

## Management modalities of scalp defects – a clinical study

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### Abstract:

*Background:* The scalp is exposed to many insults from the environment and also frequent location of various skin malignancies. It is more commonly susceptible to burns and other trauma that cause extensive disfigurement and scarring. A successful reconstruction must result in less morbidity, decreased hospitalization time, good aesthetic appearance, preserving the hairline without violating the body contour. The aim of this study was to analyze scalp defects and to discuss various established reconstructive options available and their application at our Civil Hospital, Ahmedabad.

*Materials and Method:* All patients with scalp defect admitted during the period from October 2015, to December 2017 are included in this study. The data was collected with a Proforma regarding patient, defect, treatment and treatment outcome related parameters. Detailed history was recorded and all patients were examined clinically based on etiology, surgery was planned either emergency or elective. Based on the size of scalp defect, reconstruction was done, later followed up and studied.

*Result:* The incidence rate was higher in men with mean age group 27.5 years and trauma was common etiology more commonly. Flap coverage was the commonest modality of treatment followed by Removal of outer cortex of calvarium and split skin grafting. Maximum patients were completely healed while some patients required repeat skin grafting.

*Conclusion:* Our study enhances the existing knowledge of scalp defects and may play a role in the management of scalp defect. Local scalp flaps when planned meticulously are technically simpler than free flap reconstructive techniques and 50 % of the scalp area (moderate defects) can be covered easily using these local scalp flaps. A good knowledge of the anatomy, the individual patient, and the resurfacing choices that are available is the beginning, but the surgeon's success needs creativity to add all these elements together to give a satisfactory result for the patient.

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### I. Introduction

The scalp is exposed to many insults from the environment and also frequent location of various skin malignancies. It is more commonly susceptible to burns and other trauma that cause extensive disfigurement and scarring. The best replacement for scalp tissue is scalp tissue. The factors influencing decision making in the repair of scalp defects are their size, depth, location and nature of the defect<sup>1</sup>. The type of flap needed to cover the defect is also influenced by the integrity of the surrounding scalp tissue<sup>2</sup>. 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<sup>3</sup>. In case of small and medium size defects local flaps are believed to be the workhorse flaps. Advancement, transposition and rotation flaps are the work horse flaps for reconstructing these defects. Local flaps are best raised over named vascular pedicles and is probably the safest procedure.<sup>4</sup> Free tissue transfer provides single-procedure closure of large defects and complicated wounds extending up to the bone. They also provide robust vascularity to the recipient site helping better wound healing especially in cases of defects resulting from radiation exposure and infection. Preoperative planning is important. The planning must be tailored to the individual defect as no single method is available for covering scalp defect. A successful reconstruction must

result in less morbidity, decreased hospitalization time, good aesthetic appearance, preserving the hairline without violating the body contour.

## II. Material and Methods

This prospective comparative study was carried out on patients of Department of Burns & Plastic Surgery, Civil Hospital and B. J. Medical College, Ahmedabad, Gujarat, India from October 2015 to December 2017. A total 30 adult subjects (both male and females) of all ages who were willing to participate were included.

**Study Design:** Prospective observational study

**Study Location:** This was a tertiary care teaching hospital based study done in Department of Burns & Plastic Surgery, Civil Hospital and B. J. Medical College, Ahmedabad, Gujarat, India

**Study Duration:** October 2015 to December 2017

**Sample size:** 30 patients

### Inclusion criteria:

1. The patients with scalp defects due to trauma, infection, burns and neoplasia were included in the study.
2. Patients of all age willing for study were included.

### Exclusion criteria:

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

### Procedure methodology:

**Collection of data** the data was collected with a Proforma regarding patient, defect and treatment related parameters. 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.

**Procedure:** Detailed history was recorded and all patients were examined clinically based on etiology, surgery was planned either emergency or elective. Based on the size of scalp defect, reconstruction was done by: Primary closure, Skin grafting, Wound closure device, Removal of outer table of calvarium and skin grafting, Local flap techniques: (*Rotation flap, Transposition flap, Advancement flap*) Free flap techniques: (*Antero lateral thigh flap*) Monitoring flap for viability and any complications.

**Follow up Procedure:** Patient was followed up at weekly interval for one month followed by once every two month for 6 months.

**Assessment of Outcome:** Post - operative complications were assessed. It can be either donor -site or recipient - site problems.

## III. Result

Total no of 30 patients were included in the study between October 2015 to December 2017. Age in years, gender and co morbid illnesses were noted as demographic parameters. Wound etiology was recorded as defect related factors. The mode of reconstruction and complications were taken as treatment related factors.

Age group range from 1.5 years to 75 years, suggesting scalp injuries are common in all age group. The median age of study population was 27.5 years. Out of 30 patients that were studied, there were 19 Male and 11 Female patients. Among 30 patients, two patients had diabetes mellitus and were on regular medications, two patients were tobacco chewer, one patient had taken radiotherapy for brain tumour and one patient was HBsAg positive.

**Table 1:** Trauma was the most common cause of scalp injuries accounting for 20 cases (66.66 %) and infection being the second most common cause.

Sr.No	Etiology	No of patients	Percentage
1	Post trauma	20	66.67 %
2	Post burn	4	13.34 %
3	Post excision	1	3.34 %
4	Post infection	5	16.67 %

**Table 2:** Out of 30 patients who underwent local flap for scalp defects, 16 were transposition flaps and 2 were rotation flap. One patient with history of burns underwent free anterolateral thigh flap from right thigh for left temporo-parietal scalp defect with anastomosis to neck vessels. One patient with burns scalp defect underwent wound closure device which healed completely and patient had good cosmesis. Five patients with

total scalp defect due to infection or degloving injury underwent removal of outer table of cortex and skin grafting which had partial loss and then allowing granulation tissue to proliferate and then again skin grafting which completely healed. One patient underwent tissue expansion for congenital benign naevus and followed by excision of naevus and primary closure.

Sr. No	Type of reconstruction	No. of patients
1	Transposition flap	16(53.34%)
2	Rotation flap	2
3	Free flap	1
4	Wound closure device	1
5	Removal of outer cortex of calvarium and split skin grafting	5 (16.67%)
6	Skin grafting	3
7	Tissue expansion	1
8	Temporalis muscle flap	1

**Table 3:** Out of 30 patients operated, three patients had wound dehiscence, all were transposition flap and they healed by secondary intention, not requiring secondary surgery. Out of the above three, one patient with history of radiation for brain tumour also had partial donor area skin graft loss which also healed from secondary intention after long time as local tissue were scared due to radiation changes. Out of five patient operated for total scalp defect who underwent removal of outer table of cortex and skin grafting, there was partial loss of skin graft in all five patient which was allowed to granulate and then skin grafted again which healed completely.

Sr. No	Parameter	No. of patients
1	Completely healed	21 (70%)
2	No. of flap with wound dehiscence	3
3	Partial loss of skin graft	6

#### IV. Discussion

Good knowledge regarding the anatomy of the scalp and its vascular distribution and the consideration of important factors such as the limited elasticity seen in the scalp tissues 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 resected or left exposed. This fact has to be taken into account while planning the operative procedure.

Skin grafts and local scalp flaps have been used since long and are still considered whenever indicated. In our present study, it was noted that skin grafts can be used for scalp reconstruction only if the pericranium is present or after trepanation to give vascularity to the grafted site.<sup>5</sup> Use of tissue expander facilitates direct defect closure with good aesthetic results. From the present study, it can be noted that 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 concur with the results of Newman et al in 2004.<sup>6</sup> In the present study 30 patients underwent local or distant flap coverage for scalp defects and no distal flap necrosis occurred. Local scalp flaps when planned meticulously are technically simpler than free flap reconstructive techniques. In the present study, it was noted that 50 % of the scalp area (moderate defects) can be covered easily using these local scalp flaps. The disadvantages of local scalp flaps are that they require normal adjacent scalp tissue and mostly need skin grafts to cover the donor defect which is aesthetically unacceptable. Also local scalp flaps cannot be used to cover forehead defects and they provide insufficient tissue to cover defects which are deep and very large. Indications for microvascular free flap reconstruction include but are not limited to: defect size preventing primary closure, failed primary or local flap closure due to inelastic or poor skin quality, multiple resections for recurrences, or neo - or adjuvant radiation therapy. Beasley et al in 2004 stated that when the scalp defects measure greater than 200 cm<sup>2</sup>, a free flap must be considered as the reconstructive option.<sup>7</sup> Free tissue transfer is a reliable and successful option for resurfacing large and complex defects of the scalp tissue.<sup>8</sup> However, free flaps need microvascular setup, increased operative time, higher donor site morbidity and poor aesthetic outcome in hair bearing scalp.<sup>9</sup> Total scalp avulsion is difficult to manage and scalp replantation also has failure rate and requires microsurgical facilities to be available and avulsed scalped tissue to be intact. Trepanation or removal of outer cortex of calvarium by power drill using rose head burr is an alternative method of treatment and it can be used to stimulate the formation of granulation tissue over exposed cortical bone. Healing by granulation tissue is

somewhat slow process, but it has high success rate, causes few complications as also stated in study of Latenser J et al. of power drill to fenestrate exposed bone to stimulate wound healing.<sup>10</sup> Wound closure device is helpful in obtaining primary closure in defect more than 3 cm where surrounding skin is elastic without signs of inflammation or edema and can be stretched towards each other and not allowing suture cut through as tension is distributed well on all sides equally and it maintains the tension over time. Thus, allowing skin to stretch slowly and achieving primary closure of hair-bearing scalp skin to approximate and give better cosmesis.<sup>11</sup> Despite the gross inequalities between these essentially different flap types, they have been included in a single study, as this study does not aim to assess the efficacy of any single flap. The study was only designed to highlight the various methods of scalp reconstruction procedures.

## V. Conclusion

As the elastic property of the scalp tissue is limited, primary closure of scalp wounds should be done for defects measuring less than 3 cm. Factors are likely to influence the selection of reconstructive technique are 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. 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 or removal of outer cortex and allowing it to granulate and then skin grafting is also a good method. Tissue expansion needs good amount of tissue that can be expanded, patient compliance for multiple procedures, and the calvarial cover should be stable in the expansion period. A good design for a local scalp flap should include major vascular pedicle and vascular distribution should be taken in account. The flaps should be broad based 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. Wound closure device is helpful in cases where primary closure is not achievable and defect is not very large for local flap, thus achieving better cosmesis. The near perfect reconstruction for every defect never exists; therefore, the reconstruction for every defect must be tailored for each case to perfection. A good knowledge of the anatomy, the individual patient, and the resurfacing choices that are available is the beginning, but the surgeon's success needs creativity to add all these elements together to give a satisfactory result for the patient.

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