

## RECONSTRUCTION OF HALF OF THE FOREHEAD TRAUMATIC DEFECT WITH SINGLE ROTATION FLAP AND HEMI-BROW TRANSPOSITION IN A RESOURCE CONSTRAINED SETTING: -A CASE REPORT-

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### ABSTRACT

Forehead reconstruction is very challenging due to limited availability of matching skin for coverage. This is even more challenging in acute traumatic events characterized by gross contamination, presence of open wounds and injury to surrounding tissues. The use of loco-regional flap option may be the only available resort where facility and expertise for free flaps are not adequate. We present a 50 year old lady that had traumatic avulsion of slightly over half of the forehead with an extension wound to the ipsi-lateral temporal region following road traffic accident. There were crushing of ipsi-lateral eye and periosteal stripping of the underlying bone. She had an immediate flap cover after resuscitation using a single rotation scalp flap based on the ipsi-lateral occipital, posterior auricular and superficial temporal arteries. The adjoining temporal region wound was covered with split-thickness skin graft. She had excellent flap survival and satisfactory graft take. We observed that this flap could be successfully used in the setting of trauma to transfer a like for skin in the setting of trauma. This is especially useful in resource constrained setting where free tissue transfer is still insufficiently used.

**Keywords:** Periosteal stripping; Rotational scalp flap reconstruction; Traumatic forehead avulsion.

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### INTRODUCTION

The forehead is a most conspicuous and the largest aesthetic unit of the face, comprising the upper part.[1] Several causes of defect on the forehead are commonly met in plastic surgical practice. The most common causes are trauma, neoplasia, infection, radionecrosis among others. Trauma remains a leading cause of forehead defects seen in developing countries as in the index patient. Trauma makes reconstruction more challenging because of presence of open wound, gross contamination, and injury to surrounding tissues

and lack of sufficient time to plan for the procedure. The challenges of reconstruction of forehead wounds also stem from the defect size, exposure of bone stripped of periosteum, state of surrounding structures like the eyebrow, hairline and previous surgery, irradiation or burns, the aesthetic subunit affected and the contour of the forehead [2].

The principle aesthetic unit should be employed in the forehead reconstruction to avoid cosmetic distortions.[1] The presence of exposed bone stripped of periosteum may affect the options to be used. This would make use of skin grafting an unlikely sole

option. In developing settings where the use of free flaps is not developed, there a propensity to resort to pedicled flaps. This socio-economic limitation combined with exposure of bone stripped of periosteum further narrows the option available to us. We had to use an option that is both affordable and capable of producing the expected result of supple, stable and cosmetically acceptable cover.

Exposed bones undergo desiccation with resultant loss of the affected parts. This occurs after about four days of exposure.[3] This necessitates urgent intervention to provide a cover for the exposed part. The major challenge is providing an adequate cover without introducing hair bearing skin to the forehead which will defeat the goal of reconstruction. An option capable of doing this is a contra-lateral scalp rotation flap pedicled on the ipsilateral occipital, superficial temporal and posterior auricular arteries [4]. This has been used for neoplastic wounds and following same principles was considered an adequate option [4, 5].

### CASE PRESENTATION

We present a 50 year old lady who sustained traumatic forehead avulsion wound following a road traffic accident. She was a passenger of a van that had a burst tyre and somersaulted multiple times at a moderate speed. She had right sided oculo-facial injuries with loss of the right eye, loss of the right half of the forehead with exposure of the frontal skull (**Figure 1**).



**Figure 1:** Gangrenous traumatic forehead flap at 36 hours post-trauma (Antero-posterior view)

There was no loss of consciousness or bleeding from the craniofacial orifices. She had significant blood loss with presentation hematocrit of 28%. She had initial resuscitation at the crash room. Secondary survey shows a middle aged woman in no respiratory distress but was pale. The right half of the forehead showed a traumatic avulsion measuring about 14x12cm in the widest dimension with exposed bone stripped of periosteum (**Figure 2**).



**Figure 2:** Intra-operative picture after debridement

There was wound extension to the anterior part of the ipsi-lateral temporal region. The right eye was crushed and devascularized. The laboratory parameters including serum electrolytes and the blood urea and creatinine were within normal range except the hematocrit. Patient had transfusion of two units of sedimented blood and presumptive antibiotics treatment with intravenous metronidazole and ceftriazone. She was counselled for a joint theatre session with ophthalmologists. She had evisceration of the right eye with immediate prosthesis placement and forehead reconstruction in one session due to financial challenges on the patient who patient out of pocket and was not financially buoyant. The forehead was reconstructed with a rotation flap of the scalp with a halving of the left eyebrow to transpose the superior half to the right side. Flap incision was taken to the posterior midline. The flap coverage resurfaced about four fifths of the wound while the remaining fifth was covered with a skin graft. Negative pressure dressing was applied to achieve ensure improved graft survival. There was 100% flap survival while the graft take was about 60% (**Figure 3**).



**Figure 3:** Four days post-reconstruction (Anterior view)

Surgical wound healing was satisfactory and the neobrow acceptable (**Figures 4 & 5**). Further post-operative wound care was continued with alternate dressing with 5% povidone iodine gauze. Patient was counseled for secondary grafting but refused on account of financial constraints and was discharged on financial considerations for healing by secondary intention. She was however lost to follow up due to distance.



**Figure 4:** Lateral view on the post-operative day 7

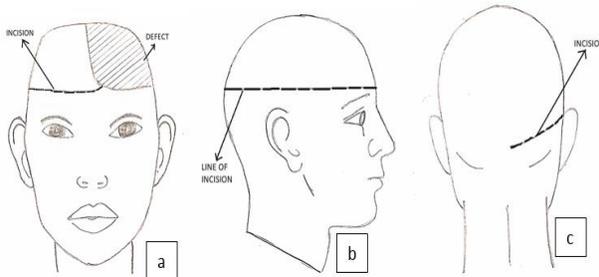


**Figure 5:** Left oblique view showing both eyebrows

## DISCUSSION

The major challenge of forehead reconstruction is providing a like tissue coverage. This is because the surrounding tissue is limited in size to suffice especially for large defects.[6] This is even more challenging when the defect is large as well as when there is limited experience with free flaps as is the case in our setting. Other modalities could be employed for large defects especially sheet split-thickness skin grafting, tissue expansion, dermal substitutes with skin grafts, and free tissue transfer. The option of sheet split-thickness skin grafting is easy to perform by most practitioners though it is usually not favoured due to colour mismatch, contour irregularities, and inadequate wound beds.[7] The major limitation of this in the index case is the wound bed which sits on bare frontal skull bone which would not support split-thickness skin graft take. The use of dermal substitute prior to grafting was limited by the relative unavailability in our setting as well as economic constraints on the side of the patient to privately source for the substitutes. Tissue expansion requires two stages and absence of infection which could not be guaranteed in the index case. [8] Free flap was not yet performed in the center at the time of this procedure. These therefore narrowed our option to essentially using a pedicled loco-regional flap for the reconstruction. A single rotational scalp flap was resorted to as it is capable of providing reasonable amount of non-hair bearing skin to the forehead. This is particularly important as the patient is a female and also cosmetically conscious. The main target of this reconstruction was to provide a cover for the bare bone and then use split-thickness skin graft to cover the adjacent anterior part of temporal region also affected. This was essentially achieved with the single rotation scalp flap and supplementary split thickness skin graft. The single rotation scalp flap is a very viable flap supplied by the occipital artery, the posterior auricular artery and superficial temporal artery, all arising from the external carotid artery on the ipsi-lateral side of the defect.[9] This makes the flap a very reliable one. In the index case, the flap showed some area of contusion with discoloration obvious only after flap elevation. Though this cast doubts on the viability of our flap, we still had 100% survival lending credence to the sufficiency of blood supply to the flap. This flap has been successfully used in reconstruction of post-tumor excision defects but has not been reported to the best of our knowledge in post-traumatic defects in acute settings [4, 5, 7]. It could cover the individuals half of the forehead [4]. The older persons with more redundant skin may afford more coverage.

Such settings do not allow adequate time for planning of reconstruction and also leaves the surgeon with limited options. With this success in trauma situation, there is a probability of successfully embarking on immediate loco-regional reconstruction of the forehead. This flap option being simple to learn could be readily used in resource poor settings to restore facial form and function. (**Figure 6 (a-c)**)



**Figure 6:** schematic diagrams: a)- -frontal view, b)- Lateral view, c)- Posterior view

## CONCLUSION

More series would further strengthen this observation bringing immediate help to the resource poor countries while awaiting the development of robust free flap reconstruction. It would stimulate more plastic surgeons to go beyond the use of split-thickness skin grafts in facial reconstruction bringing the aesthetic superiority of flaps. This would ensure replacing like with like and avoiding introducing hair bearing scalp into the forehead [7, 10] Furthermore our incidental discovery that the eyebrow could be halved as a modality for reconstructing the avulsed contra-lateral brow is a remarkable addition to the armamentarium of the plastic surgeon. We therefore recommend more trials of modality to especially include the halving of the contra-lateral brow where indicated in both traumatic and non-traumatic settings.

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## CONFLICT OF INTEREST:

We declare that there was no conflict of interest in this case report.

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