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Review Article

The Scientific review on clinical and therapeutic aspects of *Jalaukavacharan* (leech therapy)

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ABSTRACT

Medicinal bloodletting has been practiced since the Stone Age. Leeches were widely used in India, Europe, especially in France for therapeutic purposes from relieving pains to the treatment of hypertension. Famous Indian surgeon Susruta had described the therapeutic use of leeches vividly in his treatise 'Susruta Samhita'. Records of the medical usage of leeches are found date back to the beginning of civilization. Illustration of leech application to patients was found in Egyptian tombs dating back to 1500 B.C. Uses of leeches was widely spread in ancient time all over the world. It is known that even great Avicenna used leeches for treatment of a number of diseases. At that time, leeches were used as a treatment for all diseases irrespective of the symptoms. It has been mentioned in Àyurvedic texts that Jalauka first sucks impure blood only; thereafter, she may suck pure blood. When she sucks pure blood, the patient may feel itching and pain in that area.

Key words: *jalauka, leech, raktamokshana, bloodletting, hirudin, leechtherapy, sushruta*

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INTRODUCTION

Medicinal bloodletting has been practiced since the Stone Age. Leeches were widely used in India, Europe, especially in France for therapeutic purposes from relieving pains to the treatment of hypertension. Famous Indian surgeon Susruta had described the therapeutic use of leeches vividly in his treatise 'Susruta Samhita'. The first western documentation of therapeutic use of leech is in the poem *'Alexipharmaca'* by Nicander of Colophon (200-130 B.C.). Galen (129-189 A.D.), the personal physician to Marcus Aurelius, advanced the practice of bloodletting through the development of his humoural concept of disease. Records of the medical usage of leeches are found date back to the beginning of civilization. Illustration of leech application to patients was found in Egyptian tombs dating back to 1500 B.C. Uses of leeches was widely spread in ancient time all over the world. It is known that even great Avicenna used leeches for treatment of a number of diseases.Chinese writings from the first century A.D. describe medicinal leeching. Hirudotherapy has been widely used in Russia, especially in 18th and 19th centuries. At that time, leeches were used as a treatment for all diseases irrespective of the symptoms. It is known that Russian Tsar's family preferred hirudotherapy treatment.

Anatomy: A leech's body is made up of a series of ring-like segments. They have 34 body segments and their body is flattened from front to back in a variety of patterns and colors. The front most four segments are the head segments; following 21 are the body segments and finally an additional set of seven segments known as caudal segments, which fuse to form the tail sucker. Body segment 1 and 2 contain secretary glands while that of five and six are having sexual organs. The length of a leech may vary from 3/4 to 8 inches. Leech has the ability to stretch or shorten his body. When they swim the body of a leech flattens and the animal can reach a length of 15 to 20 cm and when disturbed, the body of the animal adopts a circular shape.

The largest leech discovered measures 18 inches. Leeches are black, red or brown in color and may have strips or spots on their body. They have clusters of light-sensitive cells called 'eyes' near the front end. They are also sensitive to touch, temperature and drying. Leeches have two suckers, a powerful sucker at the tail end and a smaller sucker at the head. Mouth is located in the center of the small sucker. The leech has 32 brains; 31 more of a human! The medicinal leech, Hirudo medicinalis, is an ideal organism for investigating the neural basis of behavioral plasticity. They have both; a relative simple easily studied nervous system and a well-defined behavioral change provoked by a specific stimulus. The nervous system of the leech consists of the brain, the ventral nerve cord and ganglia that are located in each segment along the nerve cord. The medicinal leech has 21 segmental ganglia; each containing 175 pair of neurons. The relatively small number and the large size of neurons have made leeches favorite subject of neurobiologist. The hirudo leech has three jaws with 100 teeth on each jaw, making 300 teeth in all.

Salivary secretion of leech: Leech injects its saliva into the bite wound during sucking of blood. It is a chief acting principle. Salivary secretion of leech is found to be very useful. It contains medicinally useful substances.
Some of these are following:
Hirudin: It is a proteolytic and thrombin specific inhibitor. It retards the coagulation of blood. Mature hirudo-medicinalis contains 285 ATU of hirudin varying with feeding state. Regarding the structure, it is polypeptide with molecular weight 10800 based on amino acid composition. Hirudin is characterized by high proportion of decarboxylic acid, which explains its acid character, and by absence of tryptophan, methomine and argentine. A specific inhibitor of thrombin, hirudin inhibits coagulation in the initial stages of clotting and does not require presence of other coagulation factors or plasma constituents.

Bdellin: It is also a proteolytic inhibitor;
Collagenase: It inhibits platelet aggregation;
Apyrase: It is also a platelet anti-aggregant.*;*
Decrosin: A potent glycoprotein antagonist and inhibitor of platelet aggregation.
Hyaluronidase: The hyaluronidase located in the salivary gland of medicinal leech plays an important role in the efficacy of leeching and it is perhaps more important than anticoagulants.
Orgelase: According to D.C. William, it is a specific hyaluronidase and helps in skin penetration.
Anaesthetic: The bite of all blood-sucking leeches is painless. It is supposed that this is due to an anaesthetic agent secreted by the leech. This substance is not identified yet, but it is known that this is different from hirudin.
Vasodilator: Except for well-known anticoagulants, there is substance to prolong bleeding. This vasodilator is histamin like substance and is shown in salivary gland of medicinal leech.
Antibiotic: Antibiotic properties of leech has been studied and it concluded that antibiotic in medicinal leech is produced by Aeromonas hydrophylla which lives endosybiotically in its gut. This bacterium cultured in vitro kill's tuberculosis, dysentery, diphtheria, S.aureus and other diseases.

Mode of action: The leech's main therapeutic benefits are not derived from the average 5 mls of blood removed during biting (although this may provide dramatic relief at first), but from the fact that each bite wound continues to ooze up to 150 ml of blood for 10 or more hours. The goal then is to produce a minimally adequate venous outflow from the tissue by adjusting the number of bite wounds to suit the clinical situation. Researches indicate that after about 3 to 5 days, new vessels in growth around flap margins develop sufficiently to restore effective venous drainage.

Therefore, it is important that treatment is not terminated too soon, but rather, continues over a period of time to avoid failure. The property of leech bite wound to continue bleeding, with encouragement, for 10 or more hours is related to pharmacologically active secretions (not the anticoagulant alone) introduced by the leech bite. It has not been found possible to simulate this effect by introducing conventional anticoagulants, such as heparin, into small stab wound in the skin.

Role of leeches in medical therapeutics: The use of the leech in the medical field goes back to ancient India and Egyptian times. The surgical book *'Susruta samhita'* dictated the extensive use of leeches in various disorders. The use of leeches in Egypt can be confirmed by drawings on the walls of caves and pyramids that remain from ancient times.

1. Reconstructive and plastic surgery: The pioneering use of leeches in modern plastic and reconstructive surgery can be attributed to two Slovenian surgeons, M. Derganc and F. Zdravic, from Ljubljana. Presently, medicine, especially the area of microsurgery, has been favored and improved by the use of the leech. Micro surgeons today are attempting at reattaching severed body parts, such as fingers. They usually have little trouble attaching the two ends of the arteries because arteries are thick walled and relatively easy to suture.

The veins, however, are thin walled and especially difficult to suture, particularly if the tissue is badly damaged. All too often, the surgeons can get blood to flow in the reattached arteries but not veins. With the venous circulation severely compromised, the blood going to the reattached finger becomes congested, or stagnant; the reattached portion turns blue and lifeless and is at serious risk of being lost. It is precisely in such cases that leeches are summoned. Whenever amputated parts are sown back or implantation or grafting done, leeches are used to enhance circulation of blood in the injured area. Blood will flow in through the arteries but it will not flow out through the veins, resulting in a buildup of pressure. The reason for this could be that there are not enough veins or because the veins are not functioning well enough, as described above. In this case, the leech is used to suck up the extra blood, causing a reduction in pressure, leading to a better circulation. The leech secretes a chemical that opens the vein thus helping in improvement in circulation. This has been one of the most important contributions of the leech to medicine over the last decade.

2. Prevention of necrosis: It has been proved that after transplanting or reattaching human limbs or the tissues, the blood supply at the site of the operation often fails to return through the veins to the heart but blocks up and reduces the supply of fresh blood through the arteries. This results in the death and decay of the tissues. Attempt by doctors using mechanical and chemical means to prevent tissue death once venous problems have risen, so far have failed. Some surgeons involved in the transplant, reattachment, removal of malignant tissues or cosmetic surgery have turned to remove blood from the site of the operation and to keep blood flow regular. The leeches suck-up blood and thereby prevent necrosis. They also provide enough time for capillaries to grow across the suture and allow normal blood flow to be resumed.

3. Oedema: Leeches are successfully used in the management of oedema. The leech itself provides immediate reduction of swelling by removing 15 to 30 ml of blood. Its most important contribution is the injection of hirudin that keeps the wound seeping for another 10 hours on average.

4. Miscellaneous uses: It is used in the management of periorbital haematoma in the accident.In the Russia, it was used in treating acute external otitis, adhesive otitis and malignant tumors. Research on leech saliva is being done involving possible anti-tumor effects of leech saliva, as well as other properties that could help in heart-related diseases. Use of leech in Burger's disease. One of their role in therapeutic is that they were used to get venom from snake bites out of human in ancient times.

General patient care: The area around leech bite wounds should be routinely observed for local infection and swabs are taken if indicated. If bleeding is there, patient's hemoglobin level should be checked daily. It is quite possible for significant falls in hemoglobin level to occur.

Ancient review:

Types of Jalauka: Jalaukas are of 12 in number and they can be divided into two groups of six each. Six Jaluka are poisonous and the remaining six are non-poisonous. Saviîa Jalauka: Owing to their poisonous nature, they are not used for the

therapeutic purposes. Leeches belonging to the genus Haemodipsa are particularly troublesome and they are considered as poisonous. They can even attach to the birds. These are used for the therapeutic purposes and are six in number. characteristics of non-poisonous Jalauka: These are bulky, stout, fast sucker of the blood, gluttonous and non-poisonous in nature. [1]

Methodology of Jalauka Application: Before applying Jalauka, it should be massaged with the solution made with mustard or turmeric. After the massage, place the Jalauka in pure water pot. This action makes the Jalauka fresh and it attach to the patient at a fast speed. The patient, who can be cured by leech application, should sit or lie on a couch in relaxed position. The procedure should be told to the patient. If patient has not any wound over the area, then the part should be dried with mud or cow-dung powder. When the Jalauka is seen in a state of hunger, she should be applied on the affected area.

The selected area is covered with a wet cloth having a hole in its middle. The Jalauka is applied over the part. If the Jalauka is not sucking blood, then a few drops of blood or milk may be drooped on that place. If still, she is not feeding blood, then make an incision on the part to make the blood available at that part. If again the efforts fail, then procedure should be repeated. If you want to confirm either the Jalauka is sucking blood or not, then you can confirm by seeing the movements of leech. The mouth of the leech becomes broad like horse-shoe, the trunk raises, head shows pulsatile movements and she breaths like a baby. These are the signs of active sucking. In this condition, cover the Jalauka with a wet cloth and pour a little quantity of water over this.[2]

The bite of leech is painless. Jalauka sucks impure blood previously; if pricking sensation or itching occurs at the bite place, then it indicates that the Jalauka is sucking pure blood. This pure blood sucking Jalauka should be removed from the sucking site manually.[3] If she resists, as she likes smell of blood, then turmeric should be sprinkled over the mouth of the Jalauka. Alternatively, oil may be applied on the mouth of the Jalauka. If she still resists, then salt may be sprinkled on the mouth, but this may prove to be lethal to the leech. By doing this, the Jalauka is separated from the patient. At least 10 Jalaukas could be applied on the affect part in one session. Every time, the leech should be undergone emesis with Haridra powder solution or rice powder.[4]

Pacchata Karma (post-operative): If you suspect that impure blood has been remained in the wound, then apply a paste of Haridra powder, Guda and Madhu followed by removal of blood with the help of massage. When Jalauka dropped of the sucking-site after sucking adequate quantity of blood, then her body is massaged with the rice paste and mouth is massaged with Saindhava lavana. It is followed by the application of firm pressure from the tail end of the body to the mouth end, so that blood should come out of the leech. This is called *'vamana'.*

The procedure should continue till complete *vamana e*nsues. The Jalauka, who underwent *vamana*, if dropped in pot render here and there in search of food. If she remains standstill in the pot and settle in the bottom, then it is supposed to be '*Durvanta*' and a further vamana should be carried out. This leech may have a fatal disease named 'Indramada'.[5]

The leech once used for blood-letting should not be used for next seven days. Moreover, leech used in a patient should not be used in another patient because communicable diseases may occur. The wound created by the Jalauka should be treated by pasting shatadhauta Ghrita and by applying *shatadhauta Ghrita picu*. Alternatively, honey should be massaged on the wound and cold water is poured. Bandaging is done after applying these drugs. If the blood is still oozing from the wound, then one must think upon either it is pure or impure blood. If the blood is impure, then allow it to ooze from the wound. Paste of Haridra, Guda and Madhu may help the impure blood to ooze completely.

Control of bleeding and care of the wound: If pure blood is draining from the bite place, then a gauze soaked in the *shatadhauta ghrita* should be applied on the part. Besides this, cold healing pastes may also be applied on the part to stop the bleeding. Alternatively, honey may be applied on the wound along with astringents. It is a good healing remedy. Susruta has said that in the *Samyak yoga* of the Jalauka, wound is dressed with *shatadhauta ghrita*. In case of Ayoga, honey is massaged on the wound, in case of *mithyayoga,* astringents are used and in case of the *atiyoga,* cold bath or bandaging is applied. [6]

CONCLUSION

As swan can separate milk from the water mixed milk, in the same way the Jalauka can separate pure and impure blood and sucks impure blood only. It has been mentioned in Àyurvedic texts that Jalauka first sucks impure blood only; thereafter, she may suck pure blood. when she sucks pure blood, the patient may feel itching and pain in that area.

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