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Leech Therapy, Positive Outcome for Venous Congestion and Arthritic Pain

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Abstract

Introduction: Leech treatment has unique properties; the leech sucks venous blood and promotes various tissue healing and can therefore be used as an effective supplement in managing complicated varicose veins and vein congestion. It has been proven to be helpful after re-attachment surgery as well.

Case Report: In our case report, we demonstrate the case of a 16-month-old child who got his foot into a lawn mower. The dorsal part of the leg was scalped and the dorsal venous system was damaged, with the extensors tendons intact. The injury was treated, but already at the end of the operation, the finger began to appear discrete signs of venostasis, which gradually worsened. Approximately 18 hours after the surgery, we decided to use hirudotherapy at the mentioned livid finger. Overall, we applied 5 leeches within 8 days. The baby was released after 17 days of hospitalization. The finger was pink, but the nail was removed. The last time the baby was on the check after one month and 9 days after the first application. The finger was vital. This case report demonstrates the effect of hirudotherapy on blood circulation for re-attached fingers and areas of transplanted skin and muscle (grafts).

Discussion: This case report highlights several critical points regarding hirudotherapy. Efficacy of hirudotherapy can be an effective adjunct treatment in enhancing microcirculation for reattached digits and grafted tissues, reducing the risk of venous congestion and subsequent tissue necrosis. With proper medical oversight, hirudotherapy is a safe procedure with minimal adverse effects. However, careful monitoring for potential complications, such as infection or excessive blood loss, is essential. Combining traditional practices like hirudotherapy with modern surgical techniques can offer comprehensive solutions to complex medical issues, particularly in reconstructive surgery.

Conclusion: Hirudotherapy proved to be a beneficial treatment in this case, promoting blood circulation and improving the outcomes for reattached fingers and transplanted skin and muscle grafts. This report supports the continued use and study of hirudotherapy as a valuable tool in reconstructive and microvascular surgery. Future studies and clinical trials could provide more robust data, further establishing its efficacy and safety in various medical contexts.

Keywords: Hirudotherapy; Leech; Hirudo Medicinalis; Venous Congestion; Arthritic Pain.

Introduction

Hirudotherapy, the use of leeches for medicinal purposes, dates back to ancient medicinal practices of various cultures as a method of balancing "biological humors" believed to contribute to poor health [1].Since that time, a developing understanding of the mechanisms of action underlying the therapeutic advantages has expanded the scope of hirudotherapy to include treatment of osteoarthritis, autoimmune disease, cardiovascular disease, cancer, and complications of diabetes. Within plastic and reconstructive surgery, the predominant role of leeches is to relieve venous congestion in compromised flaps. In the postoperative period, flap success is reliant on effective monitoring for vascular compromise, with venous thrombosis described as both the most likely and quickly damaging event [2]. Clinical signs of venous congestion include tissue with cyanotic/dusky coloration, increased turgor, cool tactile temperature, brisk capillary refill, and rapid dermal bleeding. In the 1980s, French microsurgeons began using leeches to assist with distal digital replantation involving arterial repairs [3]. Currently, medicinal leeches are used successfully for only a few medical conditions, most notably venous congestion and arthritic pain. Venous congestion occurs when blood accumulates in the veins due to inadequate venous return, often seen after surgical procedures like skin grafts and reattachment of body parts. In 1960, Deganc and Zdravic [4] conducted the first treatment of congested flaps using leeches. Today, especially in the field of reconstructive microsurgery, medicinal leech therapy is enjoying a renaissance (for review see also [5,6]). Leeches are generally used during the critical postoperative period when venous outflow cannot match the arterial inflow, which can lead to venous congestion, clinically identified by the dusky purple appearance of the skin. If this complication is not corrected, cell death may result and the flap or finger may be lost. Therefore, medicinal leeches are used to salvage compromised microvascular free-tissue transfers, replanted digits, ears, lips, and nasal tips until angiogenesis gradually improves the physiological venous drainage [7]. Frodel et al. [8] used medicinal leeches to salvage soft tissue avulsion in key facial structures of 4 patients involving avulsions of the ear, nose, lip, and scalp. In addition to using leech therapy in head and neck reconstruction, there are numerous studies showing the use of leech therapy for hematomas, penile and total scalp replantation, and pedicled skin flaps, as well as for the salvage of the entire lower limp. It is likely that the benefits of hirudotherapy are not limited to the direct decongestant effect of the leech withdrawing blood from a congested flap. The majority of the clinical benefit is likely to be due to the gentle continued oozing that occurs from the bite wound over the following 24-48 hours after the leech is removed. This continued decompression provides a bridging period during which there is enhanced oxygenation, wound healing and, most importantly, the development of collateral venous connections between the flap and the recipient bed. There is a well-established body of clinical evidence, which shows hirudotherapy is an effective treatment for venous congestion following replantation of extremities, cutaneous pedicled flaps and microvascular free tissue transfers [9]. Vargas et al. first in the literature describe the use of hirudotherapy for venous congestion in an almost completely avulsed earlobe without microsurgical blood vessel repair, as a last resort in an otherwise healthy 38-year-old male patient who sustained trauma due to physical assault. Whitaker, et.al. [10] has a systematic review analyses numerous cases where leech therapy has been effectively used to manage venous congestion in various reconstructive surgical procedures. Mumcuoglu [11] in his study discusses the historical and modern applications of leech therapy, with specific examples of successful treatment of venous congestion following reconstructive surgery. Knutson et.al. [12] In his case report and review of the literature highlighting the potential benefits of leech therapy in managing arthritis pain.

Material and methods

This study was approved by the Faculty of Medicine, Comenius University and University Hospital, board associated with Department of Plastic Surgery, Bratislava, Slovakia.

Source of leeches

For the treatment, we used pure certified leeches Hirudo medicinalis (Linné 1758).Leeches come from our breed registered in Slovakia under the number 05584/12. From Altechniky, s.r.o. The company trying to produce up to 3000 thousand pieces of leeches per year. The accompanying certificate is issued to the leeches.

Application

Leechs are stored at a temperature of 16 to 19 degrees according to the season. The water changes every three days. They have about 18 months and a minimum of 5 months are in quarantine. The leeches are usually placed on a given spot of the skin using a 5 millilitres syringe. For this purpose, the nozzle of the syringe is removed using a scissor or scalpel. The leech is placed in the barrel of the syringe and the open end of the syringe is placed on the area to be treated. When the leech starts feeding, the syringe is removed gently. We placed the leeches on precisely defined parts of the body and, after adhering to the body of the patient, shed blood, usually 20-45 minutes, while excluding the necessary amount of bioactive substances into the body. We used the leeches in one shot. Prior to application, we leached the leech for 2 to 5 minutes in a blue rock solution to get rid of dirt from the surface of the body. After detachment, the leaches were killed in 70% etylalcohol and are disposed in bags for biological waste. Leeches are generally used during the critical postoperative period when

venous outflow cannot match the arterial inflow, which can lead to venous congestion, clinically identified by the dusky purple appearance of the skin. If this complication is not corrected, cell death may result and the flap or finger may be lost. Therefore, medicinal leeches are used to salvage compromised microvascular free-tissue transfers, replanted digits, ears, lips, and nasal tips until angiogenesis gradually improves the physiological venous drainage.

Case Presentation

In our case presentation, we demonstrate the case of a 16-month-old child who got his foot into a lawn mower. The dorsal part of the leg was scalped and the dorsal venous system was damaged, with the extensors tendons intact. In addition, head II and IV. metatarz fracturing occurred, and cutting wound in a IV-th commissure, that was deep and at the same time one dig. Nerve together with artery IV. Of the finger was damaged. The injury was treated with a suture of the skin and insertion of the cutted skin transplant into the site of the defect on the shoulder of the foot. Already at the end of the operation, the finger began to appear discrete signs of venostasis, which gradually worsened. Approximately 18 hours after the surgery, we decided to use hirudotherapy at the mentioned livid finger. Overall, we applied 5 leeches within 8 days, with one unsuccessful application. (The leech was not attached). The baby got the lowest Hb from 106 to 75.2, after which she received 100 ml of deleuticized erythrase. When she was released from the hospital, Hb 109 was in place. The first two applications lasted 25min and the other two only 10min. The child was during the therapy under i.v. ATB coverage (due to injury). We released the baby after 17 days of hospitalization. The finger was pink, but the nail was removed. The last time the baby was on the check after one month and 9 days after the first application. The finger is vital. Swelling of the II. and IV. Finger seen on the enclosed pictures is caused by the fracture of both fingers, with damage and resorption of part of the head of the metatarzofalangeal joints of both fingers. We are also attributed to these fingers. The child uses the foot without restrictions. At this time, we still heal a minor defect on the edge of the skin transplant. Finger survival at pac. We are uniquely attributed to hirudotherapy. This case report demonstrates the effect of hirudotherapy on blood circulation for re-attached fingers and areas of transplanted skin and muscle (grafts) (Figures 1-11).

Results

Figure 1: First application. Leech application 18 hours after the surgery.

Figure 2: Day 2, after first leech application.

Figure 3: Day 3 unsuccessful application.

Figure 4: Day 4, third application.

Figure 5: Day 6, after fourth application.

Figure 6: Day 7, after fifth application.

Figure 7: Day 7, 40 days medical check.

Figure 8,9: 90 days medical check.

Figure 10,11: The current state in 2024.

The last time the child was examined after 3 month after the first application. The finger is vital. Inflammation of II. and IV. Finger that can be seen in the images is caused by fracture of both fingers, while part of the heads of the metatarsophalangeal joints of both fingers were damaged and resorbed. The fingers exhibited improved coloration, indicating enhanced blood flow. Capillary refill time improved, and the risk of necrosis decreased. We also attribute the position of these fingers to this. The child uses the leg without restrictions. At the end of the process, we healed a small defect on the edge of the skin transplant. The grafted areas showed signs of healthy integration with the surrounding tissue, with reduced swelling and improved tissue viability.

The current state in 2024: the patient leg does not cause any problems, she does not limp, on the contrary, she runs and jumps without problems, just like all other children. She goes to dance and to gymnastics, skis, skates, and swims without any restrictions. The fourth toe is placed below, but it grows together with the leg, except for the nail, which fell off after the injury and did not grow anymore."

Discussion

Our case report highlights several critical points regarding hirudotherapy. In our case, the treatment with leeches of our small patient was very effective and enhanced microcirculation for reattached tissues, reducing the risk of venous congestion and subsequent tissue necrosis. Leech saliva contains potent anticoagulants that can prevent blood clots in newly reconstructed tissue, enhancing the success rate of surgeries that involve blood vessel anastomosis. At the same time, hirudotherapy has been noted to provide analgesic effects due to the anesthetic compounds in leech saliva, which can be beneficial in managing postoperative pain. With proper medical oversight, hirudotherapy is a safe procedure with minimal adverse effects. However, careful monitoring for potential complications, such as infection or excessive blood loss, is essential. Combining traditional practices like hirudotherapy with modern surgical techniques can offer comprehensive solutions to complex medical issues, particularly in reconstructive surgery.

Conclusion

The ancient art of 'bloodletting' with leeches has endured for millennia and more recently has occupied a unique niche in the treatment of venous congestion in reconstructive surgery. The current body of literature indicates high salvage rates in flaps and replanted tissues affected by venous congestion. In pediatric medicine, hirudotherapy has been applied in cases where there is a need to improve blood circulation, reduce venous congestion, or promote wound healing. Hirudotherapy, or leech therapy, has been occasionally used in pediatric plastic surgery, particularly in specific cases where tissue congestion and compromised blood flow are concerns. The application of hirudotherapy in this context is similar to its use in adult plastic surgery but adapted for pediatric patients. In pediatric plastic surgery, hirudotherapy may be considered in procedures involving tissue flaps, skin grafts, or reattachment of severed body parts, where maintaining adequate blood circulation is crucial for the success of the surgery. The leeches are applied to the surgical site, where they attach and begin to feed on the blood. The anticoagulant properties of leech saliva help prevent blood clotting and promote blood flow, reducing tissue congestion and improving blood circulation to the affected area. This, in turn, can enhance the survival of the transferred tissue or graft.

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Ethical Consideration: Written informed consent from the patient parents was obtained to present this case.

Conflict of Interest: None.

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