



## Clinical Research

## Efficacy of leech therapy in the management of osteoarthritis (Sandhivata)

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### Abstract

Osteoarthritis (degenerative joint disease) is the most common joint disorder. It mostly affects cartilage. The top layer of cartilage breaks down and wears away. Osteoarthritis is of two types, primary (idiopathic) and secondary. In idiopathic osteoarthritis, the most common form of the disease, no predisposing factor is apparent. Secondary OA is pathologically indistinguishable from idiopathic OA but is attributable to an underlying cause. In *Ayurveda* the disease *Sandhivata* resembles with osteoarthritis which is described under *Vatavyadhi*. The NSAIDs are the main drugs of choice in modern medicine which have lots of side effects and therefore are not safe for long-term therapy. *Raktamokshan*, i.e., blood letting is one of the ancient and important parasurgical procedures described in *Ayurveda* for treatment of various diseases. Of them, *Jalaukavacharana* or leech therapy has gained greater attention globally, because of its medicinal values. The saliva of leech contains numerous biologically active substances, which have antiinflammatory as well as anesthetic properties. Keeping this view in mind we have started leech therapy in the patients of osteoarthritis and found encouraging results.

**Key words:** *Jalaukavacharana*, leech therapy, osteoarthritis, *sandhivata*

### Introduction

In *Ayurveda* osteoarthritis can be correlated with *Sandhivata*. The word *Sandhivata* mainly having two parts, *Sandhi* - anatomical aspect and *Vata* - physiological aspect of the body. *Acharya Charaka* has described the disease first separately by the name of "*Sandhigata anila*" under the chapter of *vata vyadhi*. *Acharya Charaka* defined it as a disease, with the symptoms of *sotha*, which is palpable as an air-filled bag (*Vata Purna Driti Sparsha*) and pain on flexion and extension of the joints (*Akunchana Prasaraṇe Vedana*). *Sandhivata* is not described in 80 types of *nanatmaj vata vyadhi*, but it may be related to *Vatakhuddata* (pain in joint). However *Sandhivata* is accepted by *Chakrapani* as *GulphaVata* or *Sandhigata Vata*. *Acharya Madhavakara* has mentioned the symptoms *Hanti Sandhigata*, *Sandhishhula*, and *Sandhishotha*. In this way, the disease *Sandhigata vata* can be defined as a disease of *Sandhi* (joint) with symptoms of *Sandhishhula*, *Sandhishotha*, and *Akunchana Prasaraṇa Pravritti Svedana* and in the later stage *Hanti Sandhigatah*. In

allopathic science the similar condition of joints is explained as osteoarthritis.

Osteoarthritis is also erroneously called degenerative joint disease, which mostly affects cartilage. Cartilage is the slippery tissue that covers the ends of bones in a joint. Healthy cartilage allows bones to glide over each other. It also helps absorb shock of movement. In osteoarthritis, the top layer of cartilage breaks down and wears away. This allows bones under the cartilage to rub together. The rubbing causes pain, swelling, and loss of motion of the joint. Over time, the joint may lose its normal shape. Also, bone spurs may grow on the edges of the joint. Bits of bone or cartilage can break off and float inside the joint space, which causes more pain and damage.

Osteoarthritis is of two types, primary (idiopathic) and secondary.<sup>[1]</sup> In idiopathic osteoarthritis, the most common form of the disease, no predisposing factor is apparent. Secondary OA is pathologically indistinguishable from idiopathic OA but is attributable to an underlying cause.

Worldwide, osteoarthritis is the most common joint disorder. In western countries, radiographic evidence of this disease is present in the majority of persons by 65 years of age and in about 80% of persons more than 75 years of age. Approximately 11% of persons more than 64 years of age have symptomatic osteoarthritis of the knee.

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The nonsteroidal anti-inflammatory drugs (NSAIDs) are the main drugs of choice in modern medicine which have lots of side effects;<sup>[2]</sup> therefore they are not safe for long-term therapy. *Raktamokshan*, i.e., blood letting is one of the ancient and important parasurgical procedures described in *Ayurveda* for treatment of various diseases. Of them, *Jalaukavacharana* or leech therapy has gained greater attention globally, because of its medicinal values. The saliva of leech contains numerous biologically active substances, which has anti-inflammatory as well as anesthetic properties. Keeping this view in mind we have started and evaluated the efficacy of leech therapy in the patients of osteoarthritis.

## Materials and Methods

### Selection of patients

A series of 32 patients with osteoarthritis visiting O.P.D. and I.P.D. of *Kayachikitsa* were selected for the present clinical study from the S.S. Hospital, Banaras Hindu University, Varanasi.

### Inclusion criteria

1. Patients aged 40-80 years.
2. Clinical signs, symptoms, and history of present illness suggestive of osteoarthritis.

### Exclusion criteria

1. Patients having age less than 40 year and more than 80 years.
2. Patients having inconclusive diagnosis.
3. Traumatic arthritis, rheumatoid arthritis, psoriatic arthritis, and gouty arthritis.
4. Patients having cardiac disease, renal disease, and endocrine disorders were excluded in the study to avoid overlapping of symptomatology.

### Criteria for diagnosis: For idiopathic osteoarthritis of the knee

#### Classification-tree format

Knee pain and osteophytes on radiographs or Knee pain plus patient age of 40 years or older, morning stiffness lasting 30 minutes or less and crepitus on motion.

### Research protocol

The research protocol reviewed and approved by our institutional ethics committee, included six study visits. The patients fulfilling the diagnostic criteria were selected for the study and interviewed thoroughly along with their family members and/or relative to obtain detailed information about the patient as well as the disease and collected in different data as follows:

The total duration of treatment was fixed for 6 weeks with the regular weekly follow-ups. The patients registered for the clinical study were not given any medicine internally as well as externally and advised not to take any other drug during the trial period either internally or externally. Each patient advised routine investigation including CBC, RBS, LFT, blood urea, Sr. creatinine, BT, CT, HIV 1 and 2 before the leech therapy. X-Ray of the involved joint is also done to diagnose the disease.

### Gradation of pain by a visual analog scale (VAS)

0-1 - No pain.

- 2-3 - Mild.  
4-5 - Uncomfortable.  
6-7 - Distressing.  
8-9 - Intense.  
10 - Worst possible.

### Gradation of swelling of joints

- 0 - Nil, no swelling.  
1 - Mild, feeling of swelling with heaviness of joints.  
2 - Moderate, apparent swelling.  
3 - Severe, huge swelling.

### Gradation of tenderness of joints

- 0 - Nil, no tenderness.  
1 - Mild, elicited on much pressure.  
2 - Moderate, elicited on moderate pressure.  
3 - Severe, elicited even on slight touch.

### Gradation of restriction of movement

- 0 - Absence of movement restriction.  
1 - <25% restriction of movement.  
2 - 25-50% restriction of movement.  
3 - >50% restriction of movement.

### Gradation of stiffness

- 0 - Nil, no morning stiffness.  
1 - Mild, morning stiffness of 5-10 minutes duration.  
2 - Moderate, morning stiffness of 10-15 minutes duration.  
3 - Severe, morning stiffness of 10-30 minutes duration.

### Gradation of crepitus

- 0 - Absence of crepitus.  
1 - Mild, perception on touch.  
2 - Moderate, audible on attention.  
3 - Severe, clearly audible.

### Leech therapy

Out of 12, only 6 varieties of nonpoisonous leeches are used for medicinal purpose.<sup>[3]</sup> The *Sankumukhi* type of leech is preferably used for medicinal purposes due to its rapid blood sucking capacity. As per classical description of *Ayurveda*, the leech neither too long, nor too small should be preferred for therapeutic purposes.

Leech should be stored in a well-labeled container having multiple pores on the top for proper aeration. The temperature should be maintained around 5-27°C (40-80°F). The water of the container should be dechlorinated and should be replaced after 5-6 days. About 50 leeches can be kept in one gallon (4l) of water. If it is not possible to get the dechlorinated water, then keep the container of chlorinated water open in the air for a period of time and then use it for storage of leech. It is better to avoid direct exposure of sunlight to the leeches.

### Method of application

#### Purva karma

- Proper *snehana* (oleation) and *swedana* (sudation) of the patient.
- Purification of leech by pouring the leech in water mixed with turmeric powder.
- Part preparation – cleaning of part of the body to which leech is going to be applied.

**Pradhana karma**

- Before application prick the skin with a sharp and sterile needle so that the drop of blood comes out and then apply the leech through its front end and cover the leech by wet cotton. If the leech is not ready to suck the blood from the body part, then application of *madhu*, *ghrita*, or butter should be done.

**Observation of leech**

1. Gradual distention in the central portion of the body.
2. Itching and burning sensation at the site of bite.
3. Pulsations on the body of leech may be visible.

**Removal of leech**

After 30-70 minutes the leech is removed by itself, or by application of turmeric powder on the mouth of leech.

**Paschata karma**

- Care of wound - After detachment of leech there is triangular wound created by the mouth of the leech. The blood comes out from the wound. The bleeding from wound is checked by application of *Yastimadhu* or turmeric powder.
- Induction of emesis - The leech that is applied to the lesion undergoes the process of *vaman* so that the same leech can be applied next time to the same patient. For the *vaman* of leech turmeric powder is applied over the mouth of the leech. The leech vomits out all the blood sucked by it to get purified. Sometimes pressing of the leech from caudal to front-end is required for proper emesis. After proper *vamana* leech should be put in fresh water, where it swims swiftly and than settles down. Replace the leech in a clean jar or aquarium.

**Contra indication of leech therapy**

1. Blood clotting disorder.
2. Severe anemia.
3. Allergic reaction to active substances of the leech such as hirudin, calin, hyaluronidase, eglina, kollagenage, apyrase, destabilase, piyavit, etc.
4. Human with weak constitution.
5. Pregnancy.

**Precautions during leech application**

1. Bleeding and clotting time of the patient should be normal.
2. Gentle handling of the leech.
3. Cover the leech with wet cotton.

**Frequency of leech application**

The frequency of leech application will vary according to the disease and severity. Generally leech should be applied once in a week up to six sittings. One leech should be reserved for a particular patient to avoid cross infection.

**Parameters of assessment**

1. Estimation of pain by visual analog scale (VAS).
2. By assessing other symptoms.
3. Radiological assessment.
4. Side effects of the leech therapy.

**Observations and Results**

During the whole study period it has been observed that pain and

stiffness start decreasing after the first sitting of leech therapy and after the last follow-ups there is a significant decrease in symptoms including pain, stiffness, and tenderness. The scar of the leech bite is also observed on the bite site but it becomes clear in 2-3 weeks after the completion of last sitting of leech therapy. In some patients itching is also observed and subsided after 2-3 hours of removal of leech. The bleeding of the bite site is also observed up to more than 1 hour in few cases. No radiographical changes occur after completion of the study.

All statistical analysis is done by the Student unpaired *t*-test. A “*P*” value <0.001 was considered to be statistically highly significant. The “*P*” value >0.05 was considered to be nonsignificant. Results are shown in the Tables 1-6.

Of 40 patients interviewed, only 32 patients were registered after detailed examination for the study.

After six weeks the visual analog pain score reduced from  $4.28 \pm 0.73$  to  $0.81 \pm 0.64$  ( $t = 24.45$ ,  $P < 0.001$ ). The tenderness scale also reduced from  $1.84 \pm 0.72$  to  $0.93 \pm 0.30$

**Table 1: The effect of leech therapy on pain in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired <i>t</i> -test)
	Before leech therapy	After leech therapy	
Pain (VAS)	$4.28 \pm 0.73$	$0.81 \pm 0.64$	$3.47 \pm 0.80$ $t = 24.45$ $P < 0.001$

**Table 2: The effect of leech therapy on tenderness in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired <i>t</i> -test)
	Before leech therapy	After leech therapy	
Tenderness	$1.84 \pm 0.72$	$0.93 \pm 0.30$	$1.75 \pm 0.76$ $t = 12.99$ $P < 0.001$

**Table 3: The effect of leech therapy on swelling in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired <i>t</i> -test)
	Before leech therapy	After leech therapy	
Swelling	$1.38 \pm 0.49$	$0.22 \pm 0.42$	$1.16 \pm 0.63$ $t = 10.42$ $P < 0.001$

**Table 4: The effect of leech therapy on stiffness in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired <i>t</i> -test)
	Before leech therapy	After leech therapy	
Stiffness	$1.72 \pm 0.46$	$0.22 \pm 0.42$	$1.50 \pm 0.50$ $t = 16.70$ $P < 0.001$

**Table 5: The effect of leech therapy on restriction of movement in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired t-test)
	Before leech therapy	After leech therapy	
Restriction of movement	2.00 $\pm$ 0.36	0.19 $\pm$ 0.40	1.81 $\pm$ 0.40 $t = 25.86$ $P < 0.001$

**Table 6: The effect of leech therapy on crepitus in patients of osteoarthritis (n = 32)**

Symptoms	Mean $\pm$ SD		Within-group comparison (paired t-test)
	Before leech therapy	After leech therapy	
Crepitus	1.75 $\pm$ 0.67	0.44 $\pm$ 0.67	1.31 $\pm$ 0.47 $t = 15.77$ $P < 0.001$

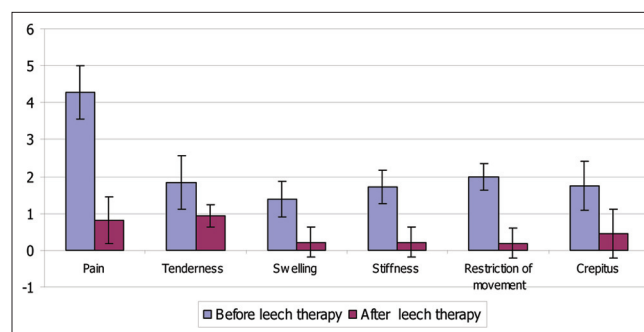
( $t = 12.99$ ,  $P < 0.001$ ). Swelling of the knee joint reduced from  $1.38 \pm 0.46$  to  $0.22 \pm 0.42$  ( $t = 10.42$ ,  $P < 0.001$ ). Stiffness of the joint also reduced from  $1.72 \pm 0.46$  to  $0.22 \pm 0.42$  ( $t = 16.70$ ,  $P < 0.001$ ). Restriction of the movement reduced from  $2.00 \pm 0.36$  to  $0.19 \pm 0.40$  ( $t = 25.86$ ,  $P < 0.001$ ). Crepitus of the joint also reduced after six weeks from  $1.75 \pm 0.67$  to  $0.44 \pm 0.67$  ( $t = 15.77$ ,  $P < 0.001$ ) [Figure 1].

## Discussion

*Ayurveda* describes many paramedical procedures and *Jalaukavcharana* is one among them. Though not in much use in the present times, it was one of the important and much emphasized procedures carried out as a last resort to treat various diseases. The ancient authors *Charaka* and *Sushruta* treated successfully many incurable wounds and other medical conditions such as *Kustha*, *Switra*, *Vatarakta*, *Sandhigatavata*, etc. by the application of leeches. Since long-term therapy for osteoarthritis of the knee has limited options and treatment carries substantial risk for serious adverse effects,<sup>[4]</sup> new therapeutic approaches should be considered. Leech therapy, although extensively used for treating pain throughout the medical history,<sup>[5]</sup> has never been evaluated in a modern scientific context.

Different mechanisms may explain the observed effects. First, various pharmacologically active substances besides the thrombin-inhibitor hirudin have been found in leech saliva, such as histamin-like vasodilators, kallikrein, and trypsin inhibitors, various other proteinase inhibitors, and anesthetics.<sup>[6-9]</sup> Through the concomitant activity of a further leech saliva component, hyaluronidase,<sup>[10]</sup> these substances might reach deeper tissue zones and possibly the joint space. However, it is not clear whether pain relieving therapy in osteoarthritis needs to affect the cartilage and subchondral bone directly. The various bioactive substances in leech saliva may also be as pharmacologically potent as hirudin and thus exert substantial effects in periarticular tissue and adjacent structures.

Second, nociceptive activation contributes to chronic pain.<sup>[11]</sup> Leech therapy could induce pain relief through antinociceptive

**Figure 1: Comparison of symptoms before and after the Leech therapy**

effects and counter irritation. However, it is not known to what extent leech bites may induce such mechanisms, and it seems unlikely that reduction of nociceptive input on a single occasion would result in the observed lasting effect, such as improved joint function.

Third, placebo effects might be responsible for the symptomatic benefit. The principal limitation of this study is that the placebo-like effects of this invasive and uncommon treatment cannot be precisely assessed.

Leech saliva also contains some anesthetic substances. Probably these substances help to decrease the symptoms such as pain and tenderness.

The antiinflammatory substances such as bdellins and eglins are helpful in reduction of inflammation by virtue of which swelling of the joint also decreases. When the inflammation of the joint decreases, pain also decreases; therefore the restriction of the joint also decreases.

Leech saliva also contains hirudin-, calin-, and destabilase-like substances which increase microcirculation by decreasing the blood viscosity. Carboxypeptidase A inhibitor increases the inflow of blood at the bite site. Histamine-like substances are also present in leech saliva which act as a vasodilator. By this way these substances that are present in leech saliva increase the microcirculation, decrease the inflammation as well as stiffness and restriction of movement of the joints.<sup>[12]</sup>

Leech therapy improves the quality of life of patients. Because NSAIDs are the drugs of choice, in patients of osteoarthritis which have lots of side effects. Using leech therapy we can avoid the hazard of analgesic drugs.

## Conclusion

In summary, traditional leech therapy seems to be an effective symptomatic treatment for osteoarthritis of the knee. The active compounds in leech saliva and their local release (that is, in the synovial fluid) deserve a further study. Currently, no pharmacologic agent has similar lasting effects after a single local administration. Further research into the antiinflammatory compounds of leech saliva could lead to the development of new effective substances for treating osteoarthritis.

On the basis of the above pilot study we can conclude that leech therapy is beneficial in reduction of pain, tenderness, stiffness, crepitus, and swelling in the patients of osteoarthritis.

With the help of leech therapy we can improve the quality of life of the arthritis patients. We can avoid the hazards of prolong use of analgesic, antiinflammatory drugs by using leech therapy.

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## हिन्दी सारांश

# संधिवात में जलौकावचारण के प्रभाव का चिकित्सकीय अध्ययन

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संधिवात बड़ी सन्धियों में पाया जाने वाला एक मुख्य विकार है। इस रोग में रोगी मुख्यतः दर्द निवारक दवाओं का सेवन करता है, जिससे शरीर पर अनेक प्रकार के दुष्प्रभाव पाये जाते हैं। प्रस्तुत अध्ययन संधिवात के ३२ रोगियों में जलौकावचारण के चिकित्सकीय प्रभाव को वैज्ञानिक मापदण्डों पर स्थापित करने हेतु किया गया। इन रोगियों में छः सप्ताह में छः वार जलौकावचारण किया गया। इस अवधि में संधिवात के लक्षणों में कमी पायी गई एवं इसका शरीर पर कोई भी दुष्प्रभाव नहीं पाया गया।