

SUCCESSFUL REPLACEMENT OF AVULSED SCALP

Case Report

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Extensive avulsion of the scalp, or stripping of a large area of soft tissue from the skull, is a serious accident. Although this process is somewhat similar to the surgical raising of a flap, the latter is less traumatic, slower, and anatomical layers are developed in which part of the blood supply is retained. Avulsions, however, usually consist of complete detachment with severe trauma.

The avulsed scalp is often injured otherwise, such as by crushing, tearing, or from multiple lacerations. The surrounding skin may be devitalized. Replacement of the scalp is usually followed by necrosis and sloughing within a short time. In such instances, the outer table of the cranium may become successively exposed, dry, dead, and affected by osteomyelitis. Hence, the securing of early healing to prevent these is of the utmost importance, as emphasized by Cushing³ in 1918 and Gillies⁸ in 1944. This importance and difficulty were also described by Davis⁴ in 1911 when he reported 81 cases of scalp avulsion, of which only 21 were successfully repaired. McWilliams¹¹ stated in 1924 that only 40 cases out of 173 were successfully replaced.

CASE REPORT

A 7-year-old caucasian girl was brought to the emergency ward following scalp avulsion caused by her long hair being caught in a grain drill. As she was in severe shock, the wound was covered by a cloth and intravenous fluids were given in one arm, with forced whole blood transfusion into the other one.

She responded to the fluid therapy very well; in approximately 40 minutes her blood pressure

had returned to 110/68. During this time we telephoned her parents at home, asking them to bring the avulsed scalp in to us. We advised them to fold the scalp with the inner sides together, to cover it with a damp cloth, and to put it in a container filled with ice.

The child was sent to the operating room. There, the cloth was removed from her head and diluted plasma solution was dripped on the skull and on the inner surface of the avulsed scalp (which had arrived by this time). On examination, it was found that approximately $\frac{1}{5}$ of the total hair-bearing area of the scalp had been torn off; a small area of the outer layer of the skull was chipped off in the occipital region (Fig. 1).

The edge of the defect was infiltrated all around with 1 per cent procaine solution, containing 8 drops of 1/1,000 epinephrine per ounce, to control the active bleeding. No vessels were ligated.

The outside of the avulsed scalp was cleaned by wiping off all of the visible dirt and foreign bodies with saline sponges. No irrigation, washing, or soaking was employed. The long hair was cut short by sharp scissors, as the scalp was gently held by fingers; no forceps were applied, no shaving was performed.

The avulsed scalp was reimplanted in its original position, using 5-0 chromic catgut sutures at $1\frac{1}{2}$ inch intervals. A few 6-0 interrupted silk sutures were used to approximate the skin between each two subcutaneous catgut sutures. Greased gauze was placed over the suture line and a gauze roll head dressing applied. From the accident to implantation of the scalp, the interval was $1\frac{1}{2}$ hours.

The dressing was changed postoperatively on the 5th, 11th, and 16th days. During her hospitalization, the patient was given one million units of penicillin intra-muscularly each day. At the time she left the hospital, the scalp was healing well.

One year later, the patient returned for follow-up examination. The scalp was completely healed and the hair was of normal appearance, length, and color throughout most of the re-

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plant, but with an area about the size of a small orange in which only a few hairs were growing. There was no line of demarcation noticeable at the periphery of the reimplantation, and she was able to arrange her hair in a manner to cover the area of sparse hair (Fig. 1).

DISCUSSION

In the early period before capillaries connect to provide blood supply for a graft, it must survive by osmotic processes from the tissue fluids of the host bed. Any irritation of the graft or bed, from foreign bodies, topical antibiotics, antiseptics, saline irrigations, scrubbing, etc., may produce an inflammatory response which can interfere with this osmotic interchange. Therefore, the use of these agents was avoided.

The application of plasma solution to the scalp and head prevented dryness and dying of the superficial cells, whose health is so necessary for this osmotic process.

The shorter the interval between the avulsion and the reimplantation, and the shorter the period of shock, the better are the chances for success. It may, or may not, have been of importance that not all of the hair-bearing area was avulsed. It was certainly important that the periosteum was left nearly intact over the skull in this patient, and that it was kept from drying out.

If a reimplanted scalp does not survive, various types of treatment may be tried. The oldest is the multiple drilling of holes through the outer table to encourage the development of granulation tissue over the skull. This procedure usually requires a long time for healing, even if there are no complications; Douglas⁶ reported two years as average healing time.

Other possible coverage is by means of rotating a local scalp flap, bringing in a pedicle flap from a distant area, or the use of a free skin graft.

Michon¹³ stated that if the lost scalp

is larger than 20 cm in diameter, repair by a local flap or flaps is impossible and tissue must be brought in from a distance. Orticochea¹⁴ of Colombia reported reconstruction by local flaps in scalps in which one-quarter to one-third had been lost.

Farmer⁷ suggested removal of the subcutaneous fat from avulsed scalps and replacing them as full-thickness skin grafts. Although many surgeons have tried this method, the results have generally been poor. Davis⁴ and Straith¹⁷ thought the difficulties were due to an insufficient nutritional basis.

In fresh avulsions, many authors have reported good healing from immediate application of split skin grafts (Davis⁴ in 1911, Kazanjian and Webster⁹ in 1946, Robinson¹⁶ in 1952, Converse² in 1955, Kazanjian and Converse¹⁰ in 1959, Straith¹⁷ in 1946). In general, the use of split-skin grafts for early healing (Brown and McDowell¹), and later replacement by a distant flap if necessary, is a well accepted procedure.

The idea of using the scalp in its original form has been reported repeatedly; this has generally failed.

Until 1950, Osborne¹⁵ used split grafts from the avulsed scalp to the pericranium with success. Secondarily, he replaced these with Wolfe grafts, successfully replacing the avulsed scalp but not achieving regrowth of hair.

In 1955, Meister¹² of Vienna attempted to restore hair growth by cutting small deep grafts from the avulsed scalp and applying them to the pericranium. In one case, epithelial covering was obtained, but no hair growth. In that same year, Delak⁵ of Yugoslavia reported a replacement similar to mine, except the patient is a bald patient. He poured alcohol over the avulsed scalp, shaved it, immersed it in saline solution, and then prepared it as a Wolfe graft. Most of the graft took, with some soft hair growing

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FIG. 1. (above) Operating room photograph, showing extent of missing scalp. (below) Result, as seen 7 years later. The area of baldness and of sparse hair growth is so small that it is easily covered by combing adjacent hair over it.

at the edges (apparently where the graft had not been thinned as much). He also injected antibiotics under his grafted scalp before applying the dressing.

SUMMARY

A successful case of reimplantation of a completely avulsed scalp is reported, in which there was normal growth of hair afterwards.

Factors in the success were: (1) replacement of the scalp within 1½ hours after the accident; (2) prevention of drying of the inside of the scalp and the outside of the head meanwhile; (3) avoidance of irritation of the scalp and head by chemicals, physical means, or otherwise.

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