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Successful Microsurgical Scalp Replantation Utilizing Loupe Magnification

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Abstract: Total scalp avulsion is a rare injury that poses a unique reconstructive challenge. Microsurgical replantation is considered the first-line choice; yet anastomotic efforts may be strained to find suitable recipient and target vessels. Concomitant injuries may also delay or hinder operative intervention. These complex scenarios are difficult to navigate and necessitate multidisciplinary input to optimize outcomes. As such, the authors present an illustrative case report of a total scalp avulsion injury that underwent successful microsurgical replantation. This report highlights the novel use of loupe magnification in scalp replantation and reviews technical and clinical nuances that facilitate a favorable reconstruction.

Key Words: Microsurgery, replantation, scalp replantation

Total scalp avulsion is a rare, devastating injury that poses a formidable challenge to reconstructive surgeons. Given its unique hair-bearing properties, the scalp should be replaced in kind; however, suitable alternatives are lacking in these difficult cases as orthotopic autologous transfer in any form (ie, skin grafts, regional/distant flaps, hair transplantation) results in significant alopecia. As such, microsurgical replantation is considered the first-line choice if the amputated part is available.[1] These complex scenarios are difficult to navigate and necessitate multidisciplinary care to not only ensure patient safety but also optimize reconstructive outcomes. Herein we present a case report of a total scalp avulsion that underwent successful microsurgical replantation. The clinical study highlights the novel use of loupe magnification during microvascular surgery and reviews technical and clinical nuances that facilitate a successful reconstruction.

CLINICAL REPORT

A 43-year-old female was rushed to our hospital after a total scalp avulsion. The injury occurred while at work from hair entanglement in rotary machinery. The amputated part was appropriately transferred with the patient in a plastic bag placed on ice, and included the forehead, upper eyelid skin, and right superior auricle (Fig. 1A-C).

FIGURE 1. Pre- and immediately post-replantation.

The operation began with exploration for recipient superficial temporal arteries and veins in the amputated scalp. Two pairs of superficial temporal bundles were identified upon incising the aponeurosis. Another team began exploring for corresponding donor vessels. Right sided superficial temporal artery (STA) had good inflow without any gross intimal damage. Left STA had a "corkscrew" appearance with intimal damage; thus, it was resected to proximal healthy vessel. Satisfactory inflow was next confirmed after papaverine and heparin irrigation of the vessels. Good caliber recipient and donor veins without significant intimal damaged were dissected and prepared for microvascular anastomosis. The scalp was next inset with anchoring sutures to the galea. Both venous anastomoses were coupled without needing vein graft with 3 mm Synovis coupler (Synovis Micro Companies Alliance Inc., Birmingham, AL). Arterial anastomoses were hand sewn with an interrupted 8-O nylon BV130-5 needle (Ethicon Inc., Cornelia, GA) under 3.5× loupe magnification. A 3 cm interpositional reverse greater saphenous vein graft was required for left sided arterial anastomosis. Evidence of reperfusion was noted immediately after completion of right sided arterial anastomosis with subdermal bleeding and an audible external Doppler signals over the forehead after completion of all anastomoses. Total of 4 anastomosis were performed (2 arterial and 2 venous) during replantation (Fig. 1D-C).

A small portion of posterior scalp was discarded which was attached to the main piece by a narrow skin bridge. Integra was utilized for a small occipital defect that had viable pericranium at its base. Two penrose drains were placed and cuticular closure was finalized. A compression dressing was placed to reduce swelling. Overall, total operative time was 6.5 hours and total ischemia time was estimated to be 10 hours with at least 6 hours of cold ischemia.

RESULTS

The entire replanted scalp survived with partial necrosis of the right superior auricle and small portions of occipital skin. The occipital defect required 2 additional debridements and split-thickness skin grafting. She went on to develop some hypertrophic scarring of her neck and posterior scalp scars. Overall, she recovered well and was very happy with her outcome. (Fig. 2A-C)

DISCUSSION

The replantation of amputated parts has enjoyed considerable success since the advent and widespread adoption of microsurgical

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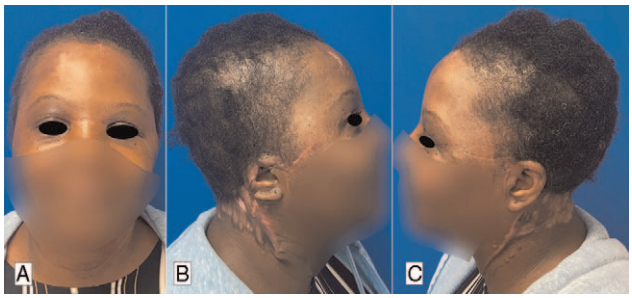

FIGURE 2. Postoperative results at 5 months.

technique.[2] Although much of the literature is preoccupied with extremity surgery, the replantation of amputated parts in the head and neck is associated with comparable outcomes.[3] These cases are rare and challenging to even the most experienced microsurgeons. Herein, we presented a case that highlights key technical and clinical factors to consider while caring for such patients.

First, all patients require a thorough evaluation according to ATLS protocol and cervical spinal injuries should be examined for in all facial trauma patients.[4] Such patients may also present with considerable blood loss, and care should be taken to evaluate for all injuries. Though there are reports of prolonged ischemia times up to 17 hours,[5] life-threatening injuries may also delay or preclude replantation. In such instances, ectopic implantation followed by delayed replantation may be considered. A 2-team approach should be utilized to prepare donor and recipient sites in efforts to minimize ischemia time. The preparation of the amputated part may begin even before the admittance of the patient to the operating theatre. The identification and preparation of suitable vessels should follow and is of utmost importance, requiring appropriate technique and judgment. Although the rich anastomotic network of the scalp allows for reperfusion and survival on a singular vascular pedicle,[5] outcomes are more favorable in instances of multi-pedicle replantations.[6] The superficial temporal vessels are commonly utilized in these scenarios, given their sufficient caliber and convenient location without necessitating positional changes. Although 1 vein can be sufficient for outflow, congestion is more likely to develop and necessitate leech therapy. As such, most recommend multiple venous anastomoses. In-setting of the amputated scalp typically precedes the microvascular portion of the procedure, and some authors have recommended progressive tension suturing to reduce the potential dead space.[7]

The complex biomechanism of avulsive scalp injuries may lead to greater segments of vessel damage than sharper mechanisms. As such, vein grafting is heavily favored in these scenarios to get beyond the zone of injury.[3] However, our case highlights the judicious use of interpositional vein grafts, in which trimming of the vessels was limited to only grossly diseased or injured segments. Pulsatile spurting is usually adequate for inflow purposes. The intima should be thoroughly inspected before each anastomosis and radical trimming is inadvisable given the higher complications associated with vein grafting. Nevertheless, interpositional grafts may be indicated and a tension-free anastomosis should always be prioritized. Our case additionally highlights the novel use of loupe magnification in total scalp replantation. Loupes are associated with comparable success rates to the microscope in a variety of settings, and offers certain advantages including operator freedom, portability, and lower costs.[8,9] There are limitations, however, particularly in pediatric cases and vessel diameters less than 1 mm. Barring these extreme circumstances, complex traumatic cases as in replantation of amputated parts in the head and neck can be successfully managed with a pair of loupes.

In our experience, anticoagulation is not without its own set of complications. Prophylactic leeching is likely not indicated and should be initiated when venous congestion initially presents itself. Lastly, the replanted specimen may exhibit signs of marginal necrosis, particularly at the site of traumatic avulsion and zone of adherence of the occiput.[7] The posterior scalp frequently exhibits delayed healing and necrosis after replantations also due to venous congestion and poor regional perfusion, especially if STA's or other anterior feeding vessels are utilized.

CONCLUSIONS

Microvascular total scalp replantation is the gold standard and should be attempted during scalp avulsive injuries. It can be safely performed solely with loupe magnification and requires sound surgical judgement, technical proficiency, and multidisciplinary approach in caring for these patients.

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The Development of Frontal and Sphenoid Sinuses After Full-House Endoscopic Sinus Surgery in a Child

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Abstract: Although endoscopic sinus surgery (ESS) is a standard procedure for adults and is considered a safe and effective procedure in children as well, some uncertainty remains when it comes to children, especially with regard to the future facial and sinus development. Overall, limited ESS does not affect sinus development, and extended ESS does not affect facial features. However,