

The therapeutic inspiration of the humble leech in reconstructive surgery: a brief overview

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ABSTRACT

Medicinal leeches (*Hirudomedicinalis*) have been used since ancient times in several fields of medicine, notably in plastic and reconstructive surgery. Currently, thanks to the mechanic properties and biochemical of their saliva (hirudin), Medicinal leeches are considered as a treatment of choice for venous insufficiency after replantation or flap surgery especially when surgical repair is not technically possible. Applying leeches must obey to well-established rules for the safe and effective use and avoiding serious complications.

Keywords: Hirudotherapy, *HirudoMedicinalis*, Hirudin, Venous Congestion

INTRODUCTION

Hirudotherapy or treatment by leeches (leech therapy) consists of using these lasts for its immediate local relieving congestion, anti-inflammatory and anti-edematous effects in the treatment of certain pathologies (tendinitis, hematoma, hemorrhoids)¹. This treatment is often used in reconstructive surgery, more in particular on flaps as well as replanted segments to avoid the post-operative venous insufficiency². The use of this therapy in Morocco is quite limited. Given the highly cost of acquisition, exploitation (storage, safe disposal after using) also the staff training for proper use. The aim of this study is to describe the right attitude for using leeches in the medical field and to promote their application in reconstructive surgery.

HISTORIC

The medical use of leeches goes back to the Egyptian era, the oldest known document establishing their use is a painting found on an Egyptian tomb of the 18th dynasty³.

On the other hand, Greeks and Romans have also used leeches to do bloodletting and to treat several pathologies (e.g. acute laryngitis; nephritis, neuralgia, epistaxis ...) ^{4,5}. Since then,

leeches have continued to be extensively used throughout history, especially in the Middle Ages, in the result of the influence of Avicenna Qanùn of Medicine in (1020) that has recommended the use of leeches in the treatment of skin diseases⁶.

In the 20th century, the therapeutic use of leeches, in various skin lesions, was widespread, thanks to the French surgeon of the Napoleonic armies, Francis Boussaud and the German surgeon Johan F.D which has established the process in rhinoplasty and flap surgeries.

However, the progress made in medical technology as well as the discovery of antibiotics gave caused a huge decline in the use of this therapy⁷.

Only after 1972 that the leeches came back in the spotlight, thanks to the French surgeon Jacques Baudet, who used them for fingers replantation. This technique is now widely used in many departments of medicine in France and worldwide^{8,9}.

PRESENTATION OF THE LEECH

Anatomy and physiology:

The leech is a hermaphrodite worm, which mean it has both male and female sex organe, bloodsucking, and belonging to the class of Huridinea.

Although there are over 700 species, the most used leech in EU (Europe) and US (United-States) is the European medical leech "*HirudoMedicinalis*", because of its abilities: it inflicts a deep bite as much as a prolonged bleeding¹⁰. In some cases, similar results were also obtained with *HirudoVerbana* and *HirudoMichaelsoni*¹¹.

"*HirudoMedicinalis*", is a dark green brown color, measuring about 6 – 12 cm of length, and weights 1-2 gram fasting¹². It has two suction cups on each extremity^{13,14} [Figure 1]:

*One cephalic and hail in which the mouth is located with a triple jaw Y-shaped

*The second is caudal and wider, for attachment and locomotion.

Adult leeches preferentially feed on the blood of mammals, amphibians or fishes¹⁵. They bite only when they are starving and on a surface temperature superior to 25 °C. They can absorb up to five times their weight during a meal that is the equivalent of 5 to 15 milliliters¹⁶.



Figure 1: European medical leech “Hirudo Medicinalis”

Mechanism of action:

The leech has a mechanical role, and relieves congestion in a venous stasis zone by absorbing some milliliters of blood¹⁷. By biting the host, the leech releases salivary secretions rich in active molecules, of which, Hirudin is the most famous¹⁸. This last is the main focus in modern medicine and plays a powerful anti-thrombotic role by inhibiting platelet aggregation induced by thrombin¹⁹.

The leech saliva also contains a local anesthetic, which makes the bite painless. It also contains vasodilator factors, which facilitate tissue dissemination of active substances (e.g. Hyaluronidase)^{20,21}.

TREATMENT

Currently, the major indication of Hirudotherapy replaces the reconstructive microsurgery, wherein the leeches are used in venous insufficiency of a flap or reimplanted segment (finger, ear...)^{22,23}.

Technique:

The first step in the treatment is to inform the patient of the procedure and to obtain his consent for treatment. The second step is the disinfection of the area to be treated with either warm soapy water or heparin physiological serum²⁴. Then the caregivers wear gloves and manipulate the leech with a non-traumatic forceps²⁵. After its attachment, the leech sucks blood (easily identifiable by large peristaltic movements) for fifteen minutes to one hour until it falls spontaneously. If it remains attached, the caregiver must use a 3% saline solution to avoid violent detachment, since teeth are likely to remain in place, and may cause infection.

Of note, alcohol use should be avoided since it causes regurgitation of the leech, and increase the risk of infection²⁶. Caregivers should monitor the progress of the treatment, once sufficient amount of blood is removed, they should wipe the wound with antiseptic, cover till bleeding stops and ensure that leeches are killed with a powerful antiseptic (70% alcohol)²⁷. The treatment is four to five days long, until new veins can grow to restore a satisfying venous return^{28,29}.

Complications:

Despite the proper use of this therapy, the following complications can take place.

- Infection is the most common complication with a rate of 3 to 14 % in the absence of an appropriate prophylaxis that is the latter should be introduced before application of leech². Infection is mainly due to commensal *Pseudomonas* of the leech, which could be responsible for various local secondary infection (skin abscess, cellulitis)^{30,31}. Several antibiotics prophylaxis are recommended: third-generation cephalosporins, aminoglycosides, tetracyclines, and ciprofloxacin^{32,33}.
- Bleeding at the site of application of leeches is also another complication of this therapy in result of the different salivary compounds disrupting the physiological haemostasis, this can be easily controlled by repeated pressure with a thrombin soaked compresses^{34,35}.
- Erratic migration of leeches in autodigestive or genital tract can also be a possible complication and this must be prevented by the vigilance of health care workers.
- In some cases, local allergic reaction or anaphylaxis due to salivary components have been described as possible complications as well³⁶.

Finally the psychological impact generated during Hirudotherapy, justifies psychological support, and the establishment of a reliable relationship between the clinician and the patient³⁷.

Side Effects and Contraindications

Leech therapy is not suitable for persons with any of the following conditions: arterial insufficiency, hemophilia, gastrointestinal bleeding diseases, hematological malignancies, Anaemia, hypotension, sepsis, immunosuppression, General and local wound healing disorders³⁸. Leech therapy is also not recommended in pregnancy and lactation, in patients with a Previous allergic reaction to leeches, and in those using anticoagulant medication. Warfarin, Heparin, Clexane (Aspirin and Clopidogrel are not contraindicated), chemotherapy and some vasoactive drugs such as Ginkgo biloba products³⁹. Leeches also should not be used if the patient refuses to consent to leech therapy or to accept a possible blood transfusion.

Side effects can occur during or after leech therapy in 6.4–13.4% of the treated patients and usually appears after 3-4 leech applications as a prolonged bleeding from bite site, Mild pain, Itching and reddening of skin around the leech bite⁴⁰. Skin infection, regional lymphadenitis and slight swelling are possible but rare⁴⁰.

CONCLUSION

Medical leeches represent a way of taking care of post-operative venous congestion of flaps and reimplanted segments. Although their use is current and trivialized in EU and US, it seems widely unrecognized and underutilized in Morocco, yet it deserves its place in reconstructive surgery.

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