



Research Article

PHYSIOLOGY OF PAIN AND ITS MANAGEMENT IN AYURVEDA W.S.R. TO *JALAUKAVACARANA*

Shubham D.Pokharna^{1*}, Ravindra S.Dhimdhime², Yogesh Shevale³

*¹PG Scholar, ²Professor &H.O.D, ³Associate Professor, Department of Kriya Sharir, Government Ayurvedic College, Dharashiv, Maharashtra, India.

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ABSTRACT

Pain is the most common symptom; it is universally accepted as a signal of disease that brings the patient to a physician's attention. It is a sensation in which additional factors like mental or spiritual distress can cause the same overarching sensation as a physical damage. Anxiety is a common side effect of any pain, whether mild or severe. It interferes with the patient's daily routine. Patient gets apprehensive or concerned about getting pain relief. It is generally known that NSAIDs can have serious side effects, which are mostly attributed to their underlying mechanisms of action. NSAIDs like indomethacin, ibuprofen, diclofenac, naproxen, aspirin, causes damaging action upon the stomach and intestine due to their acidic nature. While the selective COX-2 inhibitors cause significant adverse effects in the renal and cardiovascular systems, possibly more serious than those caused by conventional NSAIDs. Leech therapy or *Jalaukavacarana*, universally accepted around the globe, is an integral part of Ayurvedic medicine especially *Panchakarma*. Although not directly indicated for pain-management in Ayurveda texts, various studies have identified the presence of analgesic enzymes in leech's saliva that can be effective in pain management in musculoskeletal disorders. So purpose of this article is reduce the use of NSAIDS and avoid there adverse effect and use new emerging Ayurvedic methods.

INTRODUCTION

Ayurveda is "The Science of Life". A science that studies the physiological and pathological conditions of the human body. Ayurveda is *Upaveda* of *Atharvaveda*. Originally there are four *Vedas*; *Rigveda*, *Yajurveda*, *Samaveda*, and *Atharvaveda*. These *Vedas* include topics like health, astrology, spiritual business, poetry and ethical living etc.

इह खलु आयुर्वेदं अष्टंगम् उपटंगम् अथर्ववेदस्य । (सु. सू. १/६)

Pain is the most common symptom; it is universally accepted as a signal of disease that brings the patient to a physician's attention. It is a sensation in which additional factors like mental or spiritual distress can cause the same overarching sensation as a physical damage.^[1] Anxiety is a common side effect of

any pain, whether mild or severe. It interferes with the patient's daily routine. Patient gets apprehensive or concerned about getting pain relief.

Rheumatic or musculoskeletal conditions comprise over 150 diseases and syndromes, which are usually progressive and associated with pain. They can be broadly categorized as joint diseases, physical disability, spinal disorders, and conditions resulting from trauma. Musculoskeletal et al. conditions are leading causes of morbidity and disability, giving rise to enormous healthcare expenditures and loss of work. Symptomatic OA affects approximately 10% of men and 18% of women over 60 years of age, while RA affects between 0.3 and 1% of adults worldwide.^[2]

NSAIDs like indomethacin, ibuprofen, diclofenac, naproxen, aspirin, causes damaging action upon the stomach and intestine due to their acidic nature.^[5]

While the renal and cardiovascular systems are affected negatively by selective COX-2 inhibitors, these effects are likely more severe than those brought on by traditional NSAIDs.^[6] As they do not treat the ailment but rather render the patient dependent on the medication, these reimbursements in the form of side

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effects cannot be justified. Reviewing scenario mentioned above, need of a pain management protocol other than conventional NSAIDs use arises as an emergent subject, which must be safe as well as economical.

In the recent years, various novel approaches have been given by Ayurveda and Yoga system of medicine^[7-10] still most of them are neither adopted by the doctors nor by the patients. The reason behind this appears to be therapy's long duration protocol as the common mass in today's lifestyle wants effective as well as a fast-acting remedy for their complaint. Although, Ayurvedic texts are filled with various treatment modules including *Panchakarma* (five bio purificatory measures of Ayurvedic medicine) along with many herbo-mineral drugs which are also proved by various trials^[8] to be effective in musculoskeletal disorders still they are not able to provide pain management in a short duration. Again, this limitation diverts the patients towards the "pain relieving" NSAIDs.

Leech therapy or *Jalaukavacarana*, universally accepted around the globe, is an integral part of Ayurvedic medicine especially *Panchakarma*. Although not directly indicated for pain-management in Ayurveda texts, various studies have identified the presence of analgesic enzymes in leech's saliva^[11] that can be effective in pain management in musculoskeletal disorders. Also, there is no study which shows its efficacy in pain management irrespective of the site and pathology involved. This trial was conducted to compare the efficacy of leech application as a substitute to the NSAIDs so that if found effective, leech therapy can be used as the pain management method along with primary treatment of that particular musculoskeletal disorder. *Jalaukavacarana* is the ancient technique used for *Raktamokshana*, here *Jalauka* means leeches and *Avacharana* means application. *Jalauka* is one of the tools for *Raktamokshana*, among *Shring*, *Alabu* and *Prachhana* where *Jalauka*, *Shring*, *Alabu* are used for *Pitta*, *Vata*, *Kahpa Doshaj Vyadhi* respectively. *Jalaukavacarana* (leech therapy) is a non-surgical type of *Raktamokshana* and considered as the most unique and effective method of bloodletting. A lot of research work has been carried out in Ayurveda and modern medicine to prove efficacy of leech therapy in variety of pain management.

Ancient history suggests that lord *Dhanwatari* evolved in this world after *Samudra manthan* with *Jalauka* along with a pitcher filled with nectar in its hand. This demonstrates the significance of *Jalauka* in Indian medicine. They are known as "*Jalauka*" because the water is either their way of life or they are accustomed to it. *Raktamokshana* is indicated in treatment of *Rakatajroga*. Individuals with aggravated

imbalance between *Rakta* and *Pitta dosha* and high level of toxicity are recommended for *Raktamokshana* therapy. Since ancient times, Ayurvedic doctors have used leech therapy. At the end of the 19th century use of leeches began to be less prevalent due to discontinuity in flow of knowledge. Leech therapy reemerged at the end of the 19th century as a result of its function as constructive surgery. Leech therapy is widely used in plastic and reconstructive microsurgery as the protective tool against venous congestion. *Raktamokshana* is also used as regimental therapy for purification of vitiated body humours and should be done in autumn season. *Pracchana*: letting the blood pass through several incision and second is *Siravedha* also known as venipuncture, this include *Jalaukavacarana*, *Alabu* and *Shringa*.

Out of these procedures *Jalaukavacarana* is the safest as no sharp instrument is used in this therefore this can be safely used in delicate people. *Jalauka* is commonly habituated in *Jala*, so it is cold in nature and commonly used in *Raktaj* and *Pittaj roga*. There are a total twelve types of *Jalauka* described in Ayurvedic text.^[12] These twelve types are categorized into two main types based on their therapeutic use. *Jalauka* which are fit for therapeutic purposes are called *Nirvish Jalauka*, these were further sub-classified into six types each. The *Nirvish Jalauka* are *Pingla*, *Shankhamukhi*, *Mushika*, *Pundarikamukhi* and *Savarika*.

Savish Jalauka are *Jalauka* that are unfit for therapeutic use. These were each further divided into six categories. *Krishna*, *Karbura*, *Algarda*, *Indrayudha*, *Samudrika*, and *Gochandana* are the *Savish Jalauka*. The sole *Nirvish Jalauka* can be used medicinally. The proper identification of *Nirvish Jalauka* is very essential to avoid the use of *Savish Jalauka*. *Nirvish Jalauka* are identified on the basis of their breeding grounds, their characteristic appearance and behaviour, which are described in Ayurveda text.

In Sushruta Samhita, it is described in detail. The collection of leeches is very simple. Leeches can be captured using a piece of wet leather in tanks, streams, and areas with lotuses, according to Acharya Sushruta. The fresh meat of dead animals, fish, or milk must be placed to the thigh of an animal or the human being themselves may do so and then submerge the leg in water for a period of time to gather leeches. *Jalauka* will draw attention to the area and seize it. Apply rock salt (*Saindhava*) to the skin of the person to eliminate them, and then gather.^[22] Acharya Dalhana has mentioned that the best time for collecting leeches is *Sharad Ritu* (autumn). On every third day, the water should be changed, and feeding should be dropped inside the pot. The pot needs to be changed after seven days. According to Acharya Vagbhata, the pot needs to be changed every five days.^[23]

Classification of Leeches

Venomous Species are Named

Krishna, Karvura, Alagarda, Indrayudha, Samudrika and Gochandana^[13].

Non-Venomous Species are Named

Kapila, Pingala, Shankhamukhi, Musika, Pundarimukhi and Savarika^[13].

Physiology of Pain

Pain is a subjective sensation. It occurs when tissues are being damaged and causing the person to remove the pain stimulus. Thus, pain is a protective mechanism of the body.

The body's pain receptors are spread throughout. The neuroanatomical basis of pain was recognized following identification of spinal nerve roots and the existence of medullary pathways specialized for pain. There is a multi-synaptic pathway system which relays in the reticular formation of the brainstem. Stimulation of these pathways causes perception of pain at the cortical and subcortical levels.^[13]

Thermal, chemical, or electrical stimuli for pain may be combined with additional factors like fear, discomfort, and autonomic alterations.

Types of Pain

1. Superficial/ cutaneous pain
2. Deep pain (muscle, bone, joints)
3. Visceral pain
4. Referred pain
5. Psychogenic/ functional pain

Superficial/Cutaneous pain ^[14]: The stimulus is structural damage; localization is fairly accurate. It is of two types-

- a. **Epicritic**: Which is low threshold and requires lighter stimulus.
- b. **Protopathic**: Which is high threshold and requires stronger stimulus.

Deep pain: It arises from deeper structures like muscle, bone, joints, ligaments etc. The cause may be ischemia or injury. The localization is more accurate when site of origin is nearer the surface.

Visceral pain: Compared with somatic pain, visceral pain is diffused, less easily localized and often referred. It may be accompanied by either rise or fall in B.P. Muscular rigidity and hyperesthesia is commonly associated with visceral pain.

Referred pain: Deep pain whether visceral or somatic may be misinterpreted as coming from some part of the body other than the site of origin. Reference of cardiac pain to left shoulder or diaphragmatic pain to the shoulder are well known example.

Psychogenic/Functional pain: A psychogenic basis for pain can be inferred when no satisfactory organic cause for it can be found and its distribution does not

accord with a known anatomical pattern. Pain can be qualitatively classified as-

1. Pricking pain
2. Burning pain
3. Aching pain

Burning pain and aching pain results from stimulation of C-Fibers whereas, pricking pain results from stimulation of Ad-fibers.

Procedure Review

Poorva karma (Pre-procedural)

During the study, the patient was advised to stop all the prescribed medicine seven days before the leech application. Leeches were maintained starve. The medicinal leeches belong to the Hirudomedicinalis were selected to the study (Fig-1 & 2). Leeches having suckers, pigmentation of green gram on dorsal surface with two pair of black longitudinal lines with black Para interrupted lines, orange on ventral side of the body with yellow longitudinal line on the side border of the body were the main signs for detection of Hirudomedicinalis species for the therapy. Wound was washed with normal saline. Leeches were kept in *Haridra* water for activation and rinsed with clean water.

Pradhan Karma (Main procedure)

Then, prepared active leeches were left on top of the bloody surface. When leech started sucking blood, the wet cotton pad was placed over it that used to suck 30-50ml of blood individually. The leeches were applied over/nearby most tender points on the joint/site.

Observation of Leech

1. Gradual distension in the central portion of the body.
2. Itching and burning sensation at the site of the bite.
3. Pulsations on the body of leech may be visible.
4. Removal of leech: After 30-70 minutes the leech is removed by itself, or by application of turmeric powder on the mouth of the leech.

Paschata Karma (Post-procedural)

Care of Wound: A triangle wound caused by the leech's mouth remains after the leech has been detached. The wound is bleeding as you look at it. The bleeding from the wound is checked by the application of tight bandaging with the use of *Yastimadhu* or turmeric powder.

Induction of emesis the leech that is applied to the lesion undergoes the process of *Vamana* so that the same leech can be applied next time to the same patient. For the *Vamana* of the 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 leech from caudal to the front end is required for proper emesis.

Precaution during Leech Application

- BT and CT, HB%, Viral markers of patient should be normal
- Gentle handling of leech
- Cover the leech with wet gauze/cotton

Indications of Jalaukavacarana

According to Ayurvedic classics

- Vidradhi* (abscess)
- Gulma* (abdominal lump)
- Arsha* (haemorrhoid)
- Kustha* (skin diseases)
- Vatarakta* (gout)
- Krostuka shirsha* (inflamed knee)
- Sandhigata roga* (joint disorder)
- Kanthagat roga* (diseases of throat)
- Netra roga* (diseases of eye)
- Granthi* (cyst)
- Arbuda* (tumor)
- Shleepada* (filariasis)
- Vidarika* (swelling in the axilia or groin)
- Visarpa* (erysipelas)
- Siroroga* (diseases of head)
- Dantveshta* (pyorrhoea alveolaris).^[25]

Contraindications of Jalaukavacarana

According to Ayurvedic classics

- Sarvanga shoth* (Anasarca)
- Udar roga* (abdominal swelling)
- Shosha* (desiccant)
- Ksheena* (emaciation)
- Garbhini* (pregnancy)
- Pandu* (Anaemia)^[24]

MATERIALS AND METHODS

Materials

Literary Source

1. Classical text books
2. Articles from internet, journals and other published works
3. Related source of data from internet

Clinical Source

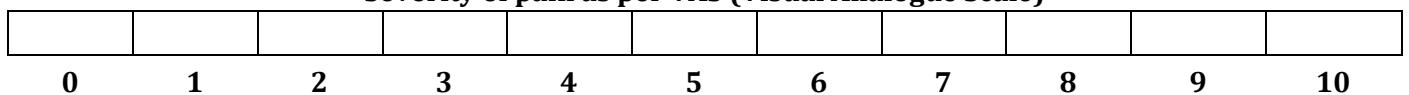
Different patients having different pain (like shoulder pain, knee joint pain etc.) back pain, neck pain with tenderness were selected by random sampling method from OPD of our hospital.

Instruments

- Kidney trays
- Normal water

Pain

Severity of pain as per VAS (Visual Analogue Scale)



Grading of pain according to VAS

Pain score	Grade
0	No pain
1-3	Mild pain

- Powder of *Haridra* (*Curcuma longa* Linn.) and *Maduyasti* (*Glycyrrhiza glabra*L)
- Decoction of *Triphala* (*Terminalia bellirica*, *Terminalia chebula*, *Emblica officinalis*.)
- Two medicinal leeches (*Hirudo medicinalis*)
- Cotton pads

Methods

Study Design: Clinical trial study in the comparative manner containing following two groups;

Group A: Etoricoxib tablet 90mg (ETROBAX by Ranbaxy Laboratories Ltd.) once a day for nine days in the morning, after breakfast (controlled group).

Group B: 3 sittings of leech therapy after every Seven-day interval (Experimental group).

Sample Size: Total 20 patients, 10 patients for each group mentioned above.

Sampling Method: 20 patients having different joint pain were selected by random sampling procedure.

Selection Criteria

1. Patients were selected with irrespective of sex, religion, occupation and socio-economic status.
2. Patients fulfilling the inclusive criteria.
3. Patients willing to participate in the study were selected by explaining them interventions in detail.

Inclusive Criteria

1. Patients of either sex.
2. Between age group 30-70 years.
3. Patients irrespective of caste, religion, economical status.
4. IPD and OPD patients of Government Ayurved Hospital, Dharashiv.
5. All patients having pain or musculoskeletal pain.

Exclusive Criteria

1. Patients of age below 20 years and above 70 years are excluded.
2. Patients suffering from major trauma having dislocation or fracture.
3. Patients suffering from any major systemic disorders like HTN, IHD.
4. HIV, HBsAg reactive patients are also excluded.

Criteria for Assessment

Assessment of the patients was done based on the symptomatic score

Symptomatic Score

Pain assessment was done based on visual analogue score (VAS) ranging from 1-10 graded by the patient only.

4-6	Moderate pain
7-10	Severe pain

Tenderness was graded on the basis of Ritchie articular index^[26]

Grade 0- Normal-absent or non-tender

Grade 1- Mild-tender

Grade 2- Moderate-tenderness and wincing

Grade 3- Severe-tenderness

OBSERVATION AND RESULTS

The study was conducted on 20 patients of either sex belonging to age between 20 and 70 years. The patients were randomly divided in two groups as follows;

Table: Procedure and number of patients in each group

Group	No. of patients	Procedure
A (Control)	10	Tab. ETROBAX 90mg
B (Experimental)	10	<i>Jalaukavacarana</i>

The experimental group was treated by performing *Jalaukavacarana* and the control group was treated by Tab. Etrobax 90 mg.

Both the groups were treated for 21 days. The follow up was taken once a week for three weeks.

Changes in Tenderness**Group A**

OPD No.	Age	Sex	Before treatment	After treatment
1633	43	Male	Grade 4	Grade 4
1634	38	Female	Grade 4	Grade 3
1705	27	Male	Grade 4	Grade 4
1710	30	Female	Grade 4	Grade 4
1780	41	Male	Grade 4	Grade 2
1789	26	Male	Grade 4	Grade 4
1806	52	Female	Grade 4	Grade 4
1817	33	Male	Grade 4	Grade 3
1897	44	Female	Grade 4	Grade 4
1922	57	Female	Grade 4	Grade 4

Group B

OPD No.	Age	Sex	Before treatment	After treatment
1522	27	Male	Grade 4	Grade 2
1529	38	Male	Grade 3	Grade 1
1672	40	Male	Grade 4	Grade 1
1709	38	Male	Grade 4	Grade 1
1793	35	Female	Grade 4	Grade 2
1812	46	Female	Grade 4	Grade 2
1859	59	Male	Grade 4	Grade 1
1907	24	Female	Grade 4	Grade 1
1975	53	Female	Grade 4	Grade 2
1999	62	Female	Grade 4	Grade 1

Changes in Pain**Group A**

OPD No.	Age	Sex	Before treatment	After treatment
1633	43	Male	9	9
1634	38	Female	8	8
1705	27	Male	8	8
1710	30	Female	8	8

1780	41	Male	9	8
1789	26	Male	9	8
1806	52	Female	7	7
1817	33	Male	9	8
1897	44	Female	7	7
1922	57	Female	8	8

Group B

OPD No.	Age	Sex	Before treatment	After treatment
1522	27	Male	8	2
1529	38	Male	6	1
1672	40	Male	9	3
1709	38	Male	8	2
1793	35	Female	9	2
1812	46	Female	9	3
1859	59	Male	7	2
1907	24	Female	7	4
1975	53	Female	8	3
1999	62	Female	9	2

DISCUSSION

Ayurvedic Aspect

The discussion is very important in every aspect of life to add new dimensions and thereby improving its understanding. Any theory or study is accepted only after the proper reasoning of the observations. The present study entitled 'Physiology of Pain and its Management in Ayurveda w.s.r. to Jalaukavacarana' was done on total 10 patients in two groups, each group having 5 patients. Group A (control group) was treated with tab. ETROBAX 90mg whereas Group B (experimental group) was treated with Jalaukavacarana'.

Pain: The visual analogue scale for pain was significantly improved in experimental group at the end of the treatment, and it is not significantly improved in control group.

As the pain was the primary inclusion criteria for this study, the majority of the patients who got registered in the study were suffering from either osteoarthritis or rheumatoid arthritis involving at least one knee joint. Results obtained during the period of intervention better in the patients who got treated with Etoricoxib in comparison to the patients who were given leech therapy as an intervention. Pain reduction was consistent in patients treated with leech therapy while on intervention withdrawal, the pain worsened again in the patients who were given Etoricoxib.

As said by Ayurveda stalwarts, pain doesn't occur without vitiation of *Vata*. For *Vata* vitiation, there must be either *Dhatu Kahaya* or *Margavarodha*, and due to a modern lifestyle in the majority of patients, *Vata* vitiation mostly occurs due to

Srotavarodha or *Margavarodha*. This *Srotavarodha* or blockage of channels primarily occurs due to the stagnation of *Kapha/Rakta* or *Pitta*. Leech therapy removes vitiated *Rakta* and/or other *Doshas*, which in turn leads to *Srotoaodhana* (clearance of blocked channels) at that particular site and nearby area. *Srotoodhana* causes *Anulomana* (proper movement) of stuck or vitiated *Vata* locally. Due to the *Anulomana* of *Vata*, its primary symptom, pain gets relieved. This can be a reason behind this analgesic action of leech therapy

Modern Aspect

According to modern science, also according to the modern science, leech application not only removes blood from that site but also injects biologically active substances which help to manage various ailments. It injects anti-inflammatory, analgesic, and bacteriostatic substances like hirudin, hyaluronidase, histamine like vasodilators, inhibitors of kallikrein, superoxide production and poorly characterized anaesthetics and analgesic compounds with its saliva which can be helpful in subsiding inflammation and pain.^[26] These substances might reach deeper tissue zones and possibly the joint spaces. Various bioactive substances in leech saliva may also be as pharmacologically potent as hirudin and thus exert substantial effects in peri-articular tissue and adjacent structure.^[27] A study has proven that leech application causes a significant increase in superficial skin perfusion, especially 16 mm around the biting zone.^[28] Therefore, it can be assumed that reason for the improvement in pain and inflammation might be a regional analgesic and antiphlogistic effect by these substances enforced by hyaluronidase. Also,

the antinociceptive effect may also be assumed responsible for pain relief, although no proven justification is available till now. As after bite, biologically active substances present in leech saliva enters the superficial blood, further reaching deep tissues and joint spaces. Hyaluronidase present in leech saliva further facilitates the penetration and diffusion of these substances into the tissues. Due to this enzyme, it is highly probable that the antiphlogistic substances in leech saliva can penetrate deep enough to exert significant effects on periarticular myofascial structures and perhaps even on intra-articular structures.^[29] Removal of venous congestion can be another assumption regarding mode of action of Leech therapy. As after leech bite following primary suction of blood by a leech, secondary oozing occurs of a few minutes to hours. This primary sucking and passive-oozing phase of leech therapy decreases venous congestion in the joints. In addition to this, a broad number of anticoagulant agents decrease venous congestion such as the thrombin inhibitor hirudin, apyrase, collagenase, hyaluronidase, Factor Xa inhibitor and fibrinase one and two.^[30] This theory also justifies the process of *Srotoodhana* by leech therapy as discussed earlier. Secondary bleeding for a few

minutes to hours, due to hirudin, causes the removal of toxins along with increased circulation to that particular area. A healthy cell gets sick when it is deprived of needed oxygen and nutrition and is unable to remove toxins accumulated during metabolism. Biologically active substances in leech saliva help the cells to absorb necessary nutrition and eliminate toxins.

CONCLUSION

Present work was a pilot study conducted with very small sample size. Still, it suggests that leech application reduces the pain to a significant level and improves quality of life of the patient without any ill effect. More large sampled trials are required to justify these results.

Although, based on this study it can't be concluded that leech therapy can replace the primary treatment of RA or OA as per modern or Ayurvedic texts because clinician should aim for the treatment of the main pathology instead of treating a particular symptom. But leech therapy can be a substitute for overused NSAIDs, and it can be accompanied either with herbal/herbo-mineral drugs and *Panchakarma* therapy or with modern medicines.



Fig.1: Multiple Leeches in Bottle



Fig.2: Single Leech in Bottle



Fig. 3: Leech Apply Behind Pinha



Fig.4: Apply on Lateral Aspect of Greater Toe



Fig. 4: Leech apply Below Lower Lip

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***Address for correspondence**

Dr. Shubham D.Pokharna

PG Scholar

Department of Kriya Sharir,
Government Ayurvedic College,
Dharashiv, Maharashtra.

Email:

shubhampokharna39@gmail.com

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