

Non-microvascular Successful Management of Near-total Ear Avulsion

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Summary: Traumatic ear avulsion represents a difficult challenge for all reconstructive surgeons; hence, replantation and reattachment will provide the best aesthetic outcome. However, when microsurgery is not possible, the surgeon must choose the most appropriate alternative method to address the concern. We are reporting a case of a near-total right ear external auricle amputation attached only by small skin bridge. The patient was admitted to our institute 22 hours after sustaining an injury during a motor vehicle collision. He was successfully managed by reattaching the external auricle into the anatomical place, with the repair of cartilage. This was followed by applying a daily protocol for venous congestion with the use of subcutaneous and intradermal injection of low-molecular-weight heparin daily for 10 days with gradual tapering of the dose. The external auricle survived with no complications or morbidity. Subcutaneous and intradermal low-molecular-weight heparin can be used effectively in cases of severe venous congestion of avulsed ear with adequate arterial inflow without causing any morbidity. (*Plast Reconstr Surg Glob Open* 2021;9:e3386; doi: [10.1097/GOX.0000000000003386](https://doi.org/10.1097/GOX.0000000000003386); Published online 26 January 2021.)

The loss of auricle is liable for the extreme imbalance of the facial contour with interference in the patient's life because of social fear and stigma. Due to the area and position, the ears are prone to outer injury by trauma, ranging from lacerations to crush injuries, and to partial or even total avulsion amputation. The outcome of the reconstructed ear after the injury is highly affected by the primary immediate management of injury during the onset of trauma and the initial decision at the emergency department.¹

Without satisfactory perfusion or reasonable vessels for microsurgical replantation, other methodologies can be utilized to endeavor ear rescue: composite grafting of the auricle, the pocket-principal strategy, or local flaps. The anatomical vascular network of the auricle is crucial, as the whole auricle can survive even if there is a small skin flap attached.^{2,3} In such sorts, the advice is to meticulously reattach and suture the remaining segment anatomically.

Venous blockage because of thrombosis or deficient venous vessels is the most well-known cause for the loss

of the ear revascularization and reattachment. Within the sight of satisfactory blood vessel inflow, sufficient venous drainage should be evaluated to prevent consequences of morbidity and total loss of replanted or reattached ear. The avulsion mechanism of ear injury especially to microvascular vessels of the ear frequently reduces chances of venous repair or even the attempt to repair.

THE CASE

A 55-year-old man with no significant past medical illness presented to The Royal Rehabilitation Center–Royal Medical Services, Jordan, with avulsion of the right external ear caused by motor vehicle collision (Fig. 1). The patient was initially managed in a private institute by simple resuturing of avulsed skin without cartilage repair and local wound care dressing. A few hours after the procedure, the ear started to develop signs of venous congestion.

The patient was then referred to our center 22 hours after the initial injury with signs of severe venous congestion of the right ear for possible microsurgical venous repair. Thereafter, the patient was subsequently taken to the operating theater immediately for exploration (Fig. 2A).

The entire external ear frame was avulsed, crushed, and attached only by a small skin bridge 5 mm from the superior helix, with satisfactory arterial supply to the external ear skin and cartilage, but had no venous return causing signs of venous congestion. Proper wound wash-out with repair of cartilage and then reattachment of skin anatomically followed by aggressive rewarming and initiation of low-molecular-weight heparin (LMWH) protocol was implemented, due to the lack of adequate veins to

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Fig. 1. Traumatic avulsion of the right ear skin and cartilage attached with small skin bridge.

perform microvascular anastomoses. All the possible management solutions were discussed with the patient and the use of local heparin injection therapy was acknowledged.

Multiple small incisions with a 11-scalpel blade on the venous-congested area of the external auricle were done along with rewarming cycles followed by subcutaneous and intradermal LMWH injection with a tapering pattern as follows:

1. 1st to 3rd day: injection of full vial 4000 IU/day with neomycin sulfate-impregnated gauze dressing.
2. 4th to 6th day: decrease injection of 3000 IU/day with neomycin sulfate-impregnated gauze dressing once daily, improvement of venous congestion noticed (Fig. 2B).
3. 7th to 9th day: further decrease injection to 2000 IU with neomycin sulfate-impregnated gauze dressing once daily.
4. 10th day: injection 1000 IU with neomycin sulfate-impregnated gauze dressing once daily.
5. from 11th day: LMWH stopped as a resolution of venous congestion achieved.

The dressing technique conducted every day through warm saline gauze to induce vasodilatation and then neomycin-sulfate-impregnated wet to dry dressing to keep a moist environment for wound and to prevent desiccation. Small superficial epidermolysis of overlying conchal skin was noticed during daily dressing, and this was managed conservatively with local wound care and coverage with oral



Fig. 2. Image showing an initial presentation to our institute 24 hours after injury with severe congestion (A), and then improvement on local LMWH protocol therapy with better resolution congestion day 6 post protocol (B).

antibiotics. Also, the amount of bleeding during the use of subcutaneous and intradermal LMWH was observed daily during dressing; however, the amount of dressing soakage was noticed to decrease with decreasing dose of local heparin injection. Daily complete blood count for the patient was obtained with no significant drop in hemoglobin level.

Venous congestion resolved completely, and good healing of the ear was obtained. The patient was discharged on day 12 with simple neomycin-sulfate-impregnated gauze light dressing. Follow-up in the clinic showed complete healing, with satisfactory outcome (Fig. 3).

DISCUSSION

Venous congestion of free and regional flaps is common and it is described in the literature that LMWH has been used effectively to treat flap venous congestion according to flap congestive surface area (in centimeters) due to bioavailability, intermediate half-life (4.5–7 hours), and dose-dependent clearance.⁴ We applied the same concept for our case, in which we considered it as congested flap with $<75\text{ cm}^2$.⁵



Fig. 3. Complete healing 6 months after injury with preservation of ear framework.

Many methods were discussed in the literature for the management of avulsed auricle⁶ and the choice of management depends on findings during intraoperative exploration, mechanism of injury, and surgeon training, especially in injuries of auricle avulsion with wholesome skin bridge attached. A composite graft is recommended in such a mechanism of injury. Some authors had also advised for restoration methods such as local skin, fascia, and muscle flaps, but long-term outcomes showed a non-convincing aesthetic appearance of the survived ear due to loss of cartilage stability and structural complexity.⁷

There are reported cases of successful ear replantation with the absence of venous drainage. Momeni et al discussed the role of the use of many venous decongestion methods in ear salvage⁸ in their systematic review of ear replantation when arterial supply is adequate and no venous limb such as medicinal leeches, soaking with a heparin sodium solution, and daily punctures with multiple stab wounds.

In general, for flap survival, if inadequate venous drainage occurs due to a defect in choke system between capillary beds and a lack of crossing venous tributaries, heparin local or systemic administration can help in supporting flaps until venous outflow is reestablished. When applying the same concept on near-total ear avulsion, subcutaneous and intradermal administration of LMWH can be used to maintain blood flow and prevent venous congestion.

Medicinal leeches are a used practice nowadays for ear salvage in cases when microsurgical anastomosis of venous outflow cannot be achieved or in cases of vein thrombosis after anastomosis. On the other side, some authors recommended the use of systemic anticoagulants alone or in addition to medicinal leeches to maintain venous outflow.⁹

Blood loss is a common consequence of the use of leech therapy along with possible infection; the latter can lead to a total loss of reconstructed ear. A complete blood count should be monitored, and RBC transfusions should be promptly administered when needed.¹⁰ Blood loss can also be a complication with the use of heparin therapy.

In our case, we achieved successful survival of near-total ear avulsion with no need for any blood transfusion or increased risk of wound infection by the use of medicinal leeches, with a simple application of subcutaneous and intradermal LMWH as pharmacological leeching in a formal protocol with regular wound care.

CONCLUSIONS

Subcutaneous and intradermal (local) LMWH with proper wound care can be used effectively in cases of severe venous congestion of avulsed ear with adequate arterial inflow without causing any morbidity to the patient and can be applied even after microsurgical arterial repair with no venous outflow. This can be a solution for traumatic avulsion in end organs with venous congestion such as nasal avulsions or fingertip injuries.

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