Salvage of three cases of class 2V ring finger avulsion injuries with medicinal leeches

Gerald L Sparkes MD FRCSC, Donald H Lalonde BSc MSc MD FRCSC, James P O’Brien BSc MD FRCSC
Dalhousie University, Halifax, Nova Scotia and Department of Plastic and Reconstructive Surgery, Saint John Regional Hospital, Saint John, New Brunswick

GL Sparkes, DH Lalonde, JP O’Brien. Salvage of three cases of class 2V ring finger avulsion injuries with medicinal leeches. Can J Plast Surg 1996;4(3):169-171. Three cases of the successful salvage of ring finger degloving injuries using medicinal leeches are described. In each case, good arterial inflow was present in the avulsed soft tissue, but venous insufficiency would have prevented viability. If venous microvascular repair failed, venous return could be temporarily provided by leeches, applied to the finger every 4 to 6 h. The leech drew blood for an average of 20 mins, but the bite site on the finger tip continued to ooze blood slowly as a result of an anticoagulant, hirudin, injected by the leech. This external venous run-off provided the equivalent of internal venous return until vascular ingrowth permitted true internal venous return, five to eight days after injury. Early movement and Coban taping assisted the achievement of a good early range of motion in the three salvaged digits.

Key Words: Hirudomedicinalis, Leech therapy, Venous failure, Venous insufficiency

Sauvetage dans trois cas de blessure à l’annulaire par avulsion de classe IIv au moyen de sungsues médicinales

RESUME : Trois cas de sauvetage réussi après traumatisme à l’annulaire au moyen de sungsues médicinales sont décrits ici. Dans chaque cas, le débit artériel était présent dans les tissus avulsés, mais l’insuffisance veineuse en aurait empêché la survie. Devant l’échec de la réparation microvasculaire, le retour veineux a pu temporairement être aspiré par les sungsues appliquées aux doigts, toutes les quatre à six heures. Les sungsues ont extrait du sang pendant en moyenne vingt minutes, mais le site de morsure à l’extrémité du doigt a continué de suinter lentement par suite de l’injection d’un anticoagulant, l’hirudine, par la sungsue. Cette évacuation veineuse externe a tenu la place du retour veineux interne jusqu’à ce que les vaisseaux se soient reformés et aient permis un retour veineux interne de cinq à huit jours après la blessure. La mobilisation rapide et un pansement de Coban ont aidé à obtenir un retour précoce à une bonne amplitude de mouvements pour les trois doigts saufs.
Degloving injuries of the hand most commonly involve the ring finger. Traditionally, ring degloving injuries with vascular compromise were treated with some form of flap coverage or amputation (1,2). In 1977, Flagg et al (1) reported the salvage of a degloved finger with microvenous anastomosis. Others (3-7) have also reported successful salvage of ring degloved digits with microsurgical repair of damaged vessels in selected cases. In 1981, Urbaniak et al (8) reported the salvage of 14 ring degloved injuries with microsurgery. They classified ring degloving injuries into three classes: class 1, circulation adequate; class 2, circulation inadequate; and class 3, complete amputation. In 1984, Nissenbaum (5) subdivided class 2, including class 2a in which arterial inflow had been disrupted but venous outflow was adequate. In 1989, Kay et al (9) recommended adding class 2V for fingers with adequate arterial circulation, but inadequate venous circulation. The patients in this case report fall into class 2V.

Foucher et al (10) reported 13 of 14 cases of replanted fingers with venous insufficiency salvaged using leeches to provide temporary run-off. A similar experience in our unit led to the use of leeches to attempt the salvage of ring degloved injuries, where the arterial inflow was adequate but the lack of venous outflow threatened digit viability.

This report presents three cases of successful salvage of ring degloved fingers threatened by venous insufficiency. Leeches were used to provide temporary venous decompression of the digit until vascular ingrowth into the degloved tissue could give adequate internal venous return.

CASE PRESENTATION

Case 1: A 25-year-old male fell off a ladder, sustaining a ring avulsion injury beginning at the junction of the distal one-third, proximal two-third level of the proximal phalanx. The patient arrived at hospital 14 h after injury with a cold, blue, swollen finger. When the soft tissue was milked to dislodge clots, the tissue started to bleed, and capillary refill returned to normal, indicating good arterial inflow. The patient was taken to the operating room where vein grafts were used to re-establish venous return.

The vein graft clotted shortly after surgery, and cyanosis returned. A leech was applied, and the colour of the finger improved quickly. The parasites were applied every 4 to 6 h with 1:1000 heparin-soaked gauze placed on the bite hole to promote oozing between applications of the leeches. Active range of motion with active physiotherapy guidance began five days postinjury, and by day eight the patient had developed sufficient restoration of venous flow that the leeches were discontinued. Intravenous cefazolin was initiated at admission. Despite the lack of clinical evidence of infection, nonhemolytic strepococcus was cultured at the degloving site. A partial loss of the distally based flap, located over the distal third of the proximal phalanx and proximal interphalangeal joint, required skin grafting 21 days postinjury. Six weeks postinjury with active and passive movement, as well as Coban taping, the finger had a total active motion (TAM) of 224°.

Case 2: A 33-year-old male caught his ring on a latch while getting down from a tractor. This resulted in a ring finger degloving injury beginning at the level of the proximal phalanx. In addition, it created a distal interphalangeal joint volar dislocation, which was
subsequently reduced. The arteries, nerves and tendons were intact, but the soft tissues were avulsed distally. Venous compromise was evident distal to the site of injury. The skin and soft tissues were repositioned and sutured proximally. The patient was admitted to hospital for application of medicinal leeches.

Skin colour of the injured digit improved within minutes of the application of the first leech. The bite site, with leech-injected anticoagulant and the application of gauze soaked in 1:1000 heparin solution, continued to ooze venous run-off at the bite hole for an average of 4 to 6 h before finger cyanosis indicated that a new leech should be applied. This procedure was continued for four days after injury. On day five, a depleted supply of parasites forced nail removal and the application of heparin-soaked gauze to the nail bed. By day six, the patient began to show evidence of internal venous return by a marked reduction in the digital cyanosis. The patient received intravenous cefazolin from the time of admission and, although pseudomonas and *Staphylococcus epidermis* were cultured at the degloving site, clinical infection did not develop.

Passive and active motion was begun on eight day after injury. A partial loss of the distally based flap over the proximal phalanx required skin grafting. Active and passive movement and Coban taping were resumed one week after the skin graft. By week seven postinjury, TAM was measured at 195°.

**Case 3:** A 46-year-old male presented with a ring degloving injury. At the initial assessment 7.5 h postinjury the digit distal to the injury site was cyanotic. Medicinal leeches were applied, and normal capillary refill was restored. Seven days postinjury, leech application was no longer required. This patient was also given intravenous cefazolin. Cultures from the wound site revealed no growth, and the patient showed no clinical signs of infection. No skin grafting was required. Physiotherapy began one week after injury, and TAM was 191° seven weeks postinjury.

**DISCUSSION**

In the three cases of ring degloving injury presented, arteries were intact and provided blood inflow, but the injuries had created obstruction of the venous outflow. The leeches in these cases merely provided temporary venous outflow until sufficient venous revascularization occurred. The leeches provided temporary external venous run-off by drawing off a small amount of blood directly and, then more importantly, by causing the slow constant ooze of blood out of the bite site through the injection of a potent anticoagulant, hirudin (11). Bloodflow out of the bite site was assisted by the application of heparin-soaked gauze. After a few days, there was enough vascular ingrowth in the degloved fingers that cyanosis did not occur when the leech hole stopped oozing. The leeches were then discontinued. Principles of this treatment are the same as those used to salvage “arterial only” replants with partial nail plate removal (12).

Leeches should not be used in a situation with sluggish arterial inflow because stagnant bloodflow may lead to bacterial infection from the leech. There have not been any clinical infections in the more than ten cases in our unit in which leeches were used, but in all cases, injured digits had good arterial inflow. Antibiotic sensitivity of bacteria cultured in the leech gut has been reported (14-18).
We are not advocating that leech therapy for venous insufficiency replace venous repair as the first line of treatment. However, we have demonstrated that leech therapy can successfully provide temporary venous outflow if microvascular venous reconstruction fails or is not available. We present leech therapy as an alternative treatment leading to the successful salvage of a ring degloved finger with good arterial inflow but no venous outflow.

ACKNOWLEDGEMENTS: We thank Karen Landry and Sandy Carson, our hand therapists, for their help and good work.

REFERENCES