# Avulsion Injury Scalp

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## Introduction

AVULSION of the scalp has serious implications and entails a major cosmetic defect, particularly in the young females. It is important, therefore to deal with this problem effectively after due planning. There are many fascinating accounts of treatment of scalp defects caused by trauma, burns and surgical procedures. Before Skin grafting came into use, these wounds were left to granulate and eventually healed by epithiliasation from the sides.

During the past four and a half years (1968-73) 30 cases of avulsion injuries of scalp have been treated in this department. There has been a gradual rise in the incidence in the number of cases in each succeeding year from 1968 (Fig. 1).

## Aetio-Pathogenesis

From a practical anatomical point of view the skin, subcutaneous tissue, occipitofrontalis and its aponeurosis form an intimately connected layer. When a shearing force is, therefore, applied to the scalp, these tissues tear off at the loose areolar tissue level in one sheet.

Women (20 cases, 66.6%) constitute the majority in our series. Out of 9 male cases, seven were sikhs working in factories

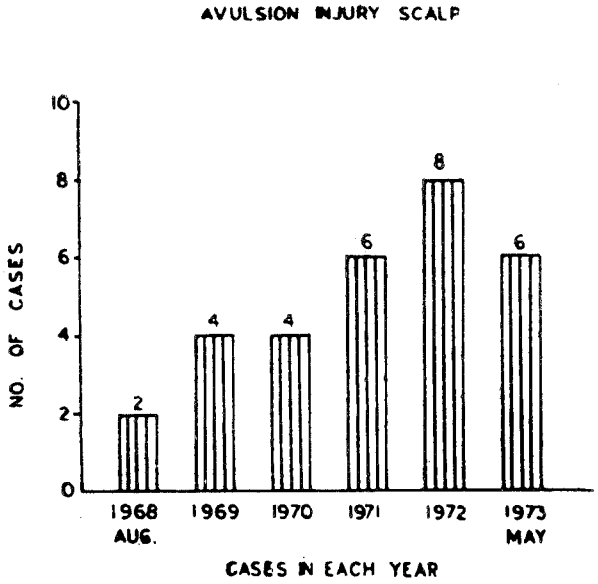


Fig. 1—Shows Number of cases in each year

(Fig. 2). Their long hair had been caught accidently in unprotected rollers or belts which lead to the scalp avulsion. Our patients belonged either to the low or the middle socio-economic strata.

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**Table 1**

| Sr. No. | Age Group in years. | Number of patients. |
|---|---|---|
| 1. | Below 10 years. | 1 |
| 2. | 10—20 ,, | 2 |
| 3. | 20—30 ,, | 18 |
| 4. | 30—40 ,, | 3 |
| 5. | 40—50 ,, | 4 |
| 6. | Over 50 ,, | 2 |
| | Total | 30 |

Table 1. shows a breakdown of incidence based on different age groups. Young and comparatively inexperienced workers are the commonest victims of these accidents. Patients above 50 years of age are likely to suffer extensive avulsion because of the laxity of the skin.

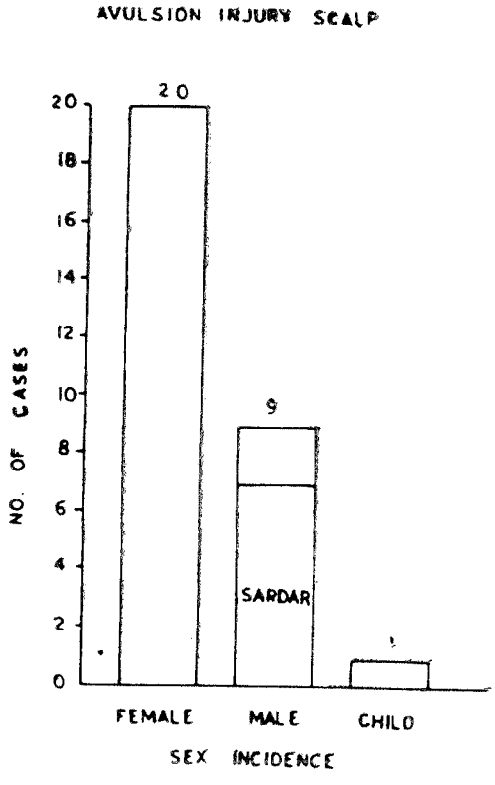


Fig. 2—Shows sex incidence

The extent of the avulsion depends upon the bunch of hair trapped and the direction and strength of the shearing force. In a small number of cases, most of the hair were caught and the whole of the scalp was avulsed. There were seven such cases.

Examination of these wounds showed that the avulsion line lay along the eyebrows in front. perhaps because the scalp gets torn against the prominent supra-orbital ridges. This line also marks the separation of the fixed portion of the skin of the face from the mobile skin of the forehead. This line of avulsion is then continued along the zygomatic arches back to the superior nuchal line. At times the upper one third of the ears may also get included in the avulsed tissue.

In most of the cases there was a partial loss of scalp only. This is because seldom all the hair get entangled in the machinery. Complete avulsion implies that the avulsed portion of the scalp is detached entirely from its moorings (20 cases), as distinct from partial avulsion, where some attachment persists (10 cases).

**Mechanism of Injury**

Our cases are results of industrial accidents. In cases of women and sikhs who wear their hair long, this catastrophy occurs chiefly due to lack of safe guards in the machines and inexperience of the workers. The long plaits get entangled in running belts and gears. We have 26 such cases in our series (Fig. 3). Homicidal

assault by dacoits formed the cause of injury in one case. Among the unusual causes were instances of a camel biting off the scalp of his owner in irritation and in

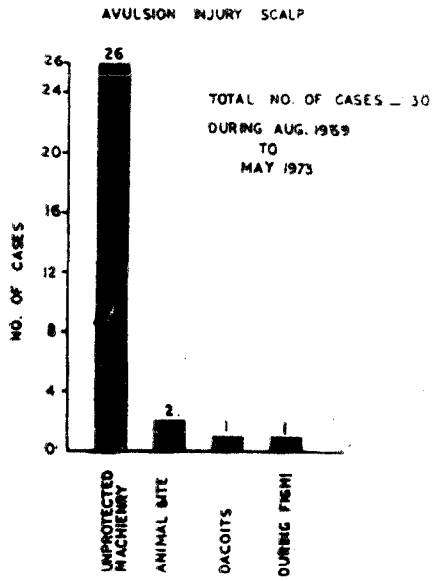


Fig. 3—Shows the etiology of avulsion

**Table 2**

| Sr. No. | Group | Remarks | No. of cases. |
|---|---|---|---|
| 1. | I | Pericranium Intact | 16 |
| 2. | II | Pericranium Lost | 5 |
| 3. | III | Pericranium Lost with Bony Complications. | 1 |
| 4. | IV | Combination of Group I and Group II. | 8 |
| | | Total | 30 |

the other case a cat had attacked an infant. Table 2 shows the break down of our cases in groups.

**Management**

Seventeen patients were admitted soon after injury and received early grafting. We have termed these cases as recent cases. Thirteen patients came to us late. Their reporting time ranged from one week to two months after the injury. These have been labelled as delayed cases.

**General Management**

Recent cases were in good general condition usually at the time of admission. In two instances blood transfusions were required to revive the patients. Bleeding was controlled by pressure dressings usually. At times, help was taken of heavy stiches applied through the skin and galea, where bleeding was persistant and copious. Antibiotics were used prophylactically. Antitetanus sera was given.

**Local Treatment**

It is futile to replace the avulsed scalp even though some dubious successes have been reported. Our policy has been to provide split skin graft cover to the raw areas of the scalp in the shortest period possible, followed by fitting of a scalp wig.

**Group I (16 cases)**

If the defect was small, it was made good with a local flap, which was done in four cases of this group. Thick split skin grafts were applied in the other twelve (Fig. 4 and 5). In cases where the entire scalp defect could not be made good by skin grafting, in one stage, due to poor general condition of the patient, forehead received priority cover to prevent cicatricial pull on the upper eyelids. The patients were kept propped up in the post-operative

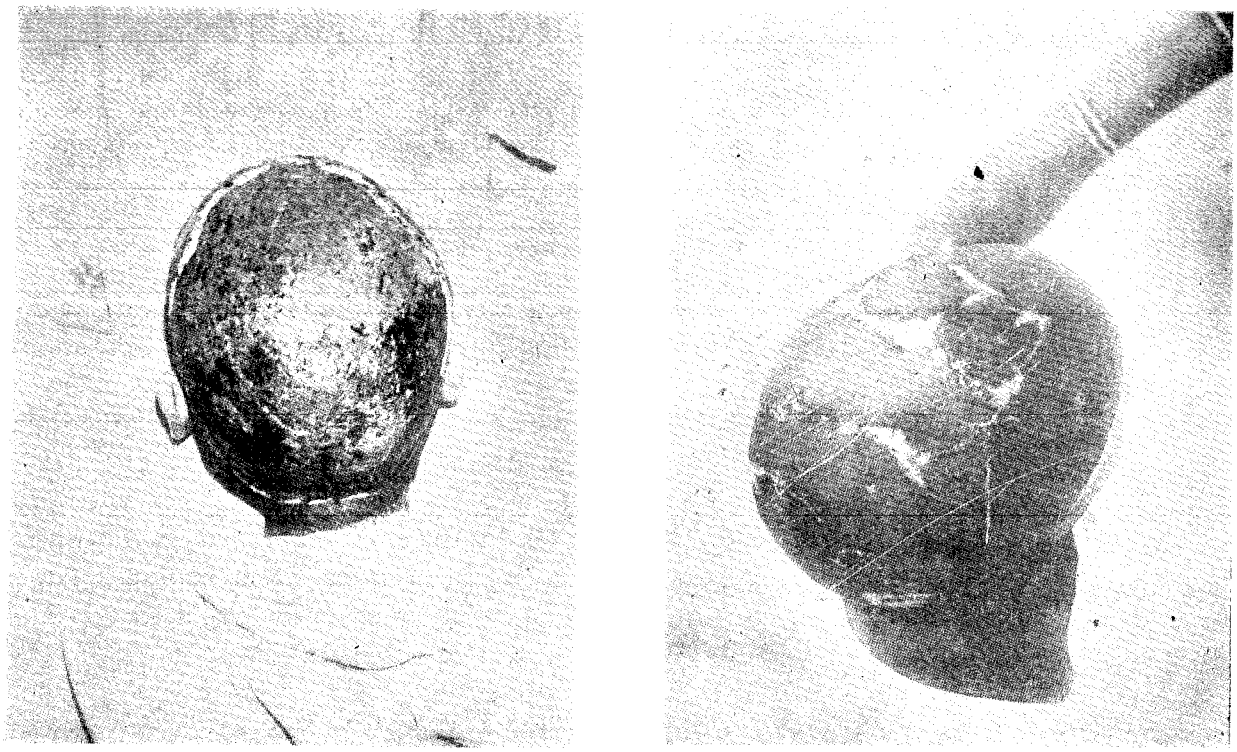

Fig. 4 & 5—Pre-operative and Post-operative photographs of another Gr. I case

period to reduce vascular congestion in the scalp. We have observed that scalp retains its mobility after this procedure.

**Group II (5 cases)**

Attempt was made to provide early skin cover over the exposed bone. Out of 5 cases in this group only one was a recent case which was treated by a transposition flap (Fig. 6).

In delayed cases because of the presence of infection and necrosis of the exposed outer table of the skull, holes were drilled to allow the diploe to produce granulation tissue. In three delayed cases a chisel was used to remove the outer necrotic layer. Burrholes were made in the fourth delayed case, but the bone necrosis was advanced and the entire outer table in that area

Fig. 6—Post-operative photograph of a Gr. II case (Local adjustment)—side view

separated out as one piece (Fig. 7). These measures are necessary before a skin graft

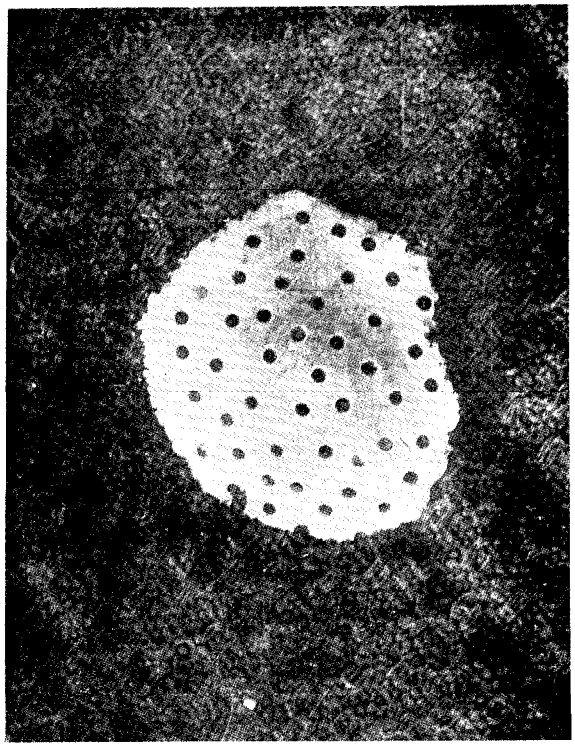

Fig. 7—Photograph shows chiselled out cortex in a delayed group II case where burrholing has failed

can be applied. In our experience, drill holes work only if there are multiple small denuded areas of bone otherwise the use of the chisel is to be recommended which facilitates removal of dead bone. The denuded cortex is divided in a criss cross fashion with the help of an electric drill. Then each area is carefully chiselled out.

**Group III (One case)**

Solitary case in this group had an associated fracture of the skull. A local flap was transposed to cover the fracture site.

**Group IV (8 cases)**

In this group the pericranium had been spared near the periphery of the wound and only in the centre was the skull exposed (Fig 8). The bare skull was covered with a transposition flap and the residual raw areas were covered with split skin grafts. In instances the denuded area was considerable usual procedure as in group II was followed in recent cases. Two delayed cases had burrholes made and skin grafts were applied subsequently.

Fig. 8—A case of Gr. IV pre-operative

**Discussion**

Davies (1911) reported 81 cases of industrial scalping. Mc William (1924) has reported 173 cases. During world war I,

Cushing and later during War II, Gillies, both emphasised the importance of early closure of the scalp. Kazanjian and Webster (1946) emphasised that split skin grafts could be applied immediately to the exposed pericranium.

In our series, immediate grafting was not possible in all cases, as some showed contamination with dirt, grease etc 24 to 36 hours were spent in getting these wounds cleaned. For this purpose, the wounds were dressed with a gauze piece soaked in normal saline and antibiotics. Strong anti-septic and detergent solutions which could destroy the intact delicate pericranium were avoided. Skin cover was provided at the earliest opportunity lest the exposed cranium suffer necrosis.

Multiple drill hole technique is a laborious procedure. The drill holes should be placed near each other. It takes about three weeks for the granulation tissue to appear before skin grafting can be done. The origin of this technique goes back to Augustin Balloste (1696). Kazanjian and Webster resorted to chiselling out of the outer cortex till multiple bleeding points were visualised. Skin grafts were then applied to the oozing surface. We prefer this method for the following reasons.

1. Chiselling done carefully is a safe procedure.
2. Granulation tissue appears faster and uniformly.
3. Split skin grafts can be applied immediately over the oozing surface.
4. This procedure reduces the hospital stay of the patient by 3 to 6 weeks.
5. The patient can be rehabilitated back in a job earlier with less socio-economic problems.

**Follow-up**

Follow-up of these, cases, showed unstable scars at the junction of the skin grafts in three cases. Satisfactory results were obtained in the others. Cases of complete avulsion, especially ladies, were fitted out with a wig as a part of their rehabilitation.

**Conclusions**

Our experience with 30 cases of avulsion injuries of the scalp during the last four and a half years has been described. Every effort should be made to achieve early skin cover for the wounds in the shortest period of time. Loss of pericranium and exposure of the cortex poses special problems, the management of which has been described.

**Acknowledgement**

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