



Research Article

EFFICACY OF SELECTED AYURVEDIC TREATMENT PROTOCOL AGAINST STANDARD
AYURVEDIC PROTOCOL IN THE MANAGEMENT OF MENISCAL INJURIES-A RANDOMISED
CONTROLLED NON-INFERIORITY TRIAL

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ABSTRACT

Meniscal tears are the second most common knee injuries which may lead to chronic pain, reduced mobility, and a higher risk of osteoarthritis if untreated. It may be correlated with *Bhagna* in ayurveda. *Sushrutacharya*, in *Bhagna chikitsa*, recommends *Bandhana* and *Snehaseka* for *Janu Bhagna*, followed by rehabilitative exercises. **Methodology:** This study aimed to compare the efficacy of a selected Ayurvedic protocol with a standard treatment protocol in MRI-confirmed meniscal injuries. 24 participants were randomly divided into two groups of 12 in each group and treated for 35 days at VPSV Ayurveda College, Kottakkal. Assessments were done on Day 0 and Day 35, with a follow-up after one month. Both groups received *Bandhana* for 3 weeks. The study group underwent *Shashtika Taila Seka* and exercises, while the control group received *Dhanwantara Taila seka*, *Shashtika Pinda Sveda*, and *Matravasti* for 2 weeks. Internal medications such as *Dhanwantara Kashaya*, *Lakshaguggulu Vati*, and *Gandha Taila* were given to both groups. **Results:** Statistical analysis showed improvement in both groups, with the study group showing slightly better symptom relief. The mean difference between the study and control groups was tested for non-inferiority using one-sided t-test and study group was found to be non-inferior. **Conclusion:** The selected Ayurvedic protocol was found non-inferior to the standard Ayurvedic protocol in managing meniscal tears and improving quality of life.

INTRODUCTION

Meniscal injuries have an incidence of 66 per 100,000 people globally.^[1] In India, according to a North Indian epidemiological study, ACL injuries were the most common sports injuries in knee (86.5%), followed by meniscal injuries (78.24%).^[2] In the United States, 10% to 20% of all orthopedic surgeries consist of surgery to the meniscus on an estimated 8,50, 000 patients each year.^[1] Meniscal tears are among the most prevalent knee injuries, frequently affecting both athletic and non-athletic populations. These injuries are commonly associated with sports and activities involving repetitive squatting, kneeling, pivoting, or twisting, such as football, basketball, and wrestling. Anatomically, the knee joint contains two menisci medial and lateral which are C-shaped

fibrocartilaginous structures located between the femur and tibia. These act as shock absorbers and play a crucial role in knee joint stability, load transmission, lubrication, and proprioception. Meniscal injuries typically occur due to sudden rotational movements, hyperflexion, trauma, or degenerative changes associated with aging.

Clinically, meniscal tears are significant due to their impact on joint function. These can cause pain, swelling, joint line tenderness, locking, catching, and restricted range of motion. Left untreated, meniscal tears may lead to chronic discomfort, impaired mobility, reduced quality of life, and an increased risk of developing knee osteoarthritis. Therefore, early diagnosis and appropriate intervention are essential for preserving knee joint function and preventing further damage.

Conventional treatment options for meniscal tears range from conservative approaches like rest, ice, compression, elevation, physiotherapy, and NSAIDs to surgical procedures such as arthroscopic meniscus repair or partial meniscectomy. Although surgical

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methods can offer short-term relief, they are associated with limitations, including the risk of biomechanical imbalance, accelerated joint degeneration, and prolonged recovery time of up to 3-6 months.

Janu Sandhi is described by *Acarya Sushruta* as “*Jangha Urvo Sandhane Janu*” and is classified as a *Vaikalyakara Sandhi Marma*, indicating its structural and functional importance.^[3] Injury to this region is said to cause *Khanjāta* (limping or instability). The meniscus, due to its fibrocartilaginous nature, may be correlated with *Tarunaasthi* in Ayurveda.

The selected Ayurvedic protocol incorporates *Shashtika Taila Seka*, isometric and isotonic exercises, and internal medications such as *Dhanwantara Kashaya*, *Lakshaguggulu Vati*, and *Gandhataila*. These aim to reduce inflammation, strengthen supportive structures, and restore knee mobility. This is compared with a standard Ayurvedic protocol involving *Dhanwantara Taila Seka*, *Matravasti* with *Dhanwantara Taila Mezhukupaka*, and *Shashtika Pinda Sveda (Ekanga)*. The selected protocol may offer a more economical and accessible option, with the added advantage of promoting early return to daily activities or sports through integrated exercise therapy.

Objective

To compare the efficacy of selected ayurvedic treatment protocol against standard treatment protocol in meniscal injuries of knee joint.

MATERIALS AND METHODS

Study Design

Study design was randomized controlled non-inferiority clinical study with 12 participants in each group. Participants were selected randomly and divided into two groups from the OPD of V.P.S.V. Ayurveda College Hospital, Kottakkal.

Diagnostic criteria

Clinically identified cases of meniscal tear confirmed using MRI knee joint.

Inclusion criteria

- Participants diagnosed with meniscal tear which occurred within 6 months confirmed with MRI report (knee).
- Participants of both gender within age group 18-50 years.
- Participants with informed consent.

Exclusion criteria

- Fractures of bone in and around knee joint.
- Uncontrolled diabetes mellitus.
- Pregnancy and lactation.

Intervention

24 participants satisfying the inclusion criteria were randomly allocated into two groups of 12 each- the study and control group. Both groups were given

Bandhana with *Murivenna* for the first three weeks. Isometric exercise was added for the study group from second week. For the study group, *Snehaseka* with *Shashikataila*, isometric exercises, straight leg raises, and quadriceps stretches were administered during the fourth week, followed by the introduction of isotonic exercises in the fifth week. In the control group *Ekangadhara* with *Dhanwantara Taila* was done in the fourth week along with *Matravasti* with *Dhanwantara Taila Mezhukupaka* and *Shashtika Pinda Sveda (Ekanga)* in the 5th week.

Internal medicines for both groups (Day 1-35)

- *Dhanwantaram Kashaya*- 15ml+60ml twice a day in empty stomach at morning and evening.
- *Laksha Guggulu Vati* - 2-0-2 with *Kashayam*.
- *Gandha Taila*- 15 drops with warm milk twice a day after food (11 am & 9 pm).

Outcome measurements

Case proforma

Subjective parameters included

Pain with VAS scale

- Nil: 0
- Mild: 1-3
- Moderate: 4-6
- Severe: >7

Joint line tenderness

- Grade 0- No pain
- Grade 1- Patient complaints of pain
- Grade 2- Patient complaints of pain and winces
- Grade 3- Patient winces and withdraws the joint
- Grade 4- Patient will not allow palpation of structure.

Assessment based on Western Ontario meniscal evaluation tool (WOMET).

It consists of 16 questions along three dimensions. The section A is based on physical symptoms containing 9 items, the section B consists of 4 questions related to sports/recreation/work/lifestyle and section C containing 3 items related to emotions. All items are measured and weighed on VAS (visual analog scales). The maximum score is 100, which is converted into a percentage score. (total aggregate score).

Objective parameters included

Range of movements using goniometer

- Knee flexion: 135°
- Knee extension: 5 - 10°
- Internal knee rotation: 10°
- External knee rotation: 30-40°

Swelling

- No swelling: Grade 0
- Mild swelling: Grade 1
- Moderate swelling: Grade 2
- Severe swelling: Grade 3

Assessment of the participants was done before treatment on 0th, after treatment on 36th day. Follow up assessment was done on 66th day.

RESULTS AND DISCUSSION

According to *Sushrutacharya*, treatment for *Janubhagna* involves *Bandhana* and *Snehaseka*.^[4] *Bandhana* provides healing in two ways, stability through immobilization and when combined with *Murivenna*, it reduces stiffness through the *Snigdha guna*. *Murivenna*, has cooling property because of coconut oil base. The liquid medium in *Murivenna*, *Dhanyamla* has *Sparsa Sita* property, effective in reducing pain, swelling, and tenderness. The *Sitavirya* of *Murivenna* reduces the *Ksatosma*, diminishes vasodilation, thereby controlling inflammation and pain, as noted by Ashik et al.^[5]

Snehaseka is aimed at mitigating pain, swelling, and stiffness associated with the injury.^[6] Use of *Shashtikataila*, a formulation from *Arogva-kalpadrumam*, is known for its therapeutic properties of reducing *Vata*.^[7] The localized warmth from *Seka*, being *Sramaghna* (reduces muscle fatigue), enhances circulation in the affected soft tissues and supports healing and improves physical function.^[8]

Shashtika Taila, has *Tila Taila* as its base. *Tila Taila* nourishes and strengthens *Dhatu*. Its *Snigdha* and *Guru Guna* reduce *Rukshata* and *Usna Guna* alleviates *Vata* and muscle spasms.^[9] The major ingredient, *Shashtika* has *Madhura rasa* and *Madhura Virya* with actions such as *Brmhana* and *Balya* known for its *Sthairvakrt* and *Balavardhana* properties, which may aid in muscle strength restoration.^[10] Mohanlal et al. demonstrated that tricin from *Njavara* (*Shashtika*) rice achieved over 65% anti-inflammatory effects in rats.^[11]

Dhanyamla, with its *Ushna*, *Tikshna*, and *Vyavayi* properties, penetrates *Sukshma Srotas*, performs *Sroto Sodhana*, and aids in spreading active principles.^[12] *Shashtika Taila* contains *Eranda Taila* and *Priyala Taila*, with the latter described by *Sushrutacharya* as *Bhagna Sandhanaka*. Ricinoleic acid from *Eranda* shows anti-inflammatory effects, as noted by Waseem et al.^[13] *Sushruta* notes that the *Virya* of

externally applied medicines penetrates the endings of the *Dhamani*.^[14]

Wing Sum Siuet et al. demonstrated that external applications act as anti-resorptive agents, aiding cell regeneration and preventing recurrent injuries.^[15] *Tailaseka*, as part of the *Svedana*, induces hyperthermia, improving blood and lymphatic circulation and boosting tissue metabolism.^[16] Hence, reduces inflammation by modulating inflammatory mediator secretion, relaxes local muscles, and increases transdermal drug delivery. Drugs in *Tailakalka* have properties like *Sophaharatava*, *Brmhana*, *Vataghna*, *Balavardhana*, and *Rasayana* as they contain essential fatty acids like oleic acid, cholesterol, oil base which contributes to progressive healing, tannins reducing inflammation, and flavonoids supporting regeneration.

Isometric exercises are crucial for preventing or minimizing muscle atrophy during immobilization, as shown by Hurst et al.^[17] Stretches focus on the quadriceps and hamstrings, which are most affected by knee immobilization, to prevent muscle strain. Straight leg raises specifically activate the vastus medialis oblique muscle. Gleeson et al. found that muscle contraction during exercise releases interleukin-6, which increases IL-10 and IL-1 receptor antagonist levels in the bloodstream. This process boosts IL-10-secreting regulatory T cells that modulate the immune response against inflammation.^[18] Exercise also reduces Toll-like receptor expression on monocytes, decreasing inflammatory signaling and leading to fewer pro-inflammatory monocytes and macrophages in adipose tissue. These exercises allow an early return to normal activities.

In rehabilitation protocols following bandage removal, integrating *Seka* alongside controlled weight-bearing exercises synergistically addresses stiffness and supports joint mobility. This approach not only aims at alleviating immediate symptoms but also focuses on long-term joint health and functional outcomes.

Table1: Symptom wise observation of patients

S.No	Group	Swelling			Pain			Joint Line Tenderness			Range Of Movements			Total Aggregate Score		
		0th day	36th day	66th day	0th day	36th day	66th day	0th day	36th day	66th day	0th day	36th day	66th day	0th day	36th day	66th day
1	Study	0	0	0	3	2	2	2	1	0	135	135	135	42	50	60
2	Study	0	0	0	3	2	1	3	1	0	135	135	135	38	53	70
3	Study	0	0	0	3	3	2	2	1	1	135	135	135	43	46	61
4	Study	0	0	0	2	2	2	1	0	0	135	135	135	59	61	66
5	Study	0	0	0	3	2	1	3	2	1	135	135	135	48	51	65
6	Study	1	0	0	3	2	1	1	0	0	135	135	135	35	58	70
7	Study	1	0	0	3	2	1	2	1	0	135	135	135	33	60	68
8	Study	1	0	0	3	2	1	2	1	0	112	135	135	29	46	57

9	Study	0	0	0	3	2	1	0	0	0	135	135	135	47	54	68
10	Study	0	0	0	3	2	0	0	0	0	135	135	135	51	58	68
11	Study	0	0	0	3	1	1	0	0	0	135	135	135	53	72	72
12	Study	2	1	0	3	2	1	2	1	0	122	135	135	54	66	74
13	Control	0	0	0	3	3	3	1	1	1	135	135	135	51	51	51
14	Control	0	0	0	3	2	1	2	1	0	135	135	135	49	57	66
15	Control	2	1	1	3	3	2	2	2	1	115	125	135	26	32	49
16	Control	2	1	0	3	2	1	2	2	1	135	135	135	35	49	61
17	Control	0	0	0	3	2	1	1	1	0	135	135	135	55	66	71
18	Control	1	0	0	3	2	1	3	1	0	100	120	135	28	46	74
19	Control	0	0	0	3	2	1	2	2	1	135	135	135	49	55	64
20	Control	0	0	0	3	3	2	2	1	1	135	135	135	45	49	59
21	Control	0	0	0	3	2	2	1	0	0	135	135	135	46	56	58
22	Control	1	0	0	3	2	1	1	0	0	135	135	135	36	47	60
23	Control	0	0	0	3	2	1	1	1	0	135	135	135	47	54	68
24	Control	0	0	0	3	2	1	2	1	0	135	135	135	45	50	68

Table 2: Effect on Total Aggregate score

Total Aggregate Score	Paired Differences			t	df	Sig. (2-tailed)
	Mean	SD	SE			
0 th day - 36 th day Study Group	-11.273	8.380	2.527	-4.462	10	.001
0 th day - 36 th day Control Group	-8.333	4.812	1.389	-6.000	11	.000

Table 3: Effect on Pain

Study Group						
Pain		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
0 th day- 36 th day	Negative Ranks	10	5.50	55.00	-3.051	.002
	Positive Ranks	0	0.00	0.00		
	Ties	2				
	Total	12				
Control Group						
0 th day- 36 th day	Negative Ranks	9	5.00	45.00	-3.000	.003
	Positive Ranks	0	0.00	0.00		
	Ties	3				
	Total	12				

Table 4: Effect on Joint line tenderness

Study Group						
Joint Line Tenderness		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
0 th day- 36 th day	Negative Ranks	9	5.00	45.00	-2.887	.004
	Positive Ranks	0	0.00	0.00		
	Ties	3				
	Total	12				
Control Group						
0 th day-	Negative Ranks	6	3.50	21.00	-2.333	.020

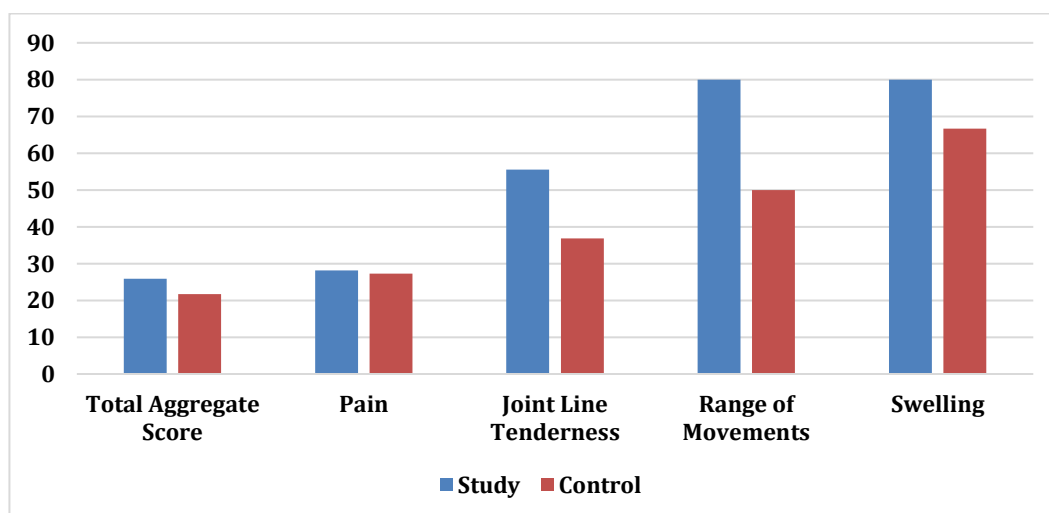
36 th day	Positive Ranks	0	0.00	0.00		
	Ties	6				
	Total	12				

Table 5: Effect on Range of movements

Study Group						
Range of Movements		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
0 th day- 36 th day	Negative Ranks	2	1.5	3	- 1.342	0.180
	Positive Ranks	0	0.00	0.00		
	Ties	12				
	Total	12				
Control Group						
0 th day- 36 th day	Negative Ranks	3	2	6	- 1.604	0.109
	Positive Ranks	0	0.00	0.00		
	Ties	9				
	Total	12				

Table 6: Effect on Swelling

Study Group						
Swelling		N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
0 th day- 36 th day	Negative Ranks	4	2.50	10.00	-2.000	.046
	Positive Ranks	0	0.00	0.00		
	Ties	8				
	Total	12				
Control Group						
0 th day- 36 th day	Negative Ranks	4	2.50	10.00	-2.000	.046
	Positive Ranks	0	0.00	0.00		
	Ties	8				
	Total	12				

**Figure1: Overall effect of treatment**

CONCLUSION

The following conclusions were evolved after conceptual compilation, critical review, clinical observations and discussions.

- The symptoms of meniscal tears like pain, joint line tenderness, swelling, range of movements were relieved in all participants in the study group. The intervention in study group also helped to improve quality of life of the participants.
- The study group and the control group showed statistical significance in treatment from 0 to 35th day considering total aggregate score, pain, joint line tenderness and swelling.
- While assessing the total aggregate score, the quality-of-life index, was slightly higher in the study group (27%) compared to the Control group (20%), indicating a greater overall reduction in symptoms for the study group.
- From the QoL, the study group's normal work life and sports improved by 16.17%, while the Control group saw a 10% increase. Emotional well-being in the study group rose by 8%, versus 1% for the Control group.
- The following percentage of relief noted in the study group pain (31%), joint line tenderness (56%), range of movement (80%), swelling (80%).
- The following percentage of relief was noted in the control group pain (25%), joint line tenderness (35%), range of movement (50%), swelling (67%).

The study did not yield any statistical significance between the two treatment protocols. The mean difference of study and control group was tested for non-inferiority using one sided t test with non-inferiority margin subtracting from mean difference and calculating t value with standardized (pooled) standard deviation (SD) and square root of sample size. The t value obtained was 2.9 which was greater than the table t value. Hence the selected ayurvedic treatment protocol is non inferior to the standard protocol in reducing symptoms and improving quality of life in meniscal tears of knee joint.

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