

EFFECT OF MECHANICAL TRACTION ON PAIN AND FUNCTION IN SUBJECTS WITH OSTEOARTHRITIS KNEE

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ABSTRACT

Background: Osteoarthritis (OA) of knee is a degenerative joint disease which contributes significantly to functional limitation and disability in older people. It is an important cause of pain which is a major cause of activity limitation, functional disability and reduced health-related quality of life. The aim was to compare the effect of mechanical traction versus conventional therapy on pain and function in participants with knee OA.

Materials and Methods: An experimental study was conducted at college of physiotherapy on 24 participants. Participants were randomly allocated into 2 groups. Group A was given mechanical traction for 10 minutes, and hot pack for 10 min 5 days/week for 1 week. Group B was given conventional physiotherapy in the form of hot pack to the knee for 10 minutes. Both groups received a set of 10 repetitions of quadriceps drill 5 times/day for one week. Numerical Pain Rating Scale (NPRS) was used to assess knee pain and Lequesne Index (LI) was used to measure physical function.

Results: Within group difference in NPRS and LI scores were calculated using t test and between groups using Mann Whitney U test. Mean difference in NPRS score for group A was 1.333 ± 0.49 , $Z = -3.176$, $p = 0.001$ and group B was 1.25 ± 0.6215 , $Z = -3.035$, $p = 0.002$. Difference in mean NPRS between the groups 1.33 ± 0.481 , $U = 68$, $p = 0.843$. Mean difference in LI score for group A was 5.0833 ± 1.916 , $Z = -3.066$, $p = 0.002$ and for group B was 3.3750 ± 1.625 , $Z = -3.074$, $p = 0.002$. Differences in mean LI scores between the groups was 4.22 ± 1.94 , $U = 35.5$, $p = 0.034$.

Conclusion: Mechanical traction is more effective in reducing pain and improving physical function in subjects with osteoarthritis knee.

KEY WORDS: Mechanical traction, Osteoarthritis, Pain, Function.

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BACKGROUND

Osteoarthritis (OA) is degenerative joint disease which causes deterioration of the joint structures leading to narrowing of the joint space [1]. It is the second most common rheumatologic problem and it is the most frequent joint disease with a prevalence of 22% to 39% in India [2]. Worldwide osteoarthritis is estimated to be the fourth leading cause of disability, in which 10% are males and 13% are females [3, 4]. In Asia,

prevalence rates of osteoarthritis knee were found to be high in elderly people, especially women [4].

The major pathological changes are seen in the articular cartilage. The first osteoarthritis change in articular cartilage is increased water content. This increase suggests that proteoglycans have been allowed to swell with water far beyond normal. There are changes in the composition of newly synthesized proteogly-

-cans. As disease progresses proteoglycans are lost, which diminishes the water content of cartilage resulting in destruction of cartilage and narrowing of joint space. This causes the cartilage to lose its compressive stiffness and elasticity. The cartilage may degenerate to the point that subchondral bone is exposed. Subchondral bone in turn can then become sclerotic and stiffer than normal bone. These changes in cartilage results in increased friction, decreased shock absorption and greater impact loading of the joint [5]. When bone surfaces are not well protected by cartilage, bone may get exposed and damaged. As a result of decreased movement secondary to pain, atrophy of regional muscles and ligaments may become more lax [1].

OA can be classified according to its causes or predisposing factors as either primary or secondary. The primary one (idiopathic) is the most common type and has no identifiable causes rather than genetic predisposition while several disorders are well recognized as causes for secondary OA. Patients suffering from osteoarthritis often complain of dull ache and pain on movement, typically occurring when movement is initiated. As osteoarthritis progresses, the pain becomes continuous, and the functionality of the joint is severely impaired [5].

Knee OA sufferers often show joint stiffness, tenderness, crepitus, joint enlargement, deformity, muscle weakness, limitation of joint motion, impaired proprioception and disability. Patients may experience a serious impact to daily activities due to difficulty in walking, moving, climbing stairs, sitting in a chair that is caused by instability or buckling of the joints together with weakness of thigh muscles [6, 7]

In addition the bones themselves become thicker and may form bony spurs. Narrowing of joint space is a good indicator of osteoarthritis. Bony spurs can also be seen in x-ray [8].Osteoarthritis is the most common form of osteoarthritis and pain associated with osteoarthritis is the most common cause of activity limitation, functional disability and reduced health related quality of life [9].

Just like manual joint distraction is found to be

beneficial likewise mechanical joint distraction can be beneficial [10]. Many studies are there which show that manual traction is effective in reducing pain and improving function in osteoarthritis knee patients [11, 12]. One study about the effect of mechanical traction on function in osteoarthritis of knee shows that mechanical traction is more effective than conventional physiotherapy treatment in improving function in osteoarthritis knee patients [10].

Reviewing various studies it was analysed that the use of hot pack [13] , Ultrasound [14,15] Short Wave Diathermy [16], electrical stimulation [17,18] low level laser therapy [19] and Manual Traction [11] were the lines of treatment accompanied by exercise program for osteoarthritis of knee joint.

MATERIALS AND METHODS

A single blinded randomized controlled trial using simple randomization was carried out on twenty four participants selected for the study conducted at VS General Hospital, physiotherapy department, Ahmedabad. The inclusion criteria for the study were males and females with age between 45 and 70 years with unilateral osteoarthritis and patients with numerical pain rating scale score between four to seven with patellofemoral or tibiofemoral osteoarthritis. Patients with any knee deformities (e.g. fixed flexion deformity, genu valgum), severe pain (NPRS 8-10), joint infections, previous ligament or meniscal injuries, with open wounds or skin disease around knee joint, bone tumours/ osteoporosis and individuals not willing to participate were excluded.

After screening process, a verbal explanation of the study protocol was given to the participants. Consent was obtained from them. The evaluation including patient profile (age, gender, h/o drug) was done. Knee joint specific evaluation included severity of pain measured using Numerical Pain Rating Scale (NPRS) and knee functions outcome was assessed using Lequesne Index (LI). The measurements were measured at baseline and 5 days after intervention.

Participants were selected and randomly allocated to either group A (Mechanical traction

+ hot pack +Q drill exercises) or group B (Hot pack+ Q drill exercises). For mechanical traction weight of patient was assessed and traction force of 1/7th kg of body weight was applied to the subject. Traction was applied with sand bag under affected knee joint keeping the hip and knee in 10-20 degree flexion position. Intermittent Traction was applied. The intervention was applied continuously for 20 seconds and 10 seconds rest for 10 minutes for 5 days/week [10]. Hot pack was given on affected knee in supine position with hip and knee in extended position for 10 minutes for 5days/ week [10]

Q drill exercises include: Static quadriceps exercise, last degree knee extension, ankle toe movement, straight leg raising, prone knee bending, and high sitting knee extension [12]. Wall slide and self stretching of hamstrings and quadriceps are performed. Each exercise was performed for 10 repetitions in a day for 5 days.

Statistical Analysis: Statistical analysis was carried out by SPSS Software version 16. Significance level was kept at 5%. Data did not follow normal distribution so non parametric tests were used to analyse the data. Intra-group comparison was analysed by Wilcoxon test. Intergroup comparison was analysed by Mann-Whitney U test.

RESULT

Sixteen females and 8 males with mean age of 58.25 ± 9.501 years were included. Comparison of difference in mean NPRS and LI scores within groups A and B are shown in tables 1 and 2. Differences between the groups are shown in table 3. No adverse reactions to therapy were observed. Table 1 shows the effect of mechanical traction and hot pack and hot pack alone on NPRS was significant.

Table 1: Mean and standard deviation of NPRS before and after treatment for group A and group.

Groups	Pre NPRS Mean ± SD	Post NPRS Mean ± SD	P value	Inference
Group A	2.92±0.515	1.583±0.514	0.001	Significant
Group B	2.83±0.835	1.583±0.668	0.002	Significant

Table 2 shows the effect of mechanical traction and hot pack and hot pack alone on LI which shows significant effect of traction on LI.

Table 2: Mean and standard deviation of LI before and after treatment for group A and group B.

Groups	Pre LI	Post LI	P value	Inference
	Mean ± SD	Mean ± SD		
Group A	14.58±2.24	9.45±2.76	0.002	Significant
Group B	12.45±2.40	9.00±1.45	0.002	Significant

Table 3 shows that difference between groups A and B for the outcomes, Difference in means for pain was not significant between the groups, and for LI it was significant.

Table 3: Difference in Means of outcome measures between groups.

Outcomes	Diff of mean ± SD	P value	Inference
NPRS	1.33 ± 0.481	0.843	Not Significant
LI	4.22 ± 1.94	0.033	Significant

DISCUSSION

Both the groups showed improvement in pain and function in participants with osteoarthritis of knee. The results of the present study indicate that mechanical traction with hot pack is more effective in improving function in participants with OA knee than hot pack treatment alone.

The results are in accordance with those of Vaishali Jagtap and other authors. Vaishali Jagtap, S. Shanmugam assessed the effectiveness of mechanical traction on the functional outcome in knee joint osteoarthritis and concluded that mechanical traction is more effective than conventional physiotherapy treatment on improving function in osteoarthritis knee[10].

A previous study shows that manual traction was effective on pain, range of motion and function in osteoarthritis knee [11].

Effects of intermittent traction included increased vascular and lymphatic flow (suction aspiration effect) which tends to reduce stasis, edema and coagulates in chronic congestions. Traction stimulates proprioceptive reflexes and helps to tone muscles, which tend to reduce fatigue and restore elasticity and resiliency. Radiographs showed increased joint space width and decreased subchondral sclerosis. The improvement in functional outcome after application of mechanical Traction may be because of relief of abnormal pressure on nociceptive receptor systems [10].

Antony Leo Aseer P assessed the effectiveness of manual traction of tibio-femoral Joint on the functional outcome in knee joint osteoarthritis and concluded that manual traction is effective in reducing pain and improving function in patients with osteoarthritis knee [11].

Exercise in the form of quadriceps drill was also prescribed to both the groups. Deyel GA et al [20] and Roddy E et al [12] also found that exercises are effective in improving physical function in participants with knee OA.

Garg stated that application of heat produces vasodilatation which increases oxygen to tissues that reduce knee symptoms as stiffness of joints [21]. The mechanism of pain relief could be that heat leads to local vasodilatation which increases blood flow to the affected area. Pain may also be reduced by the pain gate control mechanism [22].

Limitations of the study were intervention effect was seen after only five days and also pre interventional scores of pain were less and function was also less affected in the subjects.

Thus the present study shows that intermittent mechanical traction and hot pack can be used in clinical practice to relieve pain and to improve function in participants with OA knee and it is more effective than conventional treatment. Further studies can be designed to determine effectiveness of intermittent mechanical traction in the long-term follow-up and outcome measure can include range of motion.

CONCLUSION

Mechanical traction and hot pack produces a significant benefit in terms of reduction in knee related pain, and improves physical function in participants with knee OA.

Conflicts of interest: None

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