

Effects of isometric quadriceps muscle strengthening exercise on chronic osteoarthritis of the knee

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Abstract

A total of 64 patients of osteoarthritis of the knee joints were studied to observe the effects of isometric quadriceps muscle strengthening exercise plus non-steroidal anti-inflammatory drugs (NSAIDs) on osteoarthritis of knee joints. Another 75 patients were treated with NSAIDs as control. They were assessed by visual analogue scale, OMAC scale and range of motion of the knee joints and followed-up weekly for six weeks. Improvement was found in both groups ($p=0.001$) after treatment. In comparison, more improvement was found in the exercise group after four weeks ($p=0.009$). Then improvement was gradually increased day by day and finally there was highly significant improvement ($p=0.001$). This study suggests that isometric quadriceps muscle strengthening exercise has its beneficial role to reduce symptoms in osteoarthritis knee.

Introduction

Osteoarthritis is the most important of the rheumatic diseases and is responsible for a huge burden of pain and physical disability¹. Most of its community impact is due to disease of hip and knee arthritis. A wide variety of treatments are available for osteoarthritis of the knee including education, hydrotherapy, footwear and walking aids, other rehabilitation measures, physical therapy (SWD, UST, TENS, galvanic current, exercises etc), systemic drug therapy, intraarticular drug therapy and surgery²⁻⁶. Recently, it was found that isometric resistance training improves functional ability and reduces knee joint pain with patients of knee osteoarthritis⁷. But the role of specific exercises and physical therapy for the treatment of osteoarthritis knee joint is not clear. Therefore, this study was designed to see the effects of specific exercise therapy on osteoarthritis of the knee to improve the patient's condition.

Materials and Methods

The patients having osteoarthritis -knee were selected from July 2007 to June 2008. The patients were selected according to the criteria developed by the American College of Rheumatology (ACR)⁸. A total of 139 patients (male 35, female 104) were randomly

selected of which 64 were treated with non-steroidal anti-inflammatory drugs (NSAIDs) and exercise and the rest 75 were treated with NSAIDs only.

Inclusion criteria were: age ≥ 38 years and ≤ 70 years, having no morning stiffness or morning stiffness less than 30 min, having primary osteoarthritis of the knee joints, having no evidence of malignancy and having no evidence of infection on the skin over knee joints.

Exclusion criteria were: age less than 38 years and more than 70 years, having morning stiffness more than 30 min, having secondary osteoarthritis of the knee joints, having any evidence of malignancy, having swelling & effusion and having any evidence of infection on the skin over the knee joints.

Recording: Before admission into the trial the nature of the study was discussed with the patients and verbal consent of the patients was taken. History, clinical examination and relevant investigations were done. The findings were recorded at first attendance and follow up was done weekly for six weeks.

Assessment: The parameters used for comparing the treatment are visual analogue scale⁸, WOMAC osteoarthritis index and range of motion (ROM) of the knee.

Statistical methods: The numerical data were analyzed statistically. The results were expressed as

mean \pm SD and the level of significant was expressed by *p*-value unless otherwise stated. Statistical analysis was done by using SPSS package for Windows. Student's 't' tests was done to see the level of significance.

Results

There was significant improvement after treatment in both the groups (*p*=0.001)

In comparison between two groups, it was found that there was no significant difference in pre-treatment, W_1 , W_2 and W_3 , assessment scores between the two groups i.e. there was no difference in improvement. More improvement was found in exercise group than only NSAIDs group after 4th week (95% CI was -10.33 to -1.52). Then it was found that the improvement was gradually increased. Finally, it was found that there was significant improvement in exercise group than only NSAIDs group after 6th week (95% CI was -13.29 to -5.2; Table I). Regarding range of motion, in comparison between two groups, there was no significance difference in improvement of ROM between two group after treatment for six weeks (*p* = 0.45).

Discussion

Significant improvement of symptoms within both the groups began to appear at the end of first week. But, no significant difference of improvement was found to begin between the groups at this stage. After treatment significant improvement was found in the group of patients who received exercise plus NSAIDs than that of the patients who were not advised exercise but received NSAIDs only.

Jan et al. found significant improvement after treatment with ultrasound therapy (UST) or SWD only and UST plus exercise and SWD plus exercise⁹.

They studied 61 females with osteoarthritis knee joints. In another study, it was found that quadriceps exercise and ADLs in patients with osteoarthritis knee was beneficial to reduce symptoms¹⁰. This is in favor of our study. Quadriceps muscle strengthening exercise is important for increasing of the muscles strength and it is evident that muscle strengthening exercise improves the condition of the patients with osteoarthritis knee significantly found in various studies¹¹⁻¹³. It was found that home based exercise program can significantly reduce pain in osteoarthritis knee joints⁵.

In our study marked reduction of knee pain in exercise group was found. American College of Rheumatology subcommittee also recommends quadriceps strengthening exercise for knee osteoarthritis¹⁴. Quadriceps weakness is common among patients with osteoarthritis knee, in whom it has been believed to be a manifestation of disuse atrophy, which develops because of unloading of the painful extremity¹⁴.

Brandit et al. found that an exercise program may be as effective in decreasing joint pain as treatment with an NSAID¹⁵. Patient with hip and knee osteoarthritis can participate conditioning exercise programs to improve fitness and health without increasing joint pain or increasing their requirement for analgesic agents or anti-inflammatory drugs¹⁵. They described the preference of isometric exercises over isotonic exercises. In this study, we used only isometric quadriceps muscle strengthening exercise and found significant improvement. This may be due to increased muscle strength of quadriceps and thereby joint become stronger and reduced the symptoms.

In conclusion, muscle strengthening exercise is found to have better effect when it is used in adjunct to NSAIDs in osteoarthritis knee joint. Exercise may decrease the need of NSAIDs and thereby side effects of NSAIDs can be avoided.

Table I: Comparative improvement of symptoms between groups

| Group | Total scores at different weeks | | | | | | |
|----------------------------|---------------------------------|------------------|------------------|------------------|--------------------|-------------------|-------------------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| NSAIDs and exercise (n=64) | 45.43 (17.26) | 36.05 (14.35) | 30.90 (12.11) | 26.36 (12.99) | 21.69 (11.91) | 17.41 (10.77) | 12.78 (9.61) |
| NSAIDs (n=75) | 53.05 (40.45) | 37.77 (16.79) | 31.46 (14.97) | 29.32 (14.68) | 27.62 (14.33) | 24.98 (14.24) | 22.03 (14.33) |
| 95% CI | 7.29 to 2.27 | -0.86 to 1.48 | -1.49 to 0.96 | -2.23 to 0.31 | -10.33 to -1.52 | -2.86 to -0.27 | -13.29 to -5.2 |

The results are expressed in mean (SD); n = Number of the patients

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