Chettinad Health City Medical Journal
Volume 12, Issue 2 - 2023, Pg. No. 15-20
Peer Reviewed & Open Access Journal

Research Article

A Study to Assess the Effect of Dynamic Traction on Osteoarthritis of Knee

Maitreyi Kamble[1], Mandar Malawade[2]

[1]Krishna College of Physiotherapy, KVV, Karad, Maharashtra, India.
[2]HOD, Department of Pediatric Physiotherapy, Krishna College of Physiotherapy, KVV, Karad, Maharashtra, India.
DOI: https://doi.org/10.24321/2278.2044.202322

I N F O

Corresponding Author:
Maitreyi Kamble, Krishna College of Physiotherapy, KVV, Karad, Maharashtra, India.
E-mail Id:
mitu.neha1999@gmail.com
Orcid Id:
https://orcid.org/0009-0000-0985-385X
How to cite this article:
Kamble M, Malawade M. A Study to Assess the Effect of Dynamic Traction on Osteoarthritis of Knee. Chettinad Health City Med J. 2023;12(2):15-20.

Date of Submission: 2023-06-01
Date of Acceptance: 2023-06-26

A B S T R A C T

Introduction: The most common problem faced by today's sedentary lifestyle is a degenerative change that starts taking place in the most common joint i.e. knee joint. Such a degenerative condition in this joint is called osteoarthritis of the knee. The studies suggest that traction assists in circulation and also helps in decreasing the concentration of noxious irritants. Thus, in this study, dynamic traction has been used and its effects have been studied.

Method: The study was conducted on 96 people who were having osteoarthritis of the knee within the grade range of 1 and 2. The participants were given patient consent forms before beginning the study. They were divided into two different groups of the same size, i.e. Group A and Group B. Pre and post-examinations were conducted for both groups.

Results: On the basis of the statistical analysis, the outcome indicated that the experimental group in which dynamic traction was used achieved better results in their condition than the other group.

Conclusion: The study guides us to the conclusion that the use of dynamic traction is beneficial and more effective in the condition of knee osteoarthritis as compared to conventional methods.

Keywords: Arthritis, Osteoarthritis of Knee, Pain, Conventional Therapy, Dynamic Traction

Introduction

The most common problem faced by the elderly population due to today's sedentary lifestyle is knee pain. Due to lack of nutrition, exercise, or proper care, the commonest joint that can get affected is the knee,[1] and with the flow of time, degenerative changes start taking place in this joint. Such a degenerative condition, called arthritis or specifically osteoarthritis of the knee, is a non-inflammatory disorder present in joints. In this condition, the articular cartilage deteriorates progressively and osteophytes are formed in the surrounding area.[1]

In osteoarthritis, the knee joint is commonly involved due to the frequent need of squatting or sitting cross-legged in accordance with the Indian culture. Disturbance in the dissipation of stress happens due to the loss of ground substances present in cartilage. The collagen fibres undergo excessive stress and strain, which causes rupture of the fibres. The underlying subchondral bone is exposed because

the cartilage develops fissures and gets eroded. There is a development of microfractures in the trabeculae of the subchondral bone. Subchondral cysts are formed after resorption of such microfractures which is an important radiographic feature present in osteoarthritis. Osteophytes are produced as a result of inflammatory synovitis; the newly developed bone and its outgrowths are formed at the margins of the articular cartilage.[1]

The main symptom of this condition is pain. In the very initial phases, pain can occur during or after weight-bearing activities or towards the end of the day. In later stages, it continues even in the resting period. Synovitis causes inflammation of joints. Severe pain as well as capsular contractures can take place. The articular margins become prominent due to the formation of osteophytes, which also results in muscle wasting, and synovial thickening along with swelling. Movements are restricted due to certain limitations and pain. Crepitus can be felt when the joint is moved passively. In the later stage, there is a formation of new bodies in the joint, resulting in recurrent joint effusion and swelling which causes pain and thus locking of joints takes place.[1] For its treatment, the most effective technique used along with exercise is mobilisation.[2,3]

Osteoarthritis (OA) can cause pain as well as reduced movements of the joint. In some cases, the patient may be asymptomatic even when the radiographic findings are positive. It mainly affects people who belong to the age group of 45 years and above.[4] In a study performed to find out the proportion of symptomatic patients among the patients suffering from OA knee, only 15% of those having radiographic findings of knee OA were experiencing symptoms, i.e. pain or reduction in range of motion.[4]

Researches show that the primary symptoms indicating the need for diagnosis of OA are pain and impaired function due to which the quality of life deteriorates.[5] The examination of the pain inhibitory mechanism is done with the help of conditioned pain modulation (CPM).[5] Various studies suggest that movement due to traction assists in circulation and also helps in decreasing the concentration of noxious irritants.[6]

Thus, the effectiveness of dynamic traction is to be discovered in the following study by comparing the results of both groups.

Methodology

An experimental study was carried out on 96 people from Maharashtra who suffered from grade 1 or 2 knee osteoarthritis. The selected people were willing to participate in the study. People with OA knee who experienced pain while doing their daily activities as well as those whose range of motion of the affected knee was deteriorating were selected.

The study duration was of 6 months, i.e. from December 2022 to May 2023, and the tools used for the study were a goniometer and pain rating scale (VAS).

Sampling Method

Random sampling method was used.

Inclusion Criteria

Patients who had osteoarthritis of the knee of grades 1 and 2 and were willing to participate in the study were included.

Exclusion Criteria

Patients who did not suffer from osteoarthritis, or had osteoarthritis but not of the knee, or patients who had osteoarthritis of the knee but belonged to grades 3 or 4 of the condition were not included in the study.

Sample Size

It was calculated using the formula $N = 4pq/L^2$. The calculated sample size was 96.

Two groups were formed in this study. Group A was the experimental group in which dynamic traction was used along with conventional therapy and Group B was the group in which only conventional therapy was used. Therefore, the protocol used for Group A included a hot moist pack for 10 minutes, dynamic traction (here the force applied with the help of traction was around 6% of the person's weight)[7,8] for 10 minutes with intervals in between the process, followed by mobilisation with 30 repetitions for 2 times, isometrics for quadratus and hamstrings, SLR's 10 repetitions for 3 times, VMO strengthening with the help of VMO board, along with squatting for 10 repetitions and cycling for 10 minutes. Stretching of tight muscles can also help in increasing the mobility of the segment, thus helping in decreasing pain from restricted movement or strain on tight tissues.[6] Group B protocol included all of the above except dynamic traction. The results of both groups were calculated and analysed, and the effectiveness of the methods was observed and compared.

Research Tool and Data Collection

Data were collected by pre and post-examinations of patients suffering from osteoarthritis of the knee who strictly belonged to grade 1 or grade 2 of the condition. The examination was done with the help of VAS and goniometer and pre- and post-examination data were collected for both groups and were analysed. As it was collected in an urban area, there wasn't any issue of communication between researchers and respondents.

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202322

Ethical Approval

The Institutional Ethics Committee of Krishna Vishva Vidyapith, Karad (KVV) had approved the study. An explanation about the experimental study was given to respondents and informed consent was obtained from them. They also had the authority to not participate in the questionnaire. All the patients participated voluntarily and their confidentiality was maintained throughout the study.

Results

A total of 96 OA knee patients were selected who were willingly ready to participate in the study.

VAS

Here, as per the VAS pain rating scale for the experimental group, the value of p was less than 0.0001 and the value of t was 7.353. The mean ± SD value in the pre-examination was 7.979 ± 0.3503 and that in post-examination was 3.189 ± 1.468. In the case of the conventional group, p value was less than 0.0001 and t value was 25.156. The mean ± SD value in the pre-examination in this group was 7.979 ± 0.8503 and that in post-examination was 5.253 ± 0.0751. The pre-treatment value of p for the groups was 0.4240 and the t value was 0.8012 while the post-treatment value of p was less than 0.0001 and the t value was 12.079 (Table 1).

Table 1 shows that before the treatment, the pain was in severe form, but after the treatment, it reduced to a great extent in both groups. The comparison of post-examination responses of both groups showed that there was greater relief from pain in Group A than in Group B.

Range of Motion

Extension

For the range of motions in the experimental group, the p value for pre- and post-examinations was less than 0.0001 and the t value was 21.883. The mean ± SD values for pre- and post-examinations were 10.000 ± 4.783 and 0.5263 ± 1.543, respectively. In the conventional group, the p value for pre- and post-examinations was less than 0.0001 and the t value was 24.350. The mean ± SD values for pre-examination and post-examination were 10.000 ± 5.684 and 4.783 ± 4.165, respectively (Table 2).

Table 1.Comparison of VAS Values in Group A and Group B

S. No.	Groups	Tests Conducted	p Value	t Value	Mean ± SD
1.	Group A - Experimental group	Pre-examination	< 0.0001	7.353	7.979 ± 0.3503
		Post-examination			3.189 ± 1.468
2.	Group B - Conventional group	Pre-examination	< 0.0001	25.156	7.979 ± 0.8503
		Post-examination			5.253 ± 0.0751
3.	Conventional + Experimental groups	Pre-examination	0.4240	0.8012	Pre_1: 8.126 ± 0.7613 Pre_2: 8.221 ± 0.8653
		Post-examination	< 0.0001	12.079	$Post_1$: 5.253 ± 0.7851 $Post_2$: 3.189 ± 1.468

Pre_1: Values of pre-examination of Group A, Pre_2: Values of pre-examination Group B, $Post_1$: Values of post-examination of Group A, $Post_2$: Values of post-examination of Group B.

Table 2.Comparison of Values for Extension in Group A and Group B

S. No.	Groups	Tests Conducted	p Value	t Value	Mean ± SD
1.	Group A - Experimental group	Pre-examination	< 0.0001	21.883	10.000 ± 4.783
		Post-examination			0.5263 ± 1.543
2.	Group B - Conventional group	Pre-examination	< 0.0001	24.350	10.000 ± 5.684
		Post-examination			4.783 ± 4.165
3.	Conventional + Experimental groups	Pre-examination	0.3391	0.9584	Pre_1: 9.789 ± 4.665 Pre_2: 9.158 ± 4.415
		Post-examination	< 0.0001	11.319	$Post_1$: 5.684 ± 4.165 $Post_2$: 0.526 ± 1.543

Pre_1: Values of pre-examination of Group A, Pre_2: Values of pre-examination of Group B, $Post_1$: Values of post-examination of Group A, $Post_2$: Values of post-examination of Group B.

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202322

The scale used for measuring the range of motion (ROM) was a goniometer. As can be seen from Table 2, before the intervention in Group A, the ROM of extension was less than normal, but post-intervention, the extension ROM improved to a great extent. The participants of Group B also showed improvement in extension ROM in post-examination as compared to pre-examination, but when the post-examination responses of both groups were compared, greater improvement was seen in Group A than in Group B.

Flexion

In the pre- and post-intervention analysis of flexion in the experimental group, the p value was less than 0.0001 and t value was 12.582. In pre-examination, the mean ± SD was 152.26 ± 11.189 and in post-examination, it was 134.95 ± 9.153. The p value was less than 0.0001 in the conventional group and t value was 19.637. The mean ± SD values pre- and post-examination were 127.63 ± 11.105 and 143.84 ± 5.810, respectively. In the pre-intervention analysis of flexion among the participants in both groups, the p and t values were found to be 0.1448 and 1.464, respectively. These values indicate that the results were not significant. The post-intervention values of p and t were < 0.0001 and 7.997, respectively, indicating that the results were extremely significant (Table 3).

Table 3.Comparison of Values for Flexion in Group A and Group B

S. No.	Groups	Tests Conducted	p Value	t Value	Mean ± SD
1.	Group A - Experimental group	Pre-examination	< 0.0001	12.582	152.26 ± 11.189
		Post-examination			134.95 ± 9.153
2.	Group B - Conventional group	Pre-examination	< 0.0001	19.637	127.63 ± 11.105
		Post-examination			143.84 ± 5.810
3.	Conventional + Experimental groups	Pre-examination	0.1448	1.464	Pre_1: 127.63 ± 11.105 Pre_2: 125.26 ± 11.189
		Post-examination	< 0.0001	7.997	$Post_1$: 143.84 ± 5.810 $Post_2$: 134.95 ± 9.153

Pre_1: Values of pre-examination of Group A, Pre_2: Values of pre-examination of Group B, $Post_1$: Values of post-examination of Group A, $Post_2$: Values of post-examination of Group B.

In the above calculations, the scale used for measuring the range of motion was a goniometer. The results showed that flexion ROM in both groups had improved after the intervention. However, the improvement was more in Group A as compared to Group B.

Thus, the results indicate that the experimental methodology is significant and useful with better improvement in the condition of patients.

Discussion

Knee pain is the most common problem faced nowadays. In such a progressive disease, histological changes i.e. cartilage degeneration, bone proliferation, cartilage proliferation and proliferation of surrounding connective tissue take place. This, thus results in severe limitations in the functional activities of patients.[9,10] Due to a lack of nutrition, exercise, or lack of proper care, the commonest joint that can get affected is the knee.[1] The disease limits functional activities and causes pain and disabilities. The incidence of such disease is rising gradually and elders constitute the major population suffering from it.[11,12] To relieve joint compressions, relax muscles and conditions including spinal dysfunctions, traction therapy has proven to be helpful.[13,14] Pain reduction can be achieved by maintaining a normal space between joints in degenerative diseases with the help of traction. Improvement in functioning of the knee can be achieved in OA patients with the help of traction therapy as traction increases the space between the joints and also maintains the expansion; cartilage thickness is also increased which further helps in reducing loss of the bone.[15,16] Traction has shown great results especially when applied to the knee. It has helped in relieving the pain and improving the motion of the knee and has thus contributed to the improvement in the quality of life.[17] Pain can be reduced by relaxing the muscles; the neurophysiological effects can also be improved by increasing the space of the joint.[18] Thus, a good quality of life for the patient can be achieved with the help of traction therapy.[19]

Dynamic traction was previously used in the treatment of intra-articular fractures of the hand which included traction along with motion of the hand. The results showed the regeneration of cartilage which also helped in improving and maintaining mobility.[20] Here, in this study we used dynamic traction on the patients belonging to grade 1 and grade 2 of OA along with conventional therapy. The traction was stable but not static, it was given a motion in the degree of freedom of the knee joint i.e., flexion and

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202322

extension. Reduction in range of motion is considered a major problem faced by patients. As we know that traction has its own benefits; if these benefits are to be combined with movements of the knee joint, it will show results of both traction and movements applied to the joint. This study was conducted to find out whether it is more beneficial or not.

In previous studies, mechanical traction used for knee joints in different angles (90° and 20° of knee flexion) was effective in improving pain and physical functions, but was not as effective for knee passive range of motion.[21] Traction when combined with movements can cause an increase in range of motion as well as increased nutrition due to the increase in blood supply caused by movement within an already increased joint space. Moreover, movement along with traction can also decrease friction in comparison to movement alone, which can be less painful and can also give some amount of fluency in joint motion. In our study, Group A in which dynamic traction was used along with conventional therapy, showed better results than Group B in which only conventional treatment was used. There was more relief in the symptoms of patients in Group A as compared to Group B. This proves that dynamic traction is very effective in the condition of grade 1 and grade 2 of OA knee.

Conclusion

This study has shown that dynamic traction is quite effective in conditions such as grade 1 and grade 2 osteoarthritis of the knee. Conventional therapy when performed with dynamic traction shows better results in these cases.

Acknowledgement

I would like to thank Dr Mandar Malawade, Guide of the project, for inspiring and encouraging me to perform this study and for guiding me throughout the study, and Dr G Vardharajulu, Dean of Krishna College of Physiotherapy, Krishna Vishva Vidyapith, Karad, for approving the study and also for motivating me to perform this study. I would also like to thank the participants who willingly participated in the study and our institute for providing all facilities required for the study.

Source of Funding: None

Conflict of Interest: None

References

1. Maheshwari J, Mhaskar VA. Essential orthopaedics (including clinical methods). 6th ed. Jaypee Brothers Medical Publishers; 2019. [Google Scholar]
2. Weleslassie GG, Temesgen MH, Alamer A, Tsegay GS, Hailemariam TT, Melese H. Effectiveness of mobilization with movement on the management of knee osteoarthritis: a systematic review of randomized controlled trials. Pain Res Manag. 2021;2021:8815682. [PubMed] [Google Scholar]
3. Jagtap V, Shanmugam S. Effect of mechanical traction in osteoarthritis knee. Int J Sci Res. 2014;3(10):440-3. [Google Scholar]
4. Hsu H, Siwiec RM. Knee osteoarthritis. StatPearls Publishing; 2022. [PubMed] [Google Scholar]
5. Courtney CA, Steffen AD, Fernández-De-Las-Peñas C, Kim J, Chmell SJ. Joint mobilization enhances mechanisms of conditioned pain modulation in individuals with osteoarthritis of the knee. J Orthop Sports Phys Ther. 2016 Mar;46(3):168-76. [PubMed] [Google Scholar]
6. Vekariya JN, Karamta DL, Rathod SR. The effect of traction in knee osteoarthritis: an evidence based study. J Emerg Technol Innov Res. 2019;6(5):329-31. [Google Scholar]
7. de Leva P. Adjustments to Zatsiorsky-Seluyanov's segment inertia parameters. J Biomech. 1996;29(9):1223-30. [PubMed] [Google Scholar]
8. Plagenhoef S, Evans FG, Abdelnour T. Anatomical data for analyzing human motion. Res Q Exerc Sport. 1983;54(2):169-78. [Google Scholar]
9. Migliore A, Procopio S. Effectiveness and utility of hyaluronic acid in osteoarthritis. Clin Cases Miner Bone Metab. 2015;12(1):31-3. [PubMed] [Google Scholar]
10. Park SJ, Lee JH. Effect of joint mobilization and kinesio taping on pain, range of motion, and knee function in patients with knee osteoarthritis. J Kor Phys Ther. 2016;28(5):279-85. [Google Scholar]
11. Felson DT, Anderson JJ. Across-study evaluation of association between steroid dose and bolus steroids and avascular necrosis of bone. Lancet. 1987;1(8538):902-6. [PubMed] [Google Scholar]
12. Lee JH, Cho HS, Song IY. Effectiveness of shortwave therapy in management of knee osteoarthritis: a systematic review and meta-analysis of randomized controlled trials. J Kor Phys Ther. 2014;26(5):331-43. [Google Scholar]
13. Krause M, Refshauge KM, Dessen M, Boland R. Lumbar spine traction: evaluation of effects and recommended application for treatment. Man Ther. 2000;5(2):72-81. [PubMed] [Google Scholar]
14. Zusman M. The Absolute Visual Analogue Scale (AVAS) as a measure of pain intensity. Aust J Physiother. 1986;32(4):244-6. [PubMed] [Google Scholar]
15. Intema F, Van Roermund PM, Marijnissen AC, Cotofana S, Eckstein F, Castelein RM, Bijlsma JW, Mastbergen SC, Lafeber FP. Tissue structure modification in knee osteoarthritis by use of joint distraction: an open 1-year pilot study. Ann Rheum Dis. 2011;70(8):1441-6. [PubMed] [Google Scholar]
16. Alpayci M, Ozkan Y, Yazmalar L, Hiz O, Ediz L. A

randomized controlled trial on the efficacy of intermittent and continuous traction for patients with knee osteoarthritis. Clin Rehabil. 2013;27(4):347-54. [PubMed] [Google Scholar]
17. Khademi-Kalantari K, Aghdam SM, Baghban AA, Rezayi M, Rahimi A, Naimee S. Effects of non-surgical joint distraction in the treatment of severe knee osteoarthritis. J Bodyw Mov Ther. 2014;18(4):533-9. [PubMed] [Google Scholar]
18. Twomey LT. Sustained lumbar traction. An experimental study of long spine segments. Spine (Phila Pa 1976). 1985;10(2):146-9. [PubMed] [Google Scholar]
19. Lee DK, Lee NY. Case study of continuous knee joint traction treatment on the pain and quality of life of patients with degenerative gonarthritis. J Phys Ther Sci. 2018;30(6):848-9. [PubMed] [Google Scholar]
20. Schenck RR. The dynamic traction method. Combining movement and traction for intra-articular fractures of the phalanges. Hand Clin. 1994;10(2):187-98. [PubMed] [Google Scholar]
21. Abdel-Aal NM, Ibrahim AH, Kotb MM, Hussein AA, Hussein HM. Mechanical traction for different knee joint angles in patients with knee osteoarthritis: a randomized controlled trial. Clin Rehabil. 2022 Aug;36(8):1083-96. [PubMed] [Google Scholar]

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202322