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An Overview on Facial Flaps by Facial Artery

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Abstract:

Facial artery–based flaps are widely used in reconstructive surgery for the repair of soft tissue defects of the face. Because of the rich vascularity of the facial artery and its branches, these flaps provide a reliable blood supply, good mobility, and excellent color and texture match to adjacent tissues. They are frequently applied in cases of trauma, tumor excision, congenital anomalies, and post-burn deformities. With the advancement of microsurgical techniques and improved anatomical understanding, facial artery–based flaps have become a cornerstone in functional and aesthetic facial reconstruction.

Keywords: Facial artery flap; Facial reconstruction; Local flap; Pedicled flap; Reconstructive surgery; Facial defects; Perforator flap.

Introduction:

Facial reconstruction aims to restore both functional and aesthetic outcomes, which makes flap selection a critical decision in surgical practice. Local flaps derived from the facial artery have proven particularly valuable because of their robust vascular supply and close tissue match to the defect site **(1).**

The facial artery originates from the external carotid artery and follows a tortuous course across the face, providing multiple perforators that can be harnessed in flap design. This vascular anatomy allows for the creation of reliable pedicled and perforator-based flaps suitable for intraoral, perioral, and nasal reconstructions **(2).**

Over the years, several modifications of facial artery flaps have been described, such as nasolabial flaps and facial artery musculomucosal (FAMM) flaps. These techniques are widely used due to their versatility and ability to reconstruct defects of varying sizes and locations with minimal donor site morbidity **(3).**

Recent advances in imaging, particularly Doppler ultrasonography and computed tomographic angiography, have improved preoperative planning of facial artery perforator flaps. These modalities help in identifying the exact course of the facial artery and its perforators, enhancing surgical safety and predictability **(4).**

Facial artery–based flaps therefore remain an indispensable option in modern reconstructive surgery, offering both functional reliability and aesthetic harmony in facial defect coverage **(5).**

The cheek was anatomically subdivided into five zones and were created following two basic principles: anatomical contour and function, neurovascular distribution. The key landmarks for this zone are simply identifying anatomical structures, from which we defined three horizontal and three vertical lines

The horizontal lines: The horizontal plane from the nasal sill. lower border of the mandible.

The vertical lines: The lateral margin of the nose and the naso-labial crease, The lateral canthal line and The pre-auricular crease **(6).**

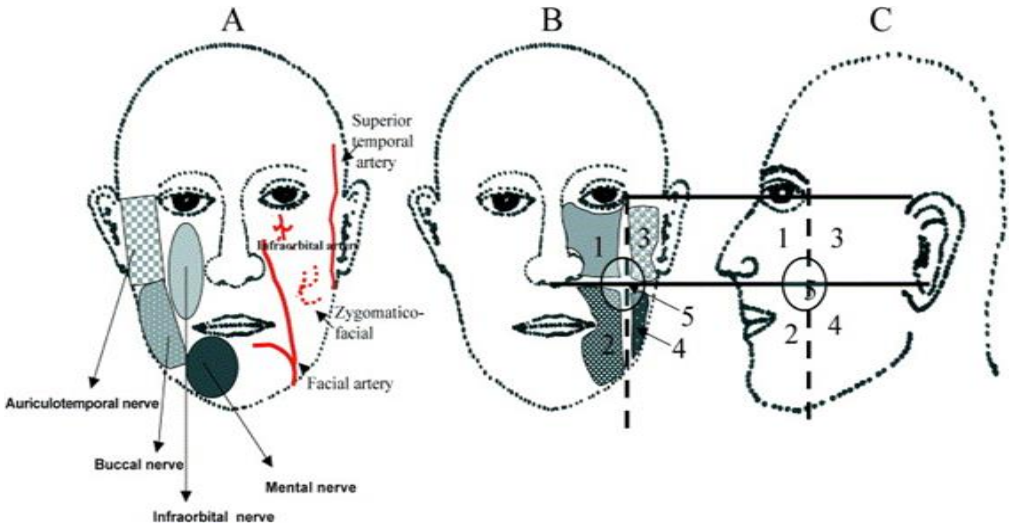


Figure 1: Zone of the Cheek(**6)**

ZONES OF CHEEK:

Zone 1: The boundaries:

Superiorly: the lower eyelid creases, Inferiorly: horizontal line from the nasal sill, Laterally: the lateral canthal line (vertical line from the lateral canthus) and Medially: the lateral margin of the nose and the naso-labial crease.

Reconstructive method: reconstructed using a V–Y **advancement flap** bringing skin and subcutaneous tissue from zones 2 and 5. This flap was based on the angular arterial supply from the facial artery.

Zone 2: The boundaries:

Superiorly: horizontal line from the nasal sill, Inferiorly: the lower jaw line.

Laterally: lateral canthal line (vertical line from the lateral canthus), Medially: vertical line from the angle of the mouth.

Reconstructive method: a local transposition flap from the neck just below the jaw line. The flap base was located medially or laterally, depend on the defect size and the hair distribution in males.

ZONE 3: The boundaries:

Superiorly: horizontal line from the lateral canthus, Inferiorly: horizontal line from the nasal sill, Medially: lateral canthal line (vertical line from the lateral canthus) and Laterally: the pre-auricular crease**.**

Reconstructive method: reconstructed using a local transposition flap based medially and the hair distribution was a critical element in the choice of its orientation.

Zone 4: The boundaries:

superiorly: horizontal line from the nasal sill,Inferiorly: the lower jaw line,

Medially: lateral canthal line (vertical line from the lateral canthus) and Laterally: the pre-auricular crease and the posterior margin of the ascending mandibular ramus.

Reconstructive method: defects required a medially based local transposition flap. This design allowed better skin mobility and caused the least distortion of the skin.

Zone 5: This is a centrally located area encompassing a diameter of 2 cm.

Reconstructive method: reconstructed using flaps based on the angle of the jaw **(6) .**

Example 1;

Reconstruction **using** a facial artery musculo-mucosal flap technique after removal of necrotic bone in the anterior areas in medication-related osteonecrosis of the jaw**(7) .**

Cause;

Patients used medication to act as anti-resorptive or anti-angiogenic like bisphosphante, denosumab and tyrosine-kinase inhibitors. That drug can produce complications as Medication-related osteonecrosis of the jaw (MRONJ).

Goal of technique;

Coverage of the defect to prevent microbial contamination of the surgical wound and provide healthy tissue to improve mucosal healing and vascularization of the affected bone.

Surgical technique;

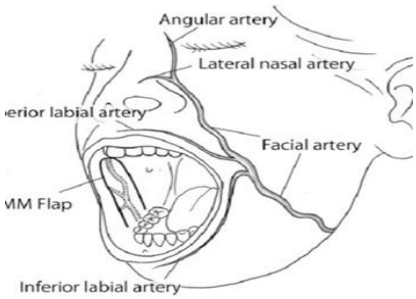
Many techniques for reconstructive surgery have been developed which produce complete wound healing of the affected bone, or at least down-staging for symptom relief.

In our example used both local and free flaps as facial artery musculo-mucosal (FAMM) flap **(7)** .

Surgical steps;

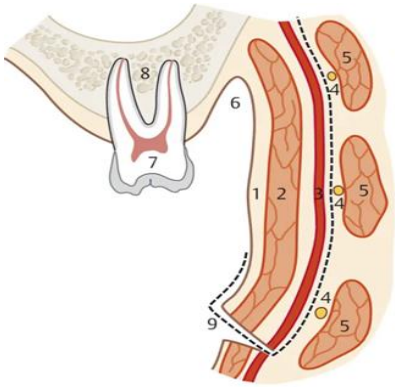
1. the muco-gingival tissue with the fistula is removed to expose the necrotic bone.
2. The necrotic bone was completely excavated until the bleeding was done at the margin of bone.
3. Remove of affected teeth.
4. the FAMM flap was drawn starting 1 cm posterior to the oral opening and continuing posteriorly (avoiding the orifice of the Stensen duct). FAMM flaps are designed to include the course of the facial artery from the gingiva-labial sulcus of the maxillary second premolar and first molar to the level of the mandibular second and third molar area with 7–9 cm length and 2–3 cm width.

5. Superior FAMM flap with base was centered over the area of the gingiva-labial sulcus of the maxillary second premolar and first molar.
6. Inferior FAMM flap with base was centered over the area of the mandibular second and third molars.



7. The FAMM flap was elevated with layer underneath the facial artery including buccinators muscle and facial artery was attached to the entire length of the flap.

8. The FAMM flap was set into the defect to cover the exposed bone and close the donor site primarily with Penrose drain was placed.
9. Postoperative nasogastric tube is important for feeding performed for 7 days.
10. Dental prothesis can don 2–3 weeks after the initial surgery by dividing base of FAMM flap.



Example 2;

Islanded facial artery osteo-myo-mucosal/osseous flap in head and neck reconstruction .**(8)**

Couse;

1. All small segmental defects of the mandible cause functional deficits.
2. Some reconstruction method to tracheal defect.

Goal of technique;

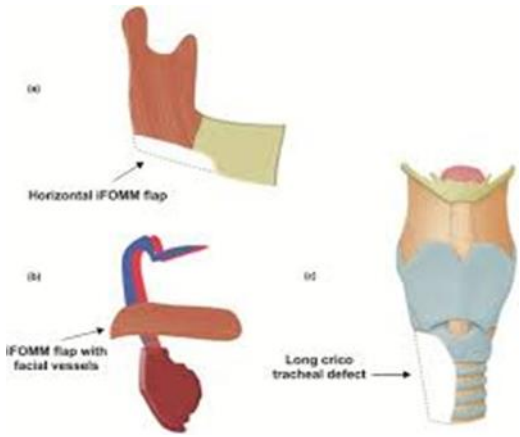
In some selected defects involving the mandible or trachea the islanded facial artery osteo-myo-mucosal/osseous flap (iFOMM) can be the solution in that cases. The flap is based on the preservation of the periosteal blood supply to the area of mandible and the facial vessels supplying it.

Surgical technique;

the islanded facial artery Osteo- Myo- mucosal/osseous flap (iFOMM).

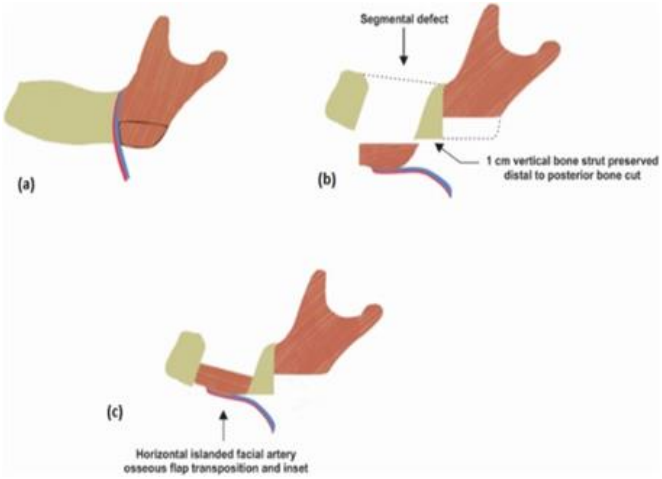
surgical steps;

1. By a cervical approach the facial artery and vein carefully dissection and preservation.
2. The neck was cleared in patients who needed a neck dissection at level Ib.
3. To avoid injury to the dental roots and inferior alveolar nerve, the bone required for reconstruction was marked 1 cm height and up to 5 cm in length from the mandibular margin.

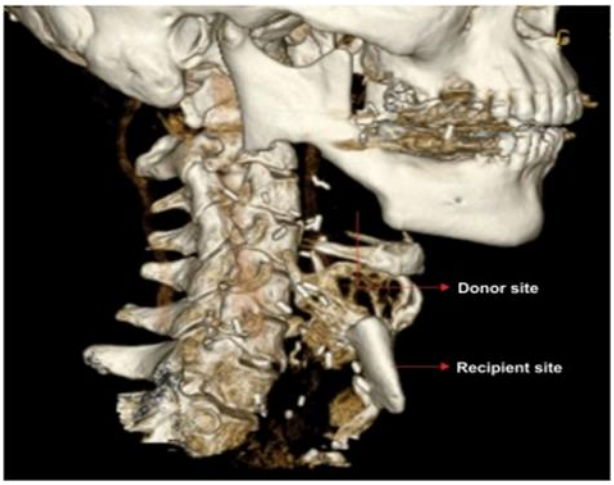


4. To insure periosteal vascularity is intact, the soft tissue surrounding this area of the mandible was kept un-dissected.

5. By oral approach, a facial artery myo-mucosal flap (FAMM) is done.
6. The dissection is done along the lateral aspect of the mandible until the superior border of the bony flap and the myo-mucosal part of the flap.



7. Bony cuts were made above the attachment of the FAMM on the mandible, 1 cm in height and up to 5 cm in length.
8. The bony flap with surrounding soft tissue was then islanded on the facial vessels (iFOMM) and transposed to the defect at the nick.
9. The cheek donor site was covered with a buccal pad of fat .**(8).**



EXAMPLE 3;

Submental flap for oral cavity reconstruction. **(9)**

Causes:

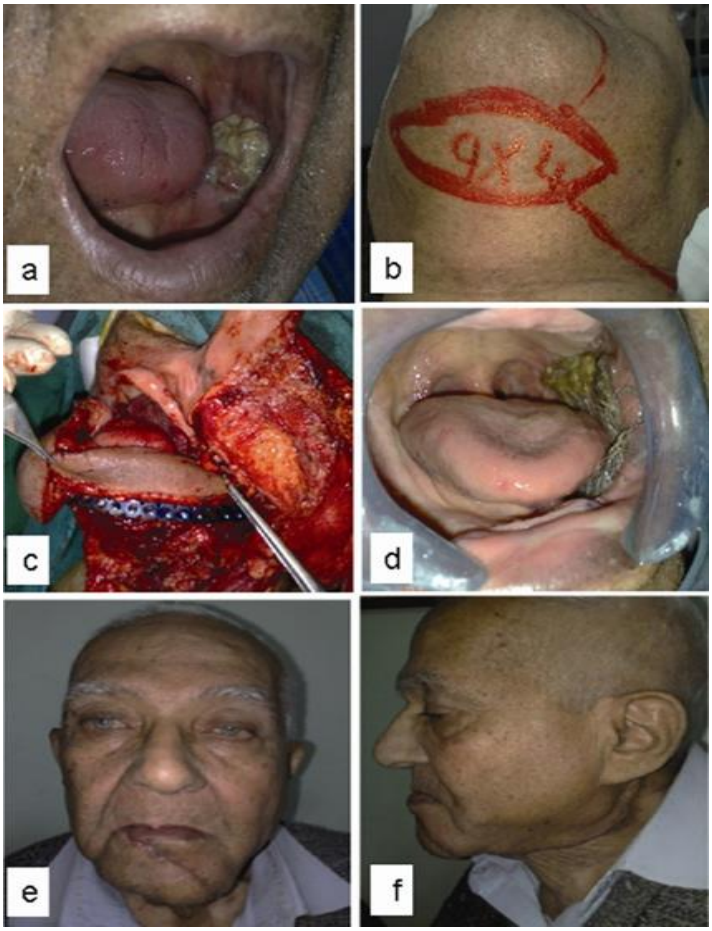
1. intraoral ulcer that failed to respond to medical treatment.
2. Local recurrence after previously surgical remove of oral cancer.

Goal of technique;

Submental artery flap used in reconstruction of small to medium sized soft tissue defects of the oral cavity.

Surgical steps;

1. skin ellipse is outlined at submental area across the midline, the upper border of flap is 1.5 cm in the midline and 3.5cm below the angle of mandible on both sides.
2. The length of flab is designed according the size of the defect, and the width is determined by a pinch test in order to close the donor site primarily.
3. Nick dissection is start first to submandibular triangle which facial artery and vain preserved and dissected carefully away from the submandibular gland by ligation its branches to gland but preserve submental branch.
4. The flap is collected form the contralateral side of the pedicle in sub-platysmal plane then at midline we identify the submental artery and vain along the medial margin of anterior belly of digastric muscle.
5. Dissection of mylohyoid muscle from the mandible and hyoid bone and ipsilateral of genio-hyoid muscle to complete mobilization of the flap.
6. Routed the flap medially to the mandible if the defect involves the floor of the mouth, the base of the tongue and the tonsillar fossa and routed the flap lateral to the mandible if the defect involve the buccal mucosa through the tunnel between defect and donor site.
7. The portion of the flap traversing the tunnel is de-epithelialized and flap close the defect and donor site close primarily in layer.**(9)**



EXAMPLE 4;

Use of the Distal Facial Artery (Angular Artery) for Super-microsurgical Midface Reconstruction.**(10)**

Causes;

1. Tumor at midface as nose.

2. Traumatic defect to midface as crush or burn.

Goal of technique;

Terminal branch of facial artery (angular artery) used as recipient to pedicel of free flaps which act as blood supply at midface reconstruction.

Surgical steps;

1. Patient with a 5*1.2 cm full thickness defect at his nose after fulling from bicycle and free flap was planning from posterior region of left ear.
2. Preoperative identify and marking of angular artery by handheld Doppler ultrasound as a blood supply and venous drainage is determine through vena comitants of facial artery or any subcutaneous vein near to the defect by using indocyanine green angiography(ICG) for direction of venous flow.

3. Incision made on the side of nose to expose the angular artery which is 0.8mm on diameter and subcutaneous vain is located in deep layer with diameter 1.0mm and venous flow confirmed by (ICG).

4. A 5*1.2cm flap was elevated from posterior region of left ear and the artery and vain of the pedicle were anastomosed to the angular artery and subcutaneous vain respectively both in end-to-end fashion using 10-0 nylon suture.

5. The flap showed excellent color match and satisfying contour 8 months after the reconstruction**.(10)**

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