

TO DETERMINE THE OUTCOMES OF FREE TISSUE TRANSFER FOR LARGE SCALP AND FOREHEAD DEFECTS RECONSTRUCTION

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ABSTRACT

Objective: To determine the outcomes of free tissue transfer for large scalp and forehead defects reconstruction.

Study Design: A descriptive case series.

Place and Duration of Study: The study was carried out at Plastic surgery department, Shifa International Hospital Islamabad, over a period of 5 years from Mar 2011 to Feb 2016.

Material and Methods: All the patients who underwent scalp reconstruction for soft tissue or composite defects greater than 6cm² during the period of 5 years were included in the series and were followed post operatively for 6 months. The patient's demographic data, medical history, surgical history, comorbidities, age, and gender were also analyzed. Indications for surgical intervention included cutaneous malignancy of the scalp, bony tumors, vascular lesions and traumatic tissue loss requiring reconstruction.

Results: A total of 20 patients (60% female and 40% male) with mean age of 38.75 years (SD=14.44), who underwent a reconstructive surgery for scalp defect, were assessed. The scalp defect were secondary to tumor resection (n=10; 50%), post-traumatic wounds (n=5, 25%) and resection of vascular malformations (n=5, 25%). Free flaps used for reconstruction were: Antero Lateral Thigh Free Flap (ALTF) (n=8; 40%), Radial Forearm Free Flap (RFFF) (n=6, 30%), free latissimus dorsi (n=4, 20%) and Transversus Abdominis muscle (TRAM) flap (n=2, 10%).

Conclusion: Scalp and forehead defects, if treated adequately, can heal with stable and aesthetically acceptable results and flap selection should be individualized according to the defects, patient's factors and availability of particular flap.

Keywords: Forehead defect, Free flap, Scalp defects.

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INTRODUCTION

The treatment of scalp and forehead defects can be extremely challenging. Scalp defects are classified according to the size of defect (table-I) their etiology and the involvement of soft tissue only/bony component. Defects of the scalp arise from several diverse etiologies including trauma, burn injury, infection, radiation, surgical excision of tumor, or congenital lesion¹. The goal of reconstruction for scalp and forehead defects is to achieve a stable coverage with acceptable aesthetic results. Smaller defects can be closed primarily where as reconstructing a large scalp defect poses a challenge in terms of availability of loco-regional tissue and probable need for bony reconstruction along with it. Advances in micro-

surgical techniques allowed free flaps to emerge as an additional and possibly superior option for scalp reconstruction².

Rotation flaps are a convenient method of reconstructing small to moderate sized scalp defect but when dealing with large to very large defects, scalp rotation remain inadequate for complete coverage. In spite of this, scalp rotation flaps are frequently utilized for restoration of hairline wherever possible in adjunct with other soft tissue coverage.

Various local flaps^{3,4} distant pedicled flaps^{5,6} and free flaps^{7,8} have been suggested for scalp reconstructions. Free flap reconstruction has rapidly established itself as a desirable and versatile option for repair of defects of the scalp, especially in more complex cases^{9,10}. Trapezius and latissimus dorsi pedicled flaps are good alternative for posterior scalp defects, but defects at the vertex and anterior to it, involving

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forehead needs coverage that is not only stable but also should be aesthetically acceptable. Free radial forearm fasciocutaneous flap, Anterolateral thigh free flap and other fasciocutaneous free flaps give good color match and ease of free designing as well as lesser risk of partial necrosis.

Scalp defect are being managed at various reconstructive centers in the country but till date no authentic data is available regarding the outcome where free flaps are used. The aim of

2011 to 29th February, 2016. Inclusion criteria was large scalp and forehead soft tissue only or composite defects including post tumor extirpation defects following tumor margin clearance, defects after resection of congenital malformations in patients aged between 10-70 years of both genders.

Patients with contaminated or dirty wounds, defects less than 6cm², age <10 and >70 years were all excluded as possible confounders.

Table-I: Classification of Scalp Defects.

S. No	Defect	Size (cm ²)	Options
1	Small	<3	Primary closure possible
2	Moderate	3-6	Local/expanded scalp flaps/Skin Grafts
3	Large	6-9	Locoregional tissue/Free tissue transfer/Skin Grafts
4	Very Large	>9	Free tissue transfer/Skin Graft

Table-II: Type of reconstruction and associated complications.

Free Flaps	No.	Seroma	Skin graft loss Complete/Partial		Hematoma	Wound dehiscence	Re-exploration
ALTF	8 (40%)	01 (12.5%)	-	-	01 (12.5%)	02 (25%)	None
RFFF	6 (30%)	None	-	-	01 (16.6%)	None	None
Latissmus Dorsi	4 (30%)	None	-	02 (50%)	None	02 (50%)	None
TRAM	2 (10%)	None	-	-	None	None	None
Total	20	01 (5%)	02 (10%)		02 (10%)	04 (20%)	0

Table-III: DONOR site complications.

Flap	ALTF	RFFF	Lat Dorsi	TRAM
Location of defect	Parietal: 3 (37.5%) Fronto-temporal: 2 (25%) Temporal: 3 (37.5%)	Frontal: 3 (15%) Fronto-parietal: 3 (15%)	Parieto-occipital: 4 (20%)	Orbital and frontal: 2 (10%)
Donor site Complication	Donor site partial graft loss: 3 (37.5%)	Donor site partial graft loss: 1 (16.7%)	Donor site seroma: 2 (50%)	None

this study is to present our experiences of reconstructing large scalp defects using microvascular free tissue and to compare various free flaps for their effectiveness in achieving aesthetically better outcomes.

MATERIAL AND METHODS

After approval of the ethical review committee, a descriptive prospective case series study was conducted at Shifa International hospital. It included all patients who underwent scalp reconstruction for soft tissue or composite defects greater than 6cm² using free tissue transfer; over a period of 5 years from 1st March

Also the patients, in whom skin graft or only loco-regional flaps were used for coverage, were excluded. Independent variables included primary diagnosis, defect size, method of reconstruction and complications. The patient's demographic data, medical history, surgical history, additional co-morbidities, age and gender were also analyzed. Indications for surgical intervention included cutaneous malignancy of the scalp, bony tumors and vascular lesions.

In cases of anticipated skull bone involvement, neurosurgical team was taken on board.

Bone grafts either from rib or split skull bone was incorporated for bony reconstruction. In cases of tumor, preoperative workup included incisional biopsy for histopathologic diagnosis and excision was done under frozen control to confirm margin clearance.

In cases of trauma, initially, effective debridement was done followed by negative pressure wound therapy or early coverage of wounds if there was exposure of vital structures. Decision was taken by the operating surgeon for the selection of flaps according to the defect size and location. Donor site morbidity was assessed on follow up visits. Minimum follow up of patients was 6 months.

All the patients were observed for any

free flap (ALTF) (n=8, 40%), Radial forearm free flap (RFFF) (n=6, 30%), free latissimus dorsi (n=4, 20%), Transversus Abdominis muscle (TRAM) flap (n=2, 10%). Lat. dorsi with skin graft was used for very large defects involving parieto-occipital region. Antero lateral thigh free flap (ALTF) was mostly used for defects of parietal region and some in temporal region as well. Radial forearm free flap (RFFF) was utilized in patients with forehead and frontal defects (fig-1,2).

The table-II shows the main complications that were assessed in our study associated with different reconstructive methods.

The main complication seen was wound dehiscence (20%) in Antero lateral thigh free flap



Figure-1: 47 year old male with (A) Arterio-Venous Malformation on left side fronto - temporal region (B) Marked feeders (C) Resection of malformation (D) Defect covered with ALT Free Flap, early postoperative view (E) 2 years postoperatively.

wound infection, seroma, hematoma, graft loss and any donor site complications. The data was analyzed using SPSS software, standard deviation and frequencies of complications were noted.

RESULT

A total of 20 patients (60% female and 40% male) with mean age of 38.75 years (SD=14.44) who underwent reconstructive procedures were included in the study. The defects included were secondary to tumor resection (n=10, 50%), post-traumatic wounds (n=5, 25%) and resection of vascular malformations (n=5, 25%). Free flaps used for reconstruction were: Antero lateral thigh

(ALTF) (25% cases) and Lat. dorsi flaps (50% cases), although it did not need resuturing but prolonged patient hospital visits for wound care. Another complication seen was skin graft partial loss, more common with latissimus dorsi flaps (10%) which did not require any intervention. None of the patients required re exploration.

The table-III shows the donor site complications observed in the study. The complication associated with latissimus dorsi flap was donor site seroma (n=2, 50%), which was drained and resolved without sequelae. There was partial graft loss on Radial forearm free flap (RFFF) donor site (n=1, 16.7%) and Antero lateral thigh

free flap (ALTF) (n=3, 37.5%) that eventually healed secondarily. There was no functional deficit in limbs in cases of Radial forearm free flap (RFFF) or Antero lateral thigh free flap (ALTF).

DISCUSSION

Reconstruction of scalp is different from other body parts; many important factors are to be considered when planning reconstruction of

on the size, location, and etiology of the defect². Critical and thorough analysis of the respective defect is highly recommended⁴.

Local flaps usage has the benefit of hair bearing skin coverage giving an acceptable and more cosmetic result without the use of any regional or distant body areas reducing the morbidity in comparison but their implication is more limited in cases of larger defects. A lot of

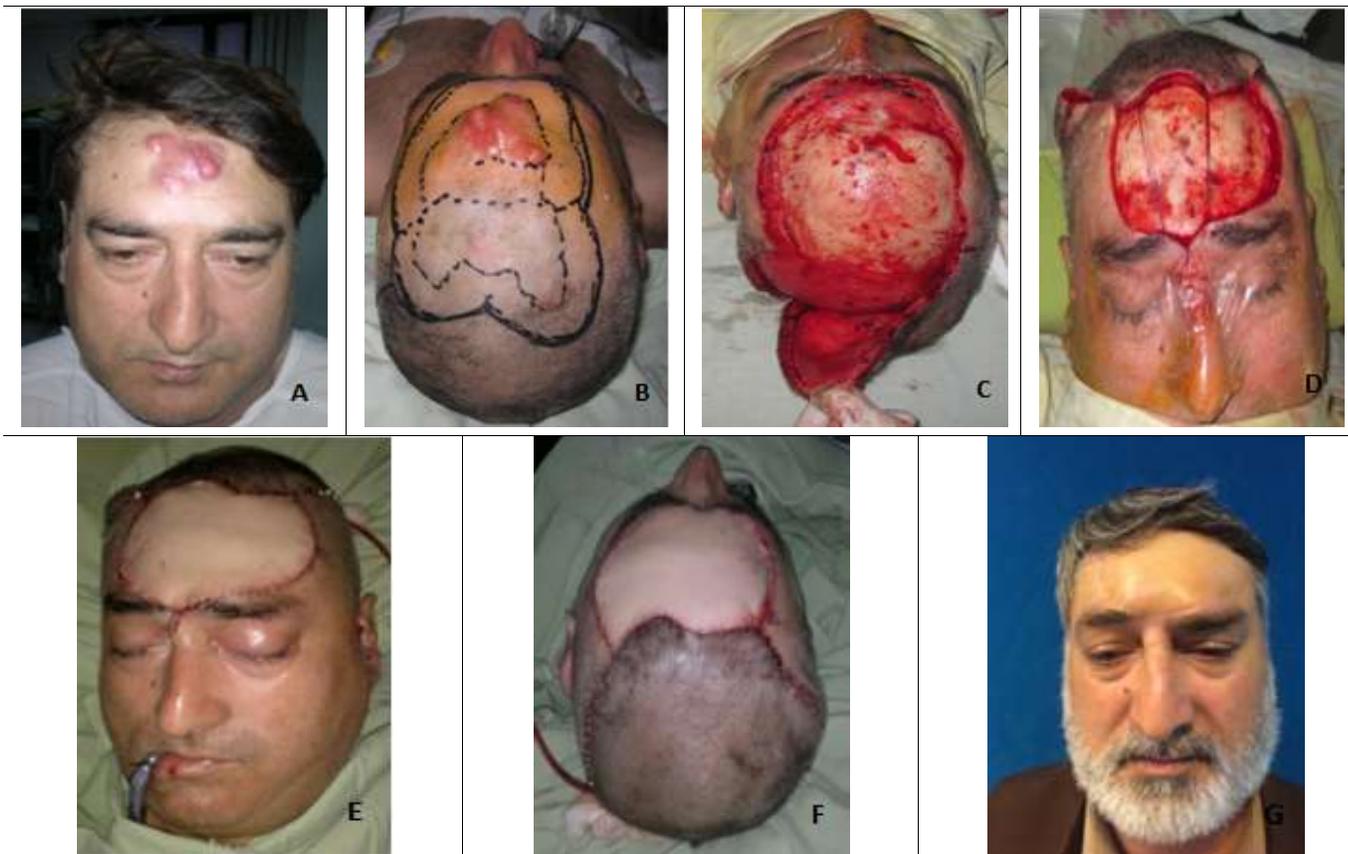


Figure-2: 50 year old male (A) DFSP forehead (B) 3cm margin taken for resection along with satellite lesions on scalp (C),(D) Defect at fronto-parietal region after resection, scalp rotation flap used for anterior hairline restoration (E), (F) and (G) RFFF used for reconstruction, Immediate and late postoperative views.

scalp and forehead, the main consideration being the anatomic nature of the scalp having limited elasticity, which renders primary closure of wounds more than 50 cm² extremely challenging^{1,3}. In most of the studies conducted, the primary closure was only feasible where the defect was smaller than 6 cm². Complex and large defects can be reconstructed by using either free flaps or local or distant pedicled flaps depending

undermining is usually necessary to elevate an adequate flap size pliable enough to cover the defect and skin graft over the donor area⁵.

Using skin grafts gives an advantage of covering an area as large as 100cm² with partial thickness grafts in a simplest way but associated with an inferior cosmetic outcome especially when meshed. Being less durable, they are more prone to recurrent ulcer formation, the risk of

partial or complete loss with bony exposure, especially in post-radiotherapy cases⁶.

Using distant pedicled flaps such as trapezius, pectoralis or latissimus dorsi flaps has an advantage of effective and durable coverage with relatively easier procedure. But the drawback of donor site morbidities and the higher possibility of flap loss, especially with senility or associated co-morbidities as diabetes or cardiac conditions make them the less likely options to be considered. Moreover the flap is bulky and non hairy⁴.

Decision for using a free flap is dependent on various factors including location and size of the defect, previous reconstructive attempts, patient's age and body habitus, consideration of donor-site morbidity, depth of the defect and preference of the operating surgeon^{2,6}.

Free flaps are considered where the primary site blood supply is poor, rotational flaps not possible or already consumed^{3,5}. Our study showed that free tissue is a versatile option for adequate coverage of large scalp defects and give ease of free designing for the given size and site.

Literature showed that most of the large scalp defects were reconstructed using a latissimus dorsi free flap (49%, n=280/567), rectus abdominis (17%, n=96/567) and anterior lateral thigh flap (14%, n=77/567). Radial forearm free flap was surprisingly rarely used (8%, 44/567)⁴.

In our study, Antero lateral thigh free flap (ALTF) was a considerably convenient and a versatile option as it gives a large surface area and long pedicle length as well as the feasibility of harvesting a chimeric flap including part of the muscle if required to fill the dural defect but color match was not good compared to the forehead skin. Its dissection is also demanding and vascular anatomy is variable. It has more bulk in cases of females than males as also identified by Larrañaga et al. It accompanies the benefit of hidden donor site and no functional deficit of the limb used as well as simultaneous harvest in two-team approach².

Radial forearm free flap (RFFF) give excellent color match and advantage of reliable and longer pedicle, easy harvest and shorter operative time. The main disadvantages are the prominent scarring over the exposed area and size limitation⁷.

Latissimus dorsi is a valid option when a very large surface area is involved especially at the parieto-occipital region. It gives good thin pliable coverage especially over the infected areas. The shortcoming of this flap is a small size skin paddle with myocutaneous flap due to difficult donor site closure and wound dehiscence with larger skin paddles or a skin grafted donor site. Donor site seroma is a common complication due to large cavity after flap harvest but is mostly temporary¹⁰.

Our study showed that because of the aesthetic burden associated with free flaps, they are very demanding technically and take more operative time yet they provide the best cosmetic and functional results⁹.

Although the outcomes observed with radial forearm free flap were significantly better and aesthetically pleasing especially in frontal defects, size limitation and exposed donor site renders the decision of using this flap difficult in most of the patients. In cases of very large defects, lat. Dorsi muscle with skin graft is the flap of choice. The Antero lateral thigh free flap (ALTF) is especially useful owing to its versatility, as well as the option of simultaneous harvest, and its minimal donor site morbidity.

Scalp and forehead defects, if treated adequately, can heal with stable and aesthetically acceptable results. Choice of method of reconstruction must follow the reconstructive ladder putting in mind certain factors as the defect size, skin pliability, local tissue vascularity, and patient general condition. In all cases in which direct closure is not possible, the local, pedicled, and free flaps discussed provide a good option for coverage. Attention to the vascularity of the scalp is crucial in planning local scalp flaps. Proper design of local scalp

flaps includes incorporation of major vascular pedicles within broadly based flaps and closure without excessive tension.

CONCLUSION

We concluded that flap selection is individualized according to the defects, patient's factors and availability of particular flap.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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