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The microsurgical replantation of seven complete scalp avulsions: Is one artery sufficient?☆

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Summary Background: Total scalp avulsion is a rare and devastating event. Microsurgical replantation is the sole method to achieve an ideal cosmetic outcome. In the literature, most studies have reviewed limited sample sizes. Most authors report better outcomes when a greater number of microvascular anastomoses are used. This strategy remains controversial, as some authors have suggested that one artery may be sufficient.

Methods: From 2005 to 2008, seven patients who sustained scalp avulsion underwent microsurgical replantation. All of the vascular anastomoses were made with a branch of the superficial temporal artery. We did not use vein grafts. The ischaemia time was 4–16 h.

Results: In six cases, a single artery and one to two veins were anastomosed; in another case, two arteries and three veins were anastomosed. Six of the seven scalp replantations were successful and achieved normal hair regrowth. In five of the six successful cases, we performed a single-artery anastomosis.

Conclusion: Scalp avulsion is rare around the world but occurs relatively frequently in our country due to the lack of safe and secure working conditions in agriculture and industry. In cases where multiple arterial anastomoses are not possible, the present findings suggest that one branch of the superficial temporal artery may be sufficient to reperfuse the replanted scalp and achieve excellent aesthetic results.

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Complete scalp avulsion is an infrequent but disfiguring injury caused by severe shearing forces applied obliquely to the hair-bearing scalp. Prior to the advent of microsurgery, the amputated scalp was replaced as a composite graft. Multiple drill holes were made in areas without periosteum, followed by skin grafts after the granulation tissue appeared.^{1–5} The first scalp replantation was performed by Miller and colleagues for a total scalp avulsion in 1976.²

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Microsurgical replantation is the best reconstructive technique following total scalp avulsion. A review of the literature found that although 60–70 scalp-avulsion cases had been reported, most of the studies had small samples (except for three reports from Chinese, Indian and Taiwanese authors).^{6–8} Most of the authors advised that the best surgical results are achieved with a greater number of sutured arteries and veins. Some reports concluded that a single artery and a single vein were sufficient for total scalp perfusion; however, they reviewed only one or two cases.^{9–15} At the university hospital in Vietnam, there are two to three cases of total scalp avulsion per year. However, there have been no reports of successful total scalp replantations. In 2005, we developed a microsurgery programme. During the first 4 years, we had seven cases of replantation of total scalp avulsion. We used only one arterial anastomosis in six cases, which are discussed in this report.

Patients and methods

From 2005 to 2008, we received 10 scalp avulsion cases in our hospital, but only seven patients underwent microsurgical replantation; the remaining three cases were excluded from the study. One patient arrived from the north mountain region far from Hanoi. She was transferred through three smaller hospitals and needed more than 48 h to arrive at my hospital; the scalp was necrotic. In one case, the scalp had gone into a machine and was cut into multiple small pieces. The third excluded case had brain trauma, and the Glasgow score was 7–8 points. After an initial examination by a neurosurgeon, we decided to perform a skin graft only. The avulsed scalp was kept in cold storage, occasionally placed directly on ice. Most of the patients lived far from the hospital, approximately 200–400 km away and were transferred multiple times before arriving at the university hospital. Table 1 summarises the patient information and injuries.

Upon arriving at the hospital, each patient received an initial evaluation and was stabilised in the emergency room. After the examination, for excluding any other associated life-threatening injuries, the patient was immediately transported to the operating room.



Figure 1 Case 1, female, aged 19, sustained a working injury.

The surgical procedures were performed under general anaesthesia (Figures 1, 2 and 8). The first team prepared the scalps, which were shaved and gently rinsed with saline (Figures 3 and 9). The distal vessels were identified under an operative microscope. The second team identified the superficial temporal vessels on the patient. All of the vessels were marked with a 6/0 Prolene suture, and the excess skin was cut. After reattaching the amputated scalp to the head with loose sutures (3/0 nylon) for support, temporal artery anastomosis (to reduce the ischaemia time) was performed in all cases, followed by venous anastomosis. When performing microanastomosis on the veins, vein clamps were used on the other bleeding veins to reduce the blood loss. Postoperatively, the patients were given soft dressings and administered anticoagulants (heparin intravenous) for the first 48 h. During the first 48 h, two drains were attached in the occipital area to prevent haematoma. The flap was monitored conventionally. Each patient was asked to return postoperatively at 1 month, 3 months, 6 months and annually thereafter.

Table 1 Summary of Patients Who Received Scalp Replantation.

Case	Age	Nature of injury	Ischaemia time	Other structures involved	Number of vessels repaired		Scalp survival
					Artery	Vein	
1	19	Rolling machinery	4 h	Hair-line	2 ST	3 ST	100%
2	40	Machinery injury	6 h	Partial right-ear, right eyebrow	1 ST	1 ST	100%
3	35	Boat motor	8 h	1/3Right eyebrow	1 ST	2 ST	100%
4	42	Truck wheel	10 h	Partial right-ear, right eyebrow	1 ST	2 ST	100%
5	60	Rolling machinery	16 h	Hair-line	1 ST	2 ST	Failure
6	32	Rolling machinery	8 h	Both eyebrows, two layers	1 ST	2 ST	50% Skin and 90% Galea survival
7	42	Rolling machinery	8 h	Partial right-ear	1 ST	2 ST	100%

ST: Branch of superficial temporal pedicle.

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