

Effect of *Jalaukavacharana* (Leech Therapy) in the Management of Carpal Tunnel Syndrome with Special Reference to *Khalli* (*Snayugata Vata*): A Case Study

Simranjot Kaur *, Akshay Khanna and Priyanka Kumari

Department of Panchakarma, Dayanand Ayurvedic College, Jalandhar, Punjab, India.

World Journal of Advanced Research and Reviews, 2026, 30(02), 1573-1582

Publication history: Received on 08 April 2026; revised on 16 May 2026; accepted on 18 May 2026

Article DOI: <https://doi.org/10.30574/wjarr.2026.30.2.1384>

Abstract

Background: Carpal Tunnel Syndrome (CTS) is the most common peripheral neuropathy caused by compression of the median nerve at the level of the wrist, resulting in pain, numbness, tingling sensation and functional impairment of the hand. Although there is no direct description of Carpal Tunnel Syndrome in classical *Ayurvedic* texts, the clinical features closely resemble *Khalli*, a *Vata-pradhana* disorder characterized by pain, stiffness, cramps and sensory disturbances affecting the extremities, including the wrist joint. In contemporary medical practice, management of CTS primarily includes analgesics, anti-inflammatory medications, splinting and local liniments, which provide only temporary symptomatic relief. Surgical decompression is often advised in chronic or severe cases.

Aims and Objectives: The aim of this study was to evaluate the therapeutic efficacy of *Raktamokshana* in the form of *Jalaukavacharana* in the management of Carpal Tunnel Syndrome W.S.R *Khalli* (*Snayugata Vata*) and to assess its role in reducing pain, numbness and improving the functional ability of the hand.

Methodology: A 40-year-old female patient diagnosed with Carpal Tunnel Syndrome was treated with *Jalaukavacharana*, considering the condition as a *Vatavyadhi* associated with *Rakta Dushti*, followed by *Pratimarsha Nasya*. Clinical assessment was carried out before and after treatment based on subjective criteria.

Results: The patient showed significant improvement after treatment. Tinel's sign, Phalen's test and Durkan's test were negative after therapy. The Symptom Severity Scale (SSS) score was reduced to Grade 1. The patient was able to perform all daily activities without any difficulty. No adverse effects were observed during the course of therapy.

Keywords: Carpal Tunnel Syndrome; *Khalli*; *Jalaukavacharana*; Leech Therapy; Median Nerve Compression

1. Introduction

Carpal Tunnel Syndrome (CTS) is one of the most common entrapment neuropathies caused by compression of the median nerve within the carpal tunnel at the wrist. The carpal tunnel is a narrow osteofibrous canal formed by the carpal bones and the flexor retinaculum, through which the median nerve and nine flexor tendons pass.¹ With repetitive hand movements, these tendons glide back and forth thousands of times, generating friction. Due to excessive mechanical strain, the tendons along with their synovial sheaths become hypertrophied, thereby reducing the available space within the tunnel. Furthermore, the hypertrophied synovial sheath produces excess fluid, leading to increased pressure within the tunnel. This elevated pressure compresses the tiny intraneural vessels, resulting in ischemia and subsequent demyelination of the median nerve. Clinically, CTS presents with pain, numbness, tingling sensation, paresthesia and weakness in the distribution of the median nerve, commonly affecting the thumb, index finger, middle

* Corresponding author: Simranjot Kaur

finger and radial half of the ring finger. Symptoms are typically more severe during the night, especially between 2–4 AM, often disturbing sleep and patients frequently obtain temporary relief by shaking the affected hand.²

Several clinical tests are useful in diagnosis, including Tinel's sign and Phalen's maneuver, while nerve conduction studies are considered confirmatory investigations.³ CTS is more common in females and may occur idiopathically or secondary to systemic conditions such as diabetes mellitus, hypothyroidism, rheumatoid arthritis, acromegaly, amyloidosis, obesity, pregnancy and repetitive occupational wrist activities.⁴ Early diagnosis and appropriate management are important to prevent permanent nerve damage and functional impairment of the hand.

According to *Ayurveda*, nerve-related conditions primarily occur due to vitiation of *Vata Dosha*. On the basis of symptomatology (*Hastakarmoolavmotani*) Carpal Tunnel Syndrome can be correlated with *Khalli*.⁵ *Acharya Charaka* has described *Khalli* under *Snayu Gata Vata* in the *Vata Vyadhi Chikitsa Adhyaya*. In *Ayurveda*, *Chikitsa* is broadly classified into two types, namely *Shodhana* and *Shamana*. *Acharyas* emphasize the importance of *Shodhana Karma* prior to the administration of *Shamana* therapies. *Acharya Charaka* has mentioned *Margavarodha* and *Dhatukshaya* as the two main causative factors in the vitiation of *Vata Dosha*.⁶

To alleviate *Margavarodha*, *Shodhana Chikitsa* is considered the prime line of treatment. Among the *Panchakarma* procedures, *Raktamokshana* especially *Jalaukavacharana* is regarded as the most effective for disorders involving *Rakta Dhatu*.⁷ *Kandara* is considered an *Upadhatu* of *Rakta Dhatu* and is one of the primary sites where the pathophysiology of the disease originates. *Kandara* is also classified as a type of *Snayu*. *Acharya Sushruta* has described four types of *Snayu*, namely *Pratanavat* (ligaments), *Vrutlavat* (tendons), *Prithula* (aponeurosis), *Sushira* (sphincter muscles). *Vrutlavat Snayu* (Rounded type) is referred to as *Kandara*. Injury to *Snayu* is considered more painful than injury to other body structures.⁸ Therefore, *Raktamokshana (Jalaukavacharana)* was selected in the management of Carpal Tunnel Syndrome to address the root cause of the disease, which lies at the level of *Kandara (Upadhatu of Rakta)* and *Snayu (Upadhatu of Meda)*.

2. Case report

A 40-year-old female patient visited the *Panchakarma* OPD of Dayanand Ayurvedic College, Jalandhar, Punjab (OPD No. 2523137) with complaints of pain and swelling over the dorsal surface of the right hand, associated with tingling sensation and numbness in the right hand since 2 years. The symptoms showed gradual progression in intensity over time and were more prominent during the night and early morning hours.

On further enquiry, the patient also complained of difficulty in performing routine household activities involving gripping and fine movements, along with disturbed sleep due to pain. For these complaints, the patient had previously consulted allopathic practitioners and was prescribed analgesic tablets and local liniments, which provided only temporary relief.

Despite continued medication, the patient experienced progressive difficulty in performing daily household activities for which a nerve conduction velocity (NCV) study was advised, which revealed bilateral Carpal Tunnel Syndrome with severe involvement, while other peripheral nerves were normal. Based on these findings, surgical intervention was advised; however, the patient was unwilling to undergo surgery. With all these complaints, she came to the *Panchakarma* OPD of Dayanand Ayurvedic College, Jalandhar, Punjab, for further management.

2.1. Past History

- The patient was a known case of Type 2 Diabetes Mellitus and Hypertension and was on regular modern medical treatment with controlled parameters.
- **Family History:** No relevant family history was found.
- **Personal History:** There is no history of smoking, alcohol intake or any other addiction.

Table 1 General Examination and Personal History

| | |
|-----------------|--------------------|
| Bowel | Regular |
| Bladder | Normal |
| Appetite | Normal |
| Sleep | Normal |
| Build | Well-built |
| <i>Prakriti</i> | <i>Kapha Pitta</i> |
| <i>Koshtha</i> | <i>Madhyama</i> |

2.2. Clinical Examination

- **General Examination:** No pallor, icterus, cyanosis, clubbing, lymphadenopathy or oedema was observed.
- **Systemic Examination:** Systemic examination revealed no significant abnormality.
- **Local Examination of the right hand:** Tinel's sign-positive, Phalen's test-positive, Durkan's test-positive.

Table 2 Ashtavidha Pariksha

| Nadi | Kaphaj (78/Min) |
|-------------|------------------------|
| Mutra | Samanaya |
| Mala | Samanya |
| Jihva | Swachha |
| Shabda | Spashta |
| Sparsha | Mridu |
| Drik | Shweta |
| Akriti | Samanya |

Table 3 Vital Parameters

| | |
|------------------|-------------------|
| B.P. | 120/80mmHg |
| Pulse Rate | 78/min |
| Respiratory Rate | 16/min |
| Temperature | Afebrile |
| Weight | 75 kg |

2.3. Investigations

The patient was advised the following investigations:

- Blood Investigations:
 - Hemoglobin – 12.1 g/dl
 - Bleeding Time and Clotting Time – Within normal limits
 - HIV, HBsAg, HCV – Non-reactive
 - FBS / PPBS- Within normal limits

Diagnosis: Carpal Tunnel Syndrome ~ *Khalli*.

2.4. Treatment Plan

According to Ayurveda, the patient was diagnosed as *Khalli*, with investigations suggestive of Carpal Tunnel Syndrome. Initially, *Prakriti* and *Koshtha Pariksha* were assessed. *Parisheka Sweda* was done using *Dhanwantram Taila* as *Sthanik Chikitsa*, followed by *Dashanga Lepa Upanah* for 3 days. These therapeutic measures provided mild relief in pain but no significant improvement in neurological symptoms.

Considering the persistence of symptoms, *Jalaukavacharana* (leech therapy) was planned as the main line of treatment after blood investigations (Hb, BT, CT and viral markers). The patient underwent three sittings of *Jalaukavacharana*, applied near the affected and painful region at weekly intervals.

The protocol for Raktamokshana is shown below:

Table 4 Treatment Protocol

| Sr. No. | Type of intervention | Drug of choice | Route of administration |
|---------|-------------------------|--------------------------------------|-------------------------|
| 1 | <i>Sthanik Abhyanga</i> | <i>Dhanwantram Taila</i> | Local |
| 2 | <i>Sthanik Swedana</i> | <i>Dashmoola Kwatha Nadi Swedana</i> | Local |
| 3 | <i>Raktamokshana</i> | <i>Jalaukavacharana</i> | Local |

2.5. Procedure of Jalaukavacharana

2.5.1. Poorvakarma (Pre-procedure)

Before the procedure, all necessary materials were arranged, including *Nirvisha Jalauka*, cotton swabs, gauze pieces, a kidney tray, sterile needle, *Saindhava Lavana*, *Haridra Churna* and milk. The leeches were first placed in a kidney tray containing water mixed with *Haridra Churna*, which helped in activating and cleansing them. After a few minutes, the leeches were transferred to another tray containing clean water.

Sthanik Abhyanga with *Dhanwantram Taila* followed by *Nadi Swedana* with *Dashmoola Kwatha* was done. During these procedures, the localized temperature of the affected region increases, producing important physiological and therapeutic effects by enhancing local blood and lymphatic circulation, thereby improving tissue metabolism. The heat also relaxes the local musculature and helps in reducing pain.

Then, the affected area of the patient's hand was washed thoroughly with *Triphala Kwatha* and cleaned properly to maintain asepsis. The skin was gently dried to remove oiliness and ensure proper attachment of the leech.

2.5.2. Pradhanakarma (Main Procedure)

Jalaukavacharana was performed during the morning hours. The leech was gently held near its mouth and applied close to the affected and painful region of the wrist. Once attached, the leech started sucking blood from the affected site, which was indicated by rhythmic movements of its body.

The leech was covered with a moist gauze piece while keeping the mouth area free. At regular intervals, small amounts of water were sprinkled over the leech to keep it moist and active. As the leech continued sucking, gradual enlargement of its body was observed.

The leech was allowed to detach on its own after adequate blood sucking. It was then gently removed by sprinkling *Haridra Churna* over/near its mouth.

2.5.3. Paschatkarma (Post-procedure)

After detachment of the leech, mild bleeding continued due to the anticoagulant effect of leech saliva. The site was cleaned properly and *Lodhra Churna* was applied locally for its hemostatic and wound healing properties. A sterile bandage was then applied over the site.

The leech was induced to vomit the sucked blood by touching its mouth with *Haridra Churna*. Once the blood was expelled, the leech was washed and placed in clean water for maintenance after adequate rest.



Figure 1 *Jalaukavacharana* Procedure During Different Sittings or Figure 1. Application of *Jalauka* During Different Treatment Sittings

After three sittings of *Jalaukavacharana*, the patient was advised to take *Pratimarsha Nasya* with *Anu Taila* after completion of *Dwiguna Parihara Kala*.

Table 5 Shamana Chikitsa

| Medicine | Dose | Unit | Frequency |
|---------------------------|------|------|-----------|
| <i>Triphala Guggul</i> | 2 | TAB | BD |
| <i>Vishamushti Vati</i> | 1 | TAB | BD |
| <i>Avipattikar Churna</i> | 3 | GM | BD |
| <i>Chitrakadi Vati</i> | 1 | TAB | BD |
| Cap. Zincosule 4G | 1 | CAP | HS |

The patient took the above medicines along with *Jalaukavacharana* and was assessed afterwards.

2.6. Criteria of Assessment ⁹

2.6.1. Symptom Severity Scale (SSS) :

The following questions assess the patient’s symptoms over a 24-hour period during the past two weeks. This questionnaire was used to evaluate the patient before and after treatment.

Table 6 Grading of Symptom Severity Scale (SSS)

| Grade | Severity |
|---------|-------------|
| Grade 1 | None/Never |
| Grade 2 | Mild |
| Grade 3 | Moderate |
| Grade 4 | Severe |
| Grade 5 | Very Severe |

In Symptom Severity Scale (SSS), 1 indicates absence of symptoms, whereas Grade 5 indicates very severe symptoms.

- How severe is your hand or wrist pain at night?

- I do not have hand or wrist pain
 - Mild pain
 - Moderate pain
 - Severe pain
 - Very Severe pain
- How often did hand or wrist pain wake you up during a typical night in the past two weeks?
 - Never
 - Once
 - Two to three times
 - Four or five times
 - More than five times

- Do you typically have pain in your hand or wrist during the daytime?
 - I never have pain during the day
 - I have mild pain during the day
 - I have moderate pain during the day
 - I have severe pain during the day
 - I have very severe pain during the day

- How often do you have hand or wrist pain during the daytime?
 - Never
 - Once or twice a day
 - Three to five times a day
 - More than five times a day
 - The pain is constant
- How long, on average, does an episode of pain last during the daytime?
 - I never get pain during the day
 - Less than 10 minutes
 - 10 to 60 minutes
 - Greater than 60 minutes
 - The pain is constant throughout the day
- Do you have numbness (loss of sensation) in your hand?
 - I have mild numbness
 - I have moderate numbness
 - I have severe numbness
 - I have very severe numbness
- Do you have weakness in your hand or wrist?
 - No weakness
 - Mild weakness
 - Moderate weakness
 - Severe weakness
 - Very severe weakness
- Do you have tingling sensations in your hand?
 - No tingling
 - Mild tingling
 - Moderate tingling
 - Severe tingling
 - Very severe tingling
- How severe is numbness (loss of sensation) or tingling at night?
 - I have no numbness or tingling at night
 - Mild
 - Moderate
 - Severe
 - Very severe
- How often did hand numbness or tingling wake you up during a typical night during the past two weeks?
 - Never
 - Once
 - Two or three times
 - Four or five times

- More than five times
- Do you have difficulty with the grasping and use of small objects such as keys or pens?
 - No difficulty
 - Mild difficulty
 - Moderate difficulty
 - Severe difficulty
 - Very severe difficulty

2.7. Functional Status Scale (FSS) :

The Functional Status Scale (FSS) was used to assess difficulty in performing daily activities due to hand and wrist symptoms during the past two weeks.

Table 7 Grading of Functional Status Scale (FSS)

| Grade | Functional Status |
|---------|--|
| Grade 1 | No difficulty |
| Grade 2 | Mild difficulty |
| Grade 3 | Moderate difficulty |
| Grade 4 | Severe difficulty |
| Grade 5 | Cannot perform activity due to hand/wrist symptoms |

In Functional Status Scale (FSS), Grade 1 indicates no difficulty in performing activities, whereas Grade 5 indicates inability to perform activities due to severe hand and wrist symptoms.

3. Results

The patient responded well to the treatment and experienced significant relief from symptoms. Tinel’s sign, Phalen’s test and Durkan’s test became negative after treatment. At the end of therapy, the Symptom Severity Scale (SSS) score was reduced from 4.36 to 1. Significant improvement was also observed in the Functional Status Scale (FSS) score, indicating better hand function and ability to perform daily activities after *Jalaukavacharana* therapy.

Table 8 Assessment of Symptom Severity Scale Before and After Treatment

| Questions | BT | AT |
|---|------|----|
| 1. How severe is your hand or wrist pain at night? | 4 | 1 |
| 2. How often did you wake up due to hand/wrist pain during a typical night in the past two weeks? | 4 | 1 |
| 3. Do you typically have pain in hand /wrist during the daytime? | 4 | 1 |
| 4. How often do you experience hand or wrist pain during the daytime? | 4 | 1 |
| 5. How long, on average, does an episode of pain last during the daytime? | 4 | 1 |
| 6. Do you experience numbness in your hand? | 5 | 1 |
| 7. Do you experience weakness in your hand or wrist? | 5 | 1 |
| 8. Do you experience a tingling sensation in your hand? | 5 | 1 |
| 9. How severe is numbness or tingling sensation at night? | 4 | 1 |
| 10. How often did hand numbness or tingling sensation wake you up during a typical night during the past two weeks? | 4 | 1 |
| 11. Do you have difficulty grasping and using small objects such as keys or pens? | 5 | 1 |
| Overall Symptom Severity Score of CTS | 4.36 | 1 |

BT- Before Treatment. AT- After Treatment

3.1. Functional Status Scale (FSS)

The scale includes activities such as writing, buttoning clothes, holding a book, gripping a telephone handle, opening jars, household chores, carrying grocery bags and bathing/dressing. Each activity was graded from 1 to 5, where 1 indicates no difficulty and 5 indicates inability to perform the activity due to symptoms.

Table 9 Functional Status Scale Before and After Treatment

| Activities | BT | AT |
|------------------------------|-----|-----|
| Writing | 4 | 1 |
| Buttoning clothes | 4 | 1 |
| Holding a book while reading | 3 | 1 |
| Gripping telephone handle | 4 | 1 |
| Opening jars | 5 | 1 |
| Household chores | 4 | 1 |
| Carrying grocery bags | 5 | 1 |
| Bathing and dressing | 3 | 1 |
| Overall FSS Score | 4.0 | 1.0 |

BT = Before Treatment; AT = After Treatment

4. Discussion

Carpal Tunnel Syndrome (CTS) can be correlated with *Khalli*, which is considered a *Vata*-dominant disorder in Ayurveda. According to Ayurveda, vitiation of *Vata* Dosha mainly occurs due to two factors namely *Margavarodha* and *Dhatukshaya*. In the present condition, *Margavarodha* occurs at the level of tendons (*Kandara*) and ligament (*Snayu*). Due to this obstruction, the nourishment of the Median Nerve (*Vata*) becomes impaired, leading to demyelination and neurological dysfunction. Initially, the treatment aimed to remove *Margavarodha* and restore normal neural and motor functions. Therefore, three sittings of *Raktamokshana* (*Jalaukavacharana*) were performed.

4.1. Role of Poorvakarma

Acharya Charaka explained that without *Poorvakarma*, the *Doshas* cannot be brought into a suitable state for elimination from the body.¹⁰ *Shodhana* procedures become easier and more effective when *Poorvakarma* is performed properly.¹¹

In the present case, *Sthanik Abhyanga* and *Sthanik Swedana* were done as *Poorvakarma* before *Jalaukavacharana*. Their therapeutic and physiological roles are explained below:

***Sthanik Abhyanga*:** *Sthanik Abhyanga* is a local therapeutic massage indicated in *Vata*-predominant musculoskeletal disorders. It helps in reducing pain, stiffness and dryness by pacifying aggravated *Vata Dosha*. Local massage improves blood circulation, nourishes muscles and nerves and enhances soft tissue flexibility, thereby improving functional movement of the affected part.

***Sthanik Swedana*:** *Sthanik Swedana* is applied after *Abhyanga* to relieve pain, stiffness and swelling. Local heat increases tissue temperature and blood circulation, leading to vasodilation and muscle relaxation. It also enhances the absorption of medicated oils and soothes irritated nerves, thereby improving joint mobility and function.

***Role of Jalaukavacharana*:** *Jalaukavacharana* (leech therapy) helps in removing toxins and improves circulation in the affected area and alleviates local inflammation and swelling through various bioactive substances present in leech saliva.¹² Eglins inhibit elastase, an enzyme that drives inflammatory process. Bdelins act as protease inhibitors and reduce inflammation by blocking inflammatory enzymes. Hyaluronidase increases tissue permeability, thereby enhancing the spread and effectiveness of anti-inflammatory substances. Additionally, anticoagulants such as hirudin improve blood flow and facilitate the removal of inflammatory mediators and toxins from the affected area.

Role of Pratimarsha Nasya after Jalaukavacharana: *Pratimarsha Nasya* is regarded as a safe and beneficial daily practice throughout all stages of life, from birth to old age.¹³ *Pratimarsha Nasya* is a type of *Navana* (Sneha) *Nasya*. Acharya Charaka has mentioned *Nasya* in the management of *Vata Vyadhi*. This therapy helps in reducing friction in ligaments and tendons. Acharyas have considered *Snayu* as an *Upadhatu* of *Meda Dhatu*. According to the *Samanya – Vishesh Siddhanta*, the unctuous properties of *Sneha Nasya* help in reducing stiffness of the transverse carpal ligament, thereby supporting its proper functioning.

5. Conclusion

Ayurveda offers a unique *Shodhana* therapy in the form of *Raktamokshana* (*Jalaukavacharana*), which specifically acts at the level of *Kandara* and *Snayu*. *Jalaukavacharana* helps in relieving *Margavarodha* and improving local circulation. As a result, it enhances local metabolism and improves circulation to the median nerve. This may ultimately improve nourishment and circulation to the median nerve, thereby reducing the neuromuscular symptoms of the patient. *Jalaukavacharana* showed significant improvement in pain, numbness, hand functions and daily activities in Carpal Tunnel Syndrome.

The treatment given to the patient was found to be effective and no complications were observed during the course of therapy. Furthermore, the treatment is cost-effective and conservative in nature. Hence, further studies should be conducted on a large sample of patients to establish its therapeutic efficacy.

Compliance with ethical standards

Acknowledgments

The authors are thankful to the Department of Panchakarma, Dayanand Ayurvedic College, Jalandhar, Punjab, India, for providing support and facilities for this case study.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval was not required for this single case study as per institutional policy. However, informed consent was obtained from the patient before commencement of treatment and publication of this case report.

Statement of informed consent

Written informed consent was obtained from patient for publication of this case report and accompanying images.

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