EFFECTIVENESS OF MANUAL TRACTION OF TIBIO-FEMORAL JOINT ON THE FUNCTIONAL OUTCOME IN KNEE JOINT OSTEOARTHRITIS

Article · January 2014

CITATIONS
2

READS
1,359

1 author:

Antony Leo
Sri Ramachandra Institute of Higher Education and Research
22 PUBLICATIONS **36** CITATIONS

SEE PROFILE

EFFECTIVENESS OF MANUAL TRACTION OF TIBIO-FEMORAL JOINT ON THE FUNCTIONAL OUTCOME IN KNEE JOINT OSTEOARTHRITIS

Antony Leo Aseer P[1], Iyer Lakshmi Subramanian[2]

1. Reader in physiotherapy,Sri Ramachandra University,chennai

2. Postgraduate in physiotherapy-Sri Ramachandra University,Chennai

ABSTRACT

The purpose of this experimental study is to analyze the effectiveness of manual traction on the pain, range of movement and the functional outcome in knee joint osteoarthritis. Traction is an oldest form of treatment for deformity correction, fractures and in treating disc prolapse. Very few studies are been performed to explore its effect in peripheral joints but no studies are reported in an experimental design. Totally forty participants were randomized into control and experimental groups. Baseline measurements of pain severity, active knee flexion range, Knee injury and osteoarthritis outcome score (KOOS) were measured. The control group received treatment in the form of pain relief modalities, exercises for muscle contractions and joint mobility. The experimental group received the same and in addition manual traction in high sitting position. All the measurements were taken after two weeks of treatment. There was significant improvement in experimental group compared to control group in terms of pain, subscales of KOOS and moderate improvement in active knee flexion range. This study adds the importance of manual knee traction, which is not commonly practiced for knee joint osteoarthritis. It further establishes traction as a means of stretching shortened, tightened structures without increasing pain severity during and after treatment. Overall the study also showed better improvements in functional outcome and in quality of life.

KEYWORDS: Knee, osteoarthritis, pain, active knee flexion, traction, KOOS.

INTRODUCTION

The knee joint is a common site of osteoarthritis of the tibio-femoral and patella-femoral joints, possibly because of its exposure to trauma and serving as a major weight bearing joint[1]. In Indian population KDJD older than 60 years is estimated to be 43% in women and 25% in men. The prevalence is estimated to be 15% for women and 5% for men[2]. Primary osteoarthritis has no known etiology; secondary osteoarthritis can be traced to abnormal joint mechanics. Abnormal knee mechanics produce secondary changes in the articular cartilage, subchondral bone, and supportive structures of the knee. Previous injury of soft tissues may be complicated by subsequent degenerative changes. Osteoarthritis may be a physiologic response to repetitive, longitudinal impulse loading of the joint. Changes may involve the medial or lateral tibio-femoral compartment, the patella-femoral joint or involving all three areas.

The sequelae of knee joint degeneration leads to pain, movement restriction, reduced muscle efficiency, alerted walking pattern, excessive energy expenditure, impaired joint functions and overall affecting the quality of life. Basically the treatment approach towards knee osteoarthritis involves reducing the joint inflammation, joint protection, training the weakened muscles and regaining the functional mobility of knee joint. As like any other joint, knee joint degeneration too has a mechanical cause. Until unless the mechanical cause is taken into consideration, the functional restoration of joint functions are incomplete. The most common alteration in alignment of the osteoarthritic knee is a varus deformity. This results in increased forces in the medial compartment, which creates a degenerative lesion of the medial meniscus and subsequent degenerative changes of the medial compartment. It's one of the commonest diagnostic radiological feature exhibiting medial joint space narrowing[3]. In advance stages, the cartilage is completely worn out, exposing the bony ends, approximating each other leading to joint replacement surgery.

It is strongly believed that all therapy related treatment approaches follow the principles of joint mechanics. When an altered mechanics is noted, therapist employs a manual way of correcting it terming as manual therapy or mobilization techniques. There are very few studies providing evidence on the efficacy of manual therapy of lower extremities[4].

Studies related to manual techniques in knee osteoarthritis have suggested that combination of manual physical therapy and supervised exercise yields functional benefits for patients with osteoarthritis of the knee and may delay or prevent the need for surgical intervention[5]. The type of manual techniques varies with therapist ranging from glides to distraction. The factors include direction of glide, force, magnitude, time period of sustaining glide, distraction force, duration etc. Many studies have focused on application of anterior/posterior glides, patellar glides to improve functional

outcomes[4]. In a comprehensive rehabilitation program of knee osteoarthritis, manual therapy program helps to regain mobility and function[6]. Outcomes of therapy are analyzed using functional outcome measures as like timed up and go walk test[4] step functions[7], osteoarthritis index[8] and knee osteoarthritis outcome survey. The drive for standardized instruments of outcome measures in practice not only considers the measurement of body function impairment (e.g.; strength, range of motion) but also should consider patient's point of view on activities of daily living and life participation[9]. Self-report measures assess the patient perspective on his/her ability to perform a task (Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Knee injury and Osteoarthritis Outcome Score (KOOS) whereas performance based measures capture the patient ability to perform a certain task[10].

The treatment module of passive glides, mobilization helps in regaining the movement deficit of the joint but not addressing the joint space narrowing. Traction is one such way of mobilization in practice for long many years. A very recent case series in 2010 have analyzed that manual traction mobilization to knee joint in patients with pain and movement dysfunction have not been assessed over time[11]. Of the passive treatment techniques advocated by Kaltenborn (1986) and Schneider (1988) traction is a well suited technique for treating pain with grade 2 or 3. The primary treatment effect is to stretch the periarticular soft tissues, increased mobility of hypo mobile joints and overall distraction at the narrowed medial joint space. The effectiveness of traction is well studied in vertebral column and upper extremity and the most under studied aspect in lower extremities[4]. Therefore the purpose of this experimental study is to analyze the effects of traction on pain response, mobility status and functional outcome in knee osteoarthtic patients.

MATERIALS AND METHODS

The experimental study was approved by the Head of Physiotherapy Department, Sri Ramachandra Hospital, Chennai.

Participants

The participants were selected from the outpatient physiotherapy department as a sample of convenience. The inclusion criteria for the study were 1) Knee pain with limitation in range of motion 2) diagnosed to have knee joint osteoarthritis 3) Radiograph showing medial joint space narrowing. Exclusion criteria included individuals 1) acute infective arthritis 2) history of previous trauma, unhealed fractures 3) Neurological disorders 4) Referred pain from low back region.

Study design

The study design is a single blinded, randomized controlled trail using simple randomization. All participants are randomly allocated to control and experimental group.

Outcomes

After screening process, a verbal explanation of the study protocol is made. An informed consent is obtained for authorizing their participation in the study. The evaluation includes patient profile (age, gender, hospital identity number) were recorded. Knee joint specific evaluation includes 1) Severity of Pain measured using visual analog scale 2) Knee joint flexion mobility using goniometer 3) Knee functions outcome using KOOS. The sub-scales include symptoms, stiffness, functions-daily living, sports, recreation activities and quality of life. The measurements are measured at baseline and two weeks after intervention.

Procedure

A total number of forty five participants were enrolled for the study, in which four of them did not meet the inclusion criteria and one was not willing to take part. A sample of forty participants were selected and randomly allocated to control and experimental group. The initial evaluator measured the baseline knee joint specific measures and post intervention. The principle evaluator administered the manual therapy techniques, pain control modalities and prescribed exercises. The evaluators were blinded of the group allocation and test results respectively.

Both the Control group and experimental group received the same line of management as referred but in turn the experimental group also received manual traction of knee joint. For pain relief, interferential therapy was given with two electrodes placed over the sides of knee joint for duration of fifteen minutes. A proper conducting medium is used. Isometric contractions of quadriceps, active mobility exercises in high sitting and in prone lysing are performed and educated to practice at home.

Manual therapy intervention

Distraction in sitting[12]

The participant is seated on the edge of the couch with toweling supporting the underside of the distal thigh. A trained manual therapist with good expertise performed the procedure. The therapist stands at the participant's side facing the patient's feet so as to direct his forearms in the line of force. A long axis distraction is produced by leaning forward with the trunk. It is performed in knee joint at ninety degree of flexion. This technique is used as general mobilization to increase tibio-femoral joint paly for pain control.to sustain the effect of distraction an

alternate method of sling is wounded around ankle with stirrup attachment for placement of therapist foot to apply distraction. This allows the therapist to palpate the joint space as the distraction is applied. The intervention was applied continuously for 30 seconds followed by a 10 second rest period. The sequence was repeated 4 times, for a total of 2 minutes of traction mobilization per session. Each participant received three sessions in a week and overall of 6 sessions of manual distraction for a 2 week period.

DATA COLLECTION

The data collection starts at baseline comprising patient profile, pain severity using visual analog scale (VAS), range of motion of knee joint using standard goniometer and KOOS questionnaire. The VAS has a test-retest reliability ranging from 0.71 to0.99[13]. The standard goniometer has high intra-tester reliability and validity[14]. KOOS is a validated outcome instrument for treatment effects in knee osteoarthritis[15]. The inter class correlation coefficients were over 0.75 for all subscales and this indicates needed test-retest reliability. Post intervention values are got after 2 weeks of intervention. The process of data analysis consists of baseline comparison between control and experimental groups, post treatment assessment between groups, pre and post treatment comparison of various variables in control and experimental group. The effectiveness of manual traction on pain, range of motion and functional outcome was analyzed using inferential statistics (two-tailed test). The data analysis was done using SPSS and statistical significance level was set.

RESULTS

The study on forty participants with 14 males and 26 females participated in this experimental study. Finally all forty participants were followed up till the end of the study and were able fulfill to measure all the variables (n=20).The mean age for all participants in control group is 59.10 and in experimental group is 57.35(table 1). All the participants were regular for follow up and there is no missing data.

On comparing the side of involvement, 50% showed right knee involvement and 42.5% has left knee involvement (Table 2)

TABLE-1 PATIENT DEMOGRAPHICS

GROUP		N	Mean	Std. Deviation	Sig. (2-tailed)
AGE	Control	20	59.10	11.073	.598
	Experimental	20	57.35	9.691	

TABLE-2 FREQUENCY AND PERCENTAGE OF SIDEDNESS

		GROUP		Total
		Control (%)	Experimental (%)	
Left	Count	8 (40.0)	9 (45.0)	17 (42.5)
Right	Count	12 (60.0)	8 (40.0)	20 (50.0)
Bilateral	Count	0 (0)	3 (15.0)	3 (7.5)

The mean value for pain severity (VAS) for the control group was 6.70 and after intervention the mean value of VAS was 5.25.The pain severity noted to be declined at a difference of 1.45. The mean value for pain severity (VAS) for the experimental group was 6.85 and after intervention the mean value of VAS was 4.00.The pain severity noted to be declined at a difference of 2.85.The differences in pain severity was statistically significant in experimental group($p<.01$)and no differences were noted in control group.

The mean value for knee flexion range for the control group was 118.25 and after intervention the mean value of flexion range was 119.75.The ROM noted to be minimally increased about 1.50. The mean knee flexion range for the experimental group was 118 and after intervention the mean value increased to 123.50.There is no significant changes in knee flexion after intervention in both the groups ($p<.001$).In experimental group, there is a significant difference in knee flexion ROM($p<.01$)

On analysis of each subscales of KOOS in control group, noted significant differences in subscale for pain, symptoms & ADL($p<.001$)and subscale of sports & recreation showed significant differences($p<.05$).Whereas in experimental group, all the subscales of KOOS were found to be significant($p<-001$).

Overall, all the variables of knee joint specific measures have found to be improved and statistical differences were noted in experimental group then control group.

TABLE-3COMPARISON OF PRE AND POST VALUES BETWEEN CONTROL AND EXPERIMENTAL GROUP

VARIABLES	GROUP	N	PRE	Sig. (2-tailed)	POST	Sig. (2-tailed)
			MEAN±SD		MEAN±SD	
VAS	Control Experimental	20 20	6.70±1.174 6.85±1.182	.689	5.25±1.482 4.00±1.451	.010
ROM	Control Experimental	20 20	118.25±12.169 118.00±18.238	.960	119.75±11.751 123.50±14.428	.373
K_SYMP	Control Experimental	20 20	62.1400±11.19779 64.4610±15.69518	.593	68.2095±9.75733 79.7955±10.98334	.001
K_PAIN	Control Experimental	20 20	57.2060±9.25045 53.7305±10.24725	.267	63.1740±7.85522 70.8080±7.83044	.004
K_ADL	Control Experimental	20 20	65.9505±8.49905 61.7595±9.07849	.140	69.33±8.230 76.24±7.448	.008
K_S&R	Control Experimental	20 20	40.75±23.579 42.00±20.417	.859	44.75±26.030 63.50±12.886	.006
K_QOL	Control Experimental	20 20	55.3125±5.83314 52.1875±11.51997	.286	57.9250±4.74972 61.8750±2.79508	.003

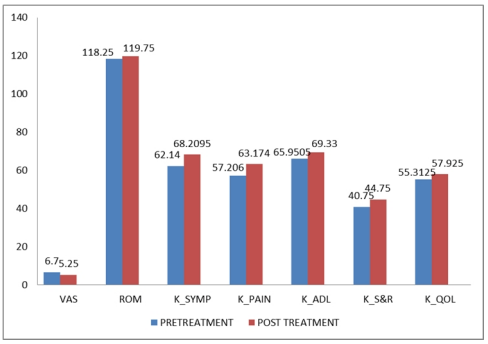

FIGURE 1: PRE AND POST TREATMENT COMPARISON ON VARIOUS VARIABLES IN CONTROL GROUP

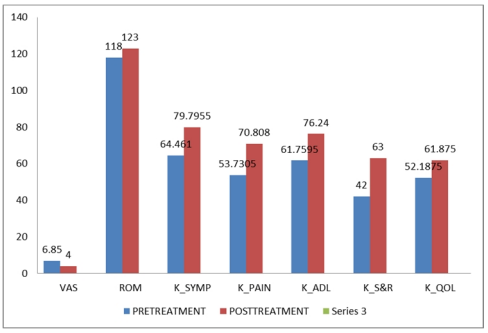

FIGURE 2: PRE AND POST TREATMENT COMPARISON ON VARIOUS VARIABLES IN EXPERIMENTAL GROUP

DISCUSSION

The study to analyse the effectiveness of manual knee traction on the various knee specific variables were analysed. It revealed that there is a significant decrement of pain severity, minimal differences in improvement of knee flexion range and improvement noted in overall functional outcome following six sessions of manual knee traction. The conventional physiotherapy management group showed decrement in pain severity and pain, symptoms, ADL subscales of functional outcome, leaving no differences in other variables.

Osteoarthritis has been largely investigated for pharmacological effects and physical therapy modalities including exercise. Much less emphasis has been placed on the manual therapy approaches. The treatment technique of manual traction to knee joint is not a common principle of practice. Generally traction is applied to vertebral joints and the similar physiological effects are expected at the knee joint also. The results indicated that the long axis distraction technique was successful in reducing self-reported present intensity of osteoarthritic knee pain in the short-term and that this change was statistically significant when compared with a control group. This change in short term pain reduction was also reported[16], who also applied manual therapy for osteoarthritic knee. Previous studies[17,18] reported improvement with exercise have ranged from 8% to 27% decreases in pain and 10% to 39% improvements in function.

The role of manual traction in range of knee flexion is noted to be increased compared to the control group. The increment in knee flexion range is not noted exemplary but compared to the baseline value a difference in ROM is noted. This finding goes in accordance to Sara Maher's study reported on significant change in passive knee flexion.

In physical therapy practice, a valid functional outcome questionnaire is needed to measure the net effects. KOOS was found to an easy tool to administer and it is an extension of WOMAC. All the subscales showed good improvement in functions as in intervention group. A very similar type of study by Gail D in 2000 showed improved WOMAC values following manual therapy in knee. Overall manual knee joint traction showed better improvements in terms of pain relief, increased range of flexion and better functional outcome.

As clearly quoted, any mechanical dysfunction need to be corrected through mechanical means. Hence manual therapy in the form of traction tends to distract the joint at the articular surface level. The mechanics involved in long axis traction is designed to distract the knee and assist in pulling the shortened soft tissues(ligament, capsule).The maneuver may temporarily decrease joint compression allow sufficient fluid mechanics[19]. However, this procedure requires intact ligamentous and capsular structures to operate successfully. It also requires practice by the practitioner to acquire the motor skills necessary to perform the procedure.

The study consisted of 3 treatments per week for 2 consecutive weeks, a total of 6 treatments that produced significant self-reported pain relief and improved functions and quality of life. In the near future estimating the relationship between dosage and outcome pertaining to the present study can be analysed.

The Preliminary findings of this study promote future research for manual therapy protocols being incorporated with exercise regimes in the management of knee joint osteoarthritis. Large Randomised clinical trials should also attempt to address the dosage and duration of treatment required to resolve or manage a condition.

The greater improvement compared with results of previous studies may be due to the manually applied treatment, which allowed the therapist to focus treatment on the specific structures that produced pain and limited function for each patient.

LIMITATIONS

The limitations include a small sample size and short term follow up of findings. The results reveal that better outcome following manual knee traction is only short term responses and long term analysis is needed. On the technical context, treatment technique is applied in one position (high sitting) and other positions as like prone lying traction can be carried out.

CONCLUSIONS

The study concludes and lends support for the use of manual knee traction or distraction of tibio-femoral joint in improving the overall functional outcome in knee osteoarthritis. This study also highlights the importance of manual techniques in restoring the altered mechanics occurring in knee joint pathologies. Hence the study supports the use of manual traction in rehabilitating knee joint arthritis.

REFERENCES

1. Mankin HJ: Articular cartilagc, cartilage injury and osteoarthritis. In Fox JM, Del Pizzo W (eds): TI,e Patellofemoral joint. New York, McG ra w-HiLI , 1993:442 .
2. Bharat S Mody, Orthopedics Today. July/august 2010.
3. Kellgren JH, Lawrence JS. Radiological assessment of osteoarthrosis. Ann Rheum Dis. 1957; 16:494-501.
4. Moss P, Sluka K, Wright A. The initial effects of knee joint mobilization on osteoarthritic hyperalgesia. Man Ther 2007; 12: 109–18.
5. Gail D Deyle,Nancy Henderson.Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee-A RCT.Annals of internal medicine. February 1, 2000 vol. 132 no. 3 173-181.
6. Prentice WE. Techniques of manual therapy for the knee. Journal of Sports Rehabilitation. 1992; 1:249-57.
7. van den Dolder PA, Roberts DL. Six sessions of manual therapy increase knee flexion and improve activity in people with anterior knee pain: a randomized controlled trial. Aust J Physiother 2006; 52: 261–4.
8. Deyle GD, Henderson NE, Matekel RL, et al. Effectiveness of manual physical therapy and exercise in osteoarthritis of the knee. A randomized, controlled trial. Ann Intern Med. 2000;132(3):173–181.
9. Their.SO.Forces motivating the use of health status assessment measures in clinical settings and related clinical research.Med Care. 1992 May;30(5 Suppl):MS15-22.
10. Piva SR, Fitzgerald GK, Irrgang JJ, Bouzubar F, Starz TW. Get up and go test in patients with knee osteoarthritis. Arch Phys Med Rehabil. 2004 Feb; 85(2):284-9.
11. Sara Maher,Doug Creighton,Melodie Kondratek. The effect of tibio-femoral traction mobilization on passive knee flexion motion impairment and pain: a case series. J Man Manip Ther. 2010 March; 18(1): 29–36.
12. Kaltenborn FM. Manual mobilization of the joints. 6th ed. Oslo: Olaf Norlis Bokhandel; 2002.
13. Finch E, Brooks D, Stratford PW. Physical rehabilitation outcome measures: a guide to enhance clinical decision making. 2nd ed Hamilton, Ont.: Canadian Physiotherapy Association; 2002.
14. Gogia PP, Braatz JH, Rose SJ. Reliability and validity of goniometric measurements at the knee. Phys Ther 1987;67: 192–5.
15. Ewa Roos M,Knee injury and osteoarthritis outcome score(KOOS)-validation and comparision to WOMAC in total knee

replacement.Health and quality of life outcomes.2003,1:17.
16. Henry Pollard,Graham Ward.The effect of manual therapy knee protocol on osteoarthritic knee pain-A RCT. J Can Chiropr Assoc. 2008 December; 52(4): 229–242.
17. Kovar PA, Allegrante JP, MacKenzie CR, Peterson MG, Gutin B, Charlson ME. Supervised fitness walking in patients with osteoarthritis of the knee. A randomized, controlled trial. Ann Intern Med. 1992; 116:529-34.
18. Ettinger WH Jr, Burns R, Messier SP, Applegate W, Rejeski WJ, Morgan T, et al. A randomized trial comparing aerobic exercise and resistance exercise with a health education program in older adults with knee osteoarthritis. The Fitness Arthritis and Seniors Trial. JAMA. 1997; 277:25-31.
19. Nordin M, Frankel V. Basic biomechanics of the musculoskeletal system. 2nd ed. Philadelphia, PA: Lea & Febiger; 1989.