

EFFECT OF HOT MUD APPLICATION AND REVULSIVE COMPRESS IN KNEE OSTEOARTHRITIS: A COMPARATIVE STUDY

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ABSTARCT

Background: Osteoarthritis is the most common joint disorder associated with an increasing socioeconomic impact owing to the ageing population. Hydrotherapy and mud therapy are the commonly used treatment modalities in the management of pain in Naturopathy. Hence this study is done to compare the effectiveness of hot mud pack and revulsive compress in the management of knee osteoarthritis. **Materials and methods:** In this randomized comparative study, 60 subjects with knee osteoarthritis were randomly allocated into two groups. Group 1 received hot mud pack to knees for 30 minutes for 10 consecutive days and group 2 received revulsive compress for 30 minutes in 10 consecutive days. All subjects were assessed for VAS and WOMAC scores day 10. **Results:** The results showed a 27.67 % reduction in pain (VAS $p=0.0001$) and WOMAC (20.27% $p=0.0001$) scores in hot mud pack group. 9.57% reduction in pain (VAS $p=0.0004$) and WOMAC (13.53% $p=0.0001$) scores in revulsive compress group. Comparative analysis of two groups using unpaired t-test has shown a 16.7% better reduction in pain (VAS $p=0.0001$) in mud pack group when compared to revulsive group. However, there was no significant difference in the reduction of WOMAC scores ($p=0.06$) in two groups. **Conclusion:** Both hot mud pack and revulsive compress reduces the pain and improves the functional capacity in knee osteoarthritis patients. Hot mud pack is relatively a better treatment modality in reducing the knee pain in osteoarthritis condition.

Index terms: Mud therapy, Revulsive compress, VAS, WOMAC, Osteoarthritis.

1. INTRODUCTION

Osteoarthritis (OA) is the most common degenerative joint disorder that affects mainly the larger joints such as knee and hip joints which is typically the result of wear and tear and progressive loss of articular cartilage. [1] OA is now considered as a whole joint disease, characterized by cartilage loss, periarticular ligament, adipose tissue, subchondral bone changes, inflammation of the synovium and meniscal degeneration. [2] Knee OA can be of two types primary and secondary depending on the underlying cause. Primary OA is the result of articular degeneration without any apparent underlying reason and secondary OA occurs as a consequence of trauma or due to the abnormal articular cartilage as in Rheumatoid arthritis. [3] The pathogenesis of OA is a dynamic interplay of mechanical, cellular and systemic molecular factors which leads to a progressive disease that eventually leads to disability with the varying clinical symptoms in individuals. [4,5] The cardinal signs include knee pain that is gradual in onset and worsens with activity, transient morning knee stiffness, swelling, Pain on prolonged sitting or resting and crepitus on joint movement that lead to joint instability and physical disability which impairs the quality of life (QoL). [6] Worldwide, knee OA is accountable for approximately 85% of the total osteoarthritis cases. [7] OA and diabetes are responsible for the largest increase in the years lived with disability in the global population. OA alone accounted for about 3 – 9% of years lived with disability (YLD) in 2015 and it is estimated to be the fourth leading cause of YLD by 2020. [8] A patient centred multidisciplinary approach with a combination of interventions, self-management strategies can result in better management and functional outcome of OA patients. [9]

The main goal of OA management is to reduce the pain, improve the joint function and to improve the QoL. [10] The non-pharmacological treatment modalities like CAM therapies are widely recommended as the first line of treatment in the management of OA. [11] Naturopathy, one of the CAM therapies is defined as a drugless, non-invasive, evidence-based system of medicine which includes treatment with natural elements based on the theories of vitality, toxemia, self-healing capacity of the body and on the principles of healthy living. [12] The main treatment modalities used by Indian Naturopathy practitioners are mud therapy, hydrotherapy, massage therapy, chromotherapy, magnetotherapy and Yoga therapy. [13]

International Society of Medical Hydrology defines mud as a natural product consisting a mixture of sea- salt lake or mineral-water with the organic and inorganic material produced by the biological and geological action which are applied topically as therapeutic agents in the form of cataplasms or baths. [14] Mud therapy has been used in the management of dermatological, rheumatic, musculoskeletal, gynaecological, neurological and cardiovascular conditions. [15] A recent systematic review proves the effectiveness of hot mud therapy in the treatment and secondary prevention of knee osteoarthritis by reducing the pain and functional limitation of OA affected individuals. [16] Hydrotherapy is one of the basic treatments widely used in naturopathy which

is probably as old as mankind. It consists of external or internal use of water in any of its forms with varying temperatures, pressure, duration and site for health promotion and disease management. [17] Revulsive compress is one of the hydrotherapeutic measures which has superior analgesic effects where the skin is being overheated by hot compress application and then making an immediate cold compress application of just sufficient intensity and duration so as to absorb the surplus heat without reducing the skin temperature below the normal point. Thus, having a purely revulsive, non-excitant analgesic effect [18] Revulsive compress has been proven to be an appropriate safe treatment to relieve the symptoms and pain associated with the knee OA. [19]

The local application of hot mud therapy and revulsive compress have been proven to be effective in the management of OA of knee, hence the present study has been done to evaluate which among the two selective naturopathic treatment can yield a better outcome in OA patients.

2. MATERIALS AND METHODS

In this comparative study, a total of 60 subjects were recruited from an inpatient set up of nature cure centre and were randomly allocated into two groups. Group one received hot mud pack and group two received revulsive compress to the knees. Written informed consent was obtained from each subject participating in the study. The study was approved by the Institutional Ethical Committee. Trial profile depicted in fig 1.

2.1 Inclusion criteria and exclusion Criteria

The subjects aged between 40 to 65 years [20] satisfying American College of Rheumatology diagnostic criteria [21] were included in the study. Subjects identified with Rheumatoid arthritis, open wounds or rashes, history of severe trauma to knee, knee surgery, intra articular corticosteroids, subjects taking oral steroids were excluded from the study.

2.2 Intervention

Subjects in group one received direct hot mud application at 45 °C to knees. Mud paste was laid on the skin extending between area 10cm distal and 10cm proximal to patella for about 30 minutes daily for consecutive 10 days. [22] Subjects in group two received Revulsive Compress consisting of four minutes of hot application by a wet linen cloth followed by one minute of cold application by a separate wet linen cloth. This cycle was repeated for six minutes in a total session of 30 minutes per day. The temperature of the water in the basin was maintained constantly at 38°C for hot applications and 15°C for cold application by monitoring continuously through a digital hydro-thermometer. [19]

2.3 Assessments

The subjects were assessed for Visual Analogue Scale (VAS) scores and Western Ontario and McMaster Universities Osteoarthritis index (WOMAC) questionnaire scores at baseline and after 10 days of intervention.

2.3.1 VAS

VAS used in the study consisted of a line of 100mm length with anchor descriptors like “no pain” at one end and “worst pain imaginable” at the other end. The subjects were asked to mark his/her perception and the distance from left end point to the mark is measured in mm. [23]

2.3.2 WOMAC

The WOMAC Index is a reliable outcome measure in OA knee subjects. It consisted of 25 item questionnaires targeting 3 domains- pain, stiffness and functional limitation. Each item of questionnaire offered five responses- “none” scored as 0, “mild” as 1, “moderate” as 2, “severe” as 3, and “extreme” as 4. The total score for each domain was: pain- (0–20; 5 items each scored 0–4), stiffness (2 items, 0–8), and physical function (17 items, 0–68). Higher scores indicated worse pain, stiffness, or physical function. The total score for each domain was the sum of scores for each response to each item in the questionnaire. [24]

2.4 Statistical analysis

Statistical analysis was done by using Statistical Package for Social Sciences (SPSS Version 20.0). The data was screened for normal distribution using Kolmogorov-Smirnov test and analysed by using paired sample t-test for paired data and independent t-test for unpaired data. A value <0.05 was considered as significant.

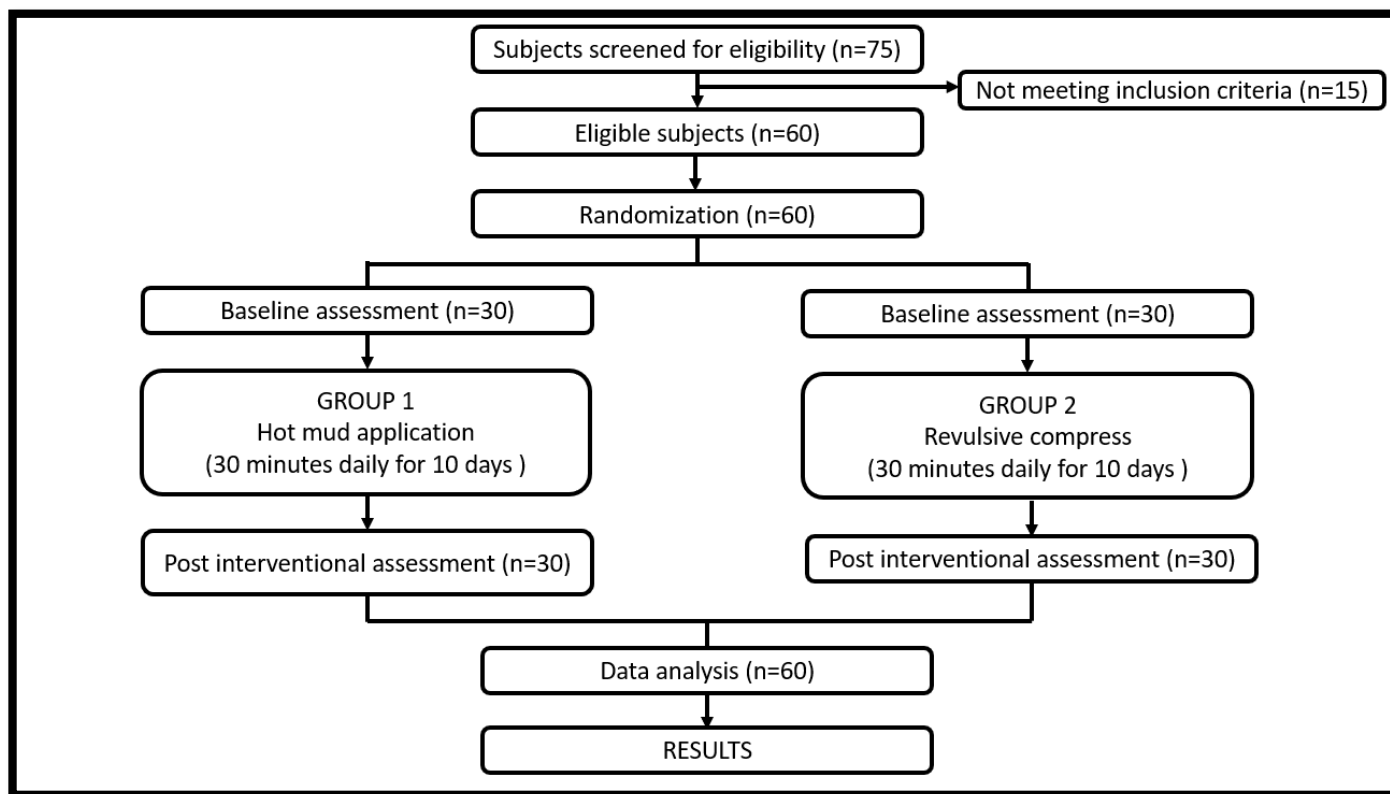


Fig. 1 Trial profile

3. RESULT

The study was aimed to compare the effectiveness of two selective hydrotherapeutic procedures on OA knee individuals. The pre –post data of mud pack group and revulsive compress groups were analysed separately using paired t – test and comparative analysis between the groups were done by using unpaired t-test.

In mud pack group there were 33% of males and 67% of females with the mean age of 56.2 ± 9.11 years and in revulsive compress group there were 27% of males and 73% of females with the mean age of 55.6 ± 10.7 years.

Mud pack group showed a reduction of 27.67% in VAS scores ($p= 0.0001$) and 20.27% reduction in WOMAC scores ($p= 0.0001$) [table 1]. Revulsive compress showed a reduction of 9.57% in VAS scores ($p= 0.0004$) and 13.53% in WOMAC scores ($p= 0.0001$) [table 2].

The comparative analysis of mud pack group and revulsive compress group showed a significant difference in VAS scores, the mean difference being 16.7% ($p= 0.0001$). However, the there was no significant changes in WOMAC scores observed between the groups. ($p= 0.06$) [table 3].

Table 1: Comparison of pre and post-test values within mud pack group

VARIABLES	MEAN PRE ± SD	MEAN POST ± SD	Mean difference	CI	df	t Value	P value
VAS (%)	74.3 ± 8.17	46.3± 11.2	27.67	24.31 - 31.02	29	16.8	0.0001
WOMAC (%)	48.4 ± 21.3	28.1 ± 10.5	20.27	15.01 - 25.52	29	7.88	0.0001

Table 2: Comparison of pre and post-test values within revulsive compress group

VARIABLES	MEAN PRE ± SD	MEAN POST ± SD	Mean difference	CI	df	t Value	P value
VAS (%)	74.6 ± 9.37	63 ± 9.5	9.57	4.73 - 14.40	29	4.04	0.0004
WOMAC (%)	46.4 ± 12.9	32.9 ± 9.4	13.53	10.16 - 16.91	29	8.20	0.0001

Table 3: Comparison of post values of mud pack and revulsive compress groups

VARIABLES	MEAN POST \pm SD (mud pack)	MEAN POST \pm SD (revulsive compress)	Mean difference	CI	df	t Value	P value
VAS (%)	46.3 \pm 11.2	63 \pm 9.5	16.7	22.06 - 11.33	58	6.22	0.0001
WOMAC (%)	28.1 \pm 10.5	32.9 \pm 9.4	4.80	9.95 - 0.35	58	1.86	0.06

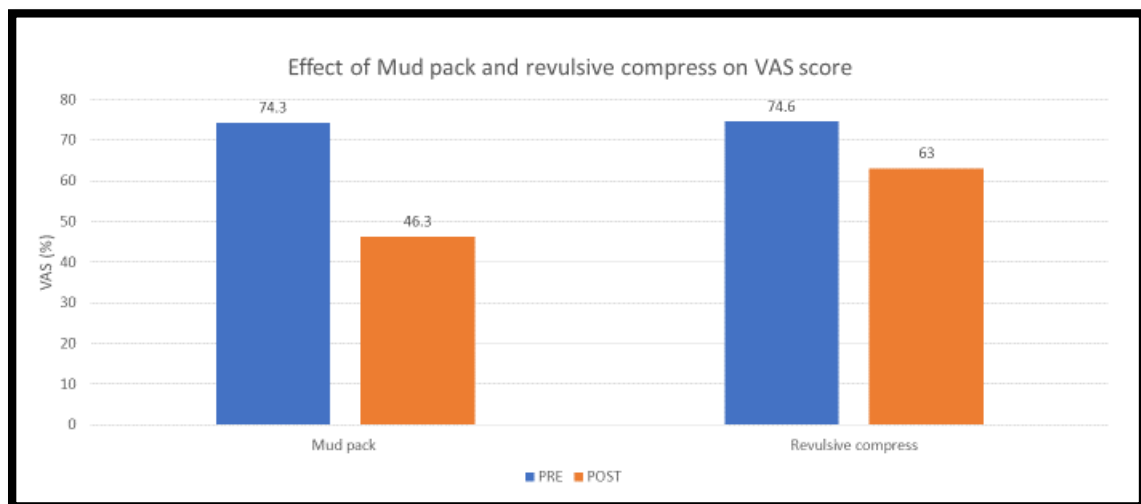


Fig 2. Effect of mud pack and revulsive compress on VAS score

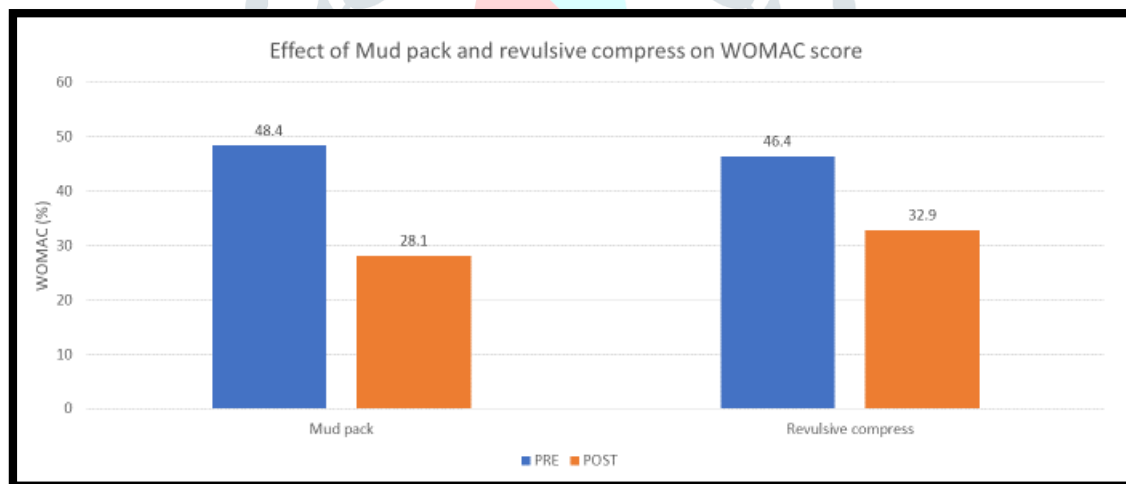


Fig 3. Effect of Mud pack and revulsive compress on WOMAC score

4. DISCUSSION

The current study evaluated the effects of hot mud therapy and revulsive compress in OA knee subjects. VAS is considered to be a reliable and a valid measure of intangible quantity like pain. [25] WOMAC is a popular measure to assess the impairment and activity limitation in patients with OA knee. [26] The present study showed a significant reduction in VAS and WOMAC scores in both the mud pack and revulsive compress groups. However, the comparative analysis between the groups showed a better reduction in WOMAC scores in hot mud pack group than the revulsive compress group.

In our study following hot mud pack to knees, there was a significant reduction in the pain. This result is in accordance with the earlier study done by Sarsan *et al*, where hot mature mud pack to knees had relieved the pain and stiffness in the OA knee individuals. [27] The reduction in the pain can be attributed to the substances in aqueous mud extracts which can penetrate across the human skin thus having the definite effects on spontaneous contractile activity of the smooth muscle tissue and also to the increased secretion of certain cytokines. [28] A study done by Belmotti *et al*, have reported that the mud pack when applied reduces the plasma levels of interleukin 1, tumour necrosis factor – α , and matrix metalloproteinase-3 and thereby reducing the inflammation of the cartilages and the tissue destruction. [29, 30, 31]

The reduction in pain and improvement in other functional index can also be due to the effect of heat, as thermal stimulation is known to cause increase in the extensibility of the collagen rich tissues. The increase in the extensibility of collagen rich tissues will increase the range of motion, and relieves the muscle spasm. [32] heat exposure to skin is also known to release a significant amount of opioid peptides which modifies the threshold of pain. [33] Thermal stress also has an anti-inflammatory effect due to the increased secretion of cortisol and catecholamines. [34]

The revulsive compress also showed a significant reduction in VAS and WOMAC scores. Similar results were reported by Jain Raj *et al*, [19] where 15 minutes of revulsive compress had reduced the total numeric pain scale score, oedema scale and range of movement in knee osteoarthritis. This is in line with results of Amal *et al*, where contrast bath has shown better improvement in knee pain and knee symptom score as compared to hot or cold therapy alone. [35] The underlying mechanism might be the strong stimulation of the local circulation following the contrast application. [36]

Even though both hot mud pack and revulsive compress have shown beneficial effects in knee osteoarthritis, hot mud pack had shown a better reduction in both VAS and WOMAC scores when compared to revulsive compress.

5. CONCLUSIONS

The present study shows that both hot mud pack and revulsive compress has remedial effect in knee osteoarthritis and the hot mud pack shown relatively better effect in reducing the pain and improving the functional capacity as measured by VAS and WOMAC respectively. Further studies with large sample size and follow-up for prolonged effects would give more robust conclusions.

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