DOI: 10.7860/JCDR/2015/16670.6918

Review Article

Dentistry Section

Hirudotherapy in Medicine and Dentistry

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ABSTRACT

The concept of Unani medicine is based on balancing body humours, the imbalance of which causes diseases. The application of leech therapy in medical and dental science is well recognized. Although easy and non-invasive, complications also exist. The article aims to presents a brief review on the applications of leech therapy. The physiological effect, along with its therapeutic role in cancer, diabetes and dentistry have been underlined. Complications of leech therapy have also been dealt with.

Keywords: Bloodletting, Hirudin, Leech therapy, Unani medicine

INTRODUCTION

Unani medicine describes three different methods to treat diseases: regimental therapy, pharmacotherapy and surgery. Regimental therapy includes leech therapy, exercise, cupping therapy, massage, bath, diet therapy and cauterization [1].

The belief is that majority of all diseases come from within, from foodstuff, blood and superfluous or corrupt humours or the metabolic products. Hence, evacuating methods like bloodletting, purging, vomiting, sweating, diuresis and cauterization were the basis of the most effective general treatment until the beginning of 19th century [2-5].

The article aims to present a brief review on the applications of leech therapy. The physiological effects, along with its therapeutic role in cancer, diabetes and dentistry have been underlined. Complications of leech therapy have also been dealt with in this review.

HOW DO LEECHES WORK?

Medicinal leeches have three saw-like jaws (tripartite) with about 100 sharp teeth on each jaw. After piercing the skin they inject anti-coagulants (Hirudin) and suck out blood. Large adult leeches can consume upto ten times their body weight in a single meal [1].

Leech therapy involves an initial bite, during which the leech sucks between 5 and 15 mL of blood, for a period of 20 to 45 minutes. During the post attachment period the site continues to bleed. The therapeutic benefit is caused by components in the leech's saliva; hirudin, a protein anticoagulant and histamine-like substances that induce vasodilation [1].

The effects of treatment lie in the amount of blood that a leech ingests and anticoagulant enzymes that allow the blood to flow from the site when the leech is detached [1]. The leech produces a number of substances; anticoagulants like hirudin, calin, inhibitors of kallikrein, hyaluronidase, histamine-like vasodilators, collagenase and poorly characterized anaesthetic and analgesic compounds [Table/Fig-1] [6,7].

INDICATIONS OF LEECH THERAPY

1. In varocise veins to draw blood from deeper tissues [1].
2. Chronic skin diseases like scabies, psoriasis, eczematous dermatitis, chronic ulcers, ring worms, reddish freckles and favus [1].
3. Phlebitis and thrombotic (blood clotting) conditions [1].
4. To decrease the blood viscosity, useful in coronary artery thrombosis, and ischemic heart disease [1].
5. In preventing post-surgical blood clotting. Helpful in re-attachment of severed extremities like fingers, toes and ears [8].
6. For relief of pain and to reduce inflammation in diseases like osteoarthritis [9].
7. In the treatment of asthma, acute rhino pharyngitis and spasmodic coryza for mucolytic action of saliva [10].
8. Treatment of sublingual haematoma and massive lingual haematoma.
9. Usage of leeches in gum diseases. For example, the direct application of 3-4 leeches can be a successful remedy for abscess and inflammation [11].
10. Treatment of hypertension, migraines, phlebitis, varicose veins, arthritis, haemorrhoids, and ovarian cysts [12].

Enzymes /substances		Function
1.	Hirudin	The most well known enzyme, a powerful anticoagulant in existence, than heparin
2.	Bdellin	A protease inhibitor thus acts as anti-inflammatory.
3.	Apyrase	A powerful platelet anti-aggregate factor thus making blood flow more fluid.
4.	Eglin	It is also an inhibitor of inflammation but at the same time it is an anti-oxidant.
5.	Destabilase	The enzyme has very powerful platelet anti-aggregating activity which acts by dissolving the blood clots, thus opening up very exciting therapeutic avenues.
6.	Hyaluronidase	It acts both as factor for diffusion and as an antibiotic.
7.	Lipase and Esterase	Used for hyperlipidaemia.
8.	Anti-elastase	This substance acts by limiting the action of Elastases which degrade cutanous elastin particularly at the level of skin.

[Table/Fig-1]: Major enzymes of leech saliva and their functions [7]

CONTRAINDICATIONS OF LEECH THERAPY [9,13].

1. Absolute haemophilia.
2. Children.
3. Pregnancy.
4. Leukaemia.
5. Anaemia.
6. Arterial insufficiency.
7. Previous exposure to leeches (because of risk for anaphylaxis or allergic reaction).

8. Patient refusal to accept blood transfusions.

9. Patient refusal to undergo leech therapy.

12. Unstable medical status.

HANDLING LEECHES AND THEIR APPLICATION

Sweden and Hungary are reported to be the best sources of leech, transported in boxes filled with marsh-sod and clay. An occasional moistening of the earth and removal of dead or sickly leeches from the boxes are required. The box are kept at a cool place, and preferably with air holes and immersed in rain-water [12]. Keeping leeches in a saucer of fresh beer for some time, makes them active. Once their movement is appreciable, they can be taken out. Leeches can also be kept in a pint jar with a perforated lid and supplying them with fresh rain-water twice a week [12].

MEDICINAL USES OF LEECHES

In medicine, leeches have recently been rediscovered and are used by maxillofacial and other micro surgeons to aid salvage of compromised venous engorged tissue, including free and pedicled flaps, and amputated digits, ears and nasal tips. Evidences suggest that the survival of a compromised, venous - congested flap is improved by early application of a leech [14]. They provide an effective means to reduce blood coagulation, relieve venous pressure from pooling blood (venous insufficiency) and in reconstructive surgery to stimulate circulation in reattachment operations for organs with critical blood flow [15].

Leech therapy is helpful in cases of avulsion injuries to the face where arterial blood supply is present, but venous outflow is lacking. The soft tissue sparing effect provides adequate results [15].

A case series on 38 patients of digit and hand amputations, showed a high success rate post leech therapy with no functional deficits [7]. Leech therapy has also been used in cosmetology, treatment of frostbites, essential hypertension and different types of arthritis [7]. A German study on 51 patients of knee osteoarthritis, showed a greater decrease in pain (seven days post leech therapy), as compared to control who received topical diclofenac application [16].

Leeches in cancer

Post surgery, a patient of basal cell carcinoma, underwent nine months of leech therapy and showed good results in terms of attaining blood circulation across the flap. Masaki I et al., reported using medical leeches to relieve venous congestion of a free forearm flap after reconstruction in a patient with intraoral carcinoma [17].

The salivary gland secretions of the Mexican leech, *Haementeria officinalis* has antimetastatic activity. Its saliva contains a protein called antistasin which prevents lung cancer colonization. There exist platelet aggregation inhibitors, anticoagulants, and the antiproteolytic enzymes in the secretions. Saliva of another tropical leech, *H. Manillensis*, showed antiproliferative activity in vitro against small cell lung cancer (SW1271) [11].

Leeches in diabetes

One of the peripheral vascular complications of diabetes is gangrene. The wild leech species *Whitmania pigra* has been used by the traditional Chinese therapists to augment blood flow to the distal parts of the body and to alleviate coagulation disorders, owing to the anticoagulant activity of the aqueous and alcoholic extracts of the body of this species [11].

LEECH THERAPY IN DENTISTRY

As early as in 1817, Thomas Bell treated a case of an oroantral fistula with facial swelling with six leeches "applied to the face" [18]. Chapin A Harris in 1839 used leeches on gums for drainage of an abscess. He used tubes for application of leeches to the gingiva [19].

Spencer Bate in 1854 treated grossly carious maxillary central incisor using a leech attached to gingiva [20]. Leeches were used in the treatment of many pediatric conditions, in the treatment of the purported symptoms caused by teething [21].

Reports exist in literature stating the benefits of leech application in dental abnormalities. The bloodletting by leeches had been used as an adjunct in the management of severe postoperative macroglossia, besides the common treatment method. Cases have been reported about the uses of leech in treating sublingual haematoma and massive lingual haematoma, in gum diseases, as a remedy for abscess and inflammation [11,22]. Leeches drain the inflammation at the site of abscess. Anticoagulating agents increase blood flow in the gums, eliminating toxins, increasing nutrition at the affected area. The antibacterial components in leech saliva reduce bacterial growth. Hirudotherapy has also been used in root canal treatment [23].

COMPLICATIONS

Infection

A leech should not be forcibly removed because its jaws may remain in the wound, causing infection, erysipelas, submucosal abscesses, ecchymosis and scarring. *Mycobacterium marinum*, a parasitic bacteria present in the leech gut might also lead to infection [24].

Bleeding

Oozing of blood is among the most common complication, severity being dependent upon the area bitten. There are reports of bleeding from vagina, rectum, urinary bladder and pharynx. Anaemia and death due to prolonged haemorrhage have also been reported [25].

Migrating leeches

Leeches will move to other areas if the flap area is not protected. Usually this means surrounding your flap area with petroleum jelly or occlusive dressings to prevent them from moving [9].

Allergy

Allergic responses like itching and rash are common signs, as well as anaphylaxis have been reported. Thus, haemophiliacs and immune-compromised patients, those on drug therapy or vitamin that increases the risk of excessive bleeding should be cautious. Once a leech has been used for a therapy, its disposal has to be done adequately; it can be returned to a retirement pool or be killed by freezing or immersion in alcohol. Dead medicinal leeches are potentially infectious and should be treated like hazardous waste material, thus releasing them live is a potential violation of drug and environmental protection laws [26].

MECHANICAL LEECH

Researchers led by head and neck surgeon Gregory Hartig at the University of Wisconsin at Madison in the United States, are developing a mechanical leech, which has distinct advantages over its flesh-and-blood counterpart. A device had been designed that can deliver and disperse heparin better to compromised tissue. The porous tip of the device is implanted beneath the skin and rotates to inhibit coagulation further. Psychologically patients feel more comfortable being attached to a machine than a live creature [27].

CONCLUSION

Leech therapy, can be safely and effectively used to evacuate blood and morbid humours from deeper tissues and in diseases

like psoriasis, chronic ulcers and eczema. Leech therapy can produce better results as a mono or an adjunctive therapy in diseases like angina pectoris, coronary thrombosis, hypertension, atherosclerosis, varicose veins and in many surgical and traumatic conditions.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Sep 06, 2015**
Date of Peer Review: **Sep 23, 2015**
Date of Acceptance: **Oct 26, 2015**
Date of Publishing: **Dec 01, 2015**