

## Original Article

# An island flap based on the anterior branch of the superficial temporal artery for perioral defects

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### ABSTRACT

Defects following excision of lesions in and around the oral commissure extending on either lip are not infrequent. A majority of them are malignant. Various local flaps have been described to correct these defects, but sometimes they may not be feasible. However, the advantage of single-stage reconstruction can still be achieved by using an island forehead flap based on the anterior branch of the superficial temporal artery. This is a versatile flap with a reliable blood supply. It is relatively less popular as it involves time-consuming dissection.

**Aims:** We have modified the island forehead flap based on the anterior branch of the superficial temporal artery by designing the flap on the frontoparietal region based on the terminal course of the anterior branch of the superficial temporal artery.

**Materials and Methods:** This flap was used in five cases of perioral defects involving both the upper and lower lips including the angle of the mouth.

**Conclusions:** Small to moderate dimension full thickness perioral defects can thus be reconstructed effectively with this modified flap in a single stage. The functional and aesthetic results are gratifying with minimal donor site morbidity.

### KEY WORDS

Full thickness oral defect, perioral defect, superficial temporal artery island flap

### INTRODUCTION

Reconstruction of full thickness perioral defect following excision of malignant lesions is challenging to reconstructive surgeons.<sup>[1]</sup> The principle is to provide three-dimensional tissues for lining, cover and a border. At the same time it should provide good mouth opening with acceptable aesthetic result.<sup>[2]</sup> When there is a malignancy, the oral mucosa is often more involved than the skin, hence the mucosal defect is larger than the skin defect.<sup>[3]</sup> Thus, greater area of non-hairy tissue is required for the reconstruction.

Various options have been described utilizing local, regional and distant tissues, either in the form of a pedicle flap or a free flap. The majority of the loco-regional flaps like 'over and out' flap of Converse,<sup>[3]</sup> Estlander flap,<sup>[4]</sup> Nasolabial flap<sup>[5]</sup> and Tongue flaps<sup>[6]</sup> are inadequate and often produce microstomia. Whereas, distant flaps like total Forehead flap,<sup>[7]</sup> Cervical flap,<sup>[8]</sup> Bakamjian flap,<sup>[9]</sup> *Pectoralis major* myocutaneous flap,<sup>[10]</sup> Sternomastoid musculocutaneous flap<sup>[10]</sup> and *Trapezius* flap<sup>[10]</sup> are either too bulky or involve multi-stage procedures.

The island flap based on the anterior branch of the

superficial temporal artery (ASTA) is not a new flap. McGregor described it first in 1966, as the 'temporal island flap',<sup>[1]</sup> based on the superficial temporal vessel pedicle. Subsequently, it appeared in the literature sporadically. This flap did not become very popular due to the technical difficulty in harvesting and the associated donor site morbidity. Many a times the forehead skin alone is insufficient for reconstruction of an average-sized defect in and around the perioral region. However, by incorporating the adjacent parietal region of the scalp, in patients with receded hairline, this flap is one of the more versatile options to reconstruct the perioral defect in a single stage with minimal donor site morbidity. In this article we share our experience of five cases using this modification of incorporating the parietal skin with forehead skin, done during June 1999 to March 2003.

## MATERIALS AND METHODS

Over a period of four years, we have used this flap in five cases of perioral defects for both the upper and the lower lips including the angle [Table 1]. All the patients were males ranging from 40 to 70 years with a mean age of 55 years. All the defects were following the excision of low-grade squamous cell carcinomas (T1 N0 M0 or T2 N0 M0). The size of the defects ranged from 4-7 cms. in width to 5-8 cms. in length. In three patients the lesion was on the left and in two on the right. In all the cases, the defect was reconstructed with ipsilateral island flap based on the anterior branch of the superficial temporal artery. The size of the flap ranged from 5-8 cms. in width to 6-10 cms. in length. Our largest flap was 7 x 8 cms. and the smallest was 5 x 7 cms. The postoperative period was uneventful. All the flaps healed without any complication. In three patients donor site was closed primarily and in two cases the defect was reduced and split skin grafted. Minor secondary corrective procedure was required in one case. The average follow-up period was three years without

recurrence. The functional and aesthetic results were very acceptable.

## Operative technique

The procedure was done under general anesthesia. The entire course of the ipsilateral ASTA can be palpated very easily, especially in the older age group and in patients with receded hairline. It should be confirmed with the audio Doppler. Starting from 1 cms., anterior to the tragus till its termination in the forehead, the entire course of the artery is traced and marked. This is desirable for safety, though it may not be mandatory in experienced hands.

At the terminal end of the anterior branch, over the frontoparietal region, the required dimension of the island paddle of the flap is marked. The design of the flap is made in such a way that about two-third lies in the fronto-parietal region and one-third on the forehead. Such a defect can be closed primarily, avoiding donor site morbidity. Xylocaine (0.5%) with adrenaline 1:200,000 is infiltrated in the surrounding tissue to minimize blood loss and also to facilitate dissection. An incision is made along the margins of the island flap and extended a few millimeters above and along the course of the vessel, up to the tragus. The plane of the vessel is in the subcutaneous tissue. Therefore, the surrounding tissue should be dissected carefully leaving at least two fat globules in the subdermal layer to ensure an adequate subdermal plexus thus preventing marginal necrosis of the suture line as well as avoiding damage to the vessel. Then, the dissection of the flap is done from distal to proximal, keeping the remaining amount of subcutaneous tissue with the pedicle. Utmost care is taken to protect the arterio-venous system. After completing the flap elevation, a subcutaneous tunnel is made in the cheek, adequate to allow the flap to reach the defect. As per requirement, the flap is folded and then inserted, to provide lining and cover in continuity. In this process,

Table 1: Patient summary

Patient	Age	Sex	Site of the defect	Size of the defect BxLin cm	Size of the flap BxLin cm	Management of the donor site
1	40	M	Left commissure and cheek	4x6	5x7	Primarily closed by undermining and advancement
2	56	M	Left commissure and lower lip	6x7	7x8	Split skin grafting
3	60	M	Left commissure and cheek	5x7	7x7	Primarily closed by undermining and rotation flaps
4	62	M	Right commissure and 80% of lower lip	7x5	8x6	Split skin grafting
5	70	M	Right commissure and cheek	4x8	5x10	Primarily closed by making two rotation flaps

the folded margin inevitably forms the vermilion border and oral commissure at the angle of the mouth. In the majority of cases the donor site can be closed primarily either by undermining and advancement or by converting into two rotation flaps. Larger defects require skin grafting after reducing the size. The average size of the defect in our series was 6 x 5 cm and average dimension of the flap was 7 x 6 cm.

## RESULTS

All the flaps had complete success with good functional and aesthetic results. Patients were evaluated based on parameters like patient acceptability, microstomia, the overall aesthetic appearance and the donor site morbidity. Patient acceptability was excellent with normal mouth opening. Aesthetic appearance was good; in one case minor secondary procedure was done. Donor site morbidity was minimal.

### Patient summary

#### Case report

A 70-year-old man presented with squamous cell carcinoma of the buccal mucosa extending to the commissure and the cheek [Figure 1]. The defect following excision was 4 x 8 cms. An Island flap [Figure 2] based on the anterior branch of the superficial temporal artery was used to reconstruct the mucosa, commissure and the adjoining cheek defect in mouth open position as a single stage procedure [Figure 3]. The donor site was closed primarily by rotation flaps. The functional and aesthetic results were gratifying and the donor site morbidity was negligible [Figures 4-5].

## DISCUSSION

The main objective of this article is to share our experience emphasizing the modification in designing the flap, selection criteria of the patients, the technical details, its advantages and results.

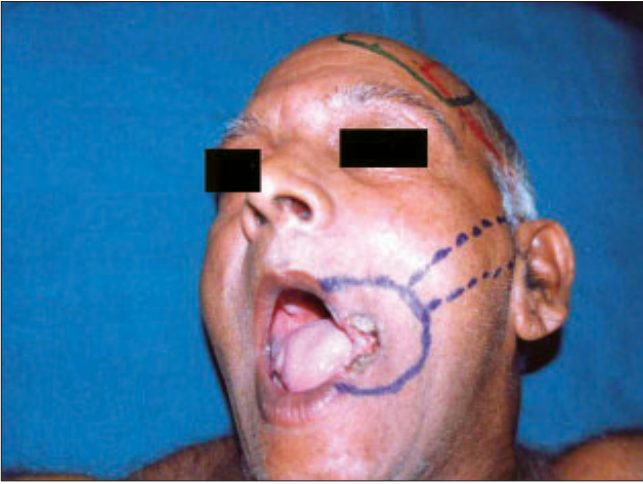
In 1966, McGregor reported the 'temporal island flap' based on the superficial temporal pedicle. He kept the pedicle as broad as the flap itself and suggested inclusion of as much thickness of tissue as practicable. He mentioned it as one of the excellent choices, if one wished to complete the procedure in a single stage. In those days, he stressed the importance of primary

closure of the defect following excision of the malignancy. He further said, "Technically this is one of the difficult flaps to harvest, due to lack of good surgical planes". He also cautioned to take additional care to prevent necrosis of the overlying skin. He wrote "We have no doubt that the island is rather less safe than the full temporal flap with or without tunnel".<sup>[11]</sup>

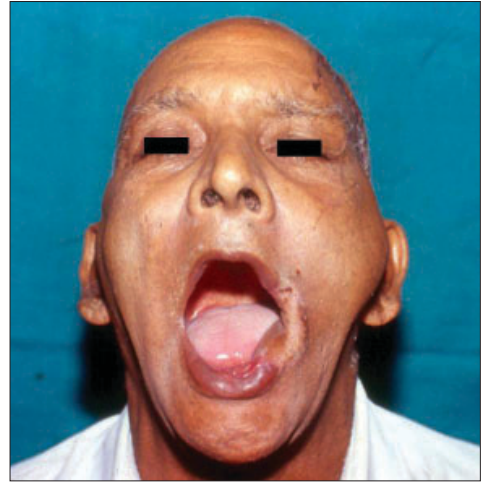
In this series we have modified the classical 'temporal island flap' that was described by McGregor. The anterior branch of superficial temporal artery, after its division from the main branch becomes superficial and travels in the subcutaneous tissue and subsequently becomes dermal in the frontoparietal region. The course of the artery may be variable. In 80% of cases, it continues as one of the terminal branches of the superficial temporal artery (Type I). Whereas in 20% of individuals, it continues as the main branch and a posterior division arises as a branch from it (Type II).<sup>[12]</sup> We have designed the flap based on this terminal course of the anterior branch, on the forehead and parietal region of the scalp. The advantages of this flap are:

1. The entire course of the artery till its termination is easily visible and palpable,
2. The temporoparietal region is often non-hairy, especially in the older age group, particularly in males, due to receding of both the frontal and temporoparietal hairlines. This (a) provides good amount of non-hairy tissue, suitable for reconstruction of perioral defect including lining and (b) by inclusion of temporoparietal region, with forehead, flaps of larger dimension can be harvested.
3. Due to its axial blood supply, an 'island flap' can be designed to complete the procedure in a single stage.
4. Being scalp tissue, this flap has minimal amount of subcutaneous tissue; hence it is desirably thin and pliable, which is suitable for reconstruction of perioral defects.
5. Due to laxity of skin, in the older age group, the donor site can be closed primarily with minimal donor site deformity.

Thus, this flap is indicated in patients with a broad forehead, receded frontal and temporoparietal hairlines with lax forehead skin and for small to moderate size perioral defects. It was felt that the dissection requires extra caution, as there is no definite surgical plane for the vessel. The importance of proper pre-operative planning by doing 'planning in reverse' is essential. The



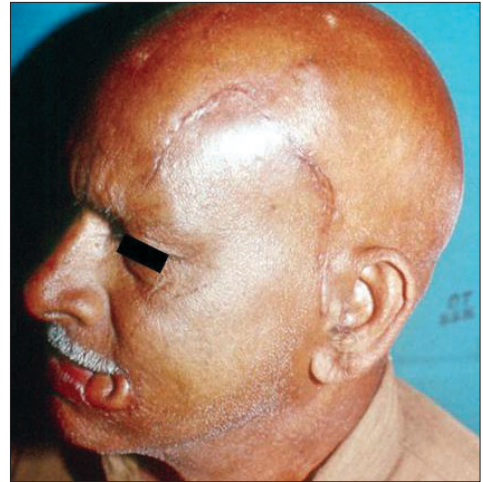
**Figure 1:** Malignant lesion involving the cheek and the commissure, with proposed plan of the flap



**Figure 4:** Postoperative functional and esthetic result with negligible donor site morbidity after six months



**Figure 2:** Dissected island flap prior to tunneling to the defect



**Figure 5:** Postoperative functional and esthetic result with negligible donor site morbidity after six months



**Figure 3:** Flap insetted as lining and cover. The folded margin forms the commissure in the mouth open position

entire course of the artery should be traced and marked with the help of audio Doppler before surgery. The use of xylocaine with adrenaline certainly minimizes the bleeding

and facilitates surgical dissection. In our experience the 1:200,000 adrenaline had no deleterious effect on the vessel. Bipolar cautery and loupe magnification proves advantageous. Two subcutaneous fat globules should be preserved while raising the skin flap during dissection of the pedicle, to avoid skin necrosis. The subcutaneous tunnel should be adequate enough to allow the flap to reach the defect, without compression on the pedicle. Since the flap is thin and pliable, it can be moulded to any kind of a three-dimensional defect.

In our experience, this is one of the flaps of choice to reconstruct perioral defects, its major advantage being a single-stage procedure. The results were highly gratifying both functionally and aesthetically. Finally, to quote Ian McGregor, "Where the use of the island makes possible a single-stage repair, the slight added difficulty and risk is probably acceptable".<sup>[11]</sup>



## REFERENCES

1. McGregor IA, McGregor AD. Fundamental techniques of plastic surgery and their surgical applications. Churchill Livingstone: Edinburgh; 1995. p. 161-5.
2. Vegers JW, Snow GB, van der Waal I. Squamous cell carcinoma of the buccal mucosa. A review of 85 cases. *Arch Otolaryngol* 1979;105:192-5.
3. Converse JM. The "over and out" flap for restoration of the corner of the mouth. *Plast Reconstr Surg* 1975;56:575-8.
4. Estlander JA. Eine Methode aus der einen Lippe Substanzverluste der anderen zu ersetzen. *Arch Klin Chir* 1872;14:622-6.
5. Ohtsuka H, Shioya N, Asano T. Clinical experience with nasolabial flaps. *Ann Plast Surg* 1981;6:207-12.
6. Ganguli A. Use of tongue flap to line cheek defects in surgery for cancer. *Plast Reconstr Surg* 1968;41:390-2.
7. Kavarana NM. Use of a folded forehead flap for reconstruction after a large excision of the full - thickness of the cheek. *Plast Reconstr Surg* 1975;56:629-32.
8. Bunkis J, Mulliken JB, Upton J, Murray JE. The evolution of techniques for reconstruction of full thickness cheek defects. *Plast Reconstr Surg* 1982;70:319-27.
9. Bakamjian VY, Long M, Rigg B. Experience with the medially based deltopectoral flap in reconstructive surgery of the head and neck. *Br J Plast Surg* 1971;24:174-83.
10. Ariyan S. Pectoralis major, sternomastoid and other musculocutaneous flaps for head and neck reconstruction. *Clin Plast Surg* 1980;7:89-109.
11. McGregor IA, Reid WH. The use of the temporal flap in the primary repair of full thickness defects of the cheek. *Plast Reconstr Surg* 1966;38:1-9.
12. Wilson JS. The application of the two centimeter pedicle flap in plastic surgery. *Br J Plast Surg* 1967;20:278-96.