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Original Research Article

Transposition flaps: a valid option for reconstruction of soft tissue defects of scalp

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ABSTRACT

Background: The scalp wounds are becoming increasingly common as a result of high-speed automobile accidents, fall from heights and others. Scalp reconstruction is a challenge for plastic surgeons. Minor wounds heal of themselves, but some wounds need some type of intervention in the form of reconstruction. Authors have raised flaps in unconventional measurements.
Methods: Authors have incorporated 19 patients in this study over a period of one year. Extensive surgical procedures like burring of the skull bones and patients with comorbid conditions were not included. Authors simply rely on local flaps preferably transposition flaps to cover mainly the exposed skull bones. All the flaps were raised leaving the galea intact. The secondary defects were always skin grafted with split skin graft taken from thigh. Authors have raised random flaps in unconventional dimensions showing that a large random flap can be raised on a single vessel with good results.
Results: All the wounds healed well without significant complications. So, this method of reconstruction can be applied to even large defects where very sophisticated services are not available.
Conclusions: This method of reconstruction can be applied to even very large defects where very sophisticated microvascular services and expertise are not available with appreciably good results.

Keywords: Random flap, Scalp defects, Scalp reconstruction

INTRODUCTION

There are multiple flap options to cover a single defect like local flaps, distant flaps and free flaps.[1] Free flaps are certainly advantageous as they can be done in a single sitting without affecting the remaining local tissues. These are the transposition flaps, rotation flaps, combination of rotation and transposition flaps.[2,3] In these setting, authors covered these defects by local flaps preferably transposition flaps. As the anatomy of scalp is such that it permits to raise a large flap on a single vessel. So, authors have exploited this fact to raise the flaps in unconventional dimensions in covering the scalp defects in these patients.

Anatomical considerations

The anatomical boundaries of scalp and forehead starts from the supraorbital rims anteriorly and extend upto the nuchal line posteriorly. On the lateral side from the frontal process of the zygomatic process, zygomatic arch and the mastoid process. The scalp has five layers namely skin being the outermost, second is the subcutaneous tissue, third is loose areolar tissue, fourth layer is aponeurotic layer and finally the pericranium. The hair follicles sweat glands and fat are within the skin and subcutaneous tissue. The connective tissue septa connect to the musculoaponeurotic layer i.e. galea aponeurotica.

The galea aponeurotica is under the subcutaneous layer, it extends anteriorly from the frontalis muscle and posteriorly upto the occipitalis muscle. On the lateral sides it continues as temporoparietal fascia.

The scalp has a very rich vascular supply. There are five pairs of vessels from anterior to posterior namely supratrochlear, supraorbital, superficial temporal, posterior auricular, and occipital. The arteries of the scalp and their accompanying veins originate in periphery and ascend to the dome in both the lateral sides; thus, it is preferable to base scalp flaps peripherally.[4,5] There is widespread anastomosis of the end vessels at the vertex in the younger patient, which provides greater margin of safety in flap design, even permitting retrograde flaps based on this rich vascularity but in older patients in whom arteriosclerosis diminishes these end vessels, this advantage cannot be exploited.[6] This can be overcome by including a large artery in the base of the flap with simultaneous delay of the flap. This has been demonstrated with the transfer of postauricular skin on a pedicle extending across the dome to the contralateral superficial temporal vessels.[3] Successful Microvascular replantation in which the entire scalp and one ear survived on a single artery and vein reanastomosis has been reported.[6,7]

Objective

The purpose of this study is to demonstrate that even large scalp defects can be covered by using transposition flaps in unconventional dimensions where facilities and expertise for sophisticated microvascular services for free tissue transfer are not available.

METHODS

This study was conducted at Department of Plastic Surgery, Uttar Pradesh University of Medical Sciences, UP, India from December 2018 to December 2019 over a period of one year. A total of 19 patients were included in this study. All the patients were males between the age of 20-40 years. All the defects were secondary to road traffic accidents. Patients requiring extensive surgical procedures and with comorbid conditions were not included in this study. These patients were coming to us through emergency department and outpatient department. A few patients were also referred to us from other institutes. In all patients, authors have covered the defects by using transposition flaps. The outcome was in terms of final outcome of the procedure i.e. the survival of the flaps which are raised in unconventional dimensions.

After thorough planning in reverse, authors shaved the scalp and markings were done carefully. Flaps were marked 1-2 cm larger than required depending on the laxity of the surrounding tissues. Incisions were given with attention to proper hemostasis. Flaps were raised above the galea, leaving the galea intact (Figure 1-3). Flaps were transposed or rotated (Figure 1) according to the need of situation. Secondary defect was always split skin grafted, usually taken from the thigh. The other margin of the flap was secured with the galea with absorbable stitches.

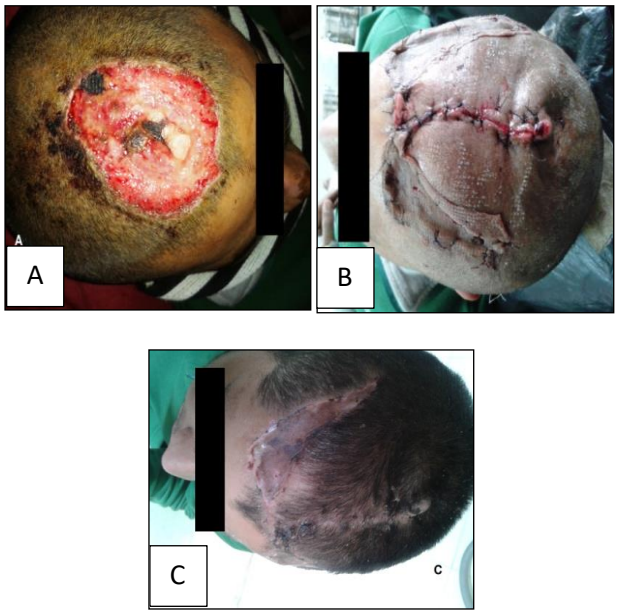

Figure 1: (A) Vertex defect (B) two transposition flaps raised, and defect closed; secondary defect spilt skin grafted (c) final result after healed flaps and graft.

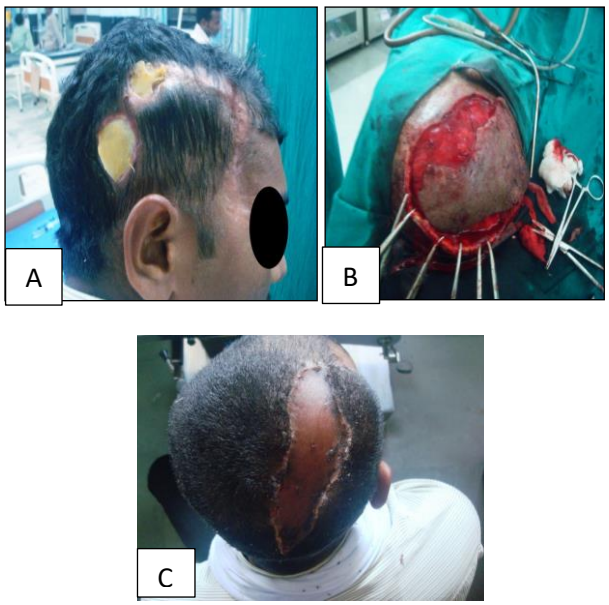

Figure 2: (A) Multiple defects over temporoparietal region (B) a large single flap raised leaving galea intact (c) nicely healed flap and graft.

A continuous suction drain was placed beneath the flap to ensure that there should be no collection. After completion of the procedure, a fluffy dressing was applied. Dressings were removed after three days or as needed and the drain was removed accordingly. At

seventh day the dressings are removed and a bland ointment is applied. At around 10-14th day stitches were removed.

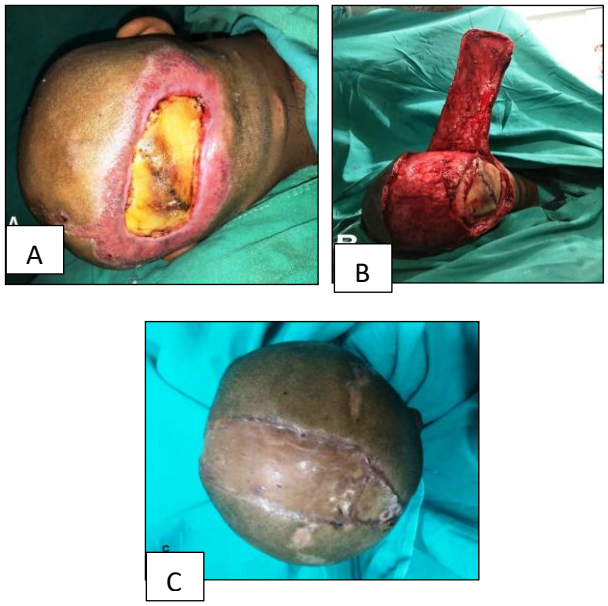

Figure 3: (A) Large full thickness defect over occiput (B) large single flap raised (c) healed flap and graft.

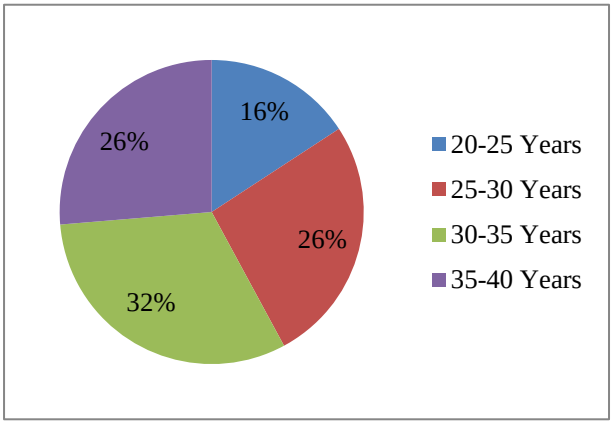

Figure 4: Age-wise distribution of the patients.

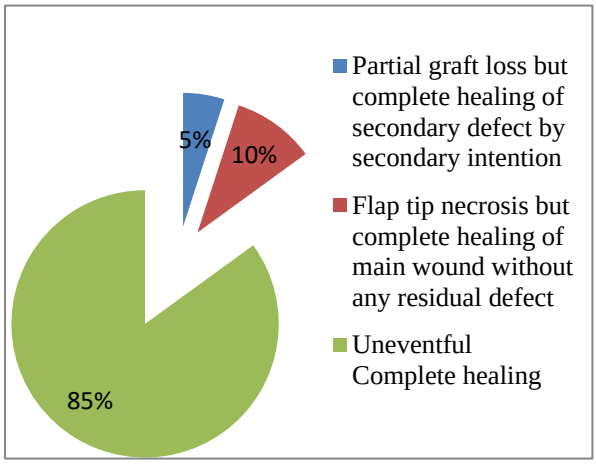

Figure 5: Final outcome.

RESULTS

All the patients were belonging to the age group between 20 to 40 years. All the patients in this study were males (Table 1).

Table 1: Incidence of site of defect.

Site of defect	No. of patients	Percentage (%)
Rt parietotemporal	7	37
Lt parietotemporal	6	31
Vertex	3	16
Occipital	3	16

Rt: Right, Lt: Left.

The average operating time was 1.5 to 2.0 hours. All the patients were operated under general anaesthesia. The average hospital stay was 4.4 days. All the defects were secondary to road traffic accidents. The average size of the defects was around 46 cm^2. There were no intraoperative complications.

The partial skin graft loss occurred in one patient and the wound healed secondarily. Two of the patients had flap tip necrosis; one was treated with regular dressing, and one required local flap revision in the operating room for exposed bone. All the patients reported acceptable aesthetic results.

DISCUSSION

The rising trend of post traumatic scalp defects due to high speed automobile accidents warrants the reconstruction of such defects. In this study, authors found that these flaps with unconventional dimensions are very effective, less time consuming and produce satisfactory results for both the patient and the surgeon. (Figure 3) In one case there was some flap loss at the tip and the underlying osteomyelitic bone was removed and the flaps were advanced to cover the defect. In six cases large flaps were raised beyond 1:1 ratio. In all cases, secondary defects were split skin grafted. All the flaps healed well except in one where there was osteomyelitic bone underneath the flap which was removed, and the flaps were advanced to cover the resultant defect (Figure 5). With these flaps authors were able to cover large scalp defects with exposed bone. The flaps are easy to plan and to execute. Moreover, these flaps proved very useful for the patients who are not suitable for microsurgical free tissue transfers. Results with these techniques are satisfying both to surgeon and patients (Figure 1-3). Furthermore, more extensive studies are needed, and it is obvious that these patients have to undergo less time under general anaesthesia, shorter hospital stay and less donor site morbidity when it is compared to more extensive procedures like free tissue transfers. Lai et al in their study of 12 free tissue transfers used to reconstruct scalp and calvarial defects reported a success rate of 100% with no major complications except for one where

wound dehiscence was caused by hematoma accumulation and was healed by local debridement.[10]

This result is comparable to it with similar success rate with minor complications which were dealt with regular dressings and only one patient requiring flap revision without partial or complete flap loss (Table 2, 3).

Table 2 : Hospital stay.

Hospital stay (in days)	No. of patients	Percentage (%)
2-4	9	47
4-6	8	42
6-8	2	11

Table 3: Complications and final outcome.

Complications	No. of patients	Percentage (%)	Final outcome
Flap tip necrosis	2	10	Complete healing of main wound without any residual defect
Partial skin graft loss	1	5	Complete healing of secondary defect by secondary intention

In another study of six patients done by Larrañaga et al, using different types of free flaps also mentioned that local flaps are also option for reconstructing the scalp defects. These flaps also offer advantage of ease of performance and replacement of hair-bearing defects with that of hair-bearing scalp.[11] These findings are consistent with this study (Table 3).

CONCLUSION

The large soft tissue scalp defects pose a real reconstruction challenge due to unyielding nature of the scalp. The increasing incidence of high-speed automobiles and road traffic accidents leads to more number of such cases in day to day surgical practice. As facilities and expertise for free tissue transfers are not available everywhere, in these situations' transposition flaps raised in unconventional dimensions provides a viable and reliable option to cover large soft tissue scalp defects.

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