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# Modern Touch to Traditional Leech Therapy: A Review

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## ABSTRACT

Leech therapy has over the centuries established itself as a natural healing method and is recognized today as a modern method of treatment with broad spectrum of effective application showing a high level of safety. Leeches have been used through history to 'cure' a number of physiological conditions. They are used to treat a number of diseases including haematoma (blood clots) and venous congestion (where the blood supply can get into the skin flap but not get back). According to this traditional method, bloodletting ('Raktamokshan') is done with the help of 'Leeches' i.e. Leeches are applied on the desired site for bloodletting. It is considered most unique & most effective method of bloodletting. Here, the vitiated morbid humours ('Doshas') are removed from the body without using any cutting instruments; hence Raktamokshan by means of 'Leech' comes under 'Ashastra' category i.e. without surgery.

**Keywords:** Leech therapy, Venous Congestion, bloodletting, Hirudin.

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## INTRODUCTION

The leech is an aquatic worm with a flattened body, tapering toward each end, and terminating in circular flattened discs, the hinder one being the larger of the two. It swims with a vertical undulating motion, and moves when out of water by means of these discs or suckers, fastening itself first by one and then by the other, and alternately stretching out and contracting its body. The mouth is placed in the centre of the anterior disc, and furnished with three cartilaginous lens-shaped jaws at the entrance of the alimentary canal. These jaws are lined at their edges with fine, sharp teeth, and meet so as to make a triangular incision in the flesh. The head is furnished with small, raised points, supposed by some to be eyes.[1] The leech belongs to the Phylum Annelida family of 'fresh-water parasitic invertebrates. [2]

The leech is a hermaphrodite, but leeches mutually impregnate each other. They are oviparous, their eggs varying from six to fifteen. The eggs are deposited near the edge of the water and hatched by the heat of the sun. There were two kinds of leeches Poisonous (Savish Jaloka) - Non- poisonous (Nirvish Jaloka ). Generally "*Hirudo medicinalis*" and the "*Hirudo verbana*" species are used for the therapy.

**Table 1: Poisonous and non-poisonous leeches (jaloka)**

| Poisonous | Non-poisonous |
|---|---|
| Krishna | Kapila |
| Karbura | Pingala |
| Alagarda | Shankh- mukhi |
| Saamudrika | Mushika |
| Indra- yudha | Pundarik- mukhi |
| Go chandana | Saa varika |

Six different types of Leeches are found in both poisonous & non- poisonous category. Basically, these leeches are named according to their appearance i.e. their external look or colour. The leech was used in medicine as a means of "local depletion" (bloodletting) from the ancient days. [3] As part of the materia medica of the popular bloodletting treatment to get rid of bad blood, A healthy leech can draw one or two fluid drachms of blood. It was noticed that leech bites continued to bleed after the leech was withdrawn. In cases of extreme debility five to eight leeches can be used. [4]

The saliva of leeches contains more than 100 bioactive substances5 (very few are known in terms of chemical structure and mechanism) including bacteriostatic, analgesic, resolving actions, has anti-oedematous, improves immune system activity, it eliminates microcirculation disorders, restores permeability of tissues and organs, eliminates hypoxia, reduces BP, detoxifies the organism. Hirudin (a potent anticoagulant) enables the blood to flow for some time without clotting. Calin is another constituent of leech saliva and the main function of this protein is to induce secondary bleeding, which can last up to 12 hours. Hyaluronidase –known as the "spreading factor" –further facilitates the penetration and diffusion of these pharmacologically active substances into the tissues- especially in joint pain (no impirical

studies to confirm this) and has antibiotic properties,Destabilase - dissolves fibrin and has thrombolytic effects, Bdellins – Anti-inflammatory effect and inhibits trypsin, plasmin and acrocin. Acetylcholine – vasodilator, Histamine-like substances – vasodilator, increases the inflow of blood at the bite site.

**Table 2: Some bioactive findings in the saliva of leech**

| Bioactive substances | Mode of action |
|---|---|
| Hirudin | Inhibits blood coagulation by binding to thrombin |
| Calin | Inhibits blood coagulation by blocking the binding of von |
| Willebrand factor to collagen. | Inhibits collagen- mediated platelet aggregation |
| Destabilase Monomerizing activity | Dissolves fibrin. Thrombolytic effects |
| Hirustasin | Inhibits kallikrein, trypsin, chymotrypsin, neutropholic cathepsin G |
| Bdellins | Anti-inflammatory. Inhibits trypsin, plasmin, acrosin |
| Hyaluronidase | Increases interstitial viscosity. Antibiotic |
| Tryptase inhibitor | Inhibits proteolytic enzymes of host mast cells |
| Eglins | Anti-inflammatory. Inhibit the activity of alpha-chymotrypsin, chymase, substilisin, elastase, cathepsin G |
| Factor Xa inhibitor | Inhibits the activity of coagulation factor xa by forming equimolar complexes |
| Complement inhibitors | May possibly replace natural complement inhibitors if they are deficient |
| Carboxypeptidase | A inhibitors Increases the inflow of blood at the bite site |
| Histaminelike substances Vasodilator | Increases the inflow of blood at the bite site |
| Acetylcholine | Vasodilator |
| Anesthetics substance | Anesthetics |

**Indication & Utility of Leech Thearapy:**

It is used effectively in the management of non- healing ulcerative lesions like Diabetic ulcer, leprotic wound etc. as it helps to improve the local blood circulation. Hence, healing is promoted. It relieves vascular congestion [6]. So, it can be effectively used in conditions like long standing Varicose ulcers, Filariasis, post-operative skin grafting lesions. It is used in arthritis [7], sprain or spasm to relieve the pain, inflammation & discomfort symptomatically.

It is used in abscess, cellulites, thrombophlebitis and varicose veins, it is also useful in third degree thrombosed prolapsed piles, in atherosclerosis of the limb as it improves circulation useful locally to treat hyper pigmentation. Useful in various skin disorders like eczema, pimples, and psoriasis etc. Research is going on to study the efficacy of leech in the management of myocardial infraction (where it is used around the pericardium) & stroke as it has got an anti- coagulant chemical called Hirudin which resembles drugs like Heparin & Strepto- kinase.

- Cardiovascular diseases – hypertension and ischaemic disease
- Respiratory – pneumonia, bronchial asthma

- GI tract – hepatitis, cholecystitis, pancreatitis, stomach ulcers ENT diseases,
- Paradontosis and other teeth diseases
- Urological diseases
- Male sterility
- Skin diseased – neurodermatitis, psoriasis, herpes, eczema
- Gynaecological disorders –female sterility, endometriosis, fibromastopathy
- Hirudo-relexotherapy used by placing the leeches strategically on the reflexogenic
- points as a "life needle" Skin color – dusky or bluish
- Capillary return – brisker than normal
- Pinprick response – bleeding should be dark and rapid
- History – known problems with veins at operation, e.g. at the site of micro vascular anaestomosis.

In Reconstructive surgery, traction or other pressure related changes in tissue tension, changes in blood flow patterns can therefore lead to impaired perfusion, vascular anastomosis concerns and thrombosis can sometimes occur in pedicle flaps, perfusion problems may develop, but imbalances between arterial and venous drainage are more common. Deficient venous return leads to venous congestion [8] (characterised by blue discolouration and the skin becomes increasingly mottled), or in extreme cases –thrombosis following reattachment of the ear post trauma [9]. The microsurgical anastomosis of the hair thin blood vessels of the ear is extremely challenging. Venous insufficiency sometimes occur and leeching can sometimes provide a good outcome.

**Contraindications:**

- Anaemia
- In extreme ages i.e. in children and old age
- Weak patients
- Allergic patients
- In extreme hot or cold climate
- Diseases like haemophilia
- Pregnancy

**Leech Therapy - Application**

One or two leeches may be sufficient to treat the skin of a degloved or replanted finger, whereas a large flap may require 6 or more depending on clinical response. The head (or biting end) of the leech can be recognized by theleech's movements, while the tail is mostly used as a sucker for attachment. When leeches bite a victim, their saliva causes blood flow to increase and prevent clotting (vasodilator and anticoagulant).

**Procedure:** Clean patient's skin thoroughly with soap and water to remove odour, traces of operation prep fluids or saline. Rinse with water (wetting site encourages the leech to bite).

Don gloves, pick leech with gloved hand, steer leech's head gently to the area to be treated – secure in place with Syringe cover or alternative means (plastic galipot).

Leech bites sometimes leave small blood spots (ecchymoses) which sometimes develop into keloids in some individuals. Most of these spots disappear within 2-3 weeks. To remove the leech, absolute care is required – Forcible removal of the leech may rupture gut contents (*Aeromonas hydrophilia*).

**Leeches in modern medicine, Mechanical Device Development:**

The device consisted of a multi port glass chamber, which was secured over a leech bite after leech detachment. The mechanical device is shown in a schematic diagram in **Figure 1.** The mechanical device is based on three main concepts:

1. Irrigation and chemical anticoagulation: Irrigation of the leech bite with heparinized saline was accomplished via an interior capillary tube, which dripped a dilute heparinized saline directly onto the leech bite (10 U/mL sodium heparin in 0.9 percent saline; inflow rate 2 to 5 mL/min via gravity flow).

2. Pulsate suction: The blood-irrigant mixture was removed from the device chamber via an outflow port that applied software-controlled pulsate suction for the duration of blood collection (–75 mmHg; 15 seconds on and 5 seconds off; Lab view, National Instruments, Austin, Texas). Negative pressure was measured in the suction line approximately 10 cm from the glass chamber with a pressure transducer (24 PC Series, Honeywell Corp., Morristown, New Jersey). In addition to removing blood-irrigant mixture from the glass chamber, the suction may have facilitated increased bleeding from the leech bite.

3. Mechanical agitation of the irrigant: When the suction was off, the pressure in the device reverted to atmospheric pressure because of an air inlet. This air inlet also drew room air down to the skin surface and caused turbulence (bubbles) in the irrigant flowing through the device when the pulsate suction was on. These bubbles provided mechanical "agitation-anticoagulation" of the leech bite, as shown in Figure 2. The device prototype was constructed, based on these three conceptual units. The capability of the device to augment blood loss volumes during the passive phase of medicinal leech therapy was then tested with the use of a porcine model.

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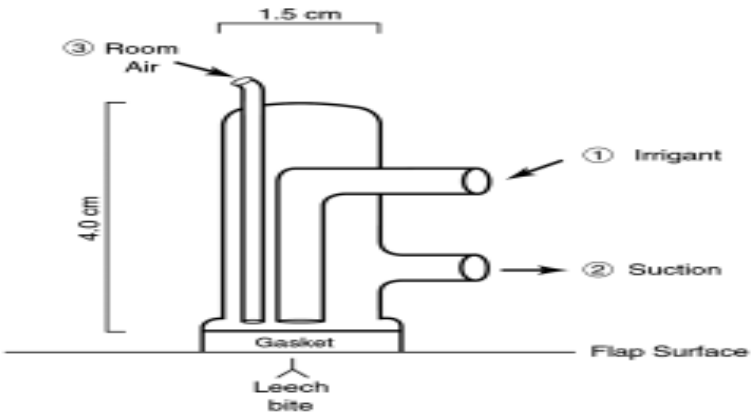


**Figure 1. Mechanical device showing irrigation port, suction port, and room air entry port**

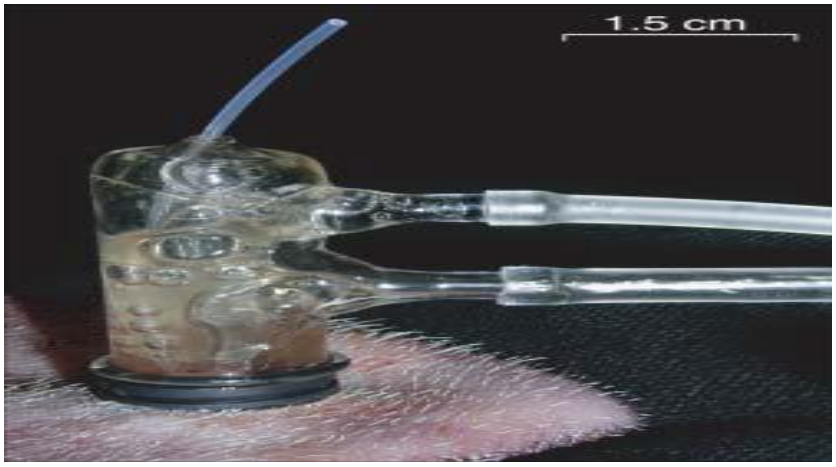


**Figure2. Mechanical device prototype is seen in use on a congested tissue flap.**

Glass chambered device was fully functional in irrigating, anticoagulating, and removing blood-irrigant mixture for all experiments. Bubble turbulence within glass shell prevents thrombosis on skin surface.

## CONCLUSION

Leech therapy, can be safely & effectively used to evacuate the blood and morbid humors from deeper tissue and in diseases like psoriasis, chronic ulcers, eczema and favus. Further modern biochemistry has been able to point out so many substances in the leech saliva as well as their mode of action. On the basis of these findings, it may be suggested that leech therapy can produce better either single or as adjuvant with drug therapy in diseases, various surgeries and traumatic conditions. In modern technology, A mechanical device was designed and tested for the removal of excess blood within congested tissues. This device functioned to augment blood removal volumes seen during the passive blood loss phase of medicinal leech therapy. Significantly, larger blood volumes were retrieved via this mechanical device, relative

to prior reports of passive blood loss alone. These findings are encouraging in the development of more effective treatments for venous congestion.

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