Prolonged Bleeding after a Single Leech Application in Pediatric Hand Surgery

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Abstract

Keywords

- leech therapy
- pediatric hand microsurgery
- single leech application

Use of the medicinal leech in microsurgery is common place for venous decongestion and can be associated with the need for transfusion over time and multiple applications. Here the authors present a case of profound, ongoing, life-threatening bleeding after a single leech application in pediatric microscopic surgery. There are no reports of such profound bleeding in the literature, and this case serves as a warning of the need for close surveillance in this subset of patients.

Introduction

Use of the medicinal leech, *Hirudo medicinalis*, is a persistent theme in ancient and modern medicine. Efficacy for treatment of venous congestion ranges between 65 and 85%.¹ Hirudotherapy provides an alternative route for the removal of pooled venous blood, which has the advantage of reducing capillary and hydrostatic pressure and improving reperfusion while the body works to restore native channels of venous egress. Though infection is considered the most common complication with the use of this parasite,^{1,2} it is routinely dealt with through prophylactic antibiotics. Skin irritation and allergic reaction sequelae to leech therapy are well tolerated with supportive care.²

A known complication that has not been reported in the literature on plastic surgery is profound or prolonged bleeding.³ Though bleeding is commonly treated with blood transfusion, it is unusual for profound acute blood loss to be attributed to a single leech application. The anticoagulation mechanism is mediated by the saliva of the leech that contains hirudin.⁴ Hirudin is a potent natural inhibitor of thrombin and acts to prevent the conversion of fibrinogen into fibrin.⁵ Though this accounts for the anticoagulative effect, it has

been postulated that the prolonged duration of bleeding can be attributed to secretion of protease enzymes by the leech impairing collagen-platelet interaction.⁴ Here the authors present a report of life-threatening bleeding after a single leech was used in pediatric hand surgery.

Case Presentation

This patient is a 5-year-old boy whose left long finger was nearly amputated by a sliding door. Minimal bleeding was reported at the scene and he was immediately brought to the hospital. Examination noted a circumferential transection through the distal interphalangeal (DIP) joint with the distal tip of the finger attached only via the flexor digitorum profundus tendon. The dorsal skin injury was through the eponychial fold, and the volar injury was at the DIP flexion crease. The ulnar digital nerve was avulsed (► Fig. 1). He was emergently taken to the operating room (OR) for exploration and the stigmata of crush injury was noted. The digital ulnar artery was identified proximally and distally, debrided to healthy tissue, and repaired under the microscope. No avenues for venous drainage could be found for repair. The bony edges of the DIP joint were debrided and the joint

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Fig. 1 The image showing circumferential transection through the DIP joint with the distal tip of the finger attached only via the flexor digitorum profundus tendon.

fused with a K-wire. Significant improvement in the color of the nail bed was noted and red capillary oozed after pin-prick. A splint was applied and the patient was transferred to the floor for monitoring and leech therapy for drainage.

The first leech was placed 9 hours postoperatively (ordering and delay in arrival). Serial pin-pricks and topical heparin were used to allow drainage until the leech arrived. The first leech fed for 20 minutes. After the leech detached, a slow, steady ooze was noted and continued uninterrupted for 15 hours at which time the patient was taken back to the OR for exploration due to bleeding and hemodynamic instability (► **Fig. 2**).

Fig. 2 The image showing placement of the first leech 9 hours postoperatively.

A punctate triradiate chevron wound consistent with a bite was noted oozing from the nail bed. A piece of Surgicel (Ethicon, Summerville, New Jersey, United States) was used to obtain hemostasis. A repeat hematocrit revealed a decrease of 20 points, and the child was transfused 2 units and placed in the intensive care unit (ICU). The fingertip redeveloped venous congestion on postoperative day (POD) 2, and a new leech was applied with caution. Congestion significantly improved without prolonged bleed, and after this point the child was continued on leech therapy at increasing intervals from every 3 to 4 hours up to one leech in 24 hours by POD4. Unfortunately on POD5, the leech would not attach and sloughing of the glabellar epidermis was noted. Ultimately on POD6, the fingertip declared and the child was taken for formal amputation.

Discussion

Here the authors describe a case of prolonged, life-threatening bleeding episode after a single leech application in pediatric plastic surgery after microsurgery. There are no other cases reported in this population. The child was on antibiotic prophylaxis with ceftriaxone and receiving 81 mg of aspirin (Bayer Pharm, Leverkusen, Germany) at the time of bleeding episode though this is not novel and is unlikely to be the reason for the profound bleeding as aspirin use has been protocolized in the literature in arterial-only replants with leech therapy without increased complication rate.⁶

A compounding variable, and likely the cause for loss of the fingertip, is the crush injury. Not only would a crush injury impair the cellular restorative process, but it would also damage the microvascular circulation preventing reestablishment of normal capillary architecture, thereby promoting aberrant drainage through the leech bite. A corollary is the extensive tissue damage and ischemia causing release of vasodilatory peptides, which, combined with hirudin, leech-based cellular proteases, and the damaged tissues, resulted in a perfect setup for ongoing bleeding. The child has done well in follow-up but serves as a warning of the life-threatening possibility of hemorrhage.

Leech therapy is used commonly by the plastic surgeons for venous congestion in flaps and replants. In these instances, bleeding is rarely encountered on this scale after a single leech application and has not been reported in the literature. Limited bleeding after detachment lasting 1 to 2 hours is normally self-limited, and blood transfusion only becomes necessary after several leech applications. Several reasons exist why this child's injury may have set up for prolonged bleeding. The relatively atraumatic tissue of a tissue transfer should not contain the inflammatory markers from tissue destruction or the vasoactive substrates of prolonged ischemia from an avulsed artery. Second, extensive crush injury lacks the micro- and macrovascular structure to promote neovascular and revascularization once vasospasm breaks. Last, the positioning of the leech on the thicker glabellar skin versus the thin damaged sterile matrix may have prevented a possible injury to a feeding vessel or allowed for better skin turgor and pressure to control the bleeding. Combined, this crush injury pattern may be distinct, with less innate ability to self-limit

blood loss by autoregulation placing the child at higher risk for life-threatening bleeding even after a single leech.

Conclusion

Profound and prolonged life-threatening bleeding is a known but exceedingly rare complication of leech therapy after single application. Products pending can provide a more controllable mechanical strategy for venous drainage that can predictably remove 600 to 800% more blood than the average leech,⁷ but these are not available yet. Standard therapy of Lovenox, aspirin, and prophylactic antibiotics should be continued. The authors conclude that leech therapy for a profound injury involving significant mechanical tissue stress and destruction places the patient at higher risk for bleeding complication and suggests a higher threshold for monitoring and institution of supportive care, especially in the pediatric population with an innately lower hemodynamic reserve.

References

- 1 Herlin C, Bertheuil N, Bekara F, Boissiere F, Sinna R, Chaput B. Leech therapy in flap salvage: systematic review and practical recommendations. *Ann Chir Plast Esthet* 2017;62(02):e1–e13
- 2 Pietrzak A, Kanitakis J, Tomasiewicz K, et al. Cutaneous complications of improper leech application. *Ann Agric Environ Med* 2012; 19(04):790–792
- 3 Faust EC, Russel PF, Jurg RC. *Craig and Faust's Clinical Parasitology*. 8th ed. Philadelphia, PA: Lea & Febiger; 1970:563–570
- 4 Munro R, Hechtel FOP, Sawyer RT. Sustained bleeding after a leech bite in the apparent absence of hirudin. *Thromb Haemost* 1989; 61(03):366–369
- 5 Rydel TJ, Tulinsky A, Bode W, Huber R. Refined structure of the hirudin-thrombin complex. *J Mol Biol* 1991;221(02):583–601
- 6 Buntic RF, Brooks D. Standardized protocol for artery-only fingertip replantation. *J Hand Surg Am* 2010;35(09): 1491–1496
- 7 Conforti ML, Connor NP, Heisey DM, Vanderby R, Kunz D, Hartig GK. Development of a mechanical device to replace medicinal leech (*Hirudo medicinalis*) for treatment of venous congestion. *J Rehabil Res Dev* 2002;39(04):497–504