

## LEECHING: THE ANCIENT ART OF HEALING

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### ABSTRACT

*Ibne Sina, Akbar Arzani, Ibn Baitar and Ambroise (1510-90) recommended leeches for bloodletting in cases where cupping glasses could not be used, "to those leeches may for the most part be put to open the coat of the haemorrhoid veins, to the mouth of the womb, the gums, lips, nose, fingers and calf."*<sup>[1,2,3,4]</sup> Harvey defended venesection as a major therapeutic tool for the relief of diseases caused by plethora. Long after accepting Harvey's theory, physicians praised the health promoting virtues of bloodletting with as much (if not more) enthusiasm as Galen.<sup>[5]</sup> For hundreds of years after the death of Galen, physicians warned their patients about the dangers posed by a plethora of blood. If a plethora of blood caused diseases, venesection was the obvious remedy; thus, spontaneous haemorrhage and venesection were as natural and helpful to the maintenance of life as the menstrual purgation was in healthy women. Bleeding was a perfectly rational means of treatment within this theoretical framework.<sup>[5]</sup> Leeching had a fixed & relatively modest range of indication in humoral pathology. The dominant paradigm in ancient European and Arabic medicine until the 17<sup>th</sup> century like bloodletting, leeching as mainly conceived as a means of eliminating the superabundance of blood, or plethora.<sup>[5]</sup> Roman physician Galen (129-199 C.E) classified leeching as part of the system of elements & temperaments, the healthy balance of which required the drainage of excess corporal substances. Plethoric changes were treated by draining blood from the body, which was achieved by leeching & bloodletting.<sup>[6]</sup> Leeches have been used medicinally for phlebotomy. They were once used in India and elsewhere for the abstraction of blood from foul ulcers and other congested parts of the body.<sup>[7]</sup>

**KEYWORDS:** Leeching; Alqa; Irsale Alaq; Leech Therapy; Jaluka; Hirudo medicinalis.

### INTRODUCTION

The use of medicinal leeches (*Hirudo medicinalis*)<sup>[8]</sup> for the salvage of tissues with venous congestion has been intermittent over the last two centuries. During the last decade venous disease is one of the best-established traditional indications for leech therapy.<sup>[9]</sup> There is a plethora of case reports and empirical studies on the subject, including clinical investigations of the efficacy of leeching for postoperative prevention of thrombosis before the advent of heparin, which is now the standard prophylactic agent. The postoperative use of leeches for prevention of thrombosis was proposed by the French surgeon *Termier* as far back as the 1920s. His recommendation was first adopted in France and was later implemented successfully in numerous hospitals around the world. In addition to its fibrinolytic and viscosity-enhancing effects in the blood, leeching also has bactericidal and some spasmolytic activity that may

have a very positive effect on the patient's general condition. Leeching was therefore a permanent institution at many hospitals for many years and was readily performed even though it was relatively time-consuming in terms of changing the dressing and caring for the animals.<sup>[6,10]</sup>

### Leeches

Leeches are carnivorous or blood sucking annelid worms with pronounced ability to extend or contract their bodies. They are hermaphrodites. They are distributed all over the world, except the polar zones, deserts and altitudes exceeding 3,700 m. About 45 species belonging to 22 genera occur in India.<sup>[7]</sup>

### Vernacular Names of leech (or Synonyms)

Arabic: Alaq.<sup>[3,11,12,13,14]</sup>

Persian: Zalu, Deucha, Shalak, Shalka, Shalook.<sup>[3,12,13,14]</sup>

Urdu: Jonk<sup>[12,15,16]</sup>

Khurasani: Zalucha.<sup>[16]</sup>  
 Turkish: Salook.<sup>[3,13]</sup>  
 English: Leech<sup>[3,15]</sup>  
 Latin: Hirudo  
 Greek: Bdella  
 Sanskrit: Raktapa, Jaluka, Jala- Sarpni.<sup>[7]</sup>  
 Hindi: Jalu, Jok, Jonk.<sup>[3,7,13]</sup>  
 Bengali: Jonk.<sup>[7]</sup>  
 Gujarati: Jala.<sup>[7]</sup>  
 Telgu: Jalagalu, Attalu, Jeriku.<sup>[7]</sup>  
 Tamil: Attai.<sup>[7]</sup>  
 Kannada: Jiganey.<sup>[7]</sup>  
 Malayalam: Atta.<sup>[7]</sup>  
 Kashmiri:Dirk.<sup>[3,7,11,12,13,14,15,16,17,18,19]</sup>

The common Indian species are *Hirudinaria granulosa*, *H. viridis*, *H. javanica*, and *H. manillensis*. These species are also common in Burma, Pakistan, Bangladesh and Sri Lanka. *H. medicinalis*, and *H. australis* are the common leeches of Britain and Australia respectively. Haemadipsa is a land leech of the hills of Southern India.<sup>[20]</sup> Leeches are of two types medicinal and poisonous. The medicinal leech, *Hirudo medicinalis*, is a European species which has been introduced into certain ponds and streams of the eastern portion of the United States. It is relatively large leech often growing to 10 or more centimeters in length. It feeds upon blood of a vertebrate to which it periodically attaches itself.<sup>[21]</sup> In Indian leeches *H. granulosa* has medicinal properties.<sup>[22]</sup> *Hirudinaria granulosa* is a common Indian leech found in freshwater tanks, ponds lakes, swamps, and slow streams. It prefers shallow water and remains concealed under weeds, logs and stones. It is sanguivorous (blood-sucking), sucking the blood of fishes and frogs, and also of cattle or human beings when they enter the pond.<sup>[20]</sup>

### Classification

#### *Hirudo medicinalis*

Kingdom: Animalia  
 Phylum: Annelida  
 Class: Hirudinea  
 Order: Gnathobdellida  
 Family: Hirudidae



Poisonous Leech

Genus: *Hirudo*  
 Species: *medicinalis*.<sup>[22]</sup>

#### *Hirudinaria granulosa* (the common Indian leech)

Kingdom: Animalia  
 Phylum: Annelida  
 Class: Hirudinea  
 Order: Gnathobdellida  
 Family: Hirudidae  
 Genus: *Hirudinaria*  
 Species: *granulosa*.<sup>[20]</sup>

### Identification of leech

**Identification of poisonous leech:** Ibn Sina describes the characteristic features of poisonous leech with reference to the Indian physicians, and said one should beware of using:

- Those with Large heads of antimonial, black colour, or Green colour; those with down on them,
- Like eels (snakefish),
- Those upon which are fine streaks of bright colour, or chameleon-like in colour.
- Leeches from unhealthy water or those whose excrement is black & muddy, and whose movement immediately darkens water, and renders it offensive in smell.
- Those with red bellies & green backs, especially if they were collected from running water.
- They would give rise to inflammations, haemorrhage, fever, syncope, paresis of the limbs, and intractable ulcers.<sup>[12,23,24,25,26,27]</sup>

### Identification of medicinal /non-poisonous Leeches

- Take leeches from water whose surface is covered over with duckweed and in which frogs live.
- The colour should be greenish (like duckweed),
- There should be 2 longitudinal lines having the colour of orpiment & ruddy; they should be rounded and liver-coloured.
- Leeches which look like little locusts, or like mouse-tails, with very small heads.<sup>[23,24,28,29]</sup>



Medicinal Leech

### Identification of *Hirudinaria granulosa*

It is a common Indian leech found in freshwater tanks, ponds lakes, swamps, and slow streams. It prefers shallow water and remains concealed under weeds, logs and stones. It is sanguivorous (blood-sucking), sucking the blood of fishes and frogs, and also of cattle or human beings when they enter the pond.<sup>[20]</sup>

### Morphology

**Shape and size:** the body of *Hirudinaria* is soft, vermiform, elongated, bilaterally symmetrical and metamerically segmented. In a state of extension, the body is dorsoventrally flattened and appears almost star-shaped but in a state of contraction, the body becomes more or less cylindrical. The body is broadest near the posterior end, while narrowest near the anterior end. It has great power of contraction and expansion. A full-grown specimen may attain the length of 30 to 35 cm.

**Colour:** the body is beautifully coloured with characteristic markings. The dorsal surface is generally olive-green and the ventral surface is orange-yellow or orange-red and the two sides bear distinct stripes of orange or yellow and black. On the dorsal side is a median longitudinal black stripe.

**Segmentation:** the body of leech is divided metamerically into segments or sometimes but metamerism is much reduced and the number of segments unlike other annelids is fixed in leeches. They always have 33 segments or somites. In case of leech the external segmentation does not correspond with the internal segmentation. But the original segmentation is obscured by secondary external annulations. Each segment is broken up externally by grooves into rings called annuli. The first and second segments have one annulus each. The third has two annuli; segments 4<sup>th</sup> to 6<sup>th</sup> have 3 annuli each. Segments 7<sup>th</sup> to 22<sup>nd</sup> are broad having five annuli each. Segments 23<sup>rd</sup> to 26<sup>th</sup> have two annuli each. Segments 27<sup>th</sup> to 33<sup>rd</sup> have one annulus each, they form the posterior sucker. However, segments with less than five annuli are referred to as incomplete, while those with five annuli are called complete segments. Each annulus of a segment is divided into small rectangular areas by longitudinal wrinkles. Each such area has a sort of papilla-like structure bearing sensory organ called annular receptor; there are 18 such receptors both on the dorsal and ventral surfaces of each annulus. Besides these, the first annulus of each segment bears larger sensory organs called sensillae or segmental receptors; there are four pairs on the dorsal side and three on the ventral side. Due to this the first annulus of each segment is called sensory annulus.

**Suckers:** each of the body of leech bears a hollow muscular organ, the sucker. The anterior sucker or cephalic or oral sucker is formed by the fusion of the prostomium with a few somites of anterior region. It is oval in outline and is placed on the ventral surface of

anterior end. It also possesses a ventrally directed cup-like hollow structure, the pre-oral chamber, which leads into the mouth. The posterior sucker or anal sucker is circular in outline and forms the highly muscular disc at the posterior end of the body of leech. It is formed by the fusion of last 7 segments. It is much better developed and larger in size than the anterior sucker. Both suckers are directed ventrally, the leech can firmly grip the substratum by its suckers. The two suckers are primarily meant for adhesion and locomotion.

**Clitellum:** During breeding season a girdle-like clitellum is formed around segments 9<sup>th</sup> to 11<sup>th</sup>, rest of the year there is no clitellum.

**Eye:** On the dorsal side are five pairs of eyes, one pair on each of the first and second segments, and one pair on the first annulus of the segments third, fourth and fifth.

**External apertures:** external apertures in the body are as follows:

- **Mouth:** It is a narrow triradiate aperture situated in the center of the funnel-like pre-oral chamber.
- **Anus:** it is a very small aperture situated mid-dorsally on the 26<sup>th</sup> segment at the root of the posterior sucker.
- **Nephridiopores:** there are 17 pairs of nephridiopores lying on the ventral surface of the body, of which one pair lies on the last annulus of each of the segments from 6<sup>th</sup> to 22<sup>nd</sup>.
- **Male generative aperture:** it is situated in a groove between the 2<sup>nd</sup> and 3<sup>rd</sup> annuli of the 10<sup>th</sup> somite on the mid-ventral line of body. A filamentous penis is sometimes seen protruding through this aperture.
- **Female generative aperture:** it is usually smaller and less conspicuous than the male aperture. It is situated mid-ventrally in a groove between the 2<sup>nd</sup> and 3<sup>rd</sup> annuli of the 11<sup>th</sup> somite of the body.
- **Divisions of body:** the body of leech is composed of 33 somites and is divisible into the 6 regions, namely cephalic or head region, preclitellar region, clitellar region, middle region, caudal region, posterior sucker.
- **Posterior sucker:** it is composed of 7 segments (27<sup>th</sup> to 33<sup>rd</sup>) arranged in concentric rings and each represented by a single annulus. These 7 segments are completely fused and their intersegmental furrows are greatly suppressed.<sup>[20,30,31,32,33,34]</sup>
- **Buccal cavity:** the triradiate mouth leads into very short chamber, the buccal cavity. In the mucous membrane of buccal cavity are embedded 3 crescentic jaws, 1 mid-dorsal and the other 2 are ventro-lateral in position. Each jaw is a laterally compressed cushion, covered with a fine cuticle which is thickened at the free edge to form a denticulous ridge bearing a row of minute teeth (denticles). As these teeth form a single series on each jaw, the jaw is termed as monostichodont. The median jaw bears 103-128 teeth, while the lateral jaws bear 85-115 teeth each. On both the sides of a

jaw are small button-shaped salivary papillae, each bearing a number of openings of salivary glands the number of papillae is 42-45 on each side of a jaw. However, the jaws are moved in such a way that they make Y-shaped wound on the body of its victim through which blood is sucked.<sup>[20]</sup>

- **Pharynx:** The buccal cavity leads into thick-walled muscular pharynx, which is an oval sac running from the 5<sup>th</sup> to 8<sup>th</sup> segments. The lumen of the pharynx varies in outline in different regions. The muscles of the pharynx are circular and radial which join the pharyngeal wall to the body wall; radial muscles dilate the pharynx producing a pump-like action for sucking blood. Large masses of unicellular pyriform salivary glands surround the pharynx, their ducts open between the teeth of jaws. The secretion of salivary glands contains a substance called hirudin or anticoagulin which prevents the coagulation of blood of the host when the leech is sucking.<sup>[20,35,36]</sup>

### Leech bite

When a leech bites it holds the sucker in place by making its body rigid. Using its semicircular and many toothed jaws like minute saws, it then makes an incision in the skin and excretes mucous from the nephropores (external openings form the kidney-like organs). This helps the sucker to adhere. A salivary secretion containing the anticoagulant and histamine floods the wound and the leech relaxes its body to allow the blood to be ingested. This mixture allows the blood to flow and also prevents clotting once inside the leech.<sup>[37]</sup>

### Procedure of application

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 stomachs. If feasible, they should be given a little lamb's blood by way of nourishment. The slime & debris from their bodies should be cleansed off, with a sponge.

### The site of application

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 (a few drops of white wine being added if they are sluggish), cleanse and apply (with one's freshly-washed hand, or with a 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, as one can tell by the sinuous movements of the neck and from the circumstance that the head forms a right angle to the body.

### Removal

When the leeches are full, and wish to let them come off, sprinkle a little salt over them, or peeper, or snuff, or ashes or nitre, or burnt bristles, or flax, or burnt sponge or burnt wool. They will then fall off. Don't detach leeches forcibly, or else there may be violent haemorrhage.

### After-treatment

After the leeches have fallen off, the place should be sucked by cupping it, in order to extract some of the blood at the spot and thereby get rid of the toxic substances left in the wound. If one wishes to keep the blood flowing anyway, one applies warm, dry cloths to the part, or a warm poultice, or a sponge soaked in warm water. After the bleeding has stopped, apply a soft, dry compress.

If the blood will not stop flowing, dust the spot with finely powdered burnt galls, quicklime, ashes, ground-up earthenware and similar styptics.

- Alum, cobwebs, pitch, gunpowder, hydrates, sesquioxide of iron, or pressing the skin into the folds have been advocated. The cautery has been necessary as a last resource. All such remedies should be at hand.
- Don't leave the patient till the bleeding has stopped, and if it is a child, watch it the following night as well.
- Don't use leeches again if they have been applied to a case of typhoid fever, cholera, smallpox, or syphilis.<sup>[23,38]</sup>

### Components of saliva

During the process of feeding, leeches secrete a complex mixture of different biologically and pharmacologically active substances into the wound. Hirudin is the best-known component of leech saliva. Hirudin is sometimes used to describe all active substances in leech saliva. In reality, Hirudin refers only to one specific active substance in leech saliva. Components of medicinal leech saliva that exert effects in the host's body are:

- **Hirudin**<sup>[30]</sup> - 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 kallikrein, trypsin, chymotrypsin, neutrophilic 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 An inhibitor-** increases the inflow of blood at the bite site.
- **Histamine like substances**<sup>[30]</sup>- vasodilator. Increases the inflow of blood at the bite site.
- **Acetylcholine-** vasodilator.<sup>[30,39,40]</sup>
- **Indications of Taleeq**
- *Jarabul Ajfaan* (Blephritis)
- *Dawali* (varicose vein)
- *Darde pindali* (Painful Calf muscle)
- *Malqoonia* and *qooruhe khabisa* (septic wound / malignant ulcer).
- Internal & external inflammation to reduce the pain & inflammation.
- *Daad / Qooba* (Ringworm)
- *Ganj / Sa'afa* (Alopecia)
- *Namash* (Chloasma), *kalaf* (Warts)
- *Khanaazeer* (Lymphadenitis)
- *Khunnaq* (Diphtheria) & other throat diseases.
- Ulcer / Malignant ulcer / infected wound.
- *Nawaseer* (Fistula in ano)
- Diseases of nose (e.g. Nose pain)
- Diseases of mammary glands.
- Diseases of ear.
- *Bawaseeri massun* (Piles)
- *Daaul feel* (Elephantiasis)
- Gangrenous wound.
- At the biting site of poisonous animals.
- Pigmentation.<sup>[1,15,28,41,42,43]</sup>

#### Contraindications of Taleeq

- Whole abdomen especially around the liver, spleen, stomach & intestine.
- Buttock
- Severely ill & bed ridden patients.
- Extreme cold climate & cold places.
- Old aged & weak people.<sup>[1,28]</sup>

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