

Research Article

Evaluation of Efficacy of Marma Therapy with Janu Basti in the Management of Janu Sandhigata Vata (Osteoarthritis of Knee)

Alka Mishra^{1*}, Vandana Shrivastava¹

¹Department of Ayurveda and Holistic Health, Dev Sanskriti Vishwavidyalaya, Gayatrikunj-Shantikunj, Haridwar, India

*Corresponding author email: alka.mishra@dsvv.ac.in

<https://doi.org/10.36018/dsij.v15i.139>

Abstract. *Background:* Janu Sandhigata Vata (Osteoarthritis of knee) is one of the most disabling musculoskeletal disorder. It is a type of Vata-vyadhi (Vata disorder), involving the Janu Sandhi (knee joint), whose symptoms include Shoola (pain), Shotha (swelling), Stabdhata (stiffness), and Atopa (crepitus). Ayurvedic texts recommend repeated use of Snehana (oleation) and Swedana (sudation) therapies for its management. In recent years, Marma Therapy has also been used for the management of various Vata disorders. *Methodology:* The present study explores the efficacy of Marma Therapy (on four Marma points of the legs, i.e. Kshipra, Gulpha, Indravasti and Janu) with Janu Basti (with Ksheerbala Taila) in the management of Janu Sandhigata Vata. The therapeutic procedure was administered for 9 days, with a followup of one month, when the patients did self-administration of Marma Therapy and massage at home. Twenty patients completed the study. *Results:* Significant improvement was observed in all the subjective parameters (Shoola, Shotha, Stabdhata, and Atopa) and objective parameters (WOMAC Index, Range of Motion, Walking Time) analyzed during the study. Mean values of all the parameters decreased continuously during the study period, including intervention time and follow-up. Verbal feedback taken about six months after the completion of the study period indicated almost complete relief for 4 patients (pursuing Marma Therapy regularly), and self-management by 10 others through regular Marma Therapy and massage. *Conclusion:* The present study illustrates the significant efficacy of the administered therapeutic intervention in the management of Janu Sandhigata Vata, both with regards to short-term relief, and long-term self-management.

Keywords.

Janu Sandhigata Vata, Osteoarthritis of knee, Ayurveda, Marma Therapy, Janu Basti, Ksheerbala Taila



Introduction

Osteoarthritis (OA) of knee is one of the most common and disabling musculoskeletal disorder, which is extremely common in the elderly population [1-3]. The symptoms of this disease include joint pain, joint stiffness, instability and loss of function, which have a severe impact on daily activities [3]. In the present times, the therapeutic interventions normally used for its treatment include the use of physiotherapy, weight control, different types of analgesics, intra-articular steroid injections, knee replacement surgery, etc. [1,2]. However, side-effect free, long-term management of this disease is still a challenge [1-3]. Given the severe disabling nature of this disease, there is definitely a need to look for safe and effective therapies for its management.

As per Ayurvedic texts, the condition that closely resembles Osteoarthritis of knee is 'Janu Sandhigata Vata' [1,3-5]. Sandhigata Vata is a type of Vata-vyadhi (Vata disorder), and a disease of Sandhi (joints) with the following symptoms - (Ashtanga Hridayam Nidana Sthana - 15/14 [6]), (Charaka Samhita Chikitsa Sthana 28/37 [5]), (Madhava Nidanam - 22/21 [7]), (Sushruta Samhita Nidana Sthana - 1/28 [4]):

- Sandhi Shoola (joint pain)
- Sandhi Shotha (swelling in joints)
- Akunchana Prasarana Pravritti Savedana (pain during movements like flexion and extension)
- Atopa / Sandhisphutana (crepitus) and, in the later stage –
- Hanti Sandhigatah (restricted movement of joints)

When Vata involves Janu Sandhi (knee joint), it is called 'Janu Sandhigata Vata'.

Management of Sandhigata Vata

Acharyas [4-6] have mentioned treatment procedures like Snehana (oleation), Swedana (sudation), Bandhana (bandaging), Agnikarma (thermal cautery), etc. for 'Sandhigata Vata'. These are mostly aimed at Bramhana (nourishing effect). Acharya Sushruta has mentioned the treatment for Sandhigata Vata as Snehana (oleation), Upanaha (poultice), Agnikarma

(thermal cautery), Bandhana (bandaging) and Unmardana (trampling of the body) (Sushruta Samhita Chikitsa Sthana 4/8 [4]). Acharya Vagbhatta has told the treatment for problems related to Sandhi as Snehana (oleation), Daaha Karma (thermal cautery) and Upanaha (poultice) (Ashtanga Hridayam Chikitsa Sthana 21/22 [6]). Acharya Charaka mentions that oil is the best among Vata-Kapha pacifying drugs, and the drug Bala is the best one among astringents, tonics and Vata pacifiers (Charaka Samhita Sutra Sthana 25/40 [5]).

Thus, all the Acharyas have given prime importance to Snehana Chikitsa (oleation therapy) in the management of 'Sandhigata Vata'. Acharya Charaka has given common principles of Vata Vyadhi Chikitsa, i.e. repeated use of Snehana (oleation) and Swedana (sudation) (Charaka Samhita Chikitsa Sthana 28/82 [5]). Several researches have demonstrated the effectiveness of these Ayurvedic treatments in the management of Janu Sandhigata Vata [1,8].

Janu Basti is a simple and effective Snehana (oleation) and Swedana (sudation) procedure of Ayurveda, which involves retaining warm medicated oil over the knee joint for sufficiently long duration [9-11]; the oleaginous properties of the oil, combined with its medicinal properties, as well as the sudation induced by the warm oil, can produce the desired therapeutic effect. Although it is a widely used practice in India, yet not many studies are available in the peer reviewed open literature that establish its quantitative efficacy in the management of Janu Sandhigata Vata.

Marma Therapy is another Ayurvedic treatment that can be useful in the management of joint disorders like Janu Sandhigata Vata [12-17]. According to Maharshi Sushruta there are 107 Marmas in the human body (Sushruta Samhita Sharira Sthana 6/3) [4]. Marma point is defined as anatomical site where muscles, veins, ligaments, bones and joints meet together (Sushruta Samhita Sharira Sthana 6/16) [4]. These are very important vital places, that are the seats of Prana (vital life force) (Ashtanga Hridaya Sharira 4/2) [6]. Any injury to these parts may lead to severe



pain, disability, loss of function, loss of sensation and death [12].

Janu Sandhi (knee joint) is also a type of Vaikalyakara Marma (disabling Marma), and hence any injury to this part may lead to disability [12]. However, recent researches indicate that if any Marma point is inflamed or painful, then stimulating its nearby Marma points can help in alleviating this pain [13]. This Marma Therapy can be used to reduce the pain of nerves, muscles, ligaments, bones and joints [12]. Several scholars have reported the therapeutic benefits of Marma Therapy in treating various physical and mental disorders [12-22]. Schrott et al. (2016) [16] state that stimulation of Marma points can affect the functioning of the internal organs and mind-body coordination, resulting in healing with regards to improvement in eye-sight, digestive system, headaches, stress, etc. Marma Therapy can be used to detoxify, revitalize and provide strength to the body [16]. The knowledge of Marman is employed by the practitioners of Kalaripayat (ancient Indian Martial Art tradition of Kerala) as a health promoting technique [18,22]. Varmakkalai is an ancient therapeutic technique practiced in Tamil Nadu, that deals with the stimulation of Varmam (the vital spots of the body) for therapeutic benefits [22]. Marma points are stimulated during Abhyanga (massage), either by applying pressure in different ways, or through specific movement of hands or other body parts, for therapeutic benefits [14,20,21]. Joshi (2010) [12] has developed a simplified form of Marma Therapy (involving application of pressure on specific Marma points) and administered it to patients suffering from various diseases like cervical spondylosis, scoliosis, muscular dystrophy, paraplegia, prolapse inter vertebral disc, etc., with encouraging results.

Marmas are the seats of Prana; hence, Marma Therapy is an important method of regulating the flow of Prana [14]. Since Prana is connected to Vata Dosha, whose vitiation leads to the maximum types of diseases, hence Marma Therapy can be especially useful in treating the Vata disorders, which correspond to chronic degenerative diseases [14] like Janu

Sandhigata Vata. Thus, Marma Therapy can be an effective approach for the management of Janu Sandhigata Vata. However, not much work is available in the peer reviewed open literature on the quantitative efficacy of Marma Therapy in the treatment of Janu Sandhigata Vata (OA of knee).

Looking at the effectiveness of these two therapeutic procedures, as well as the fact that both these therapeutic procedures are extremely cost effective, and can be easily done by the patients or their guardians, after simple training, at their home itself, a combined study of the effect of Marma Therapy with Janu Basti in the management of Janu Sandhigata Vata (OA of knee) was undertaken in the present study.

Methodology

To evaluate the efficacy of Marma Therapy with Janu Basti in the management of Janu Sandhigata Vata (Osteoarthritis of knee).

Study Design

Single group experimental study with pre-test – post-test research design was adopted.

Description of Variables

The Independent Variables of this study are Marma Therapy and Janu Basti, which have been described below in Section - Intervention. The Dependent Variables of this study are as follows:

1. Subjective Parameters

These include Sandhi Shoola (joint pain), Sandhi Shotha (joint swelling), Sandhi Stabdhatta (joint stiffness), and Atopa / Sandhisphutana (crepitus), which were analyzed through pre-defined assessment criteria and grading (Table 1).

2. WOMAC Index (Modified - CRD Pune Version)

The Western Ontario and McMaster Universities (WOMAC) Osteoarthritis (OA) Index was developed to assess pain, stiffness, and physical function in patients of knee and / or hip OA [23,24]. The WOMAC consists of 24 items, rated on a five point Likert scale, and divided into 3 sub-scales [23,24]:



Pain (5 items), Stiffness (2 items), and Physical Function (17 items).

The WOMAC Index (Modified - CRD Pune Version), suitable for Indian-Asian use, has been validated against Western Ontario and McMaster Universities (WOMAC) Osteoarthritis (OA) Index; it primarily consists of WOMAC scale for pain, WOMAC scale for stiffness, and a modified WOMAC function scale, to suit Indian conditions and activities [23,25]. This scale is successfully used in many researches for the assessment of OA of knee [23,25]. WOMAC Index (Modified - CRD Pune Version) has been used in this study for the assessment of OA of knee.

3. Range of Motion (ROM) – by Goniometer

Range of Motion (ROM) of the knee joint was measured by a Goniometer to quantitatively assess the movement of the knee joint.

4. Walking Time

Walking Time was assessed by asking the patient to walk 21 m distance, and noting the time taken for the same; two such readings were recorded, and the average of the two was taken as the final value. The Walking Time was assessed both before the starting of intervention and after the completion of intervention, as well as at the time of each follow-up.

Selection of Patients

This study was conducted to be an open trial, with single group experimental design. Patients were selected through purposive sampling from the Out Patient Section of the Department of Ayurveda and Holistic Health, Dev Sanskriti Vishwavidyalaya, Haridwar, between May 2018 to May 2019. Screening of 53 patients was done, out of which 21 patients fulfilled the inclusion criteria and joined the study; one patient left in between, so total 20 patients completed the study.

The clinical history of all the patients was taken, and they went through routine hematological examination (Hemoglobin, TLC, DLC, ESR), biological investigations like serum calcium, serum uric acid,

serum cholesterol, fasting blood sugar and urine analysis - routine and microscopic - to exclude any other pathology. The diagnosis was confirmed by X-ray examination of involved joint.

Informed consent was obtained from all the patients before the start of the therapy. The authors have maintained necessary ethical standards while conducting the research.

Inclusion Criteria

- Age – 40 to 70 years, irrespective of sex, religion and socio-economic status
- Patients having clinical features of Sandhigata Vata as described in Ayurvedic scriptures, as well as clinical features of Osteoarthritis of knee
- Patients fit to undergo Janu Basti and Marma Therapy, and willing to sign the Informed Consent

Exclusion Criteria

- Age <40 years and >70 years
- Subjects suffering from any other type of Arthritis like Rheumatoid Arthritis, Psoriatic Arthritis, Infective Arthritis, Gout, Ankylosing Spondylitis
- Subjects with any other serious systemic disorder, which may interfere with the treatment
- Traumatic causes like fracture
- Pregnancy and Lactation

Intervention

A total of 20 patients suffering from Janu Sandhigata Vata (Osteoarthritis of knee) were administered the treatment. The treatment involved administration of Marma Therapy and Janu Basti on the affected knee joint. The details of the administered treatment are as follows.

1. Marma Therapy

The Marma Therapy administered in the present study for the management of Janu Sandhigata Vata included stimulation of four Marma points, i.e. Kshipra, Gulpha, Indravasti and Janu, whose location is depicted in Figs. 1(a) and 1(b). The method of Marma Therapy adopted in the present study is described below [12,13].



Preparation for Therapy

- Removed all tight clothing such as belt, knee-cap, etc., as well as any metallic item
- The therapist must cut his / her nails before giving the therapy

Position of the Patient During Therapy

- The patient was sitting upright or in lying down position, on a hard bed
- The hands of the patient were placed on the body or on the sides

Method of Marma Therapy (Pressure application)

- Pressure over Marma point was appreciable, yet tolerable
- Pressure varied according to the consideration of age, disease, patient's capacity to bear pain and the type of Marma point
- Start with less pressure and then increase up to the bearable level
- During the therapy, therapist was supposed to continuously watch the facial expressions of the patient

The rhythm of applying and releasing pressure was kept similar to the rhythm of the heart-beat (normal heart-beat rate is 72 times per min, i.e. 0.8 second for each heart-beat). Pressure was applied at the Marma point for 0.8 second with the help of tips of fingers and thumb of the hand and then released, and this cycle was maintained.

The rate of applying pressure, i.e. the number of times, was similar to the respiratory rate – 16 to 18 times per minute. Each Marma point was pressed for 18 to 20 times. Thus, one session of Marma Therapy took about 5 minutes, and three such sessions were administered during the day. After giving pressure, the site was rubbed gently to avoid the creation of a mark at the site. The method of identifying the Marma points and applying pressure on them was taught to the patients also, so that they could do Marma Therapy on

their own, at home, during the follow-up period of the study.

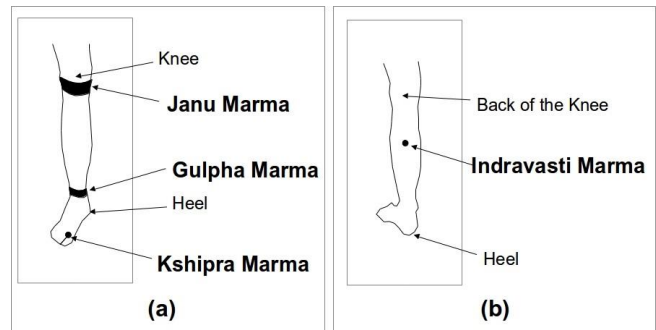


Fig. 1. (a) The front lower half of the leg, showing the position of Janu Marma, Gulpha Marma and Kshipra Marma. (b) The back lower half of the leg showing the position of Indravasti Marma.

2. Janu Basti

In Janu Basti, warm medicated oil (Ksheerbala Taila) was retained over the anterior portion of the painful knee joint (at supine position) [9] for 35 to 40 minutes.

Pre-Procedure

After releasing natural urges (urine and stool), patient was made to lie down on massage table in supine position, and expose the knee area properly.

Main-Procedure

Dough of split black gram (without skin) powder (250gm) [9] was prepared with sufficient quantity of water. This dough was stuck over the affected knee joint to form a leak-proof frame of two inches height and five inches diameter around the patellar surface of the knee, in order to retain the medicated oil. The medicated oil used in the present study was Ksheerbala oil (250ml to 300ml, for each knee, for three days). After making sure that there is no leakage from the walls of the frame, warm Ksheerbala oil (that was warmed in a hot water bath) was gradually filled in this frame with the help of a small piece of cotton of one inch thickness; the top level of oil was kept about 1 inch above the skin surface [9]. It was made sure that the temperature of oil was bearable for the patient. In order to maintain the

temperature of the oil, small amount of cooled oil was taken out after every 5 to 7 minutes with a piece of cotton, was warmed, and again filled back in the frame.

Post-Procedure

After completing the therapy, the entire oil was taken out from the frame with the help of a cotton piece, collected in a separate vessel for using over the next two days of therapy. The frame of black gram was also removed. Next, light massage of the affected joint was done for five minutes. After that medicated steam (generated from the decoction of Dashamoola) was applied on the affected knee joint for 5 to 10 minutes.

Local application of medicated steam (Nadi Sweda)

Janu Basti was followed by local application of medicated steam (Nadi Sweda) [9] on the affected knee joint for 5 to 10 minutes. The Nadi Sweda instrument consists of an electric pressure cooker, with a rubber pipe (about 5 feet long) attached to its nozzle, through which the steam flows out [9]. While administering the medicated steam, the tip of the pipe is to be kept at a distance of about 1.5 to 2 feet from the target region (affected knee joint in the present case), and rotated continuously so that the steam does not cause burning. A bundle of 500 gm medicinal herbs (Dashamoola was used in the present study) and water were kept in the pressure cooker to generate medicated steam [9]. Dashamoola is a mixture of ten medicinal herbs, i.e. *Desmodium gangeticum*, *Uraria picta*, *Solanum indicum*, *Solanum xanthocarpum*, *Tribulus terrestris*, *Aegle marmelos*, *Clerodendrum phlomidis*, *Gmelina arborea*, *Oroxylum indicum*, *Stereospermum suaveolens* [26].

So, the total time duration of therapy, including Marma Therapy and Janu Basti, was 65 to 75 minutes per day, and this intervention was given for 9 days.

After that there was a follow-up time period of one month, in which two follow-ups were taken:

- 1st Follow up: After 2 weeks of completion of treatment
- 2nd Follow up: After 4 weeks of completion of treatment
- During follow-up time period, patient had to daily do the following things, on their own, at home;
- Massage of the affected knee with Ksheerbala Taila, followed by plain water hot fomentation
- Three sessions of Marma Therapy, wherein each session included applying pressure on each of the four Marma points, 18 to 20 times.

Precautions

Patient was advised to avoid exposure to cold air or wind, immediately after taking the therapy. During the course of treatment, patient was advised to take proper rest, avoid too much walking and climbing the stairs, lifting heavy objects, etc.

Dietary recommendations

Patient was advised to take warm, fresh and easily digestible food items; especially green vegetables, green gram pulse, porridge, boiled sprouts, over-night soaked dry fruits, fenugreek, seasonal fruits, etc. Also, patient was advised to avoid heavy to digest food items like black gram pulse, beans, cauliflower, peas, okra, pumpkin, potato, polished rice, as well as cold, sour, oily, spicy food items.

Assessment Criteria and Grading

To assess the effect of therapy, the criteria given in Table 1 were followed. Grading was assigned to the criteria depending on their severity. From the time the therapy was started, required objective tests and assessments were done on day 0 (i.e. before starting the therapy), immediately after the completion of 9 days of therapy, after 2 weeks of completion of therapy, and after 4 weeks of completion of therapy. At the time of second follow-up, X-ray of the involved knee joint/s was done once again.

Statistical Analysis

For statistical analysis, the mean, percentage variation, standard deviation, standard error, t and p values were calculated by using t-test.



Results

Observations made Prior to the Starting of the Therapy

For the twenty patients who completed the study, the following observations were made in the beginning of the study, i.e. prior to the starting of the therapy.

- With regards to gender, 55% patients were female, and the remaining 45% were male
- With regards to age group, 40% patients belonged to the age group of 61-70 years, and 30% each belonged to the age groups of 51-60 years and 40-50 years
- With regards to the Prakriti, 70% patients had Vata-Pittaj Prakriti, 20% had Pitta-Kaphaja Prakriti, and 10% had Vata-Kaphaja Prakriti
- With regards to the type of Agni, 45% patients had Vishamagni, 30% had Samagni, and 25% had Mandagni
- With regards to the type of Koshta, 80% patients had Madhyama Koshta, and 20% had Krura Koshta
- With regards to Nidra Sheelata, 55% patients had disturbed sleep and 45% had sound sleep
- With regards to Nidana (Aharaj), 40% patients did Alpa Bhojana, 20% did Langhana, 15% were involved in the Atyupayoga of Tiktarasa, 10% each did Rooksha Bhojana and Atyupayoga of Katurasa, and 5% did Sheeta Bhojana
- With regards to Nidana (Viharaj), 25% each of the patients did Vega Dharana, Nisha-jagaran and Sheeghra Yaana, 15% had history of Marmaghata, and 10% did Ativyayama
- With regards to Nidana (Manasika), 75% patients did Atichinta, 15% had Atishoka, and 10% had Atibhaya.
- For 10 patients, both the knees were affected, while for the remaining 10 only one knee was affected
- Out of the 30 knees treated in the present study, 56.61% had chronicity in between 1 - 3 years, 26.64% had chronicity in between 3 - 5 years, 9.99% had chronicity of more than 7 years, and 6.66% had chronicity of less than one year

Overall Effect on the Assessment Criteria

Table 2 lists the overall effect of the therapy on all the assessment criteria of the present study, except Walking Time; for all these parameters, $n = 30$, i.e. the number of affected knees that were treated in the present study. For half of the patients, both the knees were affected, while only one knee was affected for the other half. Since, for the patients whose both the knees were affected, it was possible that a particular patient experienced different level of therapeutic effect in different knees, hence the parameters given in Table 2 were measured separately for both the knees, and as a result $n = 30$ for these parameters, i.e. the total number of knees treated in this study.

Table 3 lists the overall effect of the therapy on Walking Time; for this parameter, $n = 20$, i.e. the number of patients in the present study, because Walking Time depends on the combined effect of both the knees.

It can be seen from Table 2 that the mean score of WOMAC was 54.93 ± 1.85 before treatment, which reduced to 16.63 ± 1.97 after treatment, giving a relief of 69.73%, which is statistically significant with $p < 0.001$.

Mean score of Sandhi Shoola was 3.10 ± 0.09 before treatment, which reduced to 1.03 ± 0.13 after treatment, giving a relief of 66.77%, which is statistically significant with $p < 0.001$. Mean score of Sandhi Shotha was 2.13 ± 0.13 before treatment, which reduced to 0.40 ± 0.10 after treatment, giving a relief of 81.22%, which is statistically significant with $p < 0.001$. Mean score of Sandhi Stabdhatata was 2.40 ± 0.19 before treatment, which reduced to 0.47 ± 0.10 after treatment, giving a relief of 80.42%, which is statistically significant with $p < 0.001$. Mean score of Sandhi Atopa was 1.83 ± 0.13 before treatment, which reduced to 1.23 ± 0.13 after treatment, giving a relief of 32.79%, which is statistically significant with $p < 0.001$.

Mean score of ROM was 2.03 ± 0.09 before treatment, which reduced to 1.13 ± 0.09 after treatment, giving a relief of 44.43% which is statistically significant with $p < 0.001$.



It can be seen from Table 3 that the mean score of Walking Time was 1.05 ± 0.09 before treatment, which reduced to 0.05 ± 0.05 after treatment, giving a relief of 95.24%, which is statistically significant with $p < 0.001$.

No apparent change was observed in the X-ray examination before and after the treatment.

Variation in the Mean Value of each parameter with the duration of therapy

Table 4 lists the variation in the mean values of all the subjective and objective parameters with the duration of therapy, i.e. on days 0 (before starting the therapy), 9 (completion of therapy), 24 (first follow-up) and 39 (second follow-up).

Figures 2(a) to 2(f) show the variation in mean values with the duration of intervention for Sandhi Shoola, Sandhi Shotha, Sandhi Stabdhatata, Sandhi Atopa, Range of Motion (ROM), and overall WOMAC score, respectively. It can be seen from Table 4 and Figures 2(a) to 2(f) that the mean values of all the parameters reduced with time, indicating the continuous relief experienced by the patients during the therapy, as well as during the follow-up period.

Verbal Feedback after Six Months of Completion of the Study Period

Verbal feedback taken from patients about six months after the completion of the study period indicated that 4 patients still had almost complete relief (who had chronicity of less than 3 years) and were pursuing Marma Therapy regularly, while 10 others were able to self manage the disease through regular Marma Therapy and massage (who had chronicity of 3 to 10 years).

Discussion

The aim of the present study was to evaluate the efficacy of Marma Therapy with Janu Basti (with Ksheerbala Taila) in the management of Janu Sandhigata Vata (Osteoarthritis of knee).

According to Ayurveda, a healthy human body is supposed to have a relatively stable equilibrium (congenial homeostasis) of Dosha (psycho-biological rhythm - Vata, Pitta, Kapha), Dhatu (body

tissues) and Mala (excreta) [4]. Imbalance in this equilibrium leads to disease, and the aim of the therapy is to restore this balance [4].

Among the Tri-Doshas (i.e. Vata, Pitta and Kapha), Vata is of primary importance as it regulates the movement of the other two Doshas, Dhatus and Malas all over the body, mainly because of its Chala Guna (moving property) [4]. When Vata gets aggravated, either due to Vata Vardhaka Ahara (Vata aggravating diet), or Vihara (lifestyle), or Manasika Nidanas, or a combination of these causative factors, it gets firmly embedded in the Khavaigunya Yukta Srotas (micro-channels that have weak or defective space that can serve as a location for the starting of some pathology) associated with specific parts of the body, and impairs the functions of those body parts, causing the disease [4]. If this body part is Janu Sandhi, then the disease is termed as Janu Sandhigata Vata [1,3,4].

Vata has Ashraya-Ashrayi Sambandha (relationship) with Asthi Dhatu; this means that Vata takes shelter in Asthi [4]. In case of Janu Sandhi, if Vata is aggravated then because of its dry nature, it leads to a reduction of the Snehanasha (Shleshma / Snigdhatata) (unctuousness) from there; because of the decrease in Sneha, Khavaigunya (weak or defective space that can serve as a location for the starting of some pathology) occurs in Asthi and Sandhi, leading to the production of Sandhigata Vata there [4]. Sandhigata Vata is a Kashtasadhya Vyadhi (difficult to cure) because of factors like Madhyama Rogamarga involving Marma, Asthi and Sandhi, as well as vitiation of Asthi and Majja that are associated with Dhatukshaya (depletion of Dhatus), and occurrence primarily in Vriddhavastha (old age) [4]. It is included among the Mahagadas [4].

Janu Sandhigata Vata being a Vata Vyadhi that results in Dhatukshaya (depletion of Dhatus), Snehana (oleation) and Swedana (sudation) are recommended as viable treatment approach [1,3,4].



Sr No	Assessment Criteria of Subjective Parameters	Grade	Sr No	Assessment Criteria of Objective Parameters	Grade
1	Sandhi Shoola		1	WOMAC (for individual question)	
	No pain	0		None	0
	Mild pain	1		Slight	1
	Moderate pain without difficulty in walking	2		Moderate	2
	Moderate pain with difficulty in walking	3		Very	3
	Severe pain with difficulty in walking	4	Extreme	4	
2	Sandhi Shotha		2	Range of Motion (ROM)	
	No Swelling	0		Normal Flexion 130°	0
	Slightly obvious	1		< 130° and > 110°	1
	Covers well over the bony prominence	2		< 110° and > 90°	2
	Marked and much elevated	3		< 90° and > 70°	3
	Severe and very much elevated	4	< 70°	4	
3	Sandhi Stabdghata		3	Walking time to cover 21 m distance	
	No Stiffness	0		Up to 20 s	0
	< 5 minutes	1		21 to 30 s	1
	5 to 10 minutes	2		31 to 40 s	2
	10 to 15 minutes	3		41 to 50 s	3
	> 15 minutes	4	> 50 s	4	
4	Sandhi Atopa		4	X-ray finding (Kellgren-Lawrence radiographic grading scale of OA of Tibia femoral joint): [However, any significant radiographical changes were not expected after the completion of the study]	
	No Crepitus	0		No radiographic findings of OA	0
	Occasional Crepitus	1		Minute osteophytes of doubtful clinical significance	1
	Persistent and Palpable Crepitus	2		Definite osteophytes with unimpaired joint space	2
	Persistent and Audible Crepitus	3		Definite osteophytes with moderate joint space narrowing	3
			Definite osteophytes with severe joint space narrowing and subchondral sclerosis	4	

Table 1. Assessment criteria and grading of Subjective and Objective Parameters

Subjective Parameters	Mean (B.T.)	Mean (A.T.)	S.D.	S.E.	t value	p	% Relief
Sandhi Shoola	3.10 ± 0.09	1.03 ± 0.13	0.58	0.11	19.41	<0.001	66.77
Sandhi Shotha	2.13 ± 0.13	0.40 ± 0.10	0.64	0.12	14.84	<0.001	81.22
Sandhi Stabdghata	2.40 ± 0.19	0.47 ± 0.10	1.08	0.20	9.80	<0.001	80.42
Sandhi Atopa	1.83 ± 0.13	1.23 ± 0.13	0.77	0.14	4.27	<0.001	32.79
Objective Parameters	Mean (B.T.)	Mean (A.T.)	S.D.	S.E.	t value	p	% Relief
ROM	2.03 ± 0.09	1.13 ± 0.09	0.48	0.09	10.26	<0.001	44.43
WOMAC	54.93 ± 1.85	16.63 ± 1.97	9.82	1.79	21.37	<0.001	69.73
a) Pain	10.80 ± 0.42	2.77 ± 0.41	2.34	0.43	18.79	<0.001	74.35
b) Stiffness	3.80 ± 0.23	0.73 ± 0.16	1.39	0.25	12.10	<0.001	80.79
c) Physical Function	40.33 ± 1.34	13.13 ± 1.47	6.92	1.26	21.54	<0.001	67.44

Table 2. Overall Effect on the Assessment Criteria for all the parameters (n = 30 knees), except Walking Time . B.T.- Before Treatment; A.T.- After Treatment; S.D.- Standard Deviation; S.E.- Standard Error



Objective Parameter	Mean (B.T.)	Mean (A.T.)	S.D.	S.E.	t value	p	% Relief
Walking Time	1.05 ± 0.09	0.05 ± 0.05	0.46	0.10	9.75	<0.001	95.24

Table 3. Overall Effect on the Assessment Criteria for Walking Time (n = 20 patients). *B.T.- Before Treatment; A.T.- After Treatment; S.D.- Standard Deviation; S.E.- Standard Error*

Days	Shoola	Shotha	Stabdhatta	Atopa	ROM	WOMAC	WOMAC (Pain)	WOMAC (Stiffness)	WOMAC (Physical Function)	Walking Time
0	3.10	2.13	2.40	1.83	2.03	54.93	10.80	3.80	40.33	1.05
9	1.83	1.13	0.93	1.53	1.50	29.63	5.33	1.30	23.03	0.30
24	1.43	0.80	0.67	1.50	1.27	22.63	3.90	0.97	17.77	0.20
39	1.03	0.40	0.47	1.23	1.13	16.63	2.77	0.73	13.13	0.05

Table 4. Variation in the Mean Values of all the Subjective and Objective Parameters with the duration of therapy

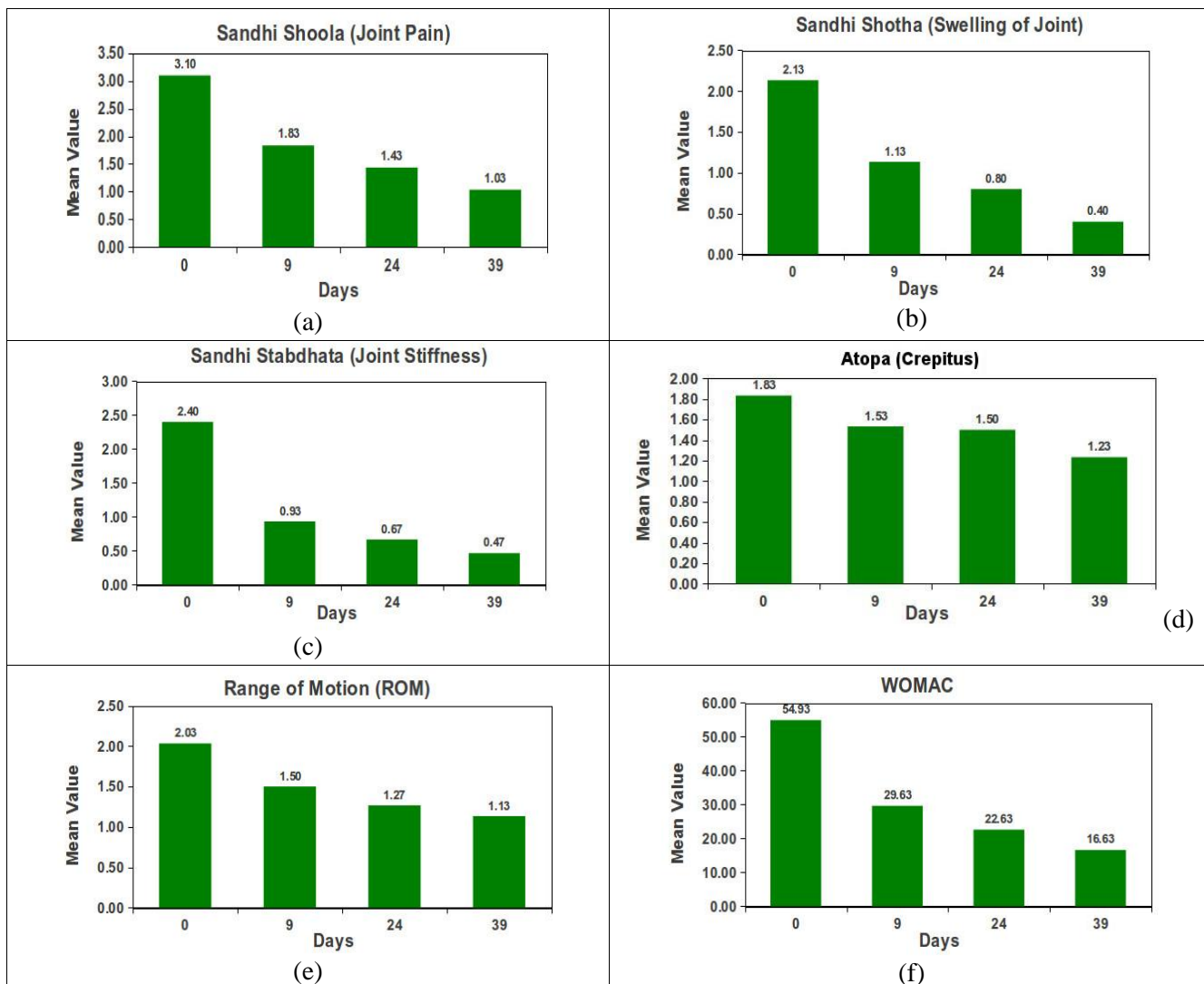


Figure 2. Variation in the mean values of (a) Sandhi Shoola, (b) Sandhi Shotha, (c) Sandhi Stabdhatta, (d) Sandhi Atopa, (e) Range of Motion (ROM), and (f) overall WOMAC score, with the duration of therapy.



Mode of action of Janu Basti

Janu Basti is an effective Snehana (oleation) and Swedana (sudation) procedure [9]. It is a procedure that has evolved from Shiro Basti [6]. It is included under the Shad Vidha Upakrama (six unique procedures), Sthanik Chikitsa (local therapy), Bahiparimarjana Chikitsa (external modality of treatment), and retaining type of procedures [5].

In this procedure, warm oil is retained for sufficiently long duration (approximately 35 to 40 minutes) over the affected body part [9]; as a result, the Veerya (active principle) of the oil is absorbed by the Loma Koopa (openings situated over the skin), which in turn undergoes Paka (metabolism) with the help of Bhrajaka Pitta situated in Twacha (skin) [4]. As the oil used in Janu Basti is opposite to the nature of Vata (has Vata pacifying properties), therefore, when it is absorbed by the skin and goes to Dhatus, it helps to rectify the disease present at that site.

In this disease, the glue that binds the cells of the cartilage, is disrupted, leading to cartilage damage at the affected site; oil, due to its properties like Tikshna (sharp) and Sukshma (minute), penetrates the cartilage, and helps in binding together the cartilage cells through its Snigdha (unctuous) and Guru (heavy/thick) properties - this property of oil is termed as Sandhaniya [27]. Also, since Snehana has properties similar to those of Kapha, it helps in bringing back Sthanika Kapha (Shleshaka) to normalcy, which further contributes to the management of this disease [4].

Mode of action of Ksheerbala Taila (oil)

In the present study, Ksheerbala Taila was used for Janu Basti. This oil has been found useful in the management of Sandhigata Vata in different body parts [4-6,28]. Ksheerbala Taila has cow's milk and Bala (*Sida cordifolia* Linn.) as ingredients, with Tila Taila (Sesame oil) as base. Due to its Snigdha (unctuousness), Pichchhila (sliminess) Guna, Madhura Rasa, Madhura Vipaka and Sheeta Veerya, Bala has Vata - Pitta pacifying and Rasayana (rejuvenating) properties [27,29]; milk has Madhura

Rasa (sweet in taste), Snigdha Guna (oily property), Sheeta Veerya (cold in nature) and Madhura Vipaka (effect after bio-transformation), which pacify Vata and Pitta Doshas [30]; and, Tila Taila pacifies Vata by its Guru (heavy/thick) and Snigdha (unctuous) Guna, and, Ushna (hot in nature) Veerya, and it also has Sandhaniya and Rasayana (rejuvenating) properties [3,26,29,31]. These properties of Ksheerbala Taila, as well as the Swedana (sudation) induced by the warm oil, must have contributed to the observed therapeutic benefit in the present study.

Mode of action of Nadi Sweda

Janu Basti was followed by Nadi Sweda over the Janu Sandhi, with Dashamoola Kwatha (local application of medicated steam generated from the decoction of Dashamoola). Swedana is Agni Deepaka (enhances the digestive fire), Srotoshuddhikara (cleans the subtle micro-channels), Sandhicheshtakara (improves joint movement), and Kaphavatanirodhaka (pacifies Kapha and Vata Doshas) [27]. Swedana supports the activation of local metabolic process, causes an increase in the local blood flow, and hence leads to an increase in the absorption of Sneha (oil) through the skin [3,4]. Sandhigata Vata is characterized by Sanga type of Srotodushti; Swedana relieves this Sanga, leading to the pacification of Sandhigata Vata [3,4,27]. Swedana produces sweating, and reduces stiffness and heaviness in the body [27,32].

Dashamoola is composed of roots of 10 medicinal plants, i.e. Shalaparni (*Desmodium gangeticum*), Prishnaparni (*Uraria picta*), Brihati (*Solanum indicum*), Kantakari (*Solanum xanthocarpum*), Gokshuru (*Tribulus terrestris*), Bilva (*Aegle marmelos*), Agnimanth (*Clerodendrum phlomidis*), Gambhari (*Gmelina arborea*), Shyonak (*Oroxylum indicum*), Patala (*Stereospermum suaveolens*). Out of these, 5 herbs have Vata-Kapha Shamaka (pacifying) property, 4 herbs have Tridoshaghna (pacify all the three Doshas) property, and 1 herb has Vata-Pitta Shamaka (pacifying) property [26,29]. Therefore, it is useful in pacifying all the three Doshas. Since, Sandhigata Vata involves inflammation, followed by degenerative changes, the



Kapha-Vata hara (pacifying) action of Dashmoola is especially useful in its treatment [4,5,26].

Mode of action of Marma Therapy

The Marma Therapy administered in the present study for the management of Janu Sandhigata Vata included stimulation of four Marma points, i.e. Kshipra, Gulpha, Indravasti and Janu, by applying pressure on these locations. The mode of action of Marma Therapy may be understood through various ancient and modern concepts as follows.

According to the scriptures, 'Havya Vaha' and 'Kavya Vaha' Tadit Shakti (bio-electric power), resides in the Marma locations [33]. The positive electricity named 'Havya Vaha' resides in the Marmas of the head and the torso, while the negative electricity named 'Kavya Vaha' resides in the Marmas of the hands and legs [33]. Imbalance of the Havya Vaha and Kavya Vaha Tadit Shakti residing in the Marma points results in the occurrence of disease and weakness [33]. In order to provide relief from this suffering by regaining this balance, the ancient sages invented Yogasanas (Yogic postures) [33]. The stretching, vibration, rhythmic movement and pressure caused by Yogasanas have a direct influence on the Marma points, which play an important role in their refinement, stability and nourishment [12-14,33]; subsequently, the functioning of the respective organs with which the specific Marmas are associated, also gets affected leading to therapeutic benefits [12]. For example, the four Marma points used in the present study are stimulated during Vajrasana and Supta Vajrasana, which are useful for knee pain/ strengthening of knee in a healthy person [13]; this indicates the effectiveness of the stimulation of these Marma points in knee disorders.

Marmas are connected to the Nadis (subtle nervous system) and Chakras (subtle energy centers) of the subtle body [14]. The Chakras can be considered to correspond to seven main Marmas or Pranic centers, which provide energy to all other Marmas [14,17]. Through stimulation of Marma points, the flow of Prana through the Chakras can be stimulated, thus

activating them, and resulting in the awakening of subtle dormant areas in the brain, that leads to the experiencing of higher realms of consciousness, which are normally inaccessible [34]; this, in turn, can lead to better control over the mind-body network including the autonomic nervous system and various organs, resulting in an overall healing effect [14].

Marmas are related to the three Doshas (Vata, Pitta and Kapha). Acharya Charaka has assigned great importance to the Trimarmas, i.e. Basti, Hridaya and Shirah [5]; these three main Marmas seem to have a direct relationship with the three Doshas, that are known to primarily reside in the same regions, i.e. Vata in the lower abdomen (site of Basti Marma), Pitta in the heart region (site of Hridaya Marma) and Kapha in the head area (site of Shirah Marma) [16]. According to Acharya Sushruta [Sushruta Sharira 6/35] [4], Marmas are the locations having the presence of the three Doshas (Vata, Pitta, Kapha), as well as their subtle forms, i.e. Prana, Tejas, Ojas, and also the three Gunas, i.e. Sattva, Rajas and Tamas [14]. Thus, the stimulation of Marmas may be correlated with the balance of the three Doshas and their subtle forms (Prana, Tejas, Ojas), as well as the three Gunas, which includes Sattva (mind) [14]. Ojas signifies the immunity power; by properly balancing it through the appropriate stimulation of Marmas, the immune system may be strengthened, as well as it can cause rejuvenating effect [14]. Through the connection with the Sattva Guna (mind), the proper stimulation of Marmas can provide relief in stress [14].

As Marmas are the seats of Prana, the vital life force that governs the physical and subtle processes of the body, therefore, through the stimulation of Marmas, the flow of Prana in different body parts can be modulated in such a way that it can be used to remove blockages, and decrease or enhance the physical and subtle energy currents within the body, resulting in the corresponding healing effect [14]. Since Prana is connected to Vata Dosha, hence Marma Therapy can be especially useful in treating the Vata disorders [14]. Out of the five forms of



Vata Dosha, Vyana Vayu, that is associated with the skin, as well as the movement and circulation of the Prana, can be most closely linked to the Marmas [14]. Thus, stimulation of the Marmas can balance the Vyana Vayu and Vata Dosha, resulting in the corresponding healing effect in diseases like Janu Sandhigata Vata.

Effect of Therapy on Cardinal Symptoms

In the present study, 66.77% relief was observed in Sandhi Shoola ($p < 0.001$) (Table 2). Vata Prakopa (vitiation) was the primary reason for pain, and hence the best treatment was to pacify the Prakupita Vata. The properties of Ksheerbala Taila, such as Snigdha and Guru Guna, and Ushna Veerya are opposite to the properties of Vata [4,28,29]; it must have helped in subsiding the Shoola. Since the stimulation of the Marmas can balance the Vyana Vayu and Vata Dosha (Kshipra and Gulpha Marma have been correlated with Vata) [14], hence this must have contributed to reducing the Shoola.

There was a relief of 81.22% in Sandhi Shotha (swelling) ($p < 0.001$) (Table 2). When Prakupita Vata gets localized in the Asthi Sandhi, it produces Srotorodha (obstruction of the micro-channels) due to Vata Sanga; consequently it produces Shotha [3,4]. The Ushnata applied by the Janu Basti procedure, and the Ushna Veerya of the oil used, do the Paka (metabolism) of the Dushyas present there, and hence Shotha gets reduced [4]. Since, the stimulation of Marmas can pacify the Prakupita Vata (Kshipra and Gulpha Marma have been correlated with Vata), and also modulate the flow of Prana in such a way that it can be used to remove blockages [14], it must have contributed to the reduction of Shotha. Kshipra, Gulpha and Janu Marmas have been correlated with Kapha, and, Janu Marma has been correlated with Udakavaha Srotas [14]; therefore, the stimulation of these Marmas may balance the functioning of Kapha and Udakavaha Srotas, causing reduction of Shotha.

There was a relief of 80.42% in Sandhi Stabdhatta ($p < 0.001$) (Table 2). When the disease is aggravated, the vitiated Vata might produce Stambha (stiffness)

due to its Ruksha (dry) and Sheeta (cold) Guna, leading to the restriction in movement [3]. Swedana leads to an increase in the Dhatvagni at the level of joints, and hence improves joint activity (Sushruta Chikitsa Sthana 32/22) [3,4]. The stiffness, i.e. restriction in the joint movement, may also be attributed to the blockage in the movement of Prana at that location; since Marma Therapy reinstates the proper flow of Prana, it must have contributed to the removal of blockages [14], resulting in the reduction of Stabdhatta. Indravasti and Janu Marma have been correlated with Pitta; Gulpha Marma has been correlated with Vata and Asthivaha srotas; and, Kshipra Marma has been correlated with Pranavaha and Rasavaha Srotansi [14]; therefore, the stimulation of these Marmas may help to increase Dhatvagni at the level of joints, remove blockage in the flow of Prana at that location, resulting in reduction of Stabdhatta. This observation is further supported by the fact that while administering Marma Therapy, several patients reported that they felt immediate relief in stiffness.

There was a relief of 32.79% in Sandhi Atopa ($p < 0.001$) (Table 2). Atopa is caused because of Vata Vriddhi (increase) and Sthanika Kapha Kshaya (depletion of local Kapha). This symptom is due to Srotoriktata (empty space in micro-channels) present at Sandhi; Swedana removes Srotoriktata and regulates the Vata Dosha, thus resulting in relief in Atopa [3]. Snehana provides Vrinhana (nourishing / rejuvenating) effect, which helps in mitigating Sthanika Kapha Kshaya [4]. Since Janu Basti provides both Snehana and Swedana, hence it must have helped in reducing the Atopa. Since the stimulation of the Marmas can balance the Vata Dosha [14], as well as modulate the proper flow of Prana, hence it must have contributed to the mitigation of the Srotoriktata that was present at Sandhi, with the corresponding reduction in Atopa. Kshipra and Gulpha Marma have been correlated with Vata and Kapha, and, Janu Marma has been correlated with Kapha [14]; therefore, the stimulation of these Marmas may balance Vata and Kapha Doshas, resulting in relief in Atopa. Gulpha Marma has been correlated with Medovaha Srotas,



Indravasti Marma has been correlated with Annavaha Srotas, and Kshipra Marma has been correlated with Rasavaha and Pranavaha Srotansi [14]; hence, stimulation of these Marmas may help to provide Vrinhana (nourishing / rejuvenating) effect, causing mitigation of Sthanika Kapha Kshaya, and subsequently helping in reducing Atopa.

With regards to the knee joint flexion (ROM), 44.43% relief was observed in the same ($p < 0.001$) (Table 2). Movement of the knee joint was restricted because of Sanga type of Sroto Dushti, as well as Sheeta Guna of Vata, which causes Stambha (stiffness) [3]. Swedana removed Stambha and Sheetata, and induced sweating; consequently, better movement of the joint was achieved (Charak Sutra 22/11) [3,5]. The restriction in the joint movement may also be attributed to the blockage in the movement of Prana at that location. Indravasti and Janu Marmas have been correlated with Pitta [14]; therefore, the stimulation of these Marmas may help to increase Dhatvagni at the level of joints, remove blockage in the flow of Prana at that location, resulting in better ROM.

On examining the Walking Time, 95.24% improvement was observed ($p < 0.001$) (Table 3). Due to pain and stiffness in the knee joint, the patients had difficulty in walking. As the pain and stiffness reduced, difficulty in walking also reduced.

The WOMAC Index (Modified - CRD Pune Version), which is suitable for Indian-Asian use [23,25], was used in this study to assess the pain, stiffness, and physical function in the patients. There was 69.73% improvement in the WOMAC score ($p < 0.001$) (Table 2). Since the therapeutic intervention reduced the pain and stiffness, and improved the physical function of the knee joint, hence the WOMAC score also reduced, illustrating the effectiveness of the therapeutic procedure.

It can be seen from Table 4 and Figure 2, that there was a continuous decrease in the mean values of all the subjective and objective parameters, with the

duration of intervention. During the first 9 days of the therapy, both Marma Therapy and Janu Basti were being administered to the patients at the Department of Ayurveda and Holistic Health; hence, the results indicate the significant efficacy of the therapeutic procedure in providing relief in the symptoms of Janu Sandhigata Vata.

During the subsequent follow-up period of four weeks, the patients had to daily do the following things, on their own, at home - massage of the affected knee with Ksheerbala Taila, followed by plain water hot fomentation, and, three sessions of Marma Therapy; hence, the results indicate that after the short-term initial therapeutic intervention, the patients attained the capability of long term self-management of the disease at home through regular practice of Marma Therapy and massage. This further indicates the efficacy of Marma Therapy in the management of symptoms of Janu Sandhigata Vata.

Verbal feedback taken from patients about six months after the completion of the study period indicated that 4 patients still had almost complete relief (who had chronicity of less than 3 years) and were pursuing Marma Therapy regularly, while 10 others were able to self manage the disease through regular Marma Therapy and massage (who had chronicity of 3 to 10 years). This further indicates the efficacy of Marma Therapy in the long-term self-management of Janu Sandhigata Vata.

Thus, the results illustrate the promise that the present therapeutic intervention holds in providing the ability to the patients for long-term self-management of this disease, after short-term initial therapeutic intervention under the supervision of a medical practitioner.

Conclusion

The present study was done to evaluate the efficacy of Marma Therapy with Janu Basti (with Ksheerbala Taila) in the management of Janu Sandhigata Vata (Osteoarthritis of knee). The therapeutic procedure involved administration of Marma Therapy on four



Marma points of the legs, i.e. Kshipra, Gulpha, Indravasti and Janu, three times during the day, and, Janu Basti with Ksheerbala Taila, followed by Nadi Sweda of Dashamoola Kwath. The total time duration of therapy was 65 to 75 minutes per day, and this intervention was given for 9 days. After that there was a followup time period of one month, during which the patient had to daily do the massage of the affected knee with Ksheerbala Taila, followed by plain water hot fomentation, as well as three sessions of Marma Therapy, wherein each session included applying pressure on each of the four Marma points, 16 to 20 times. Twenty patients completed the study, which involved the treatment of 30 knees.

With regards to the management of the symptoms of Janu Sandhigata Vata, Significant improvement was observed in the subjective parameters (Sandhi Shoola, Sandhi Shotha, Sandhi Stabdghata, and Sandhi Atopa) and objective parameters (WOMAC Index, ROM, Walking Time) analyzed during the study. After the completion of the study, there was 66.77% relief in Sandhi Shoola (pain) ($p < 0.001$), 81.22% relief in Sandhi Shotha (swelling) ($p < 0.001$), 80.42% relief in Sandhi Stabdghata (Akunchana Prasaranajanya Vedana / stiffness) ($p < 0.001$), 32.79% relief in Sandhi Atopa (crepitus) ($p < 0.001$), 44.43% relief in knee joint flexion (Range of Motion - ROM) ($p < 0.001$), 95.24% improvement in Walking Time ($p < 0.001$), and 69.73% improvement in the WOMAC score ($p < 0.001$).

Both during the initial therapeutic intervention of nine days, as well as the followup time of one month, there was continuous decrease in the mean values of all the subjective and objective parameters with the duration of intervention, indicating the efficacy of the therapeutic procedure. This also indicated that after the short-term initial therapeutic intervention, the patients attained the capability of long term self-management of the disease at home through regular practice of Marma Therapy and massage.

Verbal feedback taken from patients about six months after the completion of the study period indicated that 4 patients still had almost complete relief (who had chronicity of less than 3 years) and were pursuing Marma Therapy regularly, while 10 others were able to self manage the disease through regular Marma Therapy and massage (who had chronicity of 3 to 10 years). These observations indicate the specific efficacy of Marma Therapy in the long-term self-management of Janu Sandhigata Vata.

Thus, the present study illustrates the significant efficacy of the administered therapeutic intervention in the management of Janu Sandhigata Vata, both with regards to short-term relief, and long-term self-management.

Compliance with ethical standards

Informed consent was obtained from the patients before the start of the therapy.

Conflict of interest

The authors declare that they have no conflict of interest.

Acknowledgements

Authors would like to acknowledge the subtle guidance of their spiritual guide, Revered Pandit Shriram Sharma Acharya (http://www.awgp.org/about_us/patron_founder).

The authors thank the faculty and staff of the Department of Ayurveda and Holistic Health at Dev Sanskriti Vishwavidyalaya, Haridwar for their support in conducting this study.

References

1. Rajoria K, Singh SK, Sharma RS, Sharma SN. Clinical study on laksha guggulu, snehana, swedana & traction in osteoarthritis (knee joint). *Ayu*. 2010; 31(1): 80-87. <https://doi.org/10.4103/0974-8520.68192>
2. Long L, Soeken K, Ernst E. Herbal medicines for the treatment of osteoarthritis: a systematic review. *Rheumatology*. 2001; 40: 779-793. <https://doi.org/10.1093/rheumatology/40.7.779>
3. Joshi A, Mehta CS, Dave AR, Shukla VD. Clinical effect of nirgundi patra pinda sweda and ashwagandhadi guggulu yoga in the management of sandhigata vata



- (osteoarthritis). *Ayu.* 2011; 32(2): 207-212. <https://doi.org/10.4103/0974-8520.92588>
4. Murthy KRS. *Susruta samhita. volume I, II, III.* Varanasi, Uttar Pradesh, India: Chaukhamba Orientalia; 2008.
 5. Sharma PV. *Charaka-samhita (text with English translation). volume I, II.* Varanasi, Uttar Pradesh, India: Chaukhamba Orientalia; 2008.
 6. Gupta KA. *Ashtanga hrdayam of vagbhata - vidyotini hindi commentary.* Varanasi, Uttar Pradesh, India: Chaukhamba Sanskrit Sansthan; 2005.
 7. Sastri S. *Madhava nidanam of sri Madhavakara. part-1.* 30th ed. Varanasi, Uttar Pradesh, India: Chaukhamba Sanskrit Sansthan; 2000.
 8. Kumar AK. *A study on the effect of janu-dhara with tila taila and kethakyadi taila in janusandhigatavata.* Dissertation for the degree of Ayurveda Vachaspati in Panchakarma. Bengaluru, Karnataka, India: Rajiv Gandhi University of Health Sciences; 2010. <http://52.172.27.147:8080/jspui/handle/123456789/4705>
 9. Acharya GS. *Panchakarma illustrated.* Delhi: Chaukhamba Sanskrit Pratishthan; 2006.
 10. Verma A, Shete SU, Doddoli G. *An integrated therapy approach for the management of obesity-associated disorders: a case report.* *Journal of Family Medicine and Primary Care.* 2019; 8(4): 1491–1494. https://doi.org/10.4103/jfmpc.jfmpc_200_19
 11. Perera PK, Perera M, Kumarasinghe N. *Effect of sri lankan traditional medicine and ayurveda on sandhigata vata (osteoarthritis of knee joint).* *Ayu.* 2014; 35(4): 411–415. <https://doi.org/10.4103/0974-8520.159007>
 12. Joshi SK. *Marma science and principles of marma therapy.* 1st ed. Haridwar, Uttarakhand, India: Vani Publications; 2010.
 13. Joshi SK. *Marma chikitsa vigyan (Hindi).* Haridwar, Uttarakhand, India: Mrityunjay Mission; 2012.
 14. Frawley D, Ranade S, Lele A. *Ayurveda and marma therapy.* Delhi, India: Chaukhamba Sanskrit Pratishthan; 2015.
 15. Lad V, Durve A. *Marma points of ayurveda.* Albuquerque, New Mexico, USA: The Ayurvedic Press; 2015.
 16. Schrott E, Raju JR, Schrott S. *Marma therapy.* (Translated by) Lorys M. London, UK: Singing Dragon; 2016.
 17. Phull G, Phull R. *Clinical approach to marma chikitsa.* New Delhi, India: IP Innovative Publication Pvt. Ltd.; 2019.
 18. Denaud P. *Kalaripayat - the martial arts tradition of India.* (Translated by) Cain J. Vermont, USA: Destiny Books; 2009.
 19. Fox M, Dickens A, Greaves C, Dixon M, James M. *Marma therapy for stroke rehabilitation - a pilot study.* *Journal of Rehabilitation Medicine.* 2006;38(4):268-271. <https://doi.org/10.1080/16501970600630820>
 20. Kotelevskiy VI. *Integrative technology of massage manipulations in physical rehabilitation of students with backbone pathology.* *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports.* 2016;20(3):31-40. <https://doi.org/10.1556/18189172.2016.0305>
 21. Murota M, Iwawaki Y, Uebaba K, Yamamoto Y, Takishita Y, Harada K, Shibata A, Narumoto J, Fukui K. *Physical and psychological effects of head treatment in the supine position using specialized ayurveda-based techniques.* *The Journal of Alternative and Complementary Medicine.* 2016;22(7):526–532. DOI: 10.1089/acm.2015.0388. <https://doi.org/10.1089/acm.2015.0388>
 22. Sieler R. *Kalari and vaityayalai: medicine and martial arts intertwined.* *Asian Medicine.* 2012; 7(1): 164–195. <https://doi.org/10.1163/15734218-12341247>
 23. Chopra A, Saluja M, Tillu G, Venugopalan A, Sarmukaddam S, Raut AK, et al. *A randomized controlled exploratory evaluation of standardized ayurvedic formulations in symptomatic osteoarthritis knees: a government of India NMITLI project.* *Evidence-Based Complementary and Alternative Medicine.* 2011; 2011: 724291. <https://doi.org/10.1155/2011/724291>
 24. Salaffi F, Leardini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, et al. *Reliability and validity of the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index in Italian patients with osteoarthritis of the knee.* *OsteoArthritis and Cartilage.* 2003; 11: 551–560. [https://doi.org/10.1016/S1063-4584\(03\)00089-X](https://doi.org/10.1016/S1063-4584(03)00089-X)
 25. Chopra A. *Rheumatology: made in India (camps, COPCORD, HLA, ayurveda, HAQ, WOMAC and drug trials).* *Journal of Indian Rheumatology Association.* 2004; 12: 43–53.
 26. Pandey YK, Shalini, Sharma AK. *Effect of Grīvā Vasti in management of Grīvā Asthi Sandhi Gata Vāta (Cervical Spondylosis).* *Ancient Science of Life.* 2013; 33(1): 71–75. <https://doi.org/10.4103/0257-7941.134618>
 27. Shah MR, Mehta CR, Shukla VD, Dave AR, Bhatt NN. *A clinical study of matra vasti and an ayurvedic indigenous compound drug in the management of sandhigatavata (Osteoarthritis).* *Ayu.* 2010; 31(2): 210-217. <https://doi.org/10.4103/0974-8520.72399>
 28. Grampurohit PL, Rao N, Harti SS. *Effect of anuvasana basti with ksheerabala taila in sandhigata vata (Osteoarthritis).* *Ayu.* 2014; 35(2): 148–151. doi: 10.4103/0974-8520.146225. <https://doi.org/10.4103/0974-8520.146225>



29. 35. Murthy KRS. Bhavaprakasa of bhavamisra. volume 1 - including nighantu portion. Varanasi, Uttar Pradesh, India: Chowkhamba Krishnadas Academy; 2016. <https://doi.org/10.4103/0974-8520.68209>
30. Pokharel S, Sharma AK. Evaluation of insomrid tablet and shirodhara in the management of anidra (insomnia). Ayu. 2010; 31(1): 40-47. <https://doi.org/10.4103/0974-8520.82035>
31. Kundu C, Shukla VD, Santwani MA, Bhatt NN. The role of psychic factors in pathogenesis of essential hypertension and its management by shirodhara and sarpagandha vati. Ayu. 2010; 31(4): 436-441. <https://doi.org/10.4103/0974-8520.82035>
32. Akhtar B, Mahto RR, Dave AR, Shukla VD. Clinical study on sandhigata vata w.s.r. to osteoarthritis and its management by panchatikta ghrita guggulu. Ayu. 2010; 31(1): 53-57. <https://doi.org/10.4103/0974-8520.68210>
33. Sharma S. Gayatri mahavigyan - sanyukta sanskaran (Hindi). revised ed. Mathura, Uttar Pradesh, India: Yug Nirman Yojana Vistar Trust, Gayatri Tapobhumi; 2010.
34. Saraswati SS. Asana Pranayama Mudra Bandha. Munger, Bihar, India: Yoga Publications Trust; 2006.

