Scalp Replantation : A Case Report of Long Ischemic Time

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Abstract

A totally avulsed scalp was treated successfully by microvascular replantation in 1975[1]. Since then, scalp replantation has become the treatment of choice in scalp injuries and should always be considered even in cases of severe damage or prolonged ischemic time. Usually, every attempt is made to establish as many vascular anastomoses as possible. We report one case of total scalp avulsion with a 24-hour ischemic time, which was successfully replanted *via* one arterial and one venous anastomose.

Key word : Replantation, Scalp

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Avulsion of the scalp usually results from an entanglement of long hair in a moving part of machinery. Most of the patients are women. Microvascular anastomosis of the avulsed scalp is currently the treatment of choice[2,3]. There are numerous reports of scalp replantation from various institutions[4,5,8-12]. The longest ischemic time that has been reported was as long as 17 hours' delay (Nahai, Hurteau and Vasconez, 1978)[4]. In 1995, Chen Kaixiang reported a case of unsuccessful scalp replantation in which the ischemic time was as long as 21 hours[5]. This paper illustrates a case of a totally avulsed scalp, which was successfully revascularized with some skin loss 24 hours after injury.

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CASE REPORT

A 37 year-old woman sustained total avulsion of the scalp, caused by catching her long hair in the rotating pulleys of industrial machinery. She also was pulled around the pulleys resulting in a temporary loss of consciousness. The line of amputated scalp was found below the right eyebrow, above the left eyebrow, and along the superior parts of both auricles and occipital bone posteriorly (Fig. 1, 2). There was an obvious sign of a crushing injury to the avulsed scalp.

After recovery, she complained of cervical and lumbar pain as well as loss of motor and sensory function of the lower extremities. A cervical and lumbar spine X-ray demonstrated neither fracture nor dislocation. She was diagnosed as having total scalp avulsion and spinal shock, and received conservative treatment after orthopedic consultation.

She was referred to one community hospital and two provincial hospitals before reaching our hospital. The avulsed scalp was preserved for eighteen hours after the accident in a sealed plastic bag packed with ice.

The patient was brought to the operating room twenty-one hours after the injury. She was placed in a supine position with endotracheal tube intubation under general anesthesia. The scalp was shaved and cleaned thoroughly with normal saline. Some strands of hair attached to the raw surface of the scalp were rinsed off with difficulty, but many of them were left undisturbed. First, the scalp vessels were identified and then the head vessels of the recipient were prepared. After the scalp was loosely tacked into place by a few skin sutures, microvascular anastomoses was achieved using a single left superficial temporal artery and vein. An attempt was made to identify the right superficial temporal vessels, but did not succeed, probably due to the avulsion injury.

The left superficial temporal artery was debrided until normal intima was found, both proximally and distally, and these were repaired microsurgically using 10/0 Nylon end to end anastomosis (Fig. 3). Good perfusion throughout the entire scalp was observed, based on a single artery, and a good venous back flow *via* a superficial temporal vein was observed. The left superficial temporal vein was anastomosed in a similar manner and a good venous return was demonstrated. The anastomoses were completed with no need for a vein graft, and loose skin closure was performed without a drain.

Immediately after revascularization, the patient received heparin 5,000 units. The total ischemic time before completion of the arterial anastomoses was twenty-four hours. Estimated blood loss during the procedure was 800 ml and a blood transfusion of 750 ml was given during the operation. Total operative time was three hours.

Post-operatively the patient was kept in the Fowler position to reduce scalp edema. A low-

Fig. 1. The avulsed area comprises almost the entire scalp with some area of pericranium avulsion.

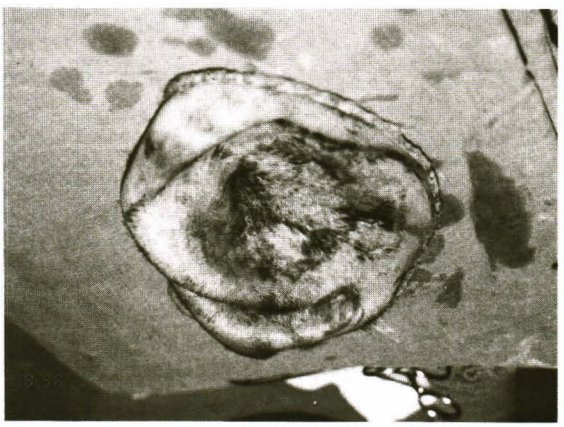

Fig. 2. The avulsed scalp (18 hours ischemic time) after trimming the long hair.

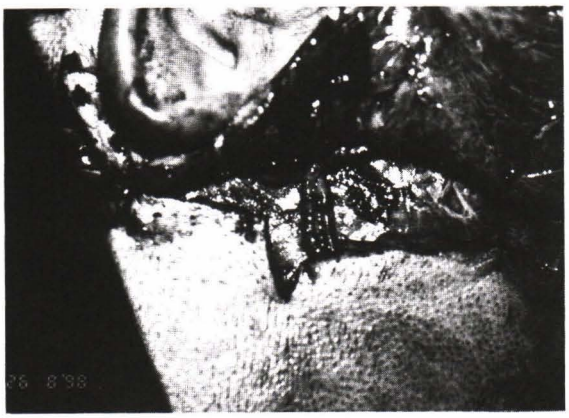

Fig. 3. Superficial temporal vessels after reanastomosis without vein graft.

Fig. 5. Debridement of the necrosed flap area and covering by STSG.

Fig. 4. Seven days post-operatively there was delayed venous thrombosis in a marginal area (right frontal, temporal and occipital area).

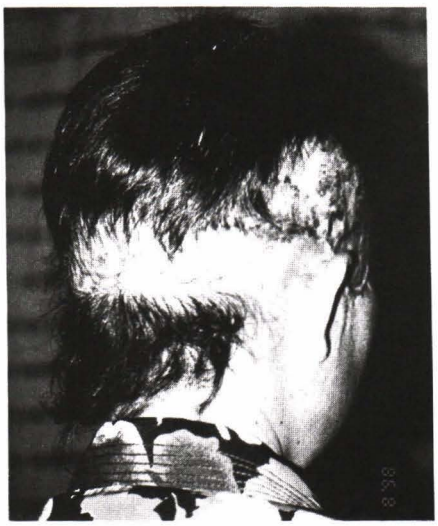

Fig. 6. The patient showed hair growth on the replanted scalp at six months follow-up.

molecular-weight dextran of 500 ml per day was given intravenously for five days and baby aspirin subsequently for four weeks. Cefazolin and Gentamicin were used as systemic antibiotics for two weeks. The patient also received six units of blood for a few days post-operatively in order to correct anemia, which was caused by gradual blood loss during wound dressing.

At 48 hours post-operatively, the scalp had some degree of venous congestion, which was gradually resolved within a few days. Seven days after the operation there was delayed venous thrombosis in a marginal area (right frontal, temporal and occipital area) (Fig. 4). Therefore, intravenous heparin was given for five days to salvage the compromised area that remained.

The patient had two more operations for debridement of the necrosed flap and covering by skin graft. Eventually, there was a 30 per cent loss of replanted scalp (Fig. 5, 6).

Fig. 7. 18 months follow-up after replantation. (Top left and right) Demonstration of good hair growth. (Lower left and right) The grafted area can be camouflaged by hair dressing.

About three weeks after the accident, the patient could feel a sensation when she touched her scalp. One week later, she could raise her left eyebrow from the functioning lower part of the left temporalis muscle that remained intact to its insertion. The motor and sensory functions of the lower extremities gradually improved from the beginning of the fourth day after the accident.

DISCUSSION

Total scalp avulsion usually occurs in a predictable pattern, due to the anatomical plane. The thinnest area of scalp is around the bony prominence, hence, when the hair is caught in rotating machinery, the scalp is torn along the supraorbital, temporal and occipital ridges. The plane of avulsion is in the loose areolar layer[6,7]. Before treating the scalp injury, the patient should be evaluated thoroughly, particularly for any life-threatening wounds such as intracranial injuries, bony fracture, cervical dislocation and hemorrhagic shock. These require more urgent management.

In the past, large scalp avulsions were treated in various ways. Replantation of the avulsed

scalp without microvascular anastomoses uniformly resulted in failure[2,3]. Replacing a scalp that was debrided as the dermis usually gave a poor result such as alopecia. Skin graft on the pericranium or decorticated skull was unstable and recurrent ulcers frequently occurred.

In 1975, Miller achieved the first successful scalp replantation. He replanted an extensively avulsed scalp by using vein grafts to arteries and multiple venous anastomoses[1]. Nahai (1978) demonstrated that the entire scalp could survive on a single microvascular anastomosis of one artery and one vein (left superficial temporal artery and right posterior auricular vein)[4]. After 1976, there were numerous reports of successful scalp replantations by one artery and vein anastomosis[4,8,9]. But most authors recommended anastomosing of multiple vessels[10-13]. Main arteries should be superficial temporal or occipital and more than one artery should be reanastomosed. Attempts to anastomose multiple veins should be made to reduce post-operative venous congestion. In the case of a severely avulsed scalp in which no vein could be identified, arteriovenous anastomosis should be considered using the remaining artery of the avulsed scalp and the vein of the recipient's head. Vein grafts may be needed in some cases. The ischemic time varies from four to twenty-one hours[2]. Preservation of the avulsed scalp in a cool environment before anastomosis increases the tolerance of the scalp to ischemia. Moreover, the scalp lacks muscle and it can, therefore, tolerate ischemia fairly well. Traditionally, venous anastomosis should first be performed to reduce intraoperative blood loss. In the case of prolonged ischemic time, arterial anastomosis may be preferred first, but massive blood loss of up to 7-10 units has been reported[8].

After the operation, it may not be necessary to give any anticoagulants because surgical wounds may bleed profusely, and hematoma beneath the scalp flap may deteriorate the microvascular anastomoses[14]. In contrast, Jonhnson and Backer [15] recommended that the patient should be routinely administrated low-molecular-weight dextran for five days and, subsequently, aspirin orally at 325 mg per day[6]. Heparin should be added in the case of severe vascular injury or recurrent vascular thrombosis. The success rate of scalp replantation is about 88 per cent. There may be partial skin loss at a marginal area that could be managed further by skin graft or tissue expansion techniques. Normal patterns of hair growth were observed in many reports. Recovery of sensation as well as an ability to raise eyebrows were noted, eventhough no neural anastomosis was performed[15].

SUMMARY

In this paper, we reported a patient who received delayed treatment due to technical problems in the referral system. This caused a 24-hour ischemic time to the avulsed scalp. However, the authors successfully replanted it using only a single artery and vein (left superficial artery and vein), eventhough there was partial skin loss. Therefore, in every case of avulsed scalp, the treatment of choice is replantation, even when the ischemic time is long or few vessels can be found. Furthermore, as many veins as possible should be anastomosed to improve the outcome. Intraoperative bleeding after prior arterial anastomosis was not a problem in the present case. The authors believed in the hemodilutional effect of low-molecular-weight dextran and antiplatelet action of aspirin.

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การต่อหนังศีรษะด้วยจุลศัลยกรรม : รายงานผู้ป่วยหนังศีรษะหลุดเป็นเวลานาน

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การรักษาหนังศีรษะหลุดจากการถูกกระชากโดยการต่อเส้นเลือดด้วยจุลศัลยกรรมได้รับความสำเร็จตั้งแต่ปี 1975 นับจากนั้นการต่อเส้นเลือดด้วยจุลศัลยกรรมนับเป็นการรักษามาตรฐานสำหรับการที่หนังศีรษะถูกกระชากหลุดออกในทุกราย แม้ว่าจะมีการทำลายของหนังศีรษะมากหรือมีการขาดเลือดเป็นเวลานาน ทั้งนี้ควรจะต่อเส้นเลือดให้มากที่สุดเท่าที่จะทำได้ ผู้รายงานได้เสนอผู้ป่วยหนังศีรษะถูกกระชากหลุดเป็นเวลานานถึง 24 ชั่วโมงก่อนที่จะได้รับการต่อเส้นเลือดแดง 1 เส้น และเส้นเลือดดำ 1 เส้น โดยยังคงประสบความสำเร็จในการรักษาหนังศีรษะส่วนที่หลุดออกมาได้ แม้ว่าจะขาดเลือดไปเลี้ยงเป็นเวลานาน ดังนั้นจึงเป็นหลักฐานที่สนับสนุนว่าไม่ว่าหนังศีรษะจะขาดเลือดเป็นเวลานานเท่าไหร่ก็ควรให้โอกาสในการต่อเส้นเลือดด้วยจุลศัลยกรรมทุกราย

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