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Traditional *marma* manipulation and *snigdha agnikarma* in osteoarthritis of knee: a quasi-experimental study

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Osteoarthritis is a prevalent degenerative arthritic disorder that affects the global population. A non-surgical treatment which provides symptomatic relief can help most of the patients to avoid surgeries. Clinically it is similar to *sandhigatavata*, presenting *shulapradhanavedana*, *sandhisopha* with '*vatapurnadruthisparsa'* and restricted movements of the joint. According to Acharya Sushruta, treatment of *sandhigatavata* includes *sneha, upanaha, agnikarma, bandhana* and *unmardana.* Since pain is the cardinal symptom of this condition, two procedures among the aforesaid treatment principle were selected for comparing its effect in alleviating pain. So, *snigdha agnikarma* which is indicated in diseases affecting *sandhi, asthi, sira* and *snayu,* and *unmardana* or traditional *marma* manipulation were studied. The study was a quasi-experimental clinical trial done on the 0^{th}, 7^{th} and 14^{th} day in groups A and B respectively, with 22 participants in each group. All the 44 participants were recruited through purposive sampling, from patients with symptoms of OA knee registered in the O.P.D and I.P.D. of Shalyatantra, P.N.N.M. Ayurveda Medical College and Hospital, Cheruthuruthy, satisfying the inclusion and exclusion criteria. Traditional *marma* manipulation and *snigdha agnikarma* were administered in groups A and B respectively. The clinical assessment was based on the parameters; pain, stiffness and physical function using WOMAC scale; swelling, crepitus and tenderness by grading scales and range of motion using goniometric readings. The parameters mentioned in the assessment criteria were assessed on 0^{th}, 14^{th}, 28^{th} and 42^{nd} day. The results were statistically analyzed and it was found to be statistically significant in reducing all the parameters in both groups, but no significant difference between the effect of both procedures was noted. Thus, both interventions were found to be equally effective in terms of overall treatment effect.

Keywords: *Marma* manipulation, Osteoarthritis, *Sandhigatavata, Snigdha agnikarma,* Traditional *marma* manipulation, WOMAC osteoarthritis index

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The most prevalent progressive musculoskeletal disorder, osteoarthritis, can affect many joints, although it mostly affects the hips and knees since they carry the majority of the body's weight[1]. Approximately 3.3% to 3.6% of people worldwide are impacted by it. Joint pain, stiffness and limited range of motion are the three main signs of osteoarthritis[2]. The knee joint is the most often impacted joint, usually resulting from gradual loss of articular cartilage due to wear and tear[3]. Most often, it affects the elderly. As life expectancy and obesity rise, its prevalence will also increase[3]. For those over 40 years of age, the combined worldwide prevalence of OA knee was 22.9%[4]. The incidence in India is 28.7%, with females being more affected (31.6%) than males (28.1%)[5]. There are presently no proven disease-modifying drugs for the treatment of osteoarthritis in the knee, despite the fact that pharmaceuticals can help delay the course of RA and other inflammatory disorders[3]. This activity emphasizes the role of *snigdha agnikarma* and traditional *marma* manipulation in lessening OA symptoms.

Agnikarma is an Ayurvedic treatment modality which is mainly indicated in *rujapradhana vata* and *kaphaja vyadhis. Snigdha dravya* like *kshoudra, guda, taila, vasa* and *madhuchishta* are used for *snigdha agnikarma* and it is indicated in diseases affecting *sandhi, asthi, sira* and *snayu*[6,7]. Since osteoarthritis of knee is one such painful condition affecting *janu sandhi, snigdha agnikarma* can be administered in order to reduce symptoms like pain, stiffness, swelling, crepitus and restricted range of motion[8]. *Agnikarma* has already been proved to be effective in reducing pain and associated symptoms, according to some previous research works done in this

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area and is selected as the procedure in the control group[9-11]. Similarly, several traditional manipulation techniques including mobilization and compression, which are in practice in parts of Kerala and Tamil Nadu have shown great results in the management in improving the range of motion, flexibility and strength of the joint, thereby alleviating pain. Here, such traditional approaches which apply physical force to correct the positional fault or partially displaced *sandhi* were reviewed to frame an effective procedure. Application of pressure which may be considered as *Unmardana* is particularly useful when *kapha* is involved with *vata*, along with passive mobilization of the knee joint within physiological limits, has a beneficial effect on chronic pain and restricted joint movement. So, *Unmardana*[12] when administered over *janumarma* along with mobilization of the joint can be translated as traditional *marma* manipulation[13] and is selected to assess its effect in osteoarthritis of knee. Considering the disease burden and the need to find a safe, effective and economical procedure which can be easily done in the O.P.D. setting, the effect of traditional *marma* manipulation is studied in comparison with *snigdha agnikarma* in osteoarthritis of knee.

Materials and Methods

44 participants of either gender belonging to the age group 40-60 years fulfilling the inclusion and exclusion criteria, registered in the O.P.D and I.P.D. of Shalyatantra, P.N.N.M. Ayurveda Medical College and Hospital, Cheruthuruthy, were recruited through purposive sampling and allocated into 2 groups, group A and group B alternatively with 22 participants in each group. Traditional *marma* manipulation and *snigdha agnikarma* were administered in respective groups.

Study design

The study design is non-equivalent control group design, a quasi-experimental clinical trial.

Diagnostic criteria

Diagnosed cases of osteoarthritis of knee according to ACR criteria[14] and stages I, II and III according to the Kellgren and Lawrence[15] (KL) radiological staging scale.

Inclusion criteria

Clinically diagnosed cases of osteoarthritis in knee as per the diagnostic criteria, irrespective of gender belonging to the age group 40 to 60 years.

Exclusion criteria

Those with uncontrolled diabetes mellitus, hypertension and other known systemic disorders; with history of knee surgery, trauma or instability; cases of secondary osteoarthritis of knee; pregnant or lactating and subjects showing unwillingness to give the written consent were excluded from the study.

Assessment criteria

Subjective parameters **(**Table 1**)**

Objective parameter (Table 2)

Intervention

Group A – Traditional *marma* manipulation[16]

Group B – *Snigdha agnikarma*

Pre-operative procedure

Patient was made to lie in supine position. Part exposed and cleaned.

Group A: *Bahyasneha* using *tilataila* and *bashpasweda* was done at the affected knee joint[16].

Group B: *Snigdha pichilaannapana* (rice and curd) was given prior to the procedure.

Operative procedure

Done on 0^{th}, 7^{th} and 14^{th} day.

Group A: The patella was raised by using forefinger and thumb of both hands to mobilize it sideways (Fig. 1a). Knee joint was elevated to 1 foot by placing pillows under the leg. Downward pressure was applied intermittently above knee for 1 min (Fig. 1b). Then the patient was made to lie in prone

Table 1 — Grading scales of subjective parameters

Parameter	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Pain	No pain	slightly painful	moderately painful	very painful	extremely painful
Stiffness	No stiffness	slightly stiff	moderately stiff	very stiff	extremely stiff
Physical function	Not affected	slightly affected	moderately affected	very much affected	extremely affected
Swelling	No swelling	Slightly obvious	Covers well over bony prominence	Much elevated	___
Crepitus	No crepitus	Palpable crepitus	Audible crepitus	___	___
Tenderness	No tenderness	Slight tenderness	Moderate tenderness	Severe tenderness	___

Table 2 — Grading scale of objective parameter

Parameter	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Range of motion	Not restricted	Upto 50%	50-70%	Above 70%	Fully restricted

Fig. 1 — Steps in Traditional *marma* manipulation, (a) Patellar mobilization, (b) Extension manipulation, (c) Flexion manipulation

position and knee joint was flexed. Downward pressure was applied intermittently for 1 minute; such that heel was approximated to the buttocks as possible (Fig 1c)[16].

Group B: Most tender points (up to 10 in number) around affected knee were identified. *Tilataila* was heated to its boiling point. Then, *tilataila* was taken in a borosil glass pipette to instill at the already identified points as 1 drop per 1 cm^2 area (Fig. 2).

Post-operative procedure

Group A: Adviced rest for 5 min.

Group B: Site of *agnikarma* was applied with *madhu* and *ghrita*.

Follow-up

Follow-up done on 28^{th} and 42^{nd}day.

Statistical analysis

The parameters mentioned in the assessment criteria were assessed on 0^{th}, 14^{th}, 28^{th} and 42^{nd} day and statistical analysis was carried out using SPSS software version 20. All observed data were statistically analysed using Repeated measures ANOVA and Friedman's test. Between groups differences were evaluated by independent t-test and Mann-Whitney U test. p-value <0.05 was considered as the level of significance.

Results

The Shapiro-Wilk test was applied as a test of normality and accordingly, parametric test was employed in case of parameters (p-value>0.05) and non-parametric test was used for parameters (p-value<0.05). Details are presented in Table 3 & Table 4. Results obtained regrading all the parameters in individual groups is highly statistically significant. Comparison of mean or mean rank between two groups is shown in Table 5 & Fig. 3. Since the p-value is higher than 0.05, the null hypothesis is accepted. It indicates that there is no significant difference between the two groups in case of all parameters.

Fig. 2 — *Snigdha agnikarma*

Since the p-value in overall comparison of two interventions is higher than 0.05, the null hypothesis is accepted (Table 6). There was no significant difference between the effect of traditional *marma* manipulation and *snigdha agnikarma* in osteoarthritis of knee. So, both interventions were found to be equally effective in terms of overall treatment effect.

Discussion

Gate control theory of pain explain the effect of both interventions in reducing pain and tenderness. The gate is closed usually inhibiting constant nociceptive transmission via C fibers and gate will be opened allowing pain transmission centrally to thalamus and cortex where it is interpreted as pain. Further central transmission of pain will be prevented by the closure of gate. Hence thermal stimulus or hot *tilataila* and mechanical stimulus or pressure of manipulation probably stimulates these myelinated nerve fibers which inhibit the transmission of pain. *Taila* itself is *vataghna* and owing to its properties such as *teekshna*, *sookshma* and *vyavayi*, *agnikarma* with *taila* is considered to have deeper penetration through *sookshmasiras* and retain heat for a longer

Table 3 — Effect of traditional *marma* manipulation

Parameter	0^{th} day	14^{th} day	28^{th} day	42^{nd} day	p-value
Pain	7.68±3.33	4.32±2.62	3.23±2.14	2.45±1.89	<0.001 (*)
Physical function	20.77±7.41	13.54±5.49	10.77±4.59	8.95±4.80	<0.001 (*)
Values are reported as Mean ± SD # p-value computed using Repeated Measures ANOVA (*) A p-value of <0.05 has been considered as significant					
Stiffness	3.55±1.49	2.59±0.96	2.07±0.83	1.80±0.84	<0.001 (*)
WOMAC Score	4.00±10.94	2.86±7.83	1.95±6.52	1.18±6.69	<0.001 (*)
Swelling	3.18±	2.32±0.21	2.25±0	2.25±0	<0.001 (*)
Crepitus	2.93±0.57	2.59±0.56	2.32±0.62	2.16±0.68	0.001 (*)
Tenderness	3.75±0.74	2.57±0.57	1.95±0.55	1.73±0.47	<0.001 (*)
ROM	3.00±0.49	2.73±0.51	2.18±0.43	1.09±0.39	<0.001 (*)
Values are reported as Mean rank ± SD # p-value computed using Friedman test (*) A p-value of <0.05 has been considered as significant					

Table 4 — Effect of *Snigdha agnikarma*

Parameter	0^{th} day	14^{th} day	28^{th} day	42^{nd} day	p-value
Pain	8.36±4.11	5.50±3.53	3.77±3.04	3.36±3.17	<0.001 (*)
Physical function	20.14±9.99	14.68±9.81	11.14±8.10	9.59±8.63	<0.001 (*)
WOMAC Score	31.18±15.16	22.09±14.55	16.32±11.72	14.14±12.51	<0.001 (*)
Values are reported as Mean ± SD # p-value computed using Repeated Measures ANOVA (*) A p-value of <0.05 has been considered as significant					
Stiffness	3.52±2.12	2.73±1.80	2.02±1.30	1.73±1.26	<0.001 (*)
Swelling	3.20±0.70	2.59±0.41	2.14±0.18	2.07±0.14	<0.001 (*)
Crepitus	2.75±0.60	2.66±0.59	2.48±0.66	2.11±0.79	0.002 (*)
Tenderness	3.77±0.69	2.70±0.81	1.84±0.67	1.68±0.66	<0.001 (*)
ROM	2.84±0.49	2.57±0.51	2.30±0.49	2.30±0.49	<0.001 (*)
Values are reported as Mean rank ± SD # p-value computed using Friedman test (*) A p-value of <0.05 has been considered as significant					

Table 5 — Comparison of mean or mean rank between two groups

Parameters	Traditional *marma* manipulation (0^{th} day – 42^{nd} day)	*Snigdha agnikarma* (0^{th} day – 42^{nd} day)	p-value
Pain	5.23±2.52	5.00±3.25	0.797
Stiffness	1.36±1.60	1.50±3.36	0.204
Physical function	11.82±6.18	10.54±7.82	0.552
Values are reported as Mean ± SD # p-value computed using Independent sample t-test			
Swelling	21.82	23.18	0.693
Crepitus	23.16	21.84	0.680
Tenderness	20.64	24.36	0.297
Range of motion	24.50	20.50	0.215
Values are reported as Mean rank # p-value computed usingMann –Whitney U test			

duration; resulting in quick relief of pain. Theory of pro-inflammation states that induced local hyperthermia at a site flushes away pro-inflammatory cytokines and releases anti-inflammatory cytokines, which reduces swelling and tenderness at that area. With the reduction of symptoms such as pain, stiffness, tenderness and swelling, physical function of the joint also gets better. In addition, pressure applied over the joint surface, increases the extensibility of connective tissue thereby promotes activity in the stiff joint and tight muscles. This in turn improves range of motion.

Increased *rooksha* and *kharaguna* along with *soshana* of *sleshakakapha* will result in *vataprakopa* in *janu sandhi. Sabda* is an attribute of *Vata*. Since *vatadosha* is the root cause for development of *sandhigatavata,* presence of crepitus or *atopa* might be because of increased *vatadosha* in the knee joint. So pacifying vitiated *vatadosha* will have an effect on all the parameters. "*Sthambhagouravaseetaghnamsvedanamsvedakarakam*" describes *svedana* as a stiffness relieving procedure. Also the verse, "*sushkanyapi hi kashtanisnehaswedopapadanai: sakyamkarmanyathamnethukimugatranijeevitham*" emphasizes the importance of *snehasweda* as *poorvakarma*. Thus, *snehana* and *swedana* which are done as *poorvakarma* in case of traditional *marma* manipulation aids in relieving stiffness. It imparts *snigdha* and *ushnagunas* to the knee joint which have an impact on vitiated *vatadosha* and also relieves from *stambha.* Probable mode of action of traditional *marma* manipulation is presented in (Fig. 4). Similarly, in case of *snigdha agnikarma, snigdha* and *ushnaguna* reach deeper tissues to impart *snigdhatha* in the affected knee joint. In this way, these *gunas* play very important role in alleviating *vatadosha* thus it reduces symptoms in *sandhigatavata.*

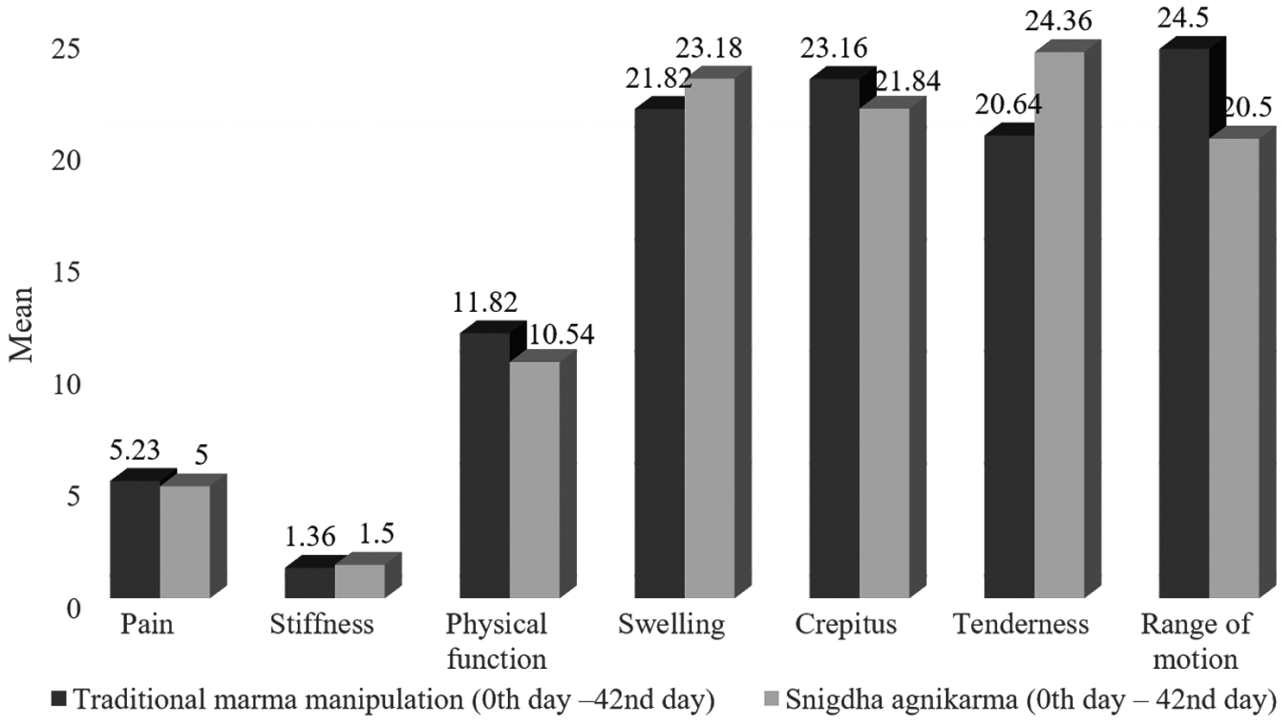

Fig. 3 — Comparison of effect of intervention on parameters between two groups

Table 6 — Overall comparison of effect of interventions

Mean		Independent sample t-test: Mean difference	Calculated value	p-value	Standard deviation	
Traditional *marma* manipulation (0^{th} day – 42^{nd} day)	*Snigdha agnikarma* (0^{th} day – 42^{nd} day)	2.68	0.424	0.674	Traditional *marma* manipulation (0^{th} day – 42^{nd} day)	*Snigdha agnikarma* (0^{th} day – 42^{nd} day)
39.59	36.91				18.32	23.37

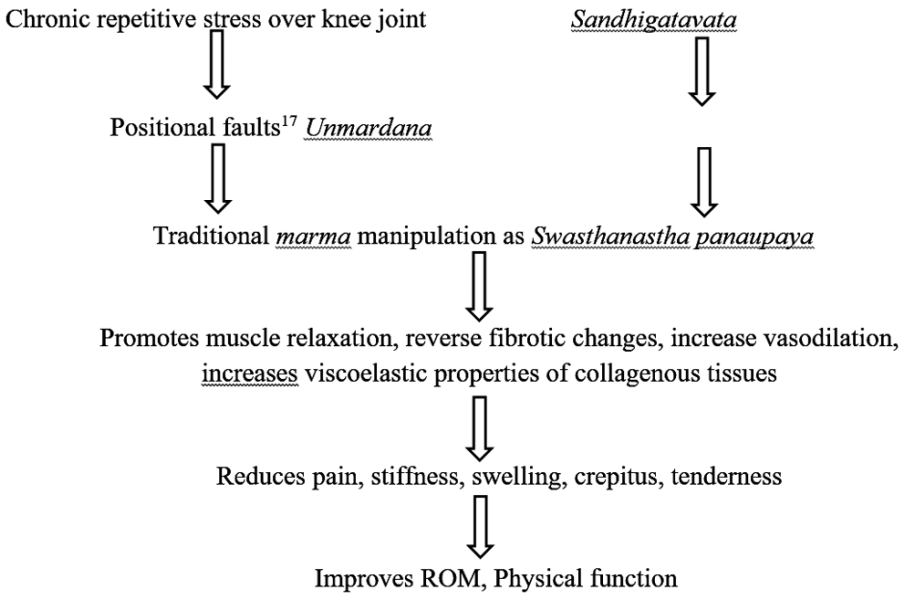

Fig. 4 — Probable mode of action of traditional *marma* manipulation

Conclusion

On comparing effect of both interventions, no significant difference was found between traditional *marma* manipulation and *snigdha agnikarma* in reducing pain, stiffness, swelling, crepitus and tenderness; and improving physical function and range of motion. Thus, null hypothesis was accepted and it can be concluded that both treatments are equally effective which are also safe and economical that can be easily done in the O.P.D. setting.

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Conflict of Interest

Authors declare that there is no conflict of interest.

Author Contributions

All the authors contributed significantly to the conception, study, data collection and finalizing of the manuscript.KCP drafted the original manuscript. SMPV, SK reviewed and edited. The authors have read and approved the final version of the manuscript before the submission.

Informed Consent

Written informed consent was obtained from all participants prior to their enrolment in the study.

Ethical Approval

Ethical clearance has been obtained from Institutional Ethics Committee, P.N.N.M. Ayurveda Medical College and Hospital, Cheruthuruthy with Ethical committee reference order no.: PNNM/A2/PG/IEC-04/2022, dated: 27/08/2022 before study and dated 20/09/2024 after study.

Data Availability

Supporting data are available from the corresponding author upon reasonable request.

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