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Case Series

FOREHEAD FLAP FOR FACIAL DEFECTS RECONSTRUCTION: CASE SERIES AND REVIEW OF THE LITERATURE

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ABSTRACT

Introduction: Forehead flap is one of the oldest techniques for reconstruction of the facial defects. Throughout the years, various advances in technologies and surgical techniques are continuously developing. Despite the ongoing advances in technology, forehead flap may be a simpler and useful alternative for facial defects.
Method: This study was a retrospective case series of four patients presented to Dr. Kariadi Central-General Hospital during 2021-2022 with facial defects undergoing reconstruction with forehead flap. Case report based on the medical and surgical records.
Result: All patients underwent reconstruction surgery in 2 stages. The first stage was flap elevation and transfer, and the second surgery was flap division and inset weeks later. All patients had overall good outcomes.
Conclusion: Forehead flap is technically simple to perform, easy to master and provides good outcomes. In cases of free flap loss, a forehead flap can be used as a Plan B. Therefore, forehead flap is a reliable option for facial defect reconstruction and should be mastered especially by general plastic surgeons.

***Keywords**: Surgical flap; Forehead flap; Facial defect; Reconstruction*

Latar Belakang: Flap dahi adalah salah satu teknik tertua untuk rekonstruksi cacat wajah. Sepanjang tahun, berbagai kemajuan dalam teknologi dan teknik bedah terus berkembang. Meskipun ada kemajuan terus-menerus dalam teknologi, flap dahi mungkin menjadi alternatif yang lebih sederhana dan berguna untuk cacat wajah.
Metodologi: Penelitian ini adalah serangkaian kasus retrospektif dari empat pasien yang datang ke Rumah Sakit Umum Pusat Dr. Kariadi selama tahun 2021-2022 dengan cacat wajah yang menjalani rekonstruksi dengan flap dahi. Laporan kasus berdasarkan catatan medis dan bedah.
Hasil: Semua pasien menjalani operasi rekonstruksi dalam 2 tahap. Tahap pertama adalah elevasi flap dan transfer, dan operasi kedua adalah pemisahan flap dan penanaman beberapa minggu kemudian. Semua pasien memiliki hasil yang secara keseluruhan baik.
Kesimpulan: Flap dahi secara teknis mudah dilakukan, mudah dikuasai, dan memberikan hasil yang baik. Dalam kasus kehilangan flap bebas, flap dahi dapat digunakan sebagai Rencana B. Oleh karena itu, flap dahi adalah opsi yang dapat diandalkan untuk rekonstruksi cacat wajah dan seharusnya dikuasai terutama oleh ahli bedah plastik umum.

***Kata Kunci:** Flap bedah; Flap dahi; Cacat wajah; Rekonstruksi*

Conflicts of Interest Statement:
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INTRODUCTION

Forehead flap was first described in 700 B.C. in Sushruta Samhita, an Indian medical document, then later popularized by McGregor in 1963.[1] Since then, various advanced reconstruction techniques have been discovered and the concept of the reconstructive elevator has been introduced. One example of a very popular option is free flap.

Free flaps provide enough volume for reconstruction, allow unrestricted flap repositioning, and are more resistant to radiation injury; as many patients with malignancies will require radiation. However, free flaps also have some drawbacks. The use of free flaps requires a more difficult technique, prolong procedure, and aesthetically they are bulkier and don't provide the same donor colour and texture.[2]

The forehead is a highly vascularized region, hence its significance for reconstruction. It's also considered an ideal donor for facial reconstruction because of the colour and texture match, suitable to the replace like-with-like principle, and forehead flaps are much easier to raise and transfer compared to free flaps.[3,4] Forehead flap is further divided based on the angiosomes; the first one is based on the supratrochlear and supraorbital arteries, and the second one is based on the superficial temporal vessels.[4,5]

The forehead flap discussed in this paper is an axial myocutaneous flap supplied by the superficial temporal arteries. Forehead flap reconstruction surgery involved two stages. The first stage involves flap elevation and transfer, and the second stage involves flap division and inset.[1]

The option of using free flaps as tissue reconstruction is now very popular, but the forehead flaps are still reliable up to this day.[3,5] This study aims to review the use of forehead flaps in facial reconstruction.

METHOD

This study was a retrospective case series of four patients presented to Dr. Kariadi Central-General Hospital during 2021-2022 with facial defects undergoing soft tissue reconstruction with forehead flap during this period. We report the cases based on the medical and surgical records.

RESULTS

CASE 1

A 79-year-old woman presented with basal cell carcinoma of the right periorbital region (Figure 1A). The patient underwent wide excision resulting in a large defect on the right periorbital region (Figure 1B). The defect was reconstructed with a forehead flap pedicled from the right superficial temporal vessels (Figure 1C) and pedicle division was done 4 weeks later (Figure 1D).

CASE 2

A 59-year-old woman presented with keratinizing squamous cell carcinoma of the left buccal region (Figure 2A-B). The patient underwent wide excision (Figure 2C), and the

Figure 1. (A) Clinical photograph showing lesion before surgery, (B) After wide excision, (C) Defect reconstruction with forehead flap, (D) Post pedicle division surgery

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Figure 2. (A-B) Clinical photographs of lesion before surgery, (B) After wide excision, (D) First defect reconstruction with radial forearm flap resulting in a non-vital flap, (E) Defect re-reconstruction a week later with forehead flap, (F) Post pedicle division surgery

defect was reconstructed with a radial forearm free flap but resulting in a non-vital flap (Figure 2D). The defect was then successfully re-reconstructed with a left pedicled forehead flap (Figure 2E) and the pedicle division was done 6 weeks later (Figure 2F).

CASE 3

A 55-year-old male presented with basal cell carcinoma of the right periorbital region (Figure 3A). The patient underwent wide excision resulting in a large defect on the right periorbital region (Figure 3B). The defect was reconstructed with a right pedicled forehead flap (Figure 3C)

Figure 3. (A) Clinical photograph showing lesion before surgery, (B) After wide excision, (C) Defect reconstruction with forehead flap, (D) Post pedicle division surgery

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and pedicle division was done 3 weeks later (Figure 3D).

CASE 4

A 38-year-old man presented with inflammatory pseudotumor + papillary endothelial hyperplasia (PEH) of the left orbital (Figure 4A). The patient underwent wide excision and left orbital exenteration, then the defect was reconstructed with a forehead flap (Figure 4B). The flap was successful and the pedicle division was done 4 weeks later (Figure 4C).

Figure 4. (A) Clinical photograph showing lesion before surgery, (B) Defect reconstruction with forehead flap, (C) Post pedicle division surgery

DISCUSSION

Most of our cases required reconstruction due to malignancy; one of the most common causes of facial defects. Malignant tumors require a wide excision surgery because of their invading and infiltrating nature, which gives rise to extensive defects of the underlying anatomy. These defects may alter an individual's psychological well-being, especially defects in the facial region; as it's one of the most significant features of appearance.[3]

Forehead flap is an axial myocutaneous flap spanning the entire forehead. It has been used previously to reconstruct various post-cancer ablation soft tissue defects over the facial region.[4] Even for skilled plastic surgeons, reconstructing large facial deformities satisfactorily on both a cosmetic and functional level can be difficult since facial skin structure varies depending on creases, wrinkles, and skin thickness.[6] Forehead flaps provide an excellent supply because they are designed with an intact major blood vessel, and they don't require microsurgical expertise, therefore it's a reliable option especially for general plastic surgeons.[7] In case number 2, the defect was first reconstructed with a free flap but resulting in a free flap loss. In cases like this a forehead flap can also be a reliable Plan B.

All of our patients underwent two staged surgeries. In the first stage, the flap design was developed and the outlines were marked on the donor site. The design of the flap should be limited below the hairline superiorly and above the eyebrows inferiorly (Figure 5).

The flap was elevated transversely across the forehead based on the right or left superficial temporal artery, just above the pericranium layer. The flap was then inset to the defect site from distal to proximal and sutured in place. The result of both donor and recipient sites are considered important, therefore the donor site was reconstructed with a split-thickness skin graft (STSG).[4,5,8]

The second stage was the pedicle division. In this stage, the unused portions of the flap were incised, any granulation tissue was debrided, and the base area of the pedicle was thinned.[4,7] Ischemic preconditioning was done by giving the flap a brief period of ischemia followed by tissue reperfusion. This procedure aims to evaluate the flap's vascularization, whether or not it survives without supply from the pedicle.[9] Adequate flap thinning is important to minimize the bulky

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Figure 5. Intra-operative clinical photographs showing the temporal flap design; the upper border is below the hairline, and the lower border is above the eyebrows.

appearance of the flap and to help improve the aesthetic results following forehead flap reconstruction.[1]

Regarding the timing of flap division, three of the cases were performed in accordance with other reports, approximately about 3-4 weeks later.[1,8] But in one case it was performed about 6 weeks later, this delay was caused by the patient's non-compliance. Some post-operative complications that might happen include flap loss, flap necrosis, dehiscence, infection, and hematoma.[6] We followed up with all of our patients one month after surgery to evaluate the post-surgery outcomes and complications. The results are summarized in Table 1 and Figure 6.

One month following the surgery, all four of the patient's forehead flaps were well vascularized, and the STSG reconstructed on the donor sites also healed well. There were no complications for patient 1, 2, and 4. However, wound dehiscence was found on patient 3. The wound dehiscence was treated, and the patient was educated to change the gauze and dressing regularly. Follow-up was scheduled a month later.

Table 1. Surgery outcomes and complications

Case #	Forehead Flap	Donor (STSG)	Complications
1	Healed well, no necrosis	100% take	No complications at 1-month post-surgery follow up
2	Healed well, no necrosis	100% take	No complications at 1-month post-surgery follow up
3	Healed well, no necrosis	100% take	Wound dehiscence
4	Healed well, no necrosis	100% take	No complications at 1-month post-surgery follow up

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Figure 6. Flap and donor follow up 1 month after reconstruction as seen on (A) Patient on case 1, (B) Patient on case 2, (C) Patient on case 3, (D) Patient on case 4

CONCLUSION

Forehead flap is technically simple to perform, easy to master and provides good outcomes. In cases of free flap loss, a forehead flap can be used as a Plan B. Therefore, forehead flap is a reliable option for facial defect reconstruction and should be mastered especially by general plastic surgeons.

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