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Review Article

Historical Aspects of Leech Therapy: A Critical Review

Malik Itrat[1*], Zarnigar[2], N. Haque[3]

[1]Lecturer, D/o Tahaffuzi Wa Samaji Tib, Allama Iqbal Unani Medical College, Muzaffarnagar, Uttar Pradesh, India.
[2]Lecturer, D/o Tahaffuzi Wa Samaji Tib, National Institute of Unani medicine, Bangalore, Karnataka
[3]Lecturer, D/o Ilmul advia, Eram Unani Medical College, Muzaffarnagar, Uttar Pradesh

[*]Correspondence Email: malik.itrat@gmail.com

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ABSTRACT

Bloodletting and the therapeutic use of Hirduo medicinalis dated back to the ancient Egypt and the beginning of the civilization. Their popularity has varied over the years. Leech therapy is one of the most important and widely practiced methods of regimental therapy, used for local evacuation of morbid humour in Unani system of Medicine. With the advent of modern pathology, physiology and microbiology in the late 19th century bloodletting with leeches fell out of favour. The leech once used by physicians of emperor and influential academic surgeon enjoyed a renaissance in reconstructive surgery during the last 15 years. The Leech is no longer ubiquitous, but has warmed its way back into the medical field. This paper presents a brief review on the history of treatment with leech from its origin to the present day.

Key words: Leech, Bloodletting, Regimental therapy, Unani Medicine.

INTRODUCTION

According to Unani system of Medicine, Bloodletting is based on concept of humoral imbalance. Their imbalance causes diseases, where restoration of the balance leads to health. [1] According to USM majority of diseases are caused by endogenous factors by excessive accumulation of blood, foodstuff and morbid humours. [2] Bloodletting in the form of venesection; leech therapy and cupping with scarification is an essential part of regimental therapy. [3] It has been utilized for preventive as well as therapeutic measures for thousands of years by ancient Unani physicians. The important advantage of leech therapy is that it may be advised on those areas of the body where other processes of blood-letting like venesection and cupping are not possible.

DESCRIPTION OF LEECHES

The leech is an aquatic worm with a flattened body, tapering end terminating in circular flattened disc, the hinder one being larger of two. It swims with a vertical undulating motion and moves, when out of water by means of these discs or suckers, flattening itself first by one and then by other and alternately stretching out and contracting its body. The mouth is placed in the centre of the anterior disc and furnished

with 3 cartilaginous lens shaped jaws. 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. [4] The leech belongs to the kingdom (Animalia); Phylum (Annelida); Class (Hirudinea); Order (Gnathobdellida); Family (Hirudidae). [5] Leech can ingest an amount of blood close to that of eight times of their own weight. The leeches can be primarily found in the freshwater lakes, ponds or rivers ranging from 5cm to nearly 25 cm. [6] Leeches are hermaphrodite having both male and female parts, but they still need to come together to meet with each other. After mating 15-50 eggs are laid in one spongy case or coccon above the waterline often under stones. The eggs hatch in 3 to 5 weeks and the young leeches need two seasons of feeding before they are ready to breed themselves. [7] In India there are about 45 species of leeches belonging to 22 genera. However the species commonly cultured for medicinal use are Hirudinaria granulosa and Hirudo medicinalis. H. granulosa is abundantly found in the state of Madras, Kerala, M.P, U.P. and Punjab, whereas Hirudo medicinalis is commonly used in western worl. [8] Leeches are known by following vernacular names: Alaq (Arabic); Zalu (Persian); Jonk (Urdu); Salook (Turkish); Leech (English); *Hirudo* (Latin); Bdella (Greek); Jaluka (Sanskrit); Jalu (Hindi); Jalagalu (Telugu); Attai (Tamil); Jiganey (Kannada). [9-11]

HISTORICAL BACKGROUND

No one knows exactly when leeches began to occupy an important role in medicine. Varying sources date the leech to 2500 years ago, when it was used for bloodletting in ancient Egypt. [12] Leeching is also mentioned in medical encyclopedia from India written in Sanskrit completed between 500 BC and 200 AD. Hirudotherapy has been mentioned in Ayurveda by the name of "Jalaukavacharan" ('Jalauka' meaning leeches and 'Avacharan' meaning application). As per Ayurveda Jalaukavacharan is one of the procedures of Raktamokshana. Raktamokshana is one of the biopurification methods mentioned in Ayurveda, in which humours vitiated in blood are expelled from the body. Ayurveda mentioned various kind of leeches out of which 6 varieties of non-poisonous leeches are used for Hirudotherapy. [13] Avicenna in the canon of medicine emphasize on the use of leeches even for skin diseases. Later in the 12th century Abdul Latif Baghdadi wrote that leech could also be used for cleaning the tissues after surgical operations. [14] Leeching reached the height of its popularity in the middle 19th century, when it was exposed by the French physicians Francois Broussais (1722-1838). Broussis was the head of French physician of the Val De Grace Hospital in Paris and a surgeon in Napoleon's grant army. Broussais treated diseases such as typhoid fever, Syphilis, T.B, and even mental illness by applying leeches to abdomen. Broussais was in fact the biggest consumer in France, ordering 2-3 millions leeches in 1824 and his requisition rose to 42 millions in 1833. A record of 57 millions leeches was used in 1854. Between the years of 1829 and 1836, five to six millions leeches were used annually in the hospitals of Paris. [15] In early 19th century American physician from Georgia wrote bloodletting is the most important treatment, whenever there appears mark of local congestion, inflammation or that sluggish or torpid action which makes incapacity in the circulation vessels. He continue to discuss the use of leeches as treatment for myocarditis, peritonitis, pleuritis, hepatitis, gastritis, tonsillitis, nephritis, pneumonia, whopping cough, dysentery, hemorrhoids, acne and pimples. [16] The use of leeches was discontinued when this practice was

rumored to transmit some diseases. Several infectious diseases were thought to be transferred from person to person through their applications- syphilis, puerperal fever and erysipelas being a few. With the advent of modern pathology physiology and microbiology in the late 19th century, bloodletting with leeches fell out of favour. [17] The leeches was brought back into the medical domain in the middle of the 20th century, its use was called as hirudotherapy. With the advent of microsurgery including plastic and reconstructive surgeries the doctors found a use for the leech in modern medicine, primarily in the reattachment of fingers, toes, arms, ears and noses and even in breast reconstructions. [18] In operation one of the biggest problems that arise is venous congestion, the excess blood from the injured or reattached tissue needs to be removed. If the blood is not cleared quickly, the blood begins to clot, the arteries that bring the fresh oxygenated blood will become clogged and the tissues that were reattached will decay and die. Venous congestion may lead to edema, capillary and arterial slowing, arterial thrombosis, flap ischemia and eventual necrosis. The main reason why leeches are employed in microsurgeries is to reduce this venous congestion. After the operation, the use of leeches should be withheld as long as possible. This is due to the anesthetic in patient's body. A leech in contact with anesthetic will not feed a phenomenon that is called as lazy leech syndrome. [19] In 1983, Handerson et al. reported a case where leeches were used in the post operative treatment of a scalp avulsion case. [20]

LEECHING TECHNIQUE

Leeches should be kept a day before applying them and they should be squeezed (or have their heads bent down) to make them eject the contents of their stomach. The slime and debris from their bodies should be cleansed of, with a sponge. The place where the leeches are to be applied must be (shaved if necessary) well laved with nitre-water and rubbed till red. Dry carefully. Dip the leeches in fresh tepid water, cleanse and apply (with one's freshly washed hands, or with soft towel, or in a test tube called a "leech glass" especially if the place in question is the palate or gums). The point of application may be smeared with clay (or moistened with sugar water or milk) or scratched with a needle till blood appears, in order to coax them to take hold. The leech must not be let go until it has taken proper hold. The leeches when starts sucking the blood, it elevates its neck and fixes its head to the supporting point of skin. One can observe wave like movements indicate sucking of blood. When leeches become fully satisfied with its food it leaves off the skin of the patient & drops itself down. If not then in such a case, a little turmeric powder is placed on the sucking point of the leech and immediately the leech takes away its mouth from that point. Leech after the use is kept in an empty tray. Turmeric powder is placed on its mouth to induce vomiting. Some of the practitioners advocate to gently squeezing out the blood with fingers. After this leech again washed in clean water. [21, 22]

CHEMICAL COMPOSITION OF LEECH SALIVA [23- 25]

The near or total painlessness of leech's bite is due to the contents of leech saliva, which contains a number of different chemical compounds .The saliva of leech contains anesthetic, which makes the bite of the leech painless to its host; an histamine like vasodilator which increases the blood flow to the feeding areas by increasing the diameter of the blood vessels; and a chemical enzyme called hyaluronidase, which facilitates the degradation of the connective tissues around the bite site

allowing the vasodilator substance, wider access to the area. There is also an anticoagulant Hirudin, which is responsible for inhibiting blood coagulation and is employed as an anticoagulant in surgical operations and has been recommended for the prevention of phlebitis and post operative pulmonary inflammation. Leech saliva also contains several other bioactive substances are as mentioned in Table.

Hirudin	Inhibits blood coagulation by binding to thrombin.
Calin	Inhibits blood coagulation by blocking the binding of von willebrand factor to collagen- mediated platelet aggregation.
Destabilase	Monomerizing activity. Dissolves fibrin. Thrombolytic effects.
Hirustasin	Inhibits kallikerin, trypsin, chymotrypsin, neutrophilic cathepsin G.
Bdellins	Anti- inflammatory, Inhibits trypsin, plasmin, and acrosin.
Tryptase inhibitor	Inhibits proteolytic enzymes of host mast cells.
Eglins	Anti- inflammatory. Inhibits activity of alpha- chymotrypsin.
Complement inhibitors	May possibly replace natural complement inhibitors, if they are deficient.

Indications And Contraindications. [26-30]

Indications	Contraindications
Varicose vein	Anemia
Ringworm	Diabetes mellitus
Alopecia	Hemophilia
Lymphadenitis	Pregnancy
Malignant ulcer	Hypotonia
Psoriasis	Leukemia
Eczema	Active tuberculosis
Elephantiasis	General fatigue
Gangrenous wound	High temperature
Osteoarthritis	Bleeding disorders
Phlebitis and thrombotic conditions	Severely ill patients
Preventing post surgical blood clotting	Bed ridden patients
Odontalgia, periodonitis and alveolar abscess	Old aged persons
Post operative skin grafting lesions	Around liver, spleen, stomach & intestine.
Revascularization of amputated fingers & toes after repalnatation procedure	On Buttock

ADVERSE EFFECTS

The most worrisome complication other than superficial scaring is aeromonas hydrophila. This bacterium is a normal inhabitant in the foregut of the leech. The leech does not contain digestive enzymes to break down red blood cells from the blood so it relies on bacterial enzymes secretions to digest blood. A. hydrophila can infect the bite or surrounding skin during feeding, such an infection presents itself as a local abscess. The infection is not reactive to penicillin but to chloramphenicol and amino glycoside. Other complications are allergic reactions such as itching followed by burning and blister formation and ulcerative necrosis due to toxins present in leech saliva have also been reported after leech therapy. Transmission of certain infections from one subject to the other is another probable complication of leech therapy. [30, 31]

SCIENTIFIC REPORTS

In recent past years, various clinical as well as experimental studies have been conducted globally to evaluate the efficacy of leech therapy in various ailments using standardized outcome measures. In a study, the hirudin was tested for thrombin inhibition in synovial inflammation in Antigen Induced Arthritis (AIA). The study was conducted on animal models where experiments showed hirudin did indeed significantly attenuate the severity of AIA as measured by both ^{99m}TC uptake and synovial histology. The intra-articular fibrin staining was reduced by hirudin treatment. There was a clear reduction seen in synovial inflammation by hirudin. [32] In India also, various studies have been conducted to prove the safety and efficacy of leech therapy in musculoskeletal and dermatological disorders on the basis of scientific parameters. Another study from Bangalore, India, has proved the safety and efficacy of leech therapy in the management of knee osteoarthritis (OA). In this study, 30

diagnosed patients of knee OA were subjected to leech therapy and the efficacy assessment was done weekly with the help of Western Ontario and McMaster University (WOMAC) OA Scale and Visual Analogue Scale (VAS) Score. After the completion of treatment of one month, these scores were reduced significantly ($p<0.05$), thereby proving the efficacy of leech therapy in OA. [33]

CONCLUSION

Nowadays leeches are used successfully for many conditions notably varicose vein and osteoarthritis. Modern biochemistry has revealed so many bioactive substances in the leech saliva as well as their mode of action. The anticoagulant property of Hirudin contained in leech saliva may lead to wider therapeutic application in the prevention and treatment of thromboembolic disease like angina pectoris, coronary thrombosis, atherosclerosis and varicose vein. At the same time optimal care should be taken when applying leeches because their use can be associated with serious complications.

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