Rediscovering Ancient Remedies: Leech Therapy Today

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Abstract:

Leech therapy was a mainstay in conventional treatment for pain from antiquity until the mid-19th century. Its use is still widespread in traditional healing procedure in Asia, Africa and Arabic countries. There is renewed interest in leech therapy in the field of complementary medicine and empirical evidence for specific benefits oin leech therapy.

Keywords: Leech, Leech saliva, Therapy, Osteoarthritis.

1. Introduction:

The most common chronic joint condition is osteoarthritis (OA) of the knee. The major tissues damaged by OA are the cartilage, which results in symptoms including stiffness, discomfort, and swelling in the joints that reduce range of motion [1,2]. It is a leading cause of malformation, leading to high medical costs and a low standard of living. Approximately 6% of persons over the age of thirty are said to experience symptoms of OA [3]. As the population ages, so does the number of individuals with knee osteoarthritis, which continues to be a major healthcare concern.

Pain relief and improved functional result are the two main objectives of medication intervention. Treatments for osteoarthritis (OA) of the knee include included hyaluronic acid, platelet-rich plasma, peri-articular glucocorticoids, and local infiltration non-steroidal anti-inflammatory medications (NSAIDs). Nonetheless, the majority of patients reported unpleasant side effects and knee discomfort [4, 5, 6, 7]. Right now, there is still debate on the best course of action. As a form of traditional treatment, leech therapy has been approved by the Food and Drug Administration (FDA). [8]. Because of its anticoagulant properties, it has been used therapeutically for a few years, mostly to treat thrombosis and phlebitis [9]. Studies have evaluated the effectiveness of leech therapy for lowering pain in knee OA because medical leeches have been proven to have anti-inflammatory and anesthetic characteristics in the past ten years. According to Michalsen et al. [10], medical leech therapy was less intrusive than joint arthroplasty and seemed to be linked to a reduction in knee pain without significant side effects.

The usefulness of medical leech therapy for treating knee OA pain is still up for debate because of the small sample size, conflicting findings, and erroneous assessments of the published research. As a result, we conducted a meta-analysis of randomized controlled trials (RCTs) to evaluate the effectiveness and safety of medical leech therapy in patients with knee OA.

A chronic, progressive, non-inflammatory condition called osteoarthritis causes the destruction of articular cartilage and the formation of marginal osteophytes in the bone underneath the cartilage [1]. The most prevalent joint illness in humans is osteoarthritis, which affects 80% of those over 79 years old [2]. The prevalence of this condition has increased due to societal growth, an increase in obesity, and aging populations. As a result, after the age of 454, the likelihood of getting osteoarthritis is increases dramatically. Osteoarthritis can generally be predisposed to in a patient by obesity, age, occupation, genetics, trauma and anatomical problems of the lower limbs, such as meniscectomy1. The highest risk factor among these categories is age5, 6. According to national statistics, the prevalence of osteoarthritis is 25% in urban areas and 26% in rural areas[7].

The tiny joints of the hand are the most frequently affected by osteoarthritis [8]. Large joints are another common region since they support a greater amount of body weight and are more vulnerable to mechanical damage [9]. Compared to other joints, the knee joint is especially vulnerable to osteoarthritis and mechanical injury. Consequently, in industrialized nations, it

might be regarded as a major contributor to old age disability [10, 11, 12]. It has been observed that the incidence of osteoarthritis in the knee varies between 9.76% and 19.3% in Iran. These figures attest to the high incidence of osteoarthritis of the knee in Iran, which might be linked to unhealthy habits, changing lifestyles, and an aging population [7].

Being the largest hinged synovial joint in the body, the knee is one of the most significant joints in the body and is essential for both weight bearing and movement. Furthermore, because to its critical position, knee dysfunction has a significant impact on a person's life. Furthermore, the knee joint is susceptible to damage and several diseases due to its weight and position. varied diseases have varied causes, including lifestyle choices, environmental variables, and usage patterns. A person's race, environment, trauma, and personal traits are some of the factors that make them more likely to develop osteoarthritis of the knee. Relieving discomfort, enhancing function, and maintaining joint mobility are the objectives of osteoarthritis treatment [13, 14]. Arthrodesis and arthroplasty are two examples of costly surgical procedures that are not employed as main interventions [15]. Analgesics such as nonsteroidal anti-inflammatory medications (NSAIDs) can be employed. However, there are adverse consequences associated with long-term oral NSAID use, such as ulcers and bleeding in the gastrointestinal tract [16]. Implanted prostheses for joint replacement are the only long-term cure for this illness. However, due to its expense and intrusive nature, this treatment is typically advised in the later stages of the illness. Patients with knee osteoarthritis typically get symptomatic medications, like NSAIDs, to relieve pain in addition to physiotherapy, which may involve transcutaneous electrical nerve stimulation (TENS). On the other hand, NSAIDs are linked to side effects such gastrointestinal bleeding, and physical therapy is quite expensive for the patient. Because of this, the present strategy makes use of both conservative therapies and certain traditional cures. Accordingly, leech saliva therapy might be able to lessen osteoarthritis symptoms in the knees [17]. Leech saliva contains therapeutic peptides that have anti-inflammatory, anticoagulant, bacteriostatic, analgesic, and anti-edematous properties that aid in healing.

The use of leeches in medical therapy is known as "leech therapy." With the aid of a leech bite, this therapy aids in the release of dirty or deoxygenated blood from a designated location. The leech gives a sustained oozing effect from the bite site by sucking blood from the site and transmitting certain enzymes in its saliva that have anesthetic, anti-inflammatory, anticoagulant, and vasodilatation effects, among other effects. Leech salivary gland secretions (SGS) include more than 150 bioactive compounds and have been shown to have bacteriostatic, analgesic, resolving, and anti-edematous effects. It eliminates microcirculation issues, repairs damaged vascular permeability in tissues and organs, eliminates hypoxia, lowers blood pressure, boosts immunity, detoxifies the tissue, frees it from potentially dangerous consequences such as infarction and stroke, and rejuvenates the body to improve its bioenergetic status. Thus, leech therapy has been shown to be among the most effective Ayurvedic treatments; nevertheless, because of a dearth of supporting data, it is not now popular.

The scientific details of Jalouka can be stated as below.

Classification:

- Medicinal leech- Hirudo medicinalis
- Indian Cattle Leech - Hirudo granulose
- Phylum - Annelida
- Class - Hirudinea
- Order - H. Limnobdella
- Family – Hirudinae
- Species - H. medicinalis
- General – Hirudinaria

Figure 1: Leech

Types of Leeches:

Depending on their level of toxicity, leeches are divided into poisonous and non-poisonous categories in traditional Indian medicine. Poisonous leeches applied topically might result in myalgia, vomiting, fever, burning sensations, fainting, and swelling and itching in the bitten area [4]. There are no problems when using non-poisonous leeches for bloodletting . Bloodletting is done in India using Hirudo medicinalis, Phylum-Annelida, Class-Hirudinea. These leeches have six longitudinal stripes on their dark body. Their bodies are convex and wrinkled transversely, measuring 2 to 3 inches in length, with tapering ends. Twelve different types of leeches are recognized, with Sanskrit names assigned to each kind.

Table 1. Types of Leeches.

Toxicity	**Varieties**	**Features**
Poisonous (*Savisha*), *Hirudo detrimental*	*Indrayudha Jalauka*	The back's stripes
	Karbura Jalauka	Fish-like, grey, with a segmented, protruding abdomen
	Algarda Jalauka	Large-fanned and hairy
	Samudraka Jalauka	Patterns on the body that are floral and blackish yellow
	Gocandana Jalauka	The lower body is separated into two parts, and the mouth is small.
Nonpoisonous (*Nirvisha*), *Hirudo medicinalis*	*Kapila Jalauka*	The back is oily and slightly green, while the flanks are dark brown with a hint of red.
	Mushika Jalauka	Brown in hue, mouse-like in shape, and foul-smelling
	Krshna Jalauka	Large-headed and black in color
	Pingalla Jalauka	round-bodied, reddish-brown, and swift
	Pundarika Mukhi Jalauka	Broad-mouthed and greenish
	Savarka Jalauka	It is utilized to cure cattle since it is oily, reddish pink, and has a longer body than others.
	Sankumukhi Jalauka	Brown, has a long, pointed mouth, and drinks blood rapidly.

Leeches Modes of Action

Leeches release substances into their saliva that are biologically active. An antiplatelet aggregation factor, an anesthetic, and antibacterial and anti-inflammatory substances are among the approximately 100 different chemicals that make up saliva. Furthermore, hirudin, an anticoagulant present in leech saliva, slows blood clotting and dissolves thrombi, removing both partial and total blockages in distal arteries. When leeches bite their hosts, chemicals in their saliva dilute the blood and enlarge blood vessels. The presence of leeches from hosts is concealed by the simultaneous delivery of a topical anesthetic, which masks any agony from the bite. By absorbing excess blood, leeches promote healing and reduce tissue edema. These microcirculatory processes enable fresh, oxygenated blood to reach the affected areas of the body before the normal circulation resumes.

Lists the main ingredients found in leech saliva.

Table 2. The makeup of leech saliva.

No.	Constituent	Function
1	Hirudin	Stops blood coagulation by attaching itself to thrombin.
2	Calin	Prevents collagen-mediated platelet aggregation and blood coagulation by preventing Von Willebrand factor from attaching to collagen.
3	Hirustatin	Inhibits neuropholic cathepsin G, chymotryptin, tryptin, and kallikrein.
4	Destabilase	Monomerizing action; breaks down fibrin
5	Hyaluronidase	Increases the action of antibiotics and intestinal viscosity.
6	Bdellins	Plasmin, trystin, and acrosin inhibition, anti-inflammatory
7	Eglins	Anti-inflammatory; suppresses α-chymotrypsin chymase, cathepsin G, substilisin, and elastase action.
8	Tryptase inhibitor	Inhibits the host mast cells' proteolytic enzymes
9	Factor Xa inhibitor	Forms equimolar complexes to inhibit coagulation factor Xa activity.
10	Carboxypeptidase-A	Boost the blood flow at the inhibitor bite site.
11	Histamine-like	Vasodilator

Figure 2: Leech applied on knee

The process for applying leech is as follows:

Before-Application Steps

Examining and preparing the patient: Before giving pertinent information regarding the usage of leeches and their actions, the patient's overall health is assessed. Applying leeches in the morning is ideal since they will be fresh and less active. Patients are either supine or seated when the leeches are applied, making sure the affected area is comfortably exposed. Depending on the patients' conditions, oil or sweating therapies were administered the day before.

Leech cleaning:

Leeches are cleaned and made more hungry and capable of sucking blood by applying a paste made of mustard and turmeric before being used. Before being used, the cleaned leeches are stored for thirty minutes in a brand-new jar of water. [17]

Leech Application Procedures:

It is necessary to carefully clean the region with sterile water before applying a leech. Avoid using soap or disinfectant as this can irritate the leech and stop it from adhering. Remove the leech from its jar and place its mouth exactly over the area where the blood has to be extracted.

The leech's tail should be held until it begins to draw blood, and then it should be carefully released. The leech should be softly covered with damp cotton (cotton wool or material)

while it is working. This will stay moist until the very end of the procedure if you apply a few drops of water as needed.

If a leech doesn't want to resist, a drop of milk or ghee put to the injured skin can encourage it to bite. A little skin puncture can also be helpful in encouraging a reluctant leech to start sucking by providing it with a droplet of blood. Should a particular leech still not suck after doing these steps, it ought to be swapped out with a new one. [18, 19] To make the leech bite, place its mouth over a piece of paper that has a small hole in it. This will force the leech to bite the paper.

The leech will be instructed to automatically draw blood from the designated spot as a result. [5] Usually, leeches absorb five milliliters of blood.

The following advice about when to remove leeches is given by Ayurvedic medicine:

•Only dirty blood should be sucked by leeches. When leeches begin to feed on pure blood, they produce symptoms like prickling pain and itching at the bite site. If these signs materialize, the leech should be carefully removed by covering its mouth with turmeric or powdered rock salt (sainthava). [20] Leeches detest these gentle chemicals, which makes them cease sucking in a pleasant manner. These materials were selected since they don't irritate the host or arouse leeches. They are antitoxic and antiseptic as well.
•The leeches should be left to finish on their own if there is no prickling sensation or itching at the bite site.
•The patient's strength and the type of condition will determine the greatest volume of blood that can be extracted from each individual.

Post application Procedures:

•Patient aftercare: Allow blood to stream from the wound for a few minutes after the leech is removed. Next, use satadhauta ghritha, a classic ayurvedic herbal ghee preparation with antiseptic and antibacterial properties, to aide in rehabilitation. Then, for six to twelve hours, the wound is loosely covered. [21] Turmeric powder has antiseptic, antimicrobial, and anti-inflammatory qualities that make it useful for other purposes. [22]
•Leech care: The same leeches can be applied to the same patients more than once, but each time they must be cleansed. The leeches are taken blood, then their mouth parts are covered in rock salt and oil, then rice flour is added. The leeches can regurgitate the blood they have consumed if you massage their body from the tail toward the mouth. Leeches that are kept in water infused with turmeric are also more likely to vomit blood naturally. In India nowadays, this easy technique is extensively used. After their blood is extracted, the leeches are stored in diluted saline, turmeric water, and plain water in that order.
The leeches have regurgitated all of the blood they have swallowed if they are moving violently in the saline. Leeches that stay still at the bottom of the jar should be removed, and they should be made to regurgitate. If this process is not followed exactly, the leeches may get sick and eventually die.
With the cleansed leeches, the previously used jar should be utilized once more. The water in the jar must be replaced every three days to remove any contaminants. Failure to do so could render the leeches toxic and unusable. [23] For a minimum of seven days following application, leeches should not be used.

How does leech therapy work ?

Potent Actions of SGS of Leech

• Anti-inflammatory and analgesic effect - Hyaluronidase, bdellins and eglins

• Blood Thinning effect- Hirudin and hirustasin, tryptase inhibitors

• fibrolytic Activity- fibrinases and Collagenases

• Anti-thrombotic effect-Anticoagulant complex

• Analgesic and anti-inflammatory activity- This is linked to the inhibition of plasma kallikrein's amidolytic and kininogenase activities, which prevents pain alleviation during leech sessions.

• Positive haemopoetic effect.

• Enhancement and restoration of capillary circulation.

• Shown adaptogenic, anti-stressful, and anti-inflammatory properties.

• The lipo-tropal effect: Blood lipids can be affected by the salivary gland enzymes of therapeutic leeches.

• Effects that stimulate and modulate the immune system.

•Enhancement of an intracellular communication system.

• Effect of early wound healing.

• Reduces the blood viscosity.

• Inhibition of platelet functions: When a bite occurs, von Willebrand factor (vWF) binds firmly to the glycoprotein (GP) on platelets, causing bloodsucking. As a result of this binding, platelets adhere to one another to create a plug that stops bleeding. This binding triggers upregulating processes.

Additional potential actions: - Numerous in vitro investigations have demonstrated leech saliva extracts' anticancer properties. Because coagulation plays a role in tumor growth and metastasis, stopping the cascade may have anti-tumor effects. It is also stated that other derivatives of anticoagulants have comparable effects and inhibit tumor growth and cell division.

Indications Not to Use Leech Therapy:

Leeches should not be applied over large, conspicuous veins or immediately to the eyes, breasts, or sexual organs. When utilizing leeches with children, caution should be utilized because bleeding might be severe or prolonged. Applying leeches around noon, evening, or night is not a good idea because this might cause problems like bleeding. [5] Leech therapy should also not be administered to patients who have endoprostheses, anemia, diabetes, leech allergies, immune compromised people, or bleeding diseases including hemophilia or vascular insufficiency. Additionally, using them while pregnant is not advised.

Conclusion:

In summary, traditional leech therapy seems to be effective symptomatic treatment for osteoarthritis of the knee. The active compounds in leech saliva is beneficial in reduction of pain, tenderness, stiffness, crepitus and swelling on the patients of osteroarthritis. With the help of leech therapy we can avoid the hazards of prolong use of analgesic, anti-inflammatory drugs.

Abbreviations:

OA: osterarthritis

FDA: Food and Drug Inspector Administered

RCT: Randomizied Controlled Trials

GP: Glycoprotein

vWF: von Willerbrand Factor

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