

**Review Article****LITERARY AND SCIENTIFIC REVIEW OF LEECH THERAPY IN AYURVEDA AND MODERN SCIENCE****Sanjaya Gupta^{1*}, Siddhanagouda Patil², Vasant Patil³, Shipra Singh⁴**¹Associate Professor, ⁴PG scholar, Dept. of Panchkarma, Rishikul Campus, Uttarakhand Ayurved University, Haridwar.²Asst. Professor, Dept. of PG Studies in Shalya, Ayurveda Mahavidyalaya, Hubli, Karnataka, India.³Professor, Dept. of PG Studies in Panchakarma, SSRAMC, Inchal, Karnataka, India.**ABSTRACT**

Leech Therapy is claimed to be the supreme therapy because of its high efficiency in the curing blood related disorders. According Ayurvedic classics it is safer and less complicated natural process therefore indicated even for the king, rich, old, fearful, weak, women, and the people of tender nature. Records of the medical usage of leeches date back to the beginning of civilization. Modern hirudotherapy differs from that of ancient one because now we do not use wild leeches but grown in a special bio factories where they are in severe quarantine. Except, now a days the leeches used only once. After using a leech it is destroyed this fact excludes infection of the patients. The absolute safety and obvious advantage of hirudotherapy and checked up by thousands of years of experience of mankind and does not cause any doubt in the secretion of medicinal leeches salivary gland, except hirudin inhibitor of ferment thrombin, there is a whole range of biological active combinations. The benefits of leech therapy were earlier thought to be derived from the amount of blood lost, hence relieving congestion and removing the noxious humors. Recent researches have demonstrated that more than the blood loss, it is the salivary secretions of the leech which contain an amazing cocktail of medicinal substances. This has led to its therapeutic use in numerous medical and surgical conditions like varicosities, various skin diseases like scabies, psoriasis, ringworm etc; phlebitis, to reduce post-operative swelling in plastic and reconstructive surgery and pain relief in various arthritic diseases.

KEYWORDS: *Raktamokshana*, Leech Therapy, Hirudotherapy.**INTRODUCTION**

Raktamokshana is a unique Para-surgical measure indicated in various diseases where gross vitiation of *Rakta* is present. *Sushruta*, the father of ancient Indian surgery, describes about physiological, pathological role of *Rakta* and its importance in surgical and Para surgical procedures.

Leech Therapy is claimed to be the supreme therapy because of its high efficiency in the curing blood related disorders. It is safer and less complicated natural process therefore indicated even for the king, rich, old, fearful, weak, women, and the people of tender nature^[1].

Medicinal bloodletting has been practiced since the Stone Age. Evil spirits were thought to cause illness and removal of these evil spirits required blood withdrawal. Records of the medical usage of leeches date back to the beginning of civilization. Illustrations of leech application to patients were found in Egyptian tombs dating back to 1500 B. C. Chinese writings from the first century A. D. describe medicinal leech application. There are also references in Sanskrit, Persian, and Arabic literature. The first Western documentation of therapeutic leech use is in the poem *Alexipharmaca* by Nicander of Colophon (200 - 130 B. C.).^[2]

Importance of Leech Therapy

1. *Sushruta's* proclamations are becoming reality even after 2000 years of change of events that, "The clinician who knows well about the leeches, habitat, and their

method of collection, varieties, storage and method of application is successful in treating the diseases amenable to them"^[3].

- Both *Sushruta*^[4] and *Vagbhata*^[5] included leech under *Anushastra*. According to *Charaka* it is one among *Shashtra Pranidhana*^[6]. *Sharangadhara* says in case of emergency, leech can be applied even in contra-indicated persons for *Raktamokshana*.
- Leech sucks the impure (*Dushta*) *Rakta* from the mixture of *Dushta* and *Shuddha Rakta*, like *Hamsa* (Swan) drinks milk from a mixture milk and water.^[7]
- Prof. Charles Lent, leading biologist of U. S. said that, Leeches are useful in removing the blood from areas where tissue has been transplanted or reattached. Because when blood accumulates, tissue may die before it heals. Applying leeches to the area once or twice a day for a week give capillaries time to grow across sutures and restore blood circulation^[8].
- The Carolina Biological Supply Co. in Burlington, N. C. is getting increased demand for the supply of leeches day by day from physicians all over the world indicating newer horizons of its utility in the coming days^[9].

Symptoms & treatment of *Savisha* Leech *Damsha*

Acharya Sushruta has advised to use only non-poisonous leech for the treatment purpose, not poisonous leech, besides this he described the list of complications

arise due to toxicity of poisonous leech as follows- burning, itching, swelling, drowsiness, fever, delirium, unconsciousness etc.^[10] According to *Acharya Vagbhata*, the symptoms are burning, fever, inflammation, edema, itching, boil, erysipelas, vitiligo, vertigo etc. Regarding these type of complications, *Acharya* has advised treatment of poisonous leech bite. The bite of *Indrayudha* leech leads to the disease *Mahagada*, which is *Asadhya*^[11]. The treatment for this is *Pana*, *Lepana*, *Nasya* etc. ^[12]

Acharya Vagbhata also classified Leeches on the basis of the sex characters. Female leech are delicate, having thin skin, small sized head, and the lower body being large. It is indicated in *Alpa Dosha* and acute disorder. Male leech are having hard skin, big head along with being semi lunar in look with large front portion are

male. It is indicated in highly vitiated *Dosha* and chronic diseases. ^[13]

According to modern science, leeches are divided in main 2 types, Marine & fresh water leeches: which are devoid of jaws and have colorless blood. Terrestrial Leeches; which have three jaws and red colored blood^[14].

Indications^[15]: Only *Vagbhata* has mentioned diseases where leech therapy is indicated viz. - *Gulma*, *Arsha*, *Vidradhi*, *Kushtha*, *Vatarakta*, *Galaroga*, *Netra Roga*, *Visha Damshta* and *Visarpa*.

Acharya Sushruta has advocated *Raktamokshana* by leech especially to king, rich people, children, old aged, coward, weak, females and delicate people^[16].

Dosha	<i>Pitta</i> (Ch.), Deep located (<i>Grathita Rakta</i>) (Su. Su.) Person having most delicate constitution (Su. Su.)
Dhatu	<i>Rasa</i> , <i>Rakta</i> , <i>Lasika</i> , <i>Mamsa</i>
Prakriti	<i>Sukumara</i> , child, woman, old man, king etc.
Diseases	<i>Kushtha</i> , <i>Arsha</i> etc.
Clinical Research Findings	Piles venous congestion, manifestation of ear and nose, headache, whooping cough, thrombosis, brain tumour, skin disease, tonsillitis, swelling and local inflammation etc.
Kala	<i>Sharad Ritu</i> (Autumn), not in extremely hot or cold season, In winter season - at noon; summer season - at cool time; In rainy season -clear sky.

Indications: Venous illness, acute phlebitis, varicose veins (Thrombo phlebitis, post thrombotic syndrome, phlebothrombosis), acute gout attack infections, otitis media, mastoiditis, glaucoma, angina pectoris, high blood pressure, piles, allergies. It is impossible to name all diseases, which can be treated by using hirudotherapy.

Contraindications: Absolute haemophilia, anaemia, hypotonia.

Hirudotherapy:

It is a treatment with using of medicinal leech. The ministry of health protection of Russian federation approves this kind of therapy. Modern hirudotherapy differs from that of ancient one because now we do not use wild leeches but grown in a special bio factories where they are in severe quarantine. Except, now a days the leeches used only once. After using a leech it is destroyed this fact excludes infection of the patients. The absolute safety and obvious advantage of hirudotherapy and checked up by thousands of years of experience of mankind and does not cause any doubt in the secretion of medicinal leeches salivary gland, except hirudin inhibitor of ferment thrombin, there is a whole range of biological active combinations^[17].

Hirudotherapy should be regarded not only as a preventive therapy, but also as a method of treatment in ischemic diseases of heart and other vascular pathologies, endocrine disorders, nervous disease and at all inflammatory diseases and so on. The success of hirudotherapy depends not only on the biological properties of leech's secretion but also from the experience of a doctor and joint actions of a patients and a

doctor^[18].

Biological active substances containing in saliva glands of medicinal leeches can restore blood circulation in the nudes of inflammation to remove an ischemia of organs, to provide capillary tissue exchange and to improve immune protection and regeneration of tissue.

The therapeutic effect is not only released by loss of blood but also by the secretions, which the leech emits in to the wound.

In western science, 2 types of Leech have been expounded known as: aquatic and terrestrial. Out of these, according to Ayurvedic texts only one type of Leech is used for therapy, which exists in water.

Leech Constituent: the saliva of leech contain following Constituents.

Hirudin: Hirudin (mainly from leech) having approximately three times more anti-thrombin activity than pseudohirudin (mainly from leech whole body).

Calin: It also prevents the blood coagulation.

Destabilise: it completely block the spontaneous aggregation of human platelet.

Hyaluronidase: It's "spreading factors" that ensures the other active substances which are active at the bitten areas can be spread.

Eglin restrains digestive proteasins.

bdellin is a plasma hindrance.

Antithrombin, antitripsin and antichymotripsin: High antithrombine activity is maintained in starved leech.

An anaesthetic substance leads to pain insensitivity (analgesic) when sucking or such pain killer chemical, which stops you from feeling of bite.

Hementin and orgelase: Have a hyperaemistic effect but it is remained in limited leeches e. g. *Haementeria ghiliani*.

Piavit: It has protective antithrombotic effects.

The salivary glands of leeches also produce cornucopia of other pharmacologically active substance including an antihistaminic, protease and possibly, an anaesthetic and antibiotic.

Leech Therapy Vidhi (Procedure of Leech Application)

Purvakarma

It includes following

- Collection of leeches
- Preservation of leeches
- Preparation of leeches
- Preparation of patient

Collection of leeches: *Acharya Sushruta* has given detailed directions on the subject of application of leech in *Sutra Sthana* 13th chapter. Knowledge from ancient times shown that, the leeches can be caught with a piece of wet leather or fresh meat from ponds, tanks, streaming water and where there are lotuses.

There is another method to collect the leeches i.e., the fresh meat of dead animals, fish or milk should be applied on the skin of animal or the human being himself and keep that part in the water for some time. Leech will attract and will catch the skin. Then remove them from the skin by sprinkling *Saindhava* (rock salt) powder and collect in a container^[19]. The best time for collecting leeches is *Sharad Ritu* (autumn) is noted by *Dalhana*^[20].

Preservation of leeches: After collecting the leeches, they should be kept in a wide and new earthen pot. The pure water of lake or river with lotus should be filled into that pot. Feed it with leaf of lotus plants (*Kamala Nala*), *Saivala*, and powder of stem of small plants. The grass and leaves of plants should be kept inside water in the pot as a bed for leech.

Water should be changed on every 3rd day and fresh feeding should be dropped inside the pot. After 7 days the pot itself should be changed^[21]. *Vagbhata* mentioned that the pot should be changed every five days. Poisonous leeches should be thrown out by differentiating from others.

Preparation of leeches: Leeches should be taken out of pot and pated with mustard seed and turmeric. Then about 48 min. (*Muhurta*) they should be kept in pot full of turmeric water (*Haridra Jala*) till they regain the natural cheerfulness and freshness (*Vigataklama*) and free from natural urges (*Muktapurisha*). Then leech should be applied to the affected part.

Preparation of patient

- For better Karma, leech should be applied after *Snehana* and *Svedana*.^[22]
- On the day of Leech Therapy, affected part should be free from any ointment etc.
- Rub the affected part with cotton gauze pieces or dried cow dung to just remove superficial dead skin.

- The site of lesion, if not painful or ulcerated should be roughened by dusting it over with a composition of loose earth and pulverized cow dung and cleaned up.
- Clean up with Luke warm water and apply local *Svedana* E.g. *Nadi Sveda* to just increase blood circulation at that part, it will also be helpful for loosening the skin layer.
- Cover up the side parts with oval cut and opened towel for just affected lesion.

Pradhana Karma^[23]

It includes following

- Application of leech
- observation

Application of leech: leech should be held with small, white, wet cloth, gauze or cotton by covering its mouth; it will catch damaged skin better way and will stick at that place. If leech is not able to stick & bite to the desired area, then a drop of milk, blood, ghee or honey should be dropped on the affected part. If Leech does not bite by doing so, then slight incision should be made over the lesion. After above said efforts, if leech does not hold at the desired spot, the leech should be discarded & other fresh leech should be applied.

After application of leech, their body should be covered with a piece of thin and wet cloth or cotton and cool water should be dropped on the covering part continuously to provide cooling effect.

Nirikshana: Features of leech sucking: when the leech bites the affected area & starts sucking, the anterior sucker assumes the shape of a horse shoe (*Ashvakhuravat Ananam, Unnabhya Va Skandham*). The neck of leech looks like a breathing rhythm of little child and continuous pulsation like peristalsis movement over the body.

Leech sucks vitiated blood only just like swan drinks only milk not water. When sensation of itching and pain occurs at the seat of the application, it indicates that, leech started to suck the fresh blood, and then the leeches should be removed.

If leeches refusing to detach even after the appearance of proper signs & symptoms of *Rakta-mokshana* or sticking to the affected part by their fondness for the smell of blood or due to their greediness (*Laulya*) or eagerness should be removed by sprinkling the *Saindhava* powder (rock salt).

Paschatkarma

- Care of leech
- Care of patient

Care of leech: After detaching the leech, vomiting should be induced. For inducing *Vamana*, the mouth of leech is massaged with oil and rock salt. Then it should be held by a tail end with the thumb and the forefinger of the left hand and both the surfaces of body should be gently rubbed with the same fingers of the right hand from tail towards the mouth to make them vomit the full quantity of sucked blood.

The procedure should be continued until the appearance of proper symptom of the *Vamana* (disgorging). Leeches that vomited the entire quantity of

blood sucked as above would vigorously move in quest of food if placed in water. If the leech is lying dull and immobile, it indicates that the blood is not vomited completely. They should be made to disgorge again. Leeches if not made to emit the entire quantity of the sucked blood stand in danger of being attacked with an incurable disease known as *Indramada*^[24].

Care of patient: After detaching the leech, affected part should be cleaned with cotton. An wound incidental to an application of leech should be rubbed with honey or washed with spray of cold water or bound up with an astringent (*Kashaya*), sweet and cooling plaster, according to the quantity of blood removed from the part.

In case of *Samyak Yoga* (proper bleeding), the wound should be applied with the *Shatadhauta Ghrutam* (100 times washed ghee), or a piece of cotton, soaked in the same substance, applied as a compress over the part.

The wound should be rubbed with honey in a case of *Ayoga* (insufficient bleeding). While it should be washed with a copious quantity of cold water if *Atiyoga* (extensive bleeding) occurs. Similarly in case marked by the absence of any bleeding at all (*Mithya Yoga*) a sour, sweet and cooling plaster should be applied over the wound.^[25]

Preservation of Leech: The leeches should then be put into a new pitcher and treated as before laid down, after they had fully omitted the sucked blood. Used leech should be restricted for reuse for at least 7 days.

They should be transformed from one pot to another filled with good mud and water in order to prevent the putrefaction of saliva for the leech becomes poisonous with such contact.^[26]

Procedure of Reuse of Medicinal Use: once a leech is distended, a small amount of salt or *Haridra* is spread over its mouth. The leech will then gush out the blood it sucked. The leech is returned to fresh water immediately to get rid of the excess salt. After this process, the leech can be used again as if it is a fresh one.^[27]

Facts about Leech therapy: Today, systemic bloodletting is restricted to a few limited conditions including polycythemia and hemochromatosis but this therapy is a special form of small bloodletting. It is always proven its miraculous effect in the field of medicine time to time.

- In the failure of adequate venous return from a graft, reduces blood supply - causing tissue necrosis placing a leech on the congested skin flat, fingers or other vascular compromised area removes the congested blood and enables the graft to be salvaged. Leeches are currently used during post-operative care of re-implanted fingers, skin graft, and breast reconstructions.^[28]
- Leech has been used in thousands of cases to treat swelling after plastic surgery and graft operations until 1985 micro-surgeons often failed when sewing severed ears, fingers and other body parts back on. Leeches are now regularly used in such cases to keep the blood oozing into the sewn or tissue until the venous congestion is relieved and normal venous drainage of the graft can develop properly.

- Leech therapy may be an effective therapy for rapid reduction of pain associated with osteo-arthritis of the knee^[29].
- Leeches are anti-phlogistic, used for the local obstruction of the blood. They are used in acute inflammation, abscess, boils, in bruises, sprains and blows^[30].
- The leech saliva has helped in countless tricky re-attachment as well as being effective against various inflammatory conditions and skin diseases such as eczema, psoriasis.
- If medicinal leech bites once, the victim can bleed for hours, allowing oxygenated blood to enter the wound area until vein re-grows and regain circulation.
- The leech saliva has helped in degradation of fibrinogen, inhibition of factor XIIIa and lysis of fibrin clots.
- As the benefits of judicious treatment with leeches are recognized, the range of conditions that can be treated extends. There are case reports of effective leech treatment for hematomas, purpuri fulminans, paronychia and even vascular congestion in the penis.

Limitations of leech therapy and solutions: Leeches gave a miraculous effect in all the fields but some limitations or side effects are also there which are summarized below.

- The leeches are very useful in micro-surgical practice i.e., plastic and graft surgery. But there is significant risk of infections.
- Particularly in those procedures where the vascularity of the tissues are compromised.
- *Hirudo medicinalis* has endosymbiotic bacteria almost 20% of infectious complications seen after leech therapy. So appropriate antibiotic prophylaxis should be administered to the patient who need leech therapy.^[31]
- *Aeromonas* infections are reported after medicinal leech therapy.^[32]
- A very rare adverse effect of medical leech therapy is the development of diffuse pseudolymphoma.^[33]
- There are two problems with leech therapy.
 - The squeamishness factor
 - The possibility of bacterial infection
 - As leeches cannot be sterilized
- Historical account warns of the transmission of syphilis, AIDS, hepatitis, after the re-application of leeches used on infected patients. So leeches should be used single time then they should be disposed away.
- More recently, *Aeromonas*, hydrophilia, the leech's Natural gut flora has been isolated from wound infections after leech treatment. So, properly prophylactic antibiotic should be provided before the leech application.
- The leech therapy may not be used in case of -
 - Haemorrhagic diathesis (hemophilia)

- Arterial look diseases (AVK) and the modifications in the capillaries in case of diabetes (diabetical micro-angiopathy).
- Many leeches are held under suspicion to act as vectors for pathogenic organism i.e. Hirudinaria manilenses of the Philippines play the role of carrier of the pathogenic organism of rinderpest disease. The lands of leeches are believed to transmit the flagellate herpentomonas causing gangrenous ulcers.

Complications of Leech Therapy

- Soreness (erysipelas) after the bite barely appears.
- The histamine emitted by the leech may lead to allergic reactions immediately or within few days.
- A plaster allergy is more often found after a treatment with leeches, therefore it is advisable to use skin preserving, hypoallergen plasters.
- A small scar at the bitten area may remain for weeks.

Research works on Leech Therapy

A randomized clinical open trial had been conducted to find out the effect of leech therapy in varicose vein, using two groups. First group was treated with leeches in alternative days for two months. Second was treated with grade 2 compression stockings and limb elevation for two months. Response was measured by assessment of pain/leg discomfort, limb girth at calf, ankle, and feet, pigmentation area & colour on every 15th day. First group showed significant reduction in pain, limb girth, and pigmentation. Second group showed significant reduction in pain & limb girth, but there was no improvement on pigmentation. Both groups do not show significant improvement on SFJ (Saphenofemoral junction) & SPJ (Saphenopopliteal Junction) incompetency.^[34]

A single course of leech therapy was effective in relieving pain in the short-term in patients suffering from chronic lateral epicondylitis (Tennis elbow) and reduced disability in intermediate-term. Further the researchers have mentioned that leeches might be considered as an additional option in the therapeutic approach to lateral epicondylitis.^[35]

Tenosynovitis of the quadriceps femoris is a local inflammatory condition. Researchers selected leech therapy in management of this condition, as Sushruta describes bloodletting therapy is beneficial in early stages of oedema. Local leech application was done at the left thigh for 7days, daily at the same time. Mobility of hip and knee joints improved and local tenderness relieved after treatment.^[36]

A scientific study showed that a diabetic ulcer was healed after 30 days with repeating leech therapy in four sittings. It improves the blood circulation and reduces the congestion due to presence of Carboxypeptidase, inhibitors Histamine like substances and Acetylcholine, thus it corrects Diabetic angiomicropathy. Vasodilators present in leech saliva enhances blood circulation and it corrects ischaemia and diabetic atherosclerosis. Leech application has anti-inflammatory action nerves due to presence of substance like Bdelin and Eglins in saliva, hence correct diabetic neuropathy^[37].

In a clinical study carried out by administering of *Siravedhana* (venepuncture) and *Jalaukavacharana* (application of leeches) in *Vicharchika* (eczema) proved that application of leeches are more effective in the management, whereas results provided by *Siravedhana* was not much encouraging.^[38]

A randomized open phase clinical trial had reported that leech therapy is effective in treating patients suffering from psoriasis and indicated statistically significant reduction in clinical features such as erythema, scaling, induration, itching, burning sensation, discoloration and dryness of lesion. Here, leeches were applied once a week for three months.^[39]

Thrombosed piles possibly occur due to high venous pressure associated with severe anal pain. Twelve patients underwent leech application with a gap of 2 days between two settings. One leech sucks 5-10 ml of blood. Bleeding lasts about 12-24 hours and patient loses about 20-30 ml of blood. Leech (*Hirudina medicinalis*) application in thrombosed piles is found to be effective in reducing pain, tenderness, oedema and discoloration and shows thrombolytic action, which contributes in re-establishment of circulation. This application also provides analgesic activity. It is observed that, pus and mucous discharge have been reduced after leech application; which may be due to antimicrobial and mucolytic properties in leeches. This treatment is found to be effective in thrombosed piles.^[40]

A series of case studies on application of leeches on Buerger's disease (Thromboangitis obliterans/ TAO) had been conducted by some researchers and reported it is effective in management of Thromboangitis Obliterans^[41].

CONCLUSION

Leech therapy (hirudotherapy) is a type of bloodletting therapy, one among the *Panchakarma*. It is one of the very effective treatment methods for treating disorders in skin diseases, cardio vascular, respiratory, gastro intestinal, genitor urinary, nervous, locomotor and endocrine systems. The success of leech therapy depends not only on the biological properties of leech's secretion but also from the experience of a doctor and joint actions of a patients and a doctor.

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