

Extensive Scalp Avulsion Injuries - Management Options And Experience At Mayo Hospital, Lahore

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Nineteen patients with extensive scalp avulsion injuries were treated at the Department of Plastic & Reconstructive Surgery, Mayo Hospital, Lahore over a period of seven years. Thirteen (70%) of the patients were females. The size of defect varied from a minimum of 30 cm² to a maximum of 650 cm². All patients, except one, received primary care elsewhere. Eleven (60%) patients were managed by split skin grafting, six (35%) needed drilling or chiselling of the outer skull table followed by split skin grafting and two patients had reconstruction with local flaps. Majority (85%) of patients required two or less operative procedures. The mean hospital stay was 40.5 days. It has been shown that drilling or chiselling of outer table of skull followed by delayed split skin grafting is an effective way to manage large full thickness scalp defects where replantation or free tissue transfer is either not feasible or possible. Secondary reconstruction following tissue expansion may be employed for better aesthetic results.

KEY WORDS: Scalp defects, Scalp avulsion, Scalp reconstruction

Scalp avulsion injury is not uncommon in Pakistan. It may result in significant disfigurement with serious physical, social and psychological implications. The Egyptians, in as early as 3000 BC, first reported the morbidity and mortality associated with lack of prompt soft tissue coverage of exposed calvarium. A review of early literature indicates that many of the unfortunate patients were doomed to die because of prolonged infection and intracranial complications. Those who survived had chronic wounds, with denuded bone, sequestrations, and dense scar. These chronic ulcers often terminated in scar carcinomas 1.

Small to moderate scalp defects can be successfully managed by use of local flaps. Large full-thickness defects with exposed bone, however, present a difficult problem. When feasible microvascular replantation is the treatment of choice in these cases 2. If replantation is not possible, coverage via free tissue transfer is the preferred management 3. In centres, like ours, where microsurgical facility is not available, large full-thickness avulsion injuries of scalp may have to be managed by chiselling or drilling of outer table of skull followed by skin grafting. In this paper we present our experience of managing extensive scalp avulsion injuries.

Patients And Methods:

The study was carried out at the Department of Plastic and Reconstructive Surgery, Mayo Hospital, Lahore from 1st January 1991 to 31st December 1997. All patients with scalp avulsion injuries whether admitted through the outpatient clinic or transferred from the general surgical units were included in the study. Each patient had wound swab sent for culture/sensitivity and twice daily wet to dry saline dressings were initiated. Blood transfusions were carried out in anaemic patients.

Small to moderate defects were managed by wide undermining, galeal scoring and local flaps. Flap donor

site was split skin grafted. Large defects with intact pericranium were covered with split skin grafts; sheet grafts were used over the frontal region while meshed grafts were applied over the temporal, parietal and occipital regions. Extensive defects with exposed calvarium were initially managed by chiselling off or drilling the outer table of skull followed by twice daily saline dressings, allowing for granulation tissue to appear. At that stage split skin grafting was undertaken. Graft dressing was changed 48 hours post-operatively in each case. Stitches were removed at 5-6 days.

Where indicated, willing patients were scheduled for secondary reconstruction following tissue expansion.

Results:

During the 7 year period, 19 patients with scalp avulsion injuries were admitted for treatment. All patients, except one, were referrals from peripheral hospitals or from general surgical units of teaching hospitals. The study group comprised 6 males and 13 females with a male to female ratio of 1:2.1 (Table: I).

Table: I: Age and sex distribution

Age in years	Male	Female	Total
0 - 10	03	01	04
11 - 20	02	08	10
21 - 30	01	-	01
31 - 40	-	01	01
41 - 50	-	03	03
Total	06	13	19

The minimum age at time of presentation was 2 years and the maximum 50 years (mean 21.15 years). The size of scalp defect varied from 30 cm² to 650 cm². Farm machinery / industrial accidents were the cause in 13 patients while road traffic accidents accounted for 6 patients (Table:2). Two female patients had history of unsuccessful attempts of scalp replantation at local hospitals.

Table: 2 Causes of scalp avulsion

Causes	Male	Female
Farm machinery / Industrial Accidents	2	11
Road Traffic Accidents	4	2
Total	6	13

Table: 3 Depth of injuries.

Depth	N=
Superficial to galea	02
Deep to galea	
(a) Pericranium Intact	8
(b) Pericranium Avulsed	9
Total	19

In 2 patients, the avulsion was superficial to galea aponeurotica and in 17 patients it was deep to it (Table: 3). In the second group, 8 patients had pericranium intact while calvarium was completely denuded in 9 patients. Three of the nine patients with full-thickness scalp loss had necrosed outer calvarial table which could easily be lifted off. In 11 patients, there was granulation tissue already present; these cases were split skin grafted a few days after admission. Local flaps were carried out in 2 patients. Six patients with pericranium avulsed had either chiselling or drilling of the outer table of skull and underwent delayed split skin grafting after appearance of granulation tissue (Table: 4).

Table: 4 reconstructive procedures performed

Procedure	N=
Split Skin Grafting on the existing granulating wound	11
Chiselling / Drilling of the outer table of skull followed by Split Skin Grafting	06
Local Flaps	02
Total	19

Table: 5 Time needed for wound to granulate (Chiselling versus Drilling)

Procedure	Average time for granulation
Chiselling	12 - 20 days
Drilling	20 - 30 days

On an average, it took 12-20 days for granulation tissue to come up after chiselling, as compared to 20-30 days after drilling of the outer table of skull (Table: 5). Majority (85%) of the patients needed two or less operative procedures with satisfactory results as regards graft take and wound healing. The mean hospital stay was 40.5 days.

Figure(1) shows a full-thickness scalp defect with exposed calvarium. Figure(2) is the same case shown after multiple drill holes have been made in the outer table of skull. Figure(3) shows the stage where granulation tissue has appeared - 3 weeks after drilling. Figure(4) is the immediate post-operative view where meshed split skin grafting has been performed. Figure(5) is the one month post-operative view of the same patient.

Discussion:

Extensive scalp avulsion injuries may be very difficult to treat. The basic principle when approaching scalp defects is early soft tissue coverage of exposed bone. Avulsion

injuries commonly produce partial-thickness losses at the subgaleal plane. Lu, in 1969, successfully managed a large scalp avulsion in a child by replacing the avulsed segment as a free composite graft 4. This technique, however, has proved to be unreliable as the volume of the replanted tissue is too great to be nourished by the underlying periosteal bed. Osborne observed that defatting the avulsed segment and replacing it as a full-thickness skin graft can also be successful 5. It is, however, generally agreed that split skin grafting of the exposed pericranium is the proper initial treatment of these injuries. We have also followed this routine in our patients who had pericranium intact. Full-thickness defects, involving loss of all layers including pericranium, mandate more aggressive approach. These defects can be reconstructed by scalp lifting as described by Brandy 6, or by Orticochea four flap technique. This method relies on utilizing remainder of the scalp in form of multiple axial flaps or a single subtotal axial flap and can be performed safely even in children 7. The non-stretchable scalp can be made to cover a larger area by making multiple incisions through galea according to the techniques of Kanzanjian and Converse 1,8,9,10,. We have successfully employed local flaps in two of our patients. Pericranium may be utilized as a pedicled flap that provides coverage of denuded bone and acts as a bed for skin grafting 11. Its use, however, is limited to smaller defects. For large full-thickness defects, the best form of reconstruction is replantation of the avulsed tissue. If the avulsed tissue is not replantable due to injury, coverage with free tissue transfer should be performed. McClean and Buncke 12 were the first to use free vascularized omental transfer for scalp coverage; the omentum was moulded to the scalp defect and then covered with a split thickness skin graft. This transfer, however, soon fell into disrepute due to the necessity of laparotomy and the availability of other less morbid flaps. The use of free groin flap 13, free latissimus dorsi muscle flap covered with a split skin graft 14, the parascapular free flap 15 and the rectus abdominus free flap 3 have since successfully been reported for reconstruction of scalp defects.

Removal of outer skull table with immediate 16 or delayed grafting is needed in a set-up like ours where microsurgical facility is not available. Grafts applied immediately are knobby, prone to ulcerate and 'take' is also unpredictable. The better though time consuming option is to let the wound granulate slowly and apply a skin graft when the bed is ready. We have used both chiselling as well as drilling of the outer table to encourage granulation. Our observation is that even after careful chiselling, there are areas left which need re-chiselling or drilling. Drilling, on the other hand, causes granulation tissue to creep up much slower as compared to chiselling. However, if the drill holes are of sufficient size and are close together further surgical intervention is rarely required prior to grafting. We now believe that the outer table should preferably be removed by first scoring with a drill and then carefully chiselling off the squares of

the table. On the basis of our experience, we conclude that drilling or chiselling of the outer table of skull followed by delayed split skin grafting provides an effective means of managing extensive full-thickness avulsion injuries in a situation where replantation or free flap reconstruction is either not possible or feasible. Secondary reconstructive procedures to reduce areas of alopecia may be considered later for better aesthetic results.

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