



SCALP RECONSTRUCTION: EXPERIENCE OF 50 PATIENTS AT TERTIARY LEVEL CENTRE IN INDIA

Plastic Surgery

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ABSTRACT

INTRODUCTION Scalp possesses unique anatomical & aesthetic features and occupies the most prominent part of the body. Scalp defects are neither easy to look at or to reconstruct. *The factors influencing decision making in the repair of scalp defects are their size, depth and location.* Various reconstructive options include primary closure, skin grafts, trephination, local tissue flaps with or without tissue expansion, regional myocutaneous flap and microvascular free flap. A successful reconstruction surgery must result in less morbidity, good aesthetic appearance, decreased hospitalization time, preserving the hairline without violating the body contour.

METHODS Study was conducted in the Department of Plastic and Reconstructive Surgery, SMS Hospital, Jaipur, India. A sample size of 50 patients From September 2019 to march 2021, requiring scalp reconstruction procedures was taken. All the details of the patient that were relevant to the study were collected during the preoperative, intraoperative and postoperative periods and during follow which was later analyzed.

RESULTS The most common cause of scalp defect was excision of malignant tumour (40%). Surgical reconstruction using rotational and transposition flap was done in 37 patients (74%). In 5 cases (10%) reconstruction done using free flap. The recovery was relatively quick in all cases. In 2 cases (4%) partial flap necrosis occur which was managed conservatively.

CONCLUSION An aesthetically pleasing scalp reconstruction requires a precise preoperative planning with detailed knowledge of scalp anatomy and blood supply. The wide armamentarium of techniques for reconstruction allows the plastic surgeon to give a much pleasing final result and his creativity on the table added to all these elements together can give a satisfactory result for the patient.

KEYWORDS

Scalp reconstruction, Reconstructive surgery, Local fasciocutaneous flap, Free flap, cutaneous malignancy.

INTRODUCTION

Scalp possesses unique anatomical & aesthetic features and occupies the most prominent part of the body. Most of the scalp has a convex surface, is relatively inelastic which makes repair of even a small defect very difficult. It is composed of non-hair bearing skin (frontal) and hair bearing skin (temporal, parietal and occipital). Scalp defects are neither easy to look at or to reconstruct. *The factors influencing decision making in the repair of scalp defects are their size, depth and location.*¹ The nature of the defect is another vital factor in deciding the management. *In case of a tumour excision the bone may be removed sometimes requiring a complex reconstructive technique. The type of flap needed to cover the defect is also influenced by the integrity of the surrounding scalp tissue.*²

Various reconstructive options include primary closure, skin grafts, trephination, local tissue flaps with or without tissue expansion, regional myocutaneous flap and microvascular free flap. Tissue expansion is one of the most important armamentaria for aesthetic scalp reconstruction. The design of these flaps should consider aesthetic re-directioning of the hair follicles, preservation of the hairline, inclusion of major vascular pedicles, and tension less closure of the wound.³

Primary closure is the best option for small defects less than 3 cm in diameter but the location of the defect has to be taken into consideration.³

Both Bilateral and unilateral rotation flaps are important for covering defects in the hair-bearing scalp. Bilateral flaps have lesser wound tension due to its distribution over a wider area as compared single flaps.

In case of small and medium size defects local flaps are believed to be the workhorse flaps. These flaps encompass the skin, galea aponeurotica and subcutaneous tissue. Local flaps should be raised over named vascular pedicles. Once a large scalp flap has been raised, skin graft cover for the donor defect becomes probably the safest procedure.⁴

Multiple scoring incisions in the galea aponeurotica can be used to increase the coverage as they overcome the resistance to stretch much better.

*Orticochea flaps, also called banana peel flaps, "when described initially used four large scalp flaps, each based on a known vascular pedicle. This method allows reconstruction of defects as large as 30% of total scalp area."*⁵

A modification of the Orticochea relies on three flaps, two of them are based on the superficial temporal vascular pedicles and a single posterior nape of neck flap based on the occipital vascular pedicle.

For large defects and complicated wounds extending up to the bone, Free Tissue Transfer provides a single-procedure closure. It also provides a robust vascularity at the recipient site which helps in better wound healing especially in cases of defects resulting from infection and radiation exposure.⁶⁻¹⁰

The disadvantages of free flaps are that they may cause significant donor site morbidity, are time consuming and are expensive for the patient. Therefore, free flaps are to be done when other simpler reconstructive techniques such as skin grafts and local scalp flaps are not an option.

Total scalp avulsions are devastating injuries that are often caused by long hair getting caught in machinery. Immediate replantation of the avulsed tissue using microsurgical techniques remains the best treatment for scalp avulsion.

If the decision making is based on a good knowledge of anatomy, consideration of the relevant patient factors, a meticulous evaluation of the defect and the knowledge of the varied reconstructive methods available, the reconstruction of scalp defects will be successful.

Preoperative planning is important. As no single method is available for covering scalp defect, the planning must be tailored to the individual defect.

A successful reconstruction surgery must result in less morbidity, good aesthetic appearance, decreased hospitalization time, preserving the hairline without violating the body contour.

AIM OF THE STUDY:

- 1 To analyze scalp defects and to discuss the various established reconstructive options available and their application.
- 2 To evaluate the outcomes of various surgical procedures following scalp reconstruction

MATERIALS & METHODS

Study was conducted in the Department of Plastic and Reconstructive Surgery, SMS Hospital, Jaipur, India.

The study population in the present study were the patients who visited the hospital for scalp reconstruction.

The patients with scalp defects due to trauma, infection, burns and cancer resection were included in the study.

Those patients who were not willing to participate were excluded from the study.

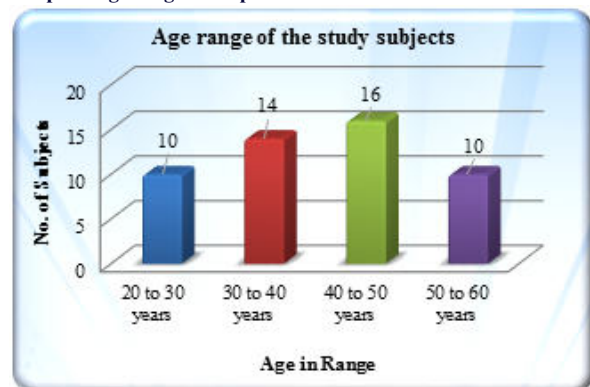
Informed and written consent was obtained from all patients prior to the start of the study. A sample size of 50 patients From September 2019 to march 2021, requiring scalp reconstruction procedures was taken. All the details of the patient that were relevant to the study were collected during the preoperative, surgical and postoperative periods and during follow up which was later analyzed.

OBSERVATION AND RESULTS

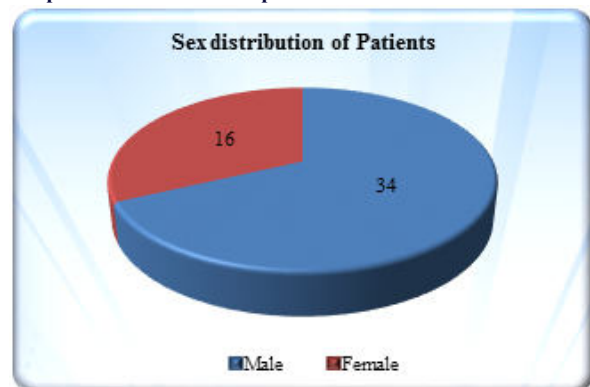
Patient related, defect related and treatment related parameters were collected. Age in years, gender and comorbid illnesses were noted as patient related parameters. Wound aetiology was recorded as defect related factors. Phase of coverage, the mode of reconstruction and complications were taken as treatment related factors.

PATIENT RELATED PARAMETERS:

Graph 1: Age range of the patients



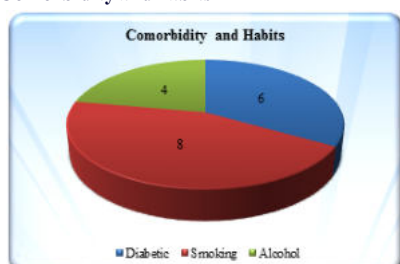
Graph 2: Sex distribution of patients



Comorbidity and Habits:

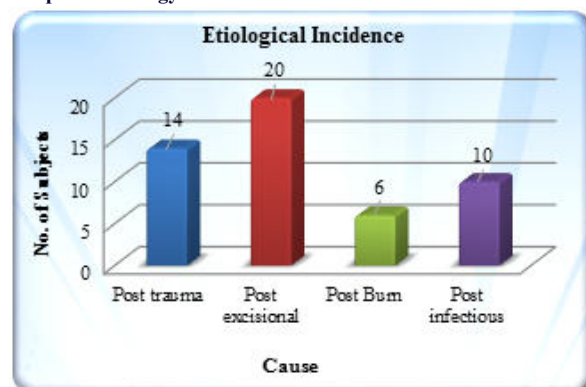
Among fifty patients, 6 patients had diabetes mellitus and were taking regular medications, 8 patients were smokers, and 4 patient had the habit of consuming alcohol. (Graph 3)

Graph 3: Comorbidity and habits



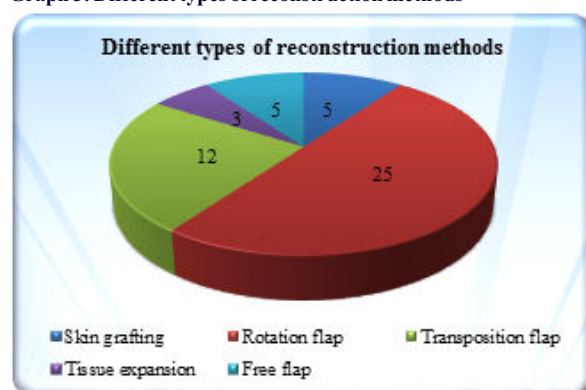
DEFECT RELATED PARAMETERS:

Graph 4: Aetiology of Defects

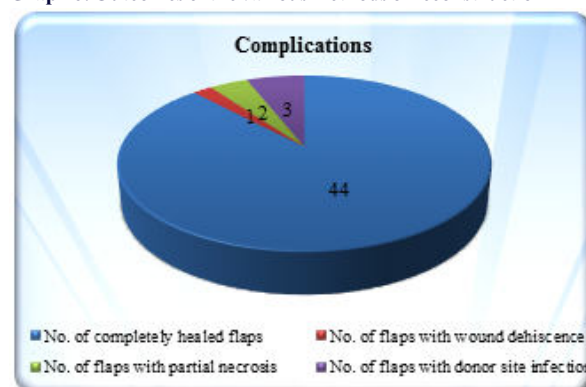


TREATMENT RELATED PARAMETERS:

Graph 5: Different types of reconstruction methods



Graph 6: Outcomes of the various methods of reconstruction



DISCUSSION

There are many considerations one needs to take in account while formulating a treatment plan for any given patient with a scalp defect. Patient expectations, comorbid conditions, limited tolerance for certain procedures etc. need to be taken into account as they may limit the utility of the procedures particularly in the case of prolonged tissue expansion. The adjacent scalp tissue is the best tissue for replacement of lost scalp.¹¹ Particular attention needs to be paid to the present hair distribution and its anticipated future.

Consideration of important factors such as the limited elasticity seen in the scalp tissues and good knowledge about the anatomy of the scalp and its vascular distribution is paramount for a successful scalp reconstruction. Another aspect that has to be considered is the depth of the defects following resection and whether the calvarial bone is left exposed or resected. This fact should be taken into account while planning the operative procedure.

There are various etiological factors responsible for scalp defects too. Local scalp flaps and skin grafts have been used since long and are still

considered whenever indicated. It was noted in our present study that skin grafts can be used for scalp reconstruction only if the pericranium is present to give vascularity to the grafted site. This was in line with the findings of Shenoy et al in 1993.¹²

Split skin grafts are used to temporarily cover the defect while the adjacent scalp tissue is prepared using tissue expanders and advancement flaps or while waiting for the pathological report to arrive in case of malignant tissue resections.

Tissue expander not just facilitates direct defect closure, it also provides good aesthetic results. As noted in the present study, tissue expansion must usually be done prior to the excision of the lesion. Therefore, tissue expansion can be considered as a good option for reconstructing scalp defects arising from excision of benign lesions. These findings are also in line with the results of Newman et al in 2004.¹³

Local scalp flaps used for defect closure are mainly single or multiple rotation flaps with or without skin grafting for the donor site. Their advantage is reconstruction with soft tissues and good texture, stable, hair-bearing adjacent skin. Usually, local scalp flaps have minimal complication rate if the vascular distribution and anatomy of the scalp are taken into account while designing the flaps.

The chances of necrosis is minimal if not more than 2 large rotation flaps are used to cover the defect. The tissues covering the periosteum also have to be mobilised widely in order to cover the defect completely.

Local scalp flaps when planned meticulously are technically simpler than free flap reconstructive techniques and offer quick, easy and safe dissection. It was noted in the present study that 50 to 60% of the scalp area (moderate to large defects) can be covered easily using these local scalp flaps.

The disadvantages of local scalp flaps are that they cannot be used to cover forehead defects as they need skin grafts to cover the donor defect which is aesthetically unacceptable.

Free flap reconstruction has rapidly established itself as a versatile and desirable therapy for defects of the scalp, especially in larger and more complex cases. Beasley et al in 2004 stated that when the scalp defects measure greater than 200 cm square, a free flap must be considered as the reconstructive option.¹⁴

Free tissue transfer is a reliable and successful option for resurfacing large and complex defects of the scalp tissue. However, free flaps need microvascular setup, increased operative time, higher donor site morbidity and poor aesthetic outcome in hair bearing scalp. Chicarilli ZN et al reported that free tissue transfer can be done as a single stage procedure and gives stable cover with highly vascular tissues.¹⁵ Foote et al in 1994 stated that free flaps can tolerate therapeutic doses of radiation as well.¹⁶

Free flaps should be reserved for situations wherein local scalp flaps or split skin grafting cannot be done.

This study does not aim to assess the efficacy of any single flap. The study was only designed to highlight the various methods and planning of scalp reconstruction procedures.

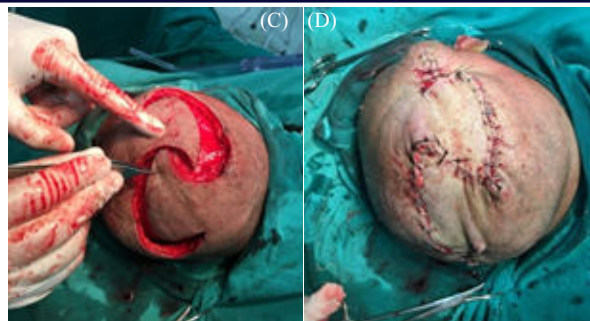


Figure 1: (A) Squamous cell carcinoma in parieto-occipital region, (B) Wide local excision was done (C) Double Hatchet flap (O→Z flap) was marked and raised with extensive undermining, (D) Immediate post op photograph.



Figure 2 : (A) Post cellulitis defect scalp in 5 years old child (B) Defect after debridement (C) Two large transposition flaps were elevated to cover the defect (D) Flap inseting done with SSG of donor site. (E) & (F) One week Post op photograph



Figure 3: (A) Expander in-situ for previously skin grafted scalp defect in Burn patient. (B) Expander removal with Flap advancement with removal of grafted area (C) &(D) Post op photograph

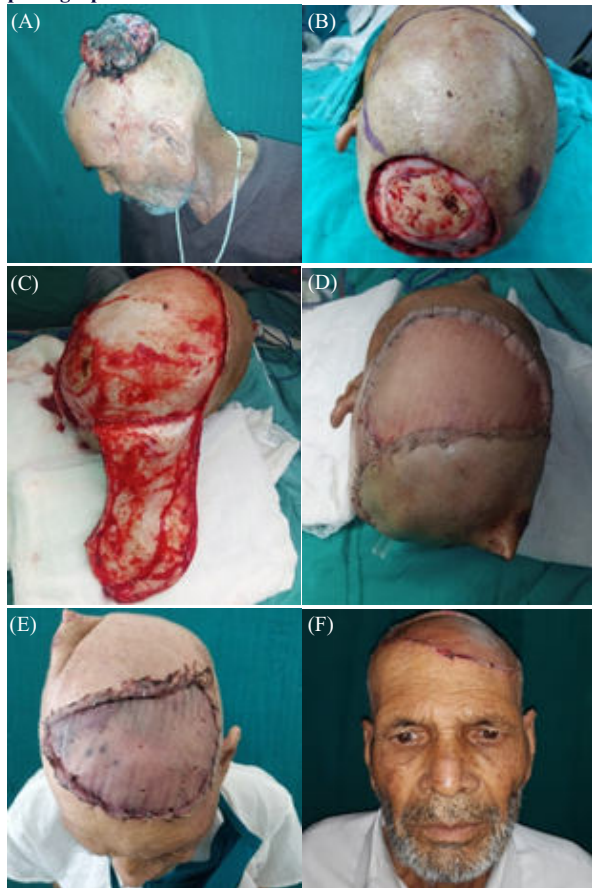


Figure 4: (A) Squamous cell carcinoma with involvement of calvaria and duramater, (B) wide local excision was done (C) A large transposition flap was raised to cover the defect, STSG was done at donor site, (D) Immediate post op photo (E) one week post-op photograph (F) 3 month post-op photograph



Figure: 5 (A) 25 years old female with total scalp avulsion injury caused by hairs caught in machine. (B) Pre-op photograph showing Scalp defect area left after initial immediate STSG done in periosteum intact area (C) Free ALT flap harvested with good pedicle length (D) 1 month post-op photograph

CONCLUSION

The following conclusions can be made from the present study:

Certain factors like the size and location of the defect in the scalp, whether the pericranium is intact to take up skin grafts, and quality of the adjacent scalp tissue are likely to influence the selection of reconstructive technique.

Primary closure of scalp wounds should be done only for defects measuring less than 3 cm as the elastic property of the scalp tissue is limited.

In certain cases, if the pericranium is viable or the outer cortex is removed and the diploic space is exposed a skin graft can be used over the bone as temporary coverage.

Tissue expansion needs patient compliance for multiple procedures and good amount of surrounding tissue that can be expanded.

The vascular distribution within the scalp tissue should be taken into account when planning local scalp flaps.

A good design for a local scalp flap should be broad based, must include major vascular pedicles and wound closure should be tension free.

Microvascular reconstruction may be the most reliable option for reconstruction of large scalp defects, especially those that occur in compromised tissues.

The perfect reconstruction for every defect does not exist; therefore, the reconstruction for every defect must be tailored according to each case and its unique requirements. A good know-how of the anatomy, the individual patient, and the resurfacing choices that are available is the beginning are all essential, but the surgeon's success requires much more than that. His creativity on the table added to all these elements together can give a satisfactory result for the patient.

Compliance with ethical standards

Conflict of interest Dr. Rakesh Jain and Dr. Nitesh Lamoria declares that they have no conflict of interest.

Ethical Approval

Institutional Ethics Committee has confirmed that no ethical approval is required.

Consent to Participant

Participants in the study consented for the publications of results.

Consent for publication

Upon submission, all authors consent to the publication of the manuscript.

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