)</td>
<td>+</td>
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<td>+ (with chimeric technique)</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>+ (with reconstruction plate)</td>
<td>(with reconstruction plate)</td>
<td>(with reconstruction plate)</td>
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ALT, anterolateral thigh; OSC, osteoseptocutaneous.
the microsurgical anastomoses has the advantage of easier inset in a bloodless operative field. Second, insetting the flap after microsurgical anastomoses has a shorter ischemia time. The second method is important in free jejunum flap transfer that is critical in ischemia time. The authors prefer the first method in most free flap transfers besides the jejunum flap transfer. One or two anchoring sutures are put at the most lateral margin of the flap to the defect. The pedicle is placed at the proper location without twisting or kinking. Any tension or compression should be avoided if there is a tunnel—usually larger than one finger width—for the pedicle. The flap is started to inset from the deepest defect part, especially the trigone area. Figure-of-eight suture with 3-0 Vicryl is commonly used to achieve watertight fashion. Then, the flap is continually sawed at both sides to a superficial part. Some redundant flap may be de-epithelized and buried underneath the defect or sutured itself to form a sulcus. The fibula OSC flap is inset starting from the reconstruction plate or miniplate fixation of the mandible/maxilla junction and between two osteotomies. Then the skin paddle of the fibula OSC flap is inset with the same methods. Sometimes, the fibula septum is cut to mobile the skin paddle to fit the defect. For the through-and-through cheek defect, a strip of skin has to be de-epithelized for the mouth angle. Chimeric technique, with two perforators for two skin paddles with only one pedicle, is a good alternative for through-and-through cheek defect; it offers a better cosmetic appearance (Figure 16).

Extensive composite mandibular/maxillary defect

The extensive composite mandibular/ maxillary defect involving buccal mucosa, bone, muscle, and skin components is usually created in the surgical treatment of T3 and T4 buccal cancer.67 Several options with various type of flaps or a combination of two flaps in reconstruction of selected cases of advanced buccal cancer is outlined in Table 2. The key to successful reconstruction in extensive composite mandibular/ maxillary defects is the careful preparing of two recipient vessels and appropriate inset of two flaps. Two separate pairs of ipsilateral neck vessels may be available in the fresh cases. The following options of recipient vessels are one ipsilateral and one contralateral pair of neck vessels, one pair of ipsilateral neck vessels and the distal run-off of the first free flap, and one pair of contralateral neck vessels and the distal run-off of the first free flap. The fibular bone is preferred to the iliac bone because it has a longer and larger pedicle, which might be suitable to serve as a flow-through conduit. The fibula OSC flap combined with the radial forearm flap when the defect is located more anteriorly and the soft tissue volume is relative not extensive is a good combination for reconstruction for the
extensive composite mandibular/maxillary defect (Table 2). The fibula OSC flap combined with a myocutaneous flap, such as the anterolateral thigh myocutaneous flap, rectus abdominis myocutaneous flap, or pectoralis major myocutaneous flap, may completely restore the extensive composite defects (Table 2). The pectoralis major myocutaneous flap is indicated for the combination of fibula OSC flap when the recipient vessels are limited or when there is difficulty in run-off technique for second free flap.57 The skin paddle of the fibula OSC flap is easier to use for the buccal mucosal reconstruction after the fibula fixing to the mandible/maxilla (Figure 16).56 Then the second flap is inset for the external cheek skin. Care should be taken to avoid kinking or twisting of the pedicles of the two flaps. It takes at least 2 hours to finish the osteotomies, reconstruction plate or miniplate fixation, and inset of two flaps. Fibula OSC flap with chimeric technique using the soleous myocutaneous component is another alternative for saving one pedicle anastomosis and operative time if there is another myocutaneous perforator besides one septocutaneous perforator available. In those advanced buccal cancer patients with poor prognosis, the big anterolateral thigh flap with reconstruction plate is the first choice for reconstruction of extensive composite mandibular/maxillary defect (Table 2).

![Figure 15](image1.png)  
(A) A rule template is tailored with appropriate length, angle, and segments after the reconstruction plate fixation. (B) The precise osteotomies and placement of the location of septocutaneous perforator are performed at the back table according to the design of the template. (Color version of figure is available online.)

![Figure 16](image2.png)  
The chimeric technique of fibula osteoseptocutaneous flap with skin, bone, and muscle components is harvested for extensive composite mandibular/maxillary defect. The skin paddle is usually inset for the buccal mucosa after bony part fixation, and the muscle part is used for tamponade of the maxillary sinus or cheek volume. (Color version of figure is available online.)

<table>
<thead>
<tr>
<th>Table 2</th>
<th>The different reconstruction options for extensive composite mandibular/maxillary defect</th>
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<tr>
<td></td>
<td>Option 1</td>
</tr>
<tr>
<td>Mucosal part</td>
<td>ALT flap</td>
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<tr>
<td>Bony part</td>
<td>Reconstruction plate</td>
</tr>
<tr>
<td>Muscular (volume) part</td>
<td>ALT myocutaneous flap</td>
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<tr>
<td>External skin part</td>
<td>ALT flap</td>
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</tbody>
</table>

ALT, anterolateral thigh; OSC, osteoseptocutaneous; PM, pectoralis major; RA, rectus abdominis.
**Postoperative care**

We encourage extubation of patients as soon as the surgical procedure is finished, unless there is extensive pharyngeal edema from resection or reconstruction, in which case a tracheostomy should be considered. The maintenance of airway and ventilation is the most important in the intensive care unit, especially those patients with tracheostomy. Pulmonary toilet and respiratory therapy is aggressively performed. The patient should be monitored in a dedicated nursing unit or intensive care unit, especially in cases of free flap reconstruction. The patient should be kept warm and well perfused postoperatively. Monitoring of the flap is critical in the first 24 to 72 hours postoperatively. Several methods have been introduced for monitoring the flap. The flap is basically monitored with capillary refilling, tissue turgor, and color by experienced nurses in most hospitals. The pencil ultrasound Doppler is good at detecting arterial pulse but not venous outflow. The implantable ultrasound Doppler placed in the venous outflow is a reliable method in most cases, especially for the buried flap or inner lining flap. Systemic heparin, a cofactor for antithrombin III, is not routinely infused in most cases because of an increased rate of hematoma formation around the pedicle and neck area. Low- or high-molecular weight (40,000-70,000) Dextran, a polysaccharide synthesized by *Leuconostoc mesenteroides*, is seldom used because it increases the incidence of pulmonary congestion and fluid overload, particularly in elderly patients. A low-dose (80-325 mg) enteric-coated aspirin for inhibiting platelet cyclooxygenase activity and decreasing production of thromboxane A2 is prescribed for 5 to 14 days postoperatively. The majority of microvascular thromboses must be assumed to be the result of technical mistakes. The most common thrombosis occurs in the venous anastomosis, which manifests as swelling, rapid capillary refilling, and blue color change in the skin paddle. Eighty percent of the compromised flaps could be successfully salvaged if early re-exploration and appropriate management are performed.

Free flap transfer is promising in reconstruction of buccal and trigone mucosal defect, although it is a challenging and technique-demanding procedure. Successful reconstruction is based on preoperative evaluation, assessment of required tissue, availability of recipient vessels, meticulous microvascular anastomoses, appropriate flap inset, and postoperative management.

The use of an active suction system such as Hemovac in the neck wound is mandatory and may enhance wound healing by generating negative pressure and pulling the flap and tissue bed together. The drain may be removed when drainage is less than 30 mL in 24 hours or the drain is in situ for more than 1 week.

Meticulous oral hygiene should be maintained in the neck wound is mandatory and may enhance wound healing by generating negative pressure and pulling the flap and tissue bed together. The drain may be removed when drainage is less than 30 mL in 24 hours or the drain is in situ for more than 1 week.

Meticulous oral hygiene should be maintained in the postoperative period if the reconstruction material is to survive. Frequent suction of retained saliva in the oral cavity and mouth washing with 0.1% chlorohexidine solution is mandatory. The patient is normally maintained on nasogastric tube feeding for approximately 1 or 2 weeks, depending on which kind of reconstruction technique was used. Nutritional supplementation via nasogastric tube is initiated as soon as feasible. The H₂-blockers may be needed if there is a stress ulcer with coffee-ground discharge from the nasogastric tube. Adequate hydration can be assessed with urine output (0.5 to 1.5 mL/kg/h). Once the oral wound heals, the patient is ready to eat, and the nasogastric tube should be pulled out as soon as possible. However, the patient is asked to follow a strict oral hygiene program of frequent use of dental floss and 0.1% chlorohexidine for oral gargling for the rest of his or her lifetime.

**Follow-up and outcome**

Functional results for surgery for early buccal and retromolar trigone cancer is excellent. However, functional outcome diminishes the more tissue is resected. Some critical areas for function preservation include the angle of the mouth, soft palate, and lateral pharyngeal wall resection. Although these areas can be reconstructed with flap, function can seldom be restored or return. Attention should be paid to exercise minimal resection with frozen-section control in these areas.

**Summary**

Cancer of the buccal membrane and retromolar trigone is one of the most common cancers in the head and neck region that surgeons in Taiwan face today. An aggressive resection to control local disease followed by adjuvant radiation therapy remain the cornerstone of successful therapy. Preservation of function by minimal resection with frozen-section control and functional reconstruction with free soft tissue transfer may further offer the patient a better quality of life.

**References**