RESEARCH ARTICLE

EFFECT OF CYCLING VERSUS TREADMILL WALKING ON FUNCTION AND QUALITY OF LIFE IN PATIENTS WITH OSTEOARTHRITIS OF KNEE

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ABSTRACT

Background: Osteoarthritis (OA) refers to a clinical syndrome of joint pain, accompanied by varying degrees of functional limitation and reduced quality of life. It is, by far, the most common form of arthritis, and one of the leading causes of pain and disability worldwide.

Aims & Objectives: To see and compare the effect of cycling and walking on pain, function and quality of life in patients with OA knee.

Materials and Methods: 30 patients were divided into 2 groups, 15 patients in each. Group A and Group B underwent conventional physiotherapy in the form of warm up exercises. Group A performed cycling and Group B did supervised walking for 30 minutes. Both the protocols were followed by a cool down period of stretching exercises for tendoachillis and hamstring. Pre and post treatment measurement of Visual Analog Scale for pain, Lequesne index for function and SF-36 scores for quality of life were documented for both groups.

Results: There was statistically significant improvement in VAS, Lequesne index and physical component of SF 36 scores in both groups. But there was no statistically significant improvement in mental component scores of Quality of life in either group. There was no statistically significant difference in outcome measures between both the groups. ($p>0.05$)

Conclusion: Cycling and walking both are effective in treating patients with OA knee, and there is no difference in the effect of cycling and walking.

Key Words: Osteoarthritis; Aerobics; Cycling; Walking; Pain; Function; Quality of Life

Introduction

Osteoarthrits (OA) is a chronic degenerative disorder, primarily affecting the articular cartilage of the synovial joints, with eventual bony remodelling, and overgrowth at the margins of the joints. There is also a progression of synovial and capsular thickening, and joint effusion.[1]

OA is the second most common rheumatological problem, and is the most frequent joint disease, with a prevalence of 22% to 39% in India.[2-4] This is the most common cause of locomotor disability in the elderly population.[5]

OA is also known as wear and tear arthritis, as it involves the thinning and breakdown of the cartilage lining, a strong protein matrix that cushions and lubricates the joints. As the body struggles to contain ongoing damage, immune and regrowth process can accelerate the pain.[6] Patients often report pain, muscle weakness, stiffness, and instability, and reduced physical functioning. Ultimately, these lead to a loss of independence in activities of daily living (ADL), and a change in quality of life in patients with OA knee.

Pain is the central symptom in OA. One of the worst features about OA knee is its negative effect on quality of life.[7] Patients with OA of weight-bearing joints are less active, and tend to be less fit, with regards to musculoskeletal and cardiovascular status than normal controls.[8-10] This reduces functional capacity of the patient, which results into cessation of activities at work, home and in leisure-time. There are also dysfunctions in the area of ambulation, body care and movement (in terms of perceived health status), and emotional behaviour (in terms of perceived psychological functioning) in patients with OA knee.[11]

Aerobic exercise has been found to have significant effects on pain, joint tenderness, functional status and respiratory capacity for patients with OA knee.[12] Cardio-respiratory capacity is recognized as an important component of health-related fitness.[13] Physical fitness and aerobic exercise capacity are low in obese individuals[14,15] and several studies have demonstrated that obese individuals having OA knee, have a lower quality of life.[16-18] Thus, aerobic exercise may be prescribed as part of the treatment for osteoarthritis, as it may reduce pain and disability, and improve physical performance and quality of life (QOL) in patients with OA knee.[19]

Cycling helps to reduce the pain and improve quality of life.[7] It has been found that low intensity aerobic

exercise is as effective as high intensity aerobic exercise, in patients with OA knee, for improving functional status, gait, pain and aerobic capacity.[20] Studies show that tibiofemoral joint forces may be increased during forward cycling, but the same reduce the patellofemoral joint forces.[21]

Studies also show that walking may reduce the pain and disability in patients with OA knee.[22] However walking may be a pathogmatic factor for biomechanical joint loading, and it may worsen the OA.

Also there is less literature comparing the effect of cycling versus walking in patients with OA of knee, especially in the Indian population. Hence the need of the study was to compare the effects of cycling versus walking on activities of daily living, and quality of life in patients with osteoarthritis of knee. The aims of the study were to see and compare the effects of cycling and walking on pain, function and quality of life, in patients with OA knee.

Materials and Methods

A quasi-experimental study was conducted at Physiotherapy OPD, SBB College of Physiotherapy, VS General Hospital, Ahmedabad. The duration of the study was from April 2010 to August 2010. 30 patients were included by convenience sampling, and randomly allocated into two groups.

50-60 years old males and females, diagnosed as having unilateral OA of knee, according to American College of Rheumatology criteria, referred by the orthopaedic OPD, VS General Hospital, were included. The involved joint was chosen as primary factor limiting physical and functional activity. Patients having acute knee pain, existing medical conditions that would preclude increase in physical activity, subjective complaints of instability of knee, were excluded. Patients with knee flexion contracture greater than 15 degrees, history of reconstructive surgery on any lower extremity joint, multiple major joint involvements, any condition which severely limited local ambulation such as amputation or stroke, gait aids used for majority of the time for ambulation, ligamentous instability around knee which was greater than grade-1, were also excluded.

The outcome measures used were Visual Analogue Scale (VAS)[23-25] for pain, Index of Severity for Osteoarthritis Knee by Lequesne[26,27] for physical function and SF 36 for Quality Of Life.[8,28]

Patients were evaluated according to the format. The study was explained to the patients and written informed consent was taken. According to inclusion and exclusion criteria, patients were randomly allocated into Group A and Group B. Group A and group B both received conventional physiotherapy, including hydrocollator packs for 15 minutes, ankle toe movements, static quadriceps exercise, last degree knee extension, straight leg rising, knee extension in high sitting, 15 counts each, in the form of warm up exercises.

Then group A performed cycling exercise program for 30 minutes and group B did supervised walking exercise program for 30 minutes. Patients of both groups were explained to maintain the intensity of exercise, i.e. cycling and treadmill walking, at 11-13 of Rate of Perceived Exertion (RPE) according to Borg scale. Both the interventions were followed by a cool down period of stretching exercises for tendoachillis and hamstrings. The individuals were required to perform the exercise for five days in a week for 3 weeks. Level of significance was kept at 5%.

Results

In this study, 30 patients within the age group of 40 to 60 years, were taken and randomly divided into 2 groups, Group A (Cycling group) and Group B (Treadmill group). All the patients completed the study program without any complications. The data obtained in both groups are shown in tables 1, 2 and 3. Graph Pad Prism 5 was used for data analysis.

In this study, to analyze the effects on outcome measures, for VAS in group A and Lequesne in group B before and after exercises, Wilcoxon matched- Pairs test was used. For VAS in group B, Lequesne in group A and SF-36- mental component summary (MCS) scores and physical component summary (PCS) scores in group A and group B, before and after exercises, Paired t-test was used.

To analyze the effects on outcome measures, VAS and Lequesne between group A and group B, Unpaired t-test was used and SF-36 - mental component summary and physical component summary, between group A and group B, Mann-Whitney U test was used.

All values in both groups showed significant differences at end of intervention, as shown in table 2. However there was no difference between the groups at the end of intervention, as shown in table 3.

Table-1: Demographic data of patients

Characteristics	Group A	Group B
N	15	15
Age in Years (Mean ± SD)	50.86 ± 5.39	50.46 ± 4.688
Males	8	7
Females	7	8
Duration of onset of symptoms in Months (Mean ± SD)	7.6 ± 1.6	8.0 ± 2.0

Table-2: Mean Difference in outcome measures in Groups A and B

Outcome	Group	Pre-Treatment	Post-Treatment	W-value	p value
VAS	A	5.55 ± 2.76	2.76 ± 0.77	120	0.0007
VAS	B	5.8 ± 3.23	3.23 ± 0.80	12.81	< 0.0001
Function	A	10.7 ± 1.6	6.43 ± 1.6	21.29	< 0.0001
Function	B	10.86 ± 1.06	6.16 ± 1.23	120	0.0007
PCS	A	49.93 ± 2.21	65.47 ± 2.72	22.85	< 0.0001
PCS	B	51.85 ± 2.67	66.69 ± 2.33	30.02	< 0.0001
MCS	A	68.16 ± 4.81	68.73 ± 4.82	1.871	0.0824
MCS	B	66.69 ± 4.06	67.07 ± 4.30	1.293	0.217

Values are in Mean ± SD

Table-3: Mean differences in outcomes between groups A and B

Outcome	Group A	Group B	t- value	p- value
VAS	2.79 ± 0.55	2.56 ± 0.74	0.9180	0.3665
Function	4.26 ± 0.77	4.7 ± 0.76	1.508	0.1427
PCS	15.53 ± 2.63	14.84 ± 1.91	77.5	0.1465
MCS	0.57 ± 1.18	0.38 ± 1.14	96	0.4659

Values are in Mean ± SD

Discussion

The present study was done to see the effect of cycling versus walking, on activities of daily living and quality of life, in subjects with osteoarthritis of knee. Both groups received conventional physiotherapy as warm up exercises. Then Group A performed cycling exercise program and Group B did walking exercise program for 30 minutes. Both the programs were followed by a cool down period of stretching exercises for bilateral tendoachillis and hamstrings. VAS, Lequesne and SF-36 scores were documented for both groups.

The main findings of the present study were that, 3 weeks of aerobic exercises, i.e. cycling and walking, significantly reduce the pain, and improve physical function and physical component summary scores of quality of life in both the groups. Mental component summary scores of quality of life showed no significant difference in both the groups. Also there was no significant difference in these outcome measures between both groups.

The study showed a considerable decrease in VAS scores in Group A and Group B. This is in accordance with the study done by Brosseau L et al[12] and Bruce B et al[29] which showed that pain and morbidity associated with aging can be reduced by participating in regular aerobic activity. According to Ettinger et al[30], aerobic exercises of moderate intensity can raise the pain threshold, improve energy level, lessen depression, improve physical self-concept, and belief in self-efficacy, and thus reduce pain by triggering the release of endorphins. Once these hormones enter the bloodstream; their two-fold effects are thought to act for several hours – the first is relief of pain and second is a sense of euphoria.

The present study showed statistically significant improvement in Lequesne index scores for function i.e. pain, maximum distance walked, and activities of daily living in both groups A and B. This is in accordance with the study done by Penninx BW et al[31] which shows that incidence of loss of ADL was significantly lesser in the group who had performed aerobic exercises. The study also showed that aerobic exercise may be an effective strategy for preventing ADL disability, and consequently may prolong older persons' autonomy.

The symptoms of pain, morning stiffness of short duration and physical dysfunction in the activities of daily living, can have an effect on many aspects of health, affecting quality of life. Regular and moderate physical activity adapted to individuals' life-styles and education, and joint protection strategies, has been advocated as management. A study done by Dias RC et al[32] shows that there is significant improvement in physical function, and decrease in OA symptom severity measured by Lequesne Index, with any form of physical activity. According to Ettinger et al[30] and Brandt et al[9], physical activity may break the vicious circle often found in these patients, that may include deterioration of aerobic and muscular fitness, flexibility, proprioception, and balance, development of cardiovascular risk factors, depressive mood, lack of self-confidence and initiative, decreasing capacity for activities of daily living, increasing dependency, and development of comorbidities.

The present study showed statistically significant improvement in SF-36 PCS component scores in both groups A & B. This is in accordance with the other studies done by Thorstensson CA et al[33], Dias RC et al[32], Pennix BJH et al[31], Multani NK[7] and Fransen et al[34], which show that there is statistically significant improvement in physical component summary scores of quality of life in the experimental groups, compared to control groups in subjects with osteoarthritis. This improvement could be seen as a direct result of pain reduction, improved physical function, and decreased ADL disability – and thus overall improved the Quality of life.

The present study showed that there was no difference in SF-36 MCS component in both groups A and B. This

could be due to a short experimental period (3 weeks) of the present study. This is in accordance with the study done by Dias RC et al[32], which shows that there is no improvement in the emotional domain of SF-36, even after the 6 months of intervention.

There was no statistically significant difference in VAS, Lequesne Index scores and PCS and MCS scores of SF-36 between Group A (Cycling group) and Group B (Treadmill group). This can be explained by the fact that cycling and walking both are equally effective as aerobic exercises in improving pain, ADL and quality of life in subjects with OA knee. There are no additional effects of cycling and walking over each other, as well as no side effects of cycling or walking.

The clinical implications of the study are that aerobic exercises should be incorporated into an exercise program for subjects with osteoarthritis of knee for reduction in pain and improvement of physical function and quality of life.

Limitations of this study are as follows. The study was conducted for a short period i.e. 3 weeks and patello-femoral, tibio-femoral and tri-compartmental arthritis differentiation was not done. Future research can be done to see long term effect of cycling and walking on pain, activity of daily living, and quality of life in subjects with OA knee.

Conclusion

Cycling and walking both are effective in treating subjects with OA knee, and there is no difference in the effect of cycling and walking.

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