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LEECHING LIFE BACK: A STUDY ON THE ROLE OF LEECH THERAPY IN REVIVING CONGESTED FLAPS

Plastic Surgery

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ABSTRACT

Leech therapy has a historical significance in medicine. It is currently experiencing a resurgence as a valuable adjunct in plastic and reconstructive surgery to manage venous congestion in tissues. This study aimed to assess the efficacy of leech therapy for salvaging congested flaps and replanted digits. Conducted over two years, the prospective study included 30 patients, primarily with lower-extremity flaps and digital replantations. Medicinal leeches were applied for 3–7 days, facilitating venous drainage until angiogenesis restored vascular outflow. A success rate of 63.33% was achieved, with complications in a few cases. Despite these challenges, leech therapy proved to be a practical, low-risk solution for venous congestion when surgical revision was not feasible. The findings support its continued use in modern reconstructive practices.

KEYWORDS

Venous offloading techniques, medicinal leeches, leech therapy, venous congestion

INTRODUCTION

The earliest evidence of leech therapy comes from Egyptian hieroglyphics dating back to 3500 years ago.[1] It is also one of the widely practiced methods of regimental therapy in Unani medicine known as Irsale Alaq.[2] In Ayurvedic text Sushruta samhita, a painless and controlled method of blood letting by leeches is mentioned as 'Raktamokshana'. [1] Today leech therapy is making a come back in plastic and reconstructive surgery to relieve venous congestion in tissues. [3] Early recognition of venous congestion and timely intervention can facilitate salvage flaps in cases of mechanical causes of flap loss.[4] However, sometimes surgical revision is unfeasible or the cause of congestion remains unidentified. In such cases, venous offloading techniques are recommended.[5] Leech therapy appears to be an effective approach in these scenarios. It has proven effective in relieving venous congestion in various compromised locoregional and free flaps following reconstruction.[3,6–8] It can provide continuous venous drainage until angiogenesis restores an outflow network.[9]

Additionally, it has been employed to alleviate venous congestion in replanted appendages like the ear, nose, lip, and scalp, as well as in cases following digital replantation and ring avulsion injuries.[5,10] We conducted a prospective study to evaluate the efficacy of leech therapy for flaps and replanted digits affected by venous congestion.

MATERIALS AND METHODS

From April 2021 to April 2023, we conducted a prospective observational study on leech therapy in patients with congested flaps and replanted digits. The study was approved by ethics committee of the institution. A total of 30 patients were included in the study after obtaining informed consent from each individual. To mitigate the risk of leech migration into natural orifices, flaps performed for head and neck reconstruction were excluded.

Technique Of Leech Therapy:

We obtained medicinal leeches *Hirudo medicinalis*, from the College of Unani Medicine, where they were routinely used for bloodletting procedures. These leeches were maintained in non-ionized water at 7-10°C. Typically, flaps were treated for 3 to 7 days. It coincides with the neovascularization period between the flap and the recipient area.

To apply the leeches, the desired area was first cleaned with saline. The skin over the congested area of flap was pricked with sterile needle to stimulate the leech to attach. Using a gloved hand or tweezers, the leech was guided to attach its larger posterior end for support while its smaller head end was directed to the desired site (Fig 1&2). Alternatively, the leech could be placed into a syringe without a plunger and released onto the target area. Once attached, the leech would remain in place until it had consumed a full blood meal, detaching after 20 to 60 minutes. To prevent leech migration and attachment to other areas of the patient's body, a thick layer of gauze was applied around the leeches and the therapy was monitored by a healthcare provider.

We induced the leeches to regurgitate their blood meal by sprinkling turmeric powder on their dorsal side, allowing them to be reused for the same patient (Fig 3). Initially, leeches were applied at 6-hour intervals on a trial basis. Depending on the severity of tissue congestion, therapy was continued at intervals of either 6 or 8 hours. Daily photographic assessments of the flap was performed, noting changes in colour, congestion, and the color of the blood flowing through the bites. Appropriate duration and frequency of the therapy were determined based on these findings.

All patients received Cefoperazone-sulbactam as prophylaxis during leech therapy, which was continued for 24 hours after the therapy concluded. Hemoglobin and white cell count were monitored daily, and transfusions were administered if hemoglobin levels dropped below 8 gm%.

RESULTS

Among the 30 patients included in the study, 24 were male and 6 were female, with a mean age of 31.77 years. Most flaps were located on the lower extremity (n=17), followed by the upper extremity and torso. The primary cause of tissue defects was road traffic accidents (RTA),

accounting for 11 cases (36.7%), followed by machinery injuries with 6 cases (20%). Other causes included electrical burns and post-necrotizing infections.

Flap congestion was more commonly observed with reverse sural (Figure 4) and transposition flaps, which represented a significant number of cases (n=10, 33.33%). Leech therapy was employed in 2 cases of digit replantation and 2 revascularisations (Figure 5). The variety of cases treated with leech therapy is summarised in Table 1. All patients received leech therapy for a minimum of 3 days (ranging from 3 to 7 days) with an average therapy duration of 5 days, as detailed in Table 2.

Unfortunately, one digit that underwent reimplantation and another following revascularization could not be salvaged, necessitating revision amputations. Complete flap loss occurred in two patients, requiring a second flap, while partial flap necrosis was observed in six patients, who then underwent debridement and flap revision. The outcomes were listed in Table 3.

Patients who had total or partial flap loss and digit loss underwent reoperations, with details provided in table 4. The most common complication associated with leech therapy was blood loss, requiring transfusions in 17 cases (56.66%). Patients with flap congestion required blood transfusions more frequently than those who underwent replantation or revascularization.

Despite prophylactic antibiotic coverage, local infections following leech therapy were observed in 3 patients (10%). These infections were managed successfully with systemic antibiotics, debridement, and dressings. Wound swabs commonly identified bacteria such as Klebsiella and Pseudomonas. Notably, no cases of *Aeromonas hydrophila* infection were documented after leech therapy.

DISCUSSION

Using leeches to alleviate venous congestion is a recognized therapeutic method, though it remains relatively uncommon. Conventional strategies are often preferred initially.[11] In our series, we employed leeches in 30 reconstruction procedures, successfully preventing total flap or appendage loss due to venous congestion in 19 cases (63.33%). This success rate is lower than that reported by Whitaker et al. in their systematic multicenter review, where they achieved a 77.9% success rate out of 277 cases.[12]

A single leech can draw up to 10 ml of blood from engorged tissue, facilitating capillary perfusion.[13] The timing of venous congestion detection is crucial for flap survival. The earlier it is identified, the quicker the management and the better the survival rate.[11] Pedicled flaps can benefit from alleviating compression or from venous supercharging whenever possible. Propeller flaps can be repositioned to their original location for 48 hours to enhance venous return.[14] For free flaps, aside from relieving extrinsic compression and performing thrombectomy, thrombolysis has been shown to improve venous microcirculation.[15] When all these methods fail, blood letting is practiced. Perez et al. utilized subcutaneous low molecular weight heparin (LMWH) to address flap congestion.[16] Consistent with other studies, we observed venous congestion more frequently in lower extremity flaps.[17]

Leech therapy is well-documented for its use in replanted or revascularized digits with poor venous outflow.[18] This therapy has been applied both prophylactically in cases where venous congestion is anticipated and clinically in cases where venous congestion is detected. Additionally there have been reports of artery-only replantation utilizing leech therapy for venous drainage.[19] The primary goal of these approaches is to ensure sufficient arterial inflow through the replanted part while allowing the development of venous channels through neovascularization. The secretion of histamine-like molecules and hyaluronidase by the leeches promotes local vasodilation and the breakdown of extracellular matrix, respectively.[20]

In a recent systematic multicenter review by Whitacker et al., 277 cases of locoregional flaps, free tissue transfers, and replanted appendages were reported, showing a 77.9% success rate with leech therapy.[12] This review represents the largest reported series of leech therapy for flap congestion. In our study, the success rate was 63.33%, and 11 patients required secondary procedures(Table 4).

Of the 30 study participants, 21 (70%) had no comorbidities, 7 (23.3%) had diabetes, and 1 (3.3%) had hypertension. However, no correlation could be established between leech therapy and the presence of comorbidities.

There is no clear consensus in the literature regarding the duration of leech therapy. Reported data varies significantly, with therapy durations ranging from 1 to 22 days.[21] In our study, we decided the duration based on signs of flap recovery. Corenjo et al, noted no significant differences in the length of leech therapy among patients who received locoregional flaps, free flaps, or appendage replantation, with an average duration of 4.6 days (range: 1–11).[17] Importantly, the timing of leech therapy is critical, as the treatment becomes ineffective once irreversible necrotic changes develop in the flap.[22]

Significant blood loss was observed in 17 patients, while 3 patients experienced local infections following leech therapy. No mortalities were recorded within 30 days of the initial reconstruction. Blood loss and the subsequent need for blood transfusions remain significant contributors to the morbidity associated with leech therapy.[17] In a study conducted by Nguyen et al., leeches were used in 27 flaps, with blood transfusions required in 22 patients (57.9%).[23] The typical blood meal volume for a medicinal leech is estimated to be 2.5 to 5 mL.[24,25] However, most of the blood loss results from post detachment bleeding, which can exceed 50 mL over 6 hours and persist for 48 to 72 hours. [24,25] As anticipated, the likelihood of requiring a blood transfusion increases with prolonged therapy duration. Additional reported complications include leech bite scars, leech migration, psychosis, and prerenal azotemia.[12]

Our observed complication rates align with those reported by Cornejo et al., where 32 out of 87 patients (36.7%) required postoperative blood transfusions, and 7 cases of infections were recorded despite prophylactic antibiotic use.[17] In our study, the success rate of leech therapy was 63.33%, encompassing cases with complete flap survival as well as partial flap loss requiring revision. Reoperations were performed in 13 patients (43.33%).

CONCLUSION

Leeches have been used by traditional therapists for centuries to treat various ailments, and they have now made a comeback in modern medicine, supported by growing evidence. Our study validates leech therapy as an effective adjunct for managing venous insufficiency in pedicled or free flaps when surgical revision is not feasible. This therapy is straight forward to administer and has minimal side effects. Its success relies on careful monitoring, proper timing appropriate therapy duration, and dose adjustments. The anticoagulant and decongestant properties of leech therapy make it beneficial even for free flaps when venous supercharging is not an option.

Table 1: Distribution Of Cases

Procedure executed	Number of cases	Percentage
Reverse sural flap	5	16.66%
Transposition flap	5	16.66%
Proximal sural flap	4	13.33%
Groin flap	4	13.33%
Digit Reimplantation	2	6.66%
Revascularisation	2	6.66%
Free ALT flap	2	6.66%
Saphenous flap	2	6.66%
Latissimus Dorsi	1	3.33%
Scalp replantation	1	3.33%
Propeller flap	1	3.33%
Gluteal rotation	1	3.33%
Total	30	100%

Table 2 Table Showing Mean Duration Of Leech Therapy

Number of days Leech therapy was administered	Number of cases	Percentage
3-4 days	6	20.0%
5-6 days	21	70.0%
7 days or more	3	10.0%
Total	30	100%

Table 3 Table Showing Final Outcomes At The End Of Leech Therapy

Outcomes at the end of leech therapy	Frequency	Percentage
Flap survival with no loss	18	60%

Flap survival with partial loss	6	30%
Replanted digits that survived	2	6.66%
Loss of Replanted digit	2	6.66%
Complete flap loss	2	6.66%
Total	30	100%

Table 4 Reoperations That The Patients Underwent

Second Procedure	Number(n)	Percentage
Debridement with flap revision	6	20%
Debridement followed by new flap	2	6.66%
Revision amputation	2	6.66%
Microvascular revision	1	3.33%
Total	11	36.66%

Figures

Figure 1) Hirudo medicinalis Leech before consuming a blood meal

Figure 2) Same leech after a blood meal

Figure 3) *Leech is made to regurgitate blood by sprinkling turmeric. It can be re used for another meal*

Figure *4a) Reverse sural artery flap cover for heel defect. Flap edema and congestion seen. 4b) Application of leeches to the flap to relieve congestion. 4c) After 3 days of leech therapy, congestion relieved and flap survived with partial loss.*

Figure *5a) Amputated left thumb 5b)Changes of venous congestion after replantation of thumb 5c)Application of leech therapy to thumb 5d) Post operative picture 4 weeks after replantation. Venous congestion got relieved and the thumb survived.*

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