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Original Article

Evolving a System of Classification for Scalp Defects and Methods of Reconstruction

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Abstract

Background: Scalp wound closure requires good understanding of scalp anatomy, knowledge of a algorithm for reconstruction of scalp defects, good planning, adequate debridement, proper execution and proper post-operative care. **Aim and objective:** The aim of the study was to use a simple algorithm to reconstruct scalp defects of various sizes and to study the efficacy of the algorithm in reconstruction of scalp defects. **Materials and Methods:** All patients with scalp defect who presented to the Department of Burns Plastic and Reconstructive surgery at Kilpauk government medical college were studied. Reconstruction of scalp defect was planned based on the algorithm. All patients were followed up for a period of 1 year post operatively. **Results:** The scalp defects were reconstructed based on the algorithm. Smaller defects were managed with primary closure and SSG. Larger size defects and defects without periosteum were given local or distant flap. All patients recovered well with lesser rate of complications. **Conclusion:** Reconstruction of scalp defect is made easy with the use of the algorithm for choice of treatment based on the defect size.

Key words: Distant flap, Free flaps for scalp wound, Local flaps, Primary suturing, Regional flaps, Scalp wound, Skin grafting

INTRODUCTION

Scalp defects can occur due to varied causes ranging from congenital (aplasia cutis) to acquired (trauma, burns, infection, and neoplasm). When scalp and forehead reconstruction is considered, several factors are important in the development of a treatment plan.[1] The evaluation of the defect is critical in the management of the patient. The factors assessed are size, site, depth of wound, laxity of scalp, and nature of available tissue and patient factors such as age and comorbidities are also taken into account. The effect of reconstruction on nearby mobile structure such as hairline and eyebrow is to be considered. The goals of reconstruction are to restore the scalp with hair-bearing skin by redistribution of local tissues and a good esthetic outcome.[2]

Objectives

To use a simple algorithm to reconstruct scalp defects of various sizes.

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MATERIALS AND METHODS

This is an observational retrospective study of patients admitted with scalp defects in the Department of Burns, Plastic and Reconstructive Surgery at Government Kilpauk Medical College and Hospital from January 2015 to January 2018.

Based on the size of the defect, an algorithm was created and patients were planned for the scalp defect reconstruction [Table 1].

Inclusion Criteria

All patients with scalp defect who presented to the Department of Burns, Plastic and Reconstructive Surgery at Kilpauk Medical College and Hospital were included in the study.

Exclusion Criteria

Patients with concurrent head injuries were excluded from the study.

Method of Study

The patients were categorized based on the scalp defect size [Table 2]. Reconstruction of the defect was planned based on the algorithm. All patients were followed up for

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Table 1: Algorithm for scalp defect reconstruction

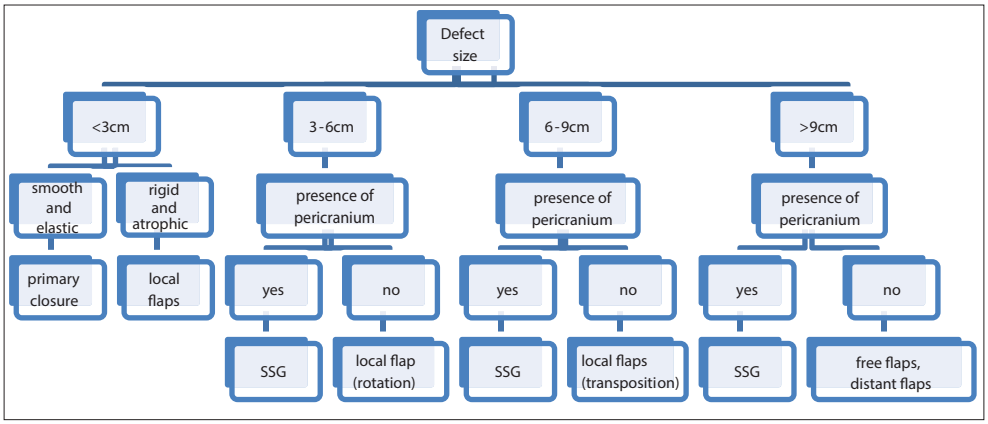

Table 2: Patient statistics

Defect size	Periosteal involvement	Reconstructive method	Number of patients
<3 cm	-	Primary closure	9
3–6 cm	With periosteum	SSG	7
3–6 cm	Without periosteum	Flap	32
6–9 cm	With periosteum	SSG	4
6–9 cm	Without periosteum	Flap	3
>9 cm	-	Flap	3

SSG: Split skin grafting

a period of 1 year postoperatively. Immediate and late post-operative complications were noted.

RESULTS

In this study, patient with aplasia cutis was managed conservatively allowing the raw area to heal by secondary intention. This patient recovered without any complications. Nine patients presented with scalp defect size <3 cm and underwent primary closure [Figure 1]. All patients recovered uneventfully. Split skin grafting was done in 11 patients with size of defects ranging from 3 to 9 cm with intact periosteum [Figure 2]. Of this, two patients had minimal graft loss, which were managed conservatively and healed with dressings alone. Thirty-two patients with defect size between 3 cm and 6 cm without periosteum were managed with local flaps (14 rotation flaps [Figures 3 and 4] and 18 transposition flaps [Figure 5]). For patients with scalp defects of size 6–9 cm without periosteum (three patients) were managed with distant flaps (two supraclavicular flaps [Figure 6] and one vertical trapezius flap). Patients who presented with a scalp defect size of >9 cm (three patients) underwent free flap cover of raw area (two anterolateral thigh free flap [Figure 7] and one latissimus dorsi free flap [Figure 8]) [Table 3].

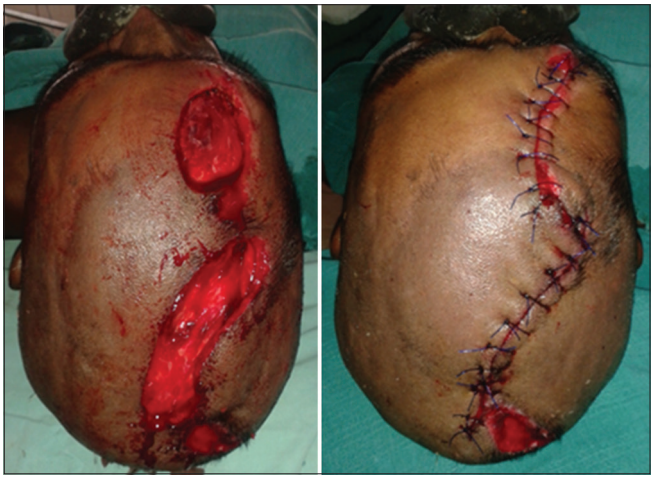

Figure 1: Primary closure for scalp defect

DISCUSSION

Scalp and forehead share five anatomic layers: skin, subcutaneous tissue, loose areolar tissue, and pericranium. The skin of the scalp is the thickest in the body. The underlying galea apneurotica is a broad fibromuscular layer that covers the cranium from the forehead to the occiput. Scalp has two muscles – occipitalis and frontalis. The scalp and forehead are supplied by five paired arteries that form rich interconnections: Supraorbital and supratrochlear arteries, superficial temporal artery, post-auricular artery, and occipital artery.

Etiology of scalp defects [Table 4] varied from congenital defects like aplasia cutis to acquired defects like trauma, thermal electrical chemical and radiation burns, infection, and neoplasm. [Figures 9 and 10].

Evaluation of the scalp defect was based on the following factors; size, site, depth of wound, laxity of scalp, nature of available tissue, and patient factors.[3]

Table 3: Reconstructive methods

Reconstructive methods	Number of patients
Conservative	1
Primary closure	9
Split skin graft	11
Rotation flap	14
Transposition flap	18
Distant flap	
Supraclavicular flap	2
Vertical trapezius flap	1
Free flap	
Anterolateral thigh flap	2
Latissimus dorsi flap	1
Total	59

Table 4: Etiology of scalp defects

Etiology	Number of patients
Congenital	
Aplasia cutis	1
Acquired	
Trauma	18
Burns	29
Infection	5
Neoplasm	6
Total	59

Table 5: Complications

Complications	Number of patients
Minimal graft loss	2
Anterolateral thigh free flap failure	1
Minimal flap necrosis	4

Scalp defects classified based on the size of the defect:

1. <3 cm – small
2. 3–6 cm – moderate
3. 6–9 cm – large
4. >9 cm – extensive.

Reconstructive options of scalp defect are primary closure, skin grafting, local flaps, distant flaps, free flaps, and tissue expander.

In the case of the scalp, the repair of even small defects is complicated. The goals of reconstruction are to restore the scalp with hair-bearing skin by redistribution of local tissues and for a good esthetic outcome. If the skin defect does not exceed 3 cm in diameter, it can be closed primarily. If primary closure is not possible without tension, the surrounding loose connective tissue can be undermined to attain more mobility. In larger defects with a vascularized bed and intact pericranium, split skin grafting is the choice for reconstruction. This is technically easier but has poor cosmetic results and is unstable. Local flaps are indicated in moderate- and large-sized defects exposing cranial bone

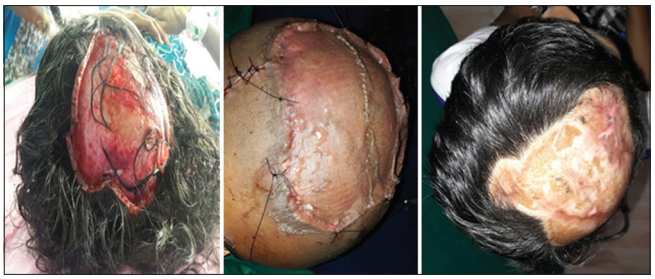

Figure 2: Split skin grafting for scalp defect

Figure 3: Double rotation flap cover for scalp defect

Figure 4: Rotation flap for scalp defect

without pericranium.[4] Distant flaps are preferred when there are an extensive defects with unavailable local tissues. Regional musculocutaneous flap such as the trapezius flap and latissimus dorsi flap can be used in reconstruction. Free flaps are indicated in larger to extensive defects with unavailable local tissues and absent pericranium. With scalp defect more than 9 cm defect and availability of technical expertise, free flaps are the choice for reconstruction.[5] Regional musculocutaneous flap like the trapezius flap and latissimus dorsi flap can be used in reconstruction.

Figure 5: (a) Transposition flap for scalp defect. (b) Transposition flap cover for scalp defect

Figure 6: Supraclavicular flap cover for scalp defect

Figure 7: Anterolateral thigh flap for scalp defect

Free flaps are indicated in larger to extensive defects with unavailable local tissues and absent pericranium.[6] With scalp defect more than 9cms defect and availability of technical expertise, free flaps are the choice for reconstruction.[7] Scalp reimplantation can be considered only when complete or near complete avulsion of the scalp has occurred. It is contraindicated when the patient is hemodynamically unstable. It is absolutely contraindicated in severely macerated scalp part and in patients with concomitant severe life threatening injuries. As a secondary procedure, tissue expansion can be considered to provide hair bearing scalp.[8]

Figure 8: Latissimus dorsi free flap for scalp defect

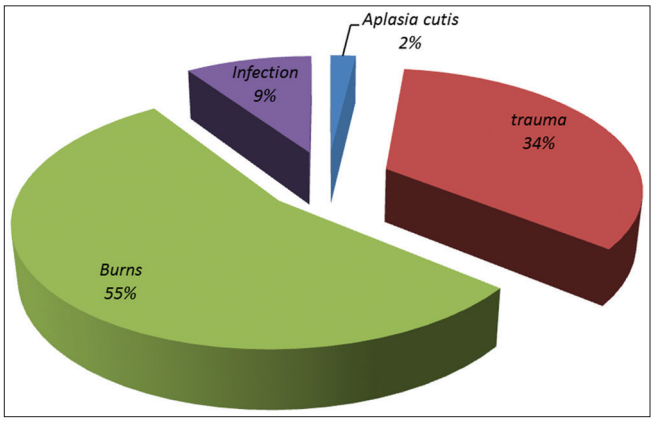

Figure 9: Etiology of scalp defects

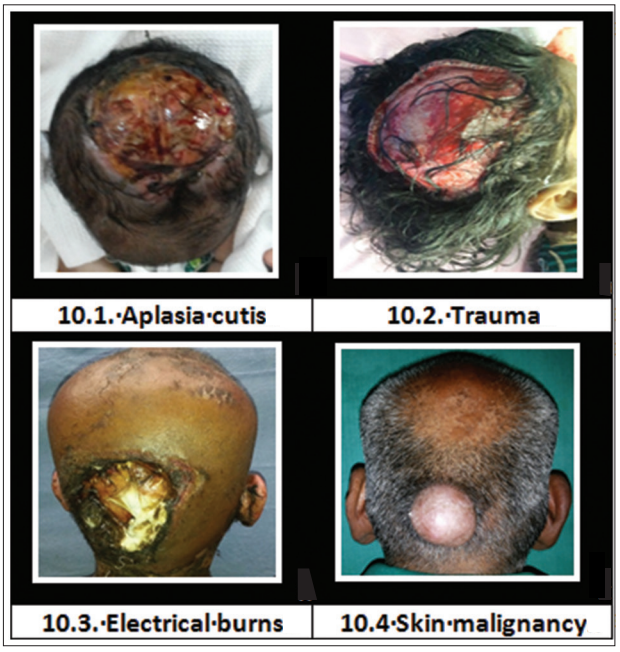

Figure 10: Etiology of scalp defects

Complications

The most common complications following scalp defect reconstruction are bleeding, wound dehiscence, infection, flap necrosis, graft loss, and flap loss. The complications encountered in this study [Table 5] were minimal graft loss in two patients who were managed conservatively. Minimal flap necrosis developed in four patients that were debrided and sutured primarily. Complete failure one anterolateral thigh free flap was encountered which was managed with wound debridement and distant flap cover.

CONCLUSION

Successful reconstruction of the scalp requires careful preoperative planning, adequate debridement, precise intraoperative execution, and proper post-operative care.[9] Detailed knowledge of scalp anatomy, skin biomechanics, hair physiology, and the variety of available local tissue rearrangements allows for excellent esthetic reconstruction.[10] Reconstruction is made easy with the use of the algorithm for choice of treatment based on the defect size.

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