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REVIEW ARTICLE

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Systemic Overview of Therapeutic Leech Application Recommending its Practical Significance

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ABSTRACT

Removing vitiated blood from the body using *jaloka* is considered as the most easy and convenient method. Whenever, there is disequilibrium of doshas in the body, it directly affects the health and physiology. *Rakata visravavan* is indicated when vitiated dosha is present in *rakta*, it is advised when drug therapy fails (using *sheeta, usha, snigdha* etc.), the final attribute of *rakta visravan* can be considered on its tremendous prophylactic potential to do away certain diseases. Recent researches have shown the presence of a variety of bio-active peptides and proteins in the saliva of the leech. They provide an effective means which helps in blood coagulation; relieve venous pressure from pooling blood (Venous insufficiency) thrombosis, in "Reconstructive Surgery" to stimulate circulation in reattachment operation for organ with critical blood flow, such as "eyelid, fingers, ears and for improving brain circulation. They are now coming back in "Microsurgery", for treating abscesses, painful joints, glaucoma, myasthenia, complications of diabetes mellitus, various infectious diseases etc.

KEYWORDS

Jaloka, Raktavisravavan, Leech, Protein, Circulation

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INTRODUCTION

Leeches are found in water and since water is their life, they are called *jalayuka.* In other words since they are accustomed to water, they are called *jalayuka.*It is best suited to kings, wealthy persons, children, old aged, frightful, debilitated, women and persons of tender constitution[1]. In various Ayurvedic text descriptions of leeches are found. *Shringa* (cow's horn) is hot in potency, sweet in taste and unctuous; hence it is ideal to remove blood vitiated by vata. *Jaloka* (leech) dwell in cold, are sweet and born in water, hence it is ideal to remove blood vitiated by *pitta*, *Alabu* (pitcher gourd) is considered bitter, dry and penetrating; hence it is ideal to remove blood vitiated by kapha.

AIMS AND OBJECTIVES

To discuss the types of leeches, habitat, rearing of leeches, general indications, method of leech application, complications and contraindications and leech therapy in other system of medicine.

Historical review

- Apart for Ayurvedic texts the leech was used in medicine as a means of local depletion from ancient days of Greek, Rome and Arabia.
- According to 'Galen' (130-201 AD) the medicinal leeches were used to remove blood from a patient as a part of a process to balance 'the humors'. The 4 humors of ancient medical philosophy were- Blood, Phlegm, Black bile, Yellow bile. He prescribed blood-letting by leeches for almost all illnesses such as simple inflammatory conditions, mental disorders and hemorrhoids[2]
- In Greece, first mentioned by Themison (80-40 B.C.).
- Ambroise Pare (1510-90) recommended leeches for bloodletting in case where cupping glasses could not be used. They use them to open the coat of the "Hemorrhoid Vein" to the mouth of the womb, the gums, lips, nose, and finger.
- The first recorded use of leeches in medicine was in 200 B.C by the Greek poet "Nicander of Colophain" in his medical poems[3].
- Vicenna (980-1037 AD) wrote in his book "Canon of Medicine" that leech suck blood from deep veins which is not reached by conventional wet cupping[4].
- Modern use for medicinal leeches was introduced by "Abd-el-latif-al-Baghdali" in the 12 century. The author says that after the bloodletting by leech, salt should be sprinkled on the affected part of the human body. He also mentioned in his texts the beneficial usage of leech application after surgical operation[5].

- Leeches were especially used for battle would treatment.
- The use of leeches began to become less wide spread towards the end of 19th century.

Types of Leeches[6]

A. Poisonous leeches

Table 1 Name and morphological description of poisonous leeches

S. No.	Name of the leech	Morphological description of the leech
1.	*Krishna*	Colour similar to that of *anjana* powder (antimony), big head
2.	*Karbura*	Broad like *varmi* fish, abdomen segmented and bulging
3.	*Algarda*	Hairy with big flanks and black mouth
4.	*Indrayudha*	Have strips on their back
5.	*Samudrika*	Slightly blackish yellow, have marks resembling many flowers
6.	*Gochandana*	Lower part divided into two halves like the bull's scrotum and very small mouth.

B. Non poisonous leeches

Table 2 Name and morphological description of non- poisonous leeches

S.N.	Name of the leech	Morphological description of the leech
1.	*Kapila*	*Manashila* (realgar-slightly red) coloured flanks, oily back with the colour of green gram
2.	*Pingala*	Slightly red coloured, round body and moves quickly
3.	*Shankumukhi*	Brown coloured, long, penetrating mouth and sucks blood quickly
4.	*Mushika*	Similar to mice in shape and colour with unpleasant odour
5.	*Pundarikmukhi*	Green gram coloured and mouth resembling the lotus
6.	*Sawarika*	Oily, slightly red coloured, eighteen *angula* (36 cms.), useful for cattle

Habitat

Leeches which are born from the urine, excreta and putrefied dead bodies of poisonous fish, insects, worms and frogs and which live in dirty water are poisonous. The non poisonous leeches are found in provinces like *yavan* (Arab countries), *pandya* (South India), *sahya* (central India) and *pautana* (region around Mathura in U.P.). Among them, those which have large body, drink blood quickly are non poisonous. Leeches born from putrefied lotus, white lotus, lily, red lily, white lotus and algae and which live in clean water are non poisonous[7].In permanently humid regions of Malaysia leeches stay active throughout the year while in territories with wet and dry seasons they remain active and in a dormant phase[8].

Rearing of leeches

Leeches should be caught with moist leather or by any other method. Then they should be placed in a big pot containing water. Algae, dried meat of aquatic animals and tubers all made into powder should be put into water to serve as food for leeches. Straw leaves of aquatic plants

to serve as bed for sleeping; the water in the pot and food materials should be changed once in every three days and leeches should be transferred to another pot after seven days[9]. The feeds and water which are stable should be removed once in three days, to get rid of saliva and decomposing matters and fresh one added. The leeches are to be transferred to new pots once in five days[10].

Size of the leech

The maximum length of all kinds of leeches is eighteen *angulas* (finger breadth); of them those are four, five or six finger breadth should be used for men and other for elephants and horses. Those which are slender, of thin skin, small head and large lower part (hind part) are females; those of opposite features and which have their mouth part shaped like half moon are males. Males are to be used in conditions of profound increase of doshas and in diseases which are long standing; females are used in the opposite conditions[11].

Unfit leeches for use

Leeches with big abdomen, ugly in appearance, very thick, slow in their activities, which do not bite, suck very little quantity of blood and which are poisonous are not ideal[12].

General indications

Benign tumors, hemorrhoids, abscesses and boils, skin disorder such as dermatitis, psoriasis, alopecia, ulcers, and vitiligo, gout, throat disorders, diseases of the eye, cysts, headache, herpes zoster, thrombosis, wound management such as diabetic, pyogenic wound[13].

Method of leech application

1. *Poorva karma*

First collect all the materials required for the procedure like leeches, turmeric powder, kidney tray, cotton, bandage, *jatyadi ghrita*, gloves, *triphla kwatha*, Inj. T.T., 2 ml syringe, ash of cow dung etc. Before application leeches are to be kept drowned in water mixed with turmeric or fermented gruel or butter milk. They are taken out and washed in clean water[14].

The patient, who is suffering from the disease which is curable by applying leeches, should be made either to sit or lie down; the selected area for applying the leeches is made rough by rubbing with either mud or fine powder of cow dung without causing pain. The body of the leeches should be smeared with the solution of mustard and turmeric and kept in water pot for a period of one *muhurta* (28 minutes)[15].

2. *Pradhan karma*

Then after knowing that they are free from fatigue, one of them should be picked up and made to bite the diseased part; smooth,

white moist cotton wool or piece of cotton cloth should be put on it and its mouth moistened with drops of water often.

If it does not suck the blood, a drop of milk or blood should be put at its mouth or even a small incision may be made on the patient's body. In spite of all these if it does not bite, then another leech should be applied. When it makes its mouth in the shape of a horse's hoof, and lifts its neck then it is to be understood as catching, it should be covered with a moist cloth and retained.

Pricking pain and itching at the site of the bite means that leech is sucking the pure blood, and then it should be removed. If it does not leave off easily because of its fondness of the odour of blood, then powder of rock salt should be sprinkled over its mouth. Leech sucks impure and vitiated blood first, just like swan drinking milk first from a mixture of milk and water. After drinking vitiated blood it begins to drink pure blood,whichshouldto be prevented[15].

3. *Paschatkarma*

(a) Care of the leech

After the leech falls off, its body should be sprinkled with rice flour; its mouth is bathed with oil added with salt, held at its tail end by the thumb and fingers of the left hand and its body kneaded slowly in the downward direction with thumb and fingers of the right hand and make it vomit all the blood consumed by the leech till signs of complete vomiting appear.

Vomiting can be induced by dropping mustard oil and rubbing with grains of starch. The leeches should be protected from drowsiness because of sucking of the blood. They should not be allowed to suck up to one week[16].

Signs of satisfactory vomiting are that it moves fanatically to and fro in search of food, when put into the water vessel. Leech which sinks and shows no movement is to be understood as improperly vomited, that should be made to vomit completely once again. After complete vomiting, it should be placed in water vessel.

(b) Care of the patient

After noticing the proper and improper sucking of blood by the leech the area of bite should be anointed with *satadhota ghrit* (ghee washed many times in water or decoction of drugs of cold potency). The wound caused by the leech should be massaged with honey, bathed in cold water or a cold poultice made with drugs having astringent sweet, unctuous and cold potency is kept over the site and bandaged. If the blood coming out from the place of the bite is found to be bad, the wound should be touched with honey or molasses, squeezed slightly to let out some more

blood. Afterwards the place is to be washed with cold water and covered with cloth dipped in ghee. When the bleeding has stopped, a thin paste of drugs having astringent, sweet taste and cold potency, mixed with ghee should be applied over the place to conserve the residue of good blood. The person who has been bled will have increase of vata. By cold applications etc., he develops pricking pain, itching and swelling at the bleeding site. The patient should be treated by pouring warm ghee over the place of bleeding[17].

1. *Samayak yoga*: *Satadhota ghrit* application is enough in case of proper bleeding.

2. *Heena yoga:* In case of inadequate bleeding, the wound created by the leech should be squeezed to promote more flow of blood.

3. *Atiyoga*: In excess bleeding, bathing with cold water and binding with cloth are to be done to stop the bleeding.

4. *Mithya yoga*: Application of cold poultice and bandaging should be done in case of improper bleeding[18].

Divisions of bloodletting

Table 3 Comparative description of bloodletting methods by ancient *Acharyas*

S.N0	Types	*Charak*	*Sushruta*	*Vagbhata*
1.	*Shringa*	In *vata dosha*	In *vata dosha, avagadha-tama rakta*	*Vata-pittaja dosha, tvak-gata dusti*
2.	*Jalauka*	In *pitta dosha*	In *pitta dosha, avagadha-grathita rakta*	In *pitta dosha, grathita rakta*
3.	*Alabu*	In *kapha dosha*	In *kapha dosha, avagadhatvak-sthita rakta*	In *vata kapha dosha, tvakgata rakta*
4.	*Siravedh*	In *vikrit sira*	In *sarvangagata dosha*	In *sarvang gata dosha*
5.	*Prakchhan*	In *sancharyamana dosha*	In *uttana rakta*	*Ek deshsthita-pindita rakta*
6.	*Ghatiyantra*	In *shastra karma of gulma*	-	In *kapha-vata dosha*

Complications

Of the leech: Incomplete vomiting by leeches develops an incurable disease known as *Indramada.*

Of the patient: The bite of poisonous leeches will produce burning sensation, swelling, ulcers, itching, eruptions, herpes, fever, fainting and leucoderma. These conditions are to be treated with drugs which are anti-poisonous, and mitigate pitta and rakta[19].If poisonous leeches are used for bloodletting, there may be itching, inflammation, fever and vertigo. Anti-poisonous and anti-hemorrhagic therapies are to be applied there[20].Local itching is a very common minor side effect. It carries an infection risk because of colonization of *Hirudo medicinalis* with *Aeromonas hydrophilia* bacteria[21].Infection and septicemia with *A. hydrophilia*have been reported where leeches have been used in very ill patients or applied to malperfused tissue in reconstructive or plastic surgery[22].

Contraindications of leech application

According to Ayurveda leech application should not be performed in patients suffering from *sarwanga sopha* (generalized anasarca), *sosha* (cachexia), *pandu* (anaemia), *udar* (ascites) and *garbhini* (pregnant lady)[23]. Leeches should not be applied directly over large, prominent veins or to the eyelids, breasts or genital organs. Care should be taken in using leeches with children as bleeding can be severe or prolonged. Applying leeches at midday or during the evening or night is also inadvisable as this can lead to complications such as hemorrhage[24].

In addition, leech therapy is contraindicated in patients who are immune-compromised or taking anticoagulants; those who have endoprostheses, anemia, diabetes, or an allergy to leeches; as well as those with bleeding disorders such as hemophilia and arterial insufficiency. It is also inadvisable to apply them during pregnancy[25].

Leech application in various aliments

1. Reconstruction and microsurgery

Researchers have proved that leeches are successful remedy to improve blood flow after microsurgery of a severely avulsed scalp[26]. By the year 1984, some physicians used leech therapy to treat seven patients with engorged skin flaps. They applied leeches 2-4 times a day for 2-4 days. They reported that leeches prevent flap collapse with noticeable improvement in color and minor complications[27].Leech therapy was successfully applied to avoid venous insufficiency in patients who received free perforator flaps for the medial sural artery which supplies the medial gastrocnemius muscle and the overlying skin[28].

2. Cardiovascular diseases

Clinical studies showed that in patients with thrombophlebitis, it can help in reducing blood hypercoagulability with an anti-inflammatory effect[29]. Patients with phlebitis who received topical leech application exhibited better walking ability, less pain and minor leg swelling; along with near normal leg skin color[30]. Hirudin can also reduce DVT, pulmonary embolism and the spread of venous thrombosis[31].

3. Infectious diseases

A wide spectrum antibacterial activity against both Gram positive (*S. aures*) and Gram negative (*S. typhi*and *E. coli*) bacterial stains have been found in salivary gland secretion of the tropical leech *H. manillensis*[32].

4. Osteoarthritis

A clinical trial on advanced osteoarthritis at the knee proved that leech therapy could effectively reduce the need for analgesic intake. It has been outlined that a double

treatment regimen at a four weeks interval exhibited a longer term relieving and a better physical activity than a single treatment course[33].

5. Carcinoma

Metastasis of melanoma, breast cancer, lung cancer, and prostate cancer can be suppressed by anti-metastatic and anti-coagulant protein ghilanten, purified from the salivary gland secretion of the proboscis leech [34]. In a wide range of malignant tumor cells, such as pulmonary carcinoma, breast carcinoma, bladder carcinoma, colorectal carcinoma, soft tissue sarcoma, leukemia, and lymphoma synthetic Hirudin preparation acts as an efficacious metastasis inhibitor[35].

6. Complications of Diabetes Mellitus

Diabetic patients are at a high risk of myocardial infarction, which is main death causing reason in type 2 DM. Hirudin plays an important role in preventing clotting process because of its ability to bind thrombin and consequently suppress thrombin mediated conversion of fibrinogen into fibrin enabling it to be efficacious for the reliving of ischemic events[36].

Composition of Leech saliva[37]

Table 4 Composition of leech saliva

S.N.	Active substance	Effect on the host
1.	Hirudin	Inhibits blood coagulation by binding to thrombin.
2.	Calin	Inhibits blood coagulation by blocking the Von will brand factor to collagen inhibits collagen mediated platelet aggregation.
3.	Destabilase	Monomerizing activity dissolves fibrin, thrombolytic effect
4.	Hirustasin	Inhibits Kallikrein, trypsin, chymotripsin, neutrophiliccathepsin-G
5.	Bdellins	Anti-inflammatory, inhibits trypsin, plasmin, acrosin
6.	Hyaluronidase	Increases interstitial viscosity and antibiotic activity
7.	Tryptase inhibitor	Inhibitsproteolytic enzymes of host mast cells.
8.	Eglins	Anti-inflammatory. Inhibits the activity of alpha chymotrypsin, chymase, substilisin, elastage, and cathepsin-G.
9.	Factor Xa inhibitor	Inhibits the activity of coagulation factor Xa by forming equimolar complexes.
10.	Carboxy peptidase A	Increases the inflow of blood at the bite site.
11.	Histamine	Vasodilator increases the inflow of blood at the bite site.
12.	Acetylcholine	Vasodilator
13.	Leech derived Tryptase inhibitor	Inhibits proteolytic enzymes of host mast cells
14.	Complement inhibitors	May possibly replace natural complement inhibitors if they are deficient
15.	Anesthetic substance	Anesthetic

Leech therapy in Siddha medicine[38]

Siddha medicine practitioners believe that leeches should be applied on specific parts of the body according to the diseases. In Siddha medicine it is mentioned that leeches should not be applied on certain parts of the body on specific day of the month. The list is shown below:

CONCLUSION

According to our ancient Ayurvedic literature, diseases occur when there is

Table 5 Specific sites in particular disease

S.N.	Disease name	Parts of the body
1.	Swelling due to injury, boil and abscess	Affected site
2.	Uncontrolled vomiting	Fonticulusgutturis
3.	Intractable headache	Forehead
4.	Headache due blood stasis in piles	Anus region
5.	Headache during menopause	Thigh
6.	Stomach pain due to dysentery	Anus region
7.	Hepatomegaly	Liver
8.	Whooping cough in childern	Middle of the back
9.	Chronic swelling of the joints	Affected joints
10.	Pain in eyes and eyebrows with watering	1.25 cm away from the lateral angle of the eye

Table 6 Specific site in particular day (*tithi*)

S.No.	*Tithi* (day after the new moon)	Part of the body
1.	1st day (Piradhamai)	Great toe
2.	2nd day (Thuthiyai)	Plantar region
3.	3rd day (Thirithigai)	Knee joint
4.	4th day (Chathurthi)	Thigh
5.	5th day (Panchami)	Generative organs
6.	6th day (Shasti)	Umbilical region
7.	7th day (Saptami)	Breast
8.	8th day (Ashtami)	Hands
9.	9th day (Navami)	Neck
10.	10th day (Dashami)	Female reproductive organs
11.	11th day (Ekadashi)	Tongue
12.	12th day (Dwadashi)	Forehead
13.	13th day (Trayodashi)	Eyelid
14.	14th day (Chaturdashi)	Nape
15.	15th day (Asypoornam)	Head

CONCLUSION

According to our ancient Ayurvedic literature, diseases occur when there is vitiation of tri-doshas in the body. Leech application is very useful in purification of the body by eliminating the deep rooted doshas, especially *pitta* and *rakta.* This is very effective treatment modality described in our ancient ayurvedic literatures, now gaining popularity because of simple application with very few manageable complications.

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