

# **Effects of Isokinetic Exercise on Gait Biomechanics of Patients with Knee Osteoarthritis**

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## **Introduction**

Osteoarthritis (OA) is the most prevalent joint disease and the second leading cause of disability in older adults, and knee is the second most commonly afflicted joint of osteoarthritis. According to the American College of Rheumatology Guidelines for the Medical Management of Osteoarthritis, the goals of management for patients with OA of the knee are to control pain and other symptoms, maintain/improve joint mobility, minimize disability, and educate patients and their families about the disease and its therapy (1). Isokinetic exercise was found to be effective and well-tolerated treatment for knee osteoarthritis in terms of pain severity and functioning (2).

## **Statement of Clinical Significance**

This study was planned to evaluate the effects of isokinetic exercises on gait biomechanics of patients with knee osteoarthritis

## **Methodology**

Subjects were 29 patients with bilateral knee osteoarthritis. Knee radiographs (weight-bearing, antero-posterior view x-rays) were used to demonstrate the degree of OA in terms of joint space narrowing and osteophyte formation. Entry criteria consisted of, willingness to participate in the study, being older than 40 years of age, and having radiographic evidence of Kellgren and Lawrence grade II-III OA of the knee. Osteoarthritis of the hips, ankles and feet were ruled out during the medical history. The subjects had OA of the knees and associated symptoms (joint pain, tenderness, swelling, crepitus and improved mobility) for more than 2 years.

Patients were evaluated twice, before and after 6 weeks of isokinetic exercise program. Spatio-temporal, kinematic and kinetic characteristics of gait using a three-dimensional computerized gait analysis system (Vicon 370 with five cameras, and two Bertec forceplates) were measured before and after the intervention (six weeks' of isokinetic quadriceps and hamstring strengthening program).

Data analysis was performed using SPSS for Windows version 9.0. Wilcoxon matched-pairs signed-ranks test was used to determine the differences of pain severity, stiffness, physical functioning and gait characteristics before and after the isokinetic exercise program.

## **Results**

Mean  $\pm$  SD age of the 29 patients was  $53.1 \pm 9.7$  years. Twenty-six of them were female, all of the patients had bilateral involvement (19 with grade II, 10 with grade III radiological evidence score) and the average disease duration was  $73.9 \pm 80.0$  months. Spatio-temporal, kinematic and kinetic gait characteristics of the patients before and after the isokinetic exercise program were presented in Table 1. There was not a statistically significant

difference between the trials, before and after the treatment, in terms of spatio-temporal, kinematic and kinetic variables of gait. A slight increase in walking velocity was observed after treatment. However, the adductor and extensor moments, and vertical ground reaction forces which are the major determinants of knee loading did not differ after six weeks of isokinetic exercise program for the knee extensors and flexors.

**Table 1:** Spatio-temporal, kinematik and kinetik gait characteristics of the patients before and after the isokinetik exercise program

	Before treatment	After treatment	P
Walking velocity (m/sec)	0.81 ± 0.15	0.88 ± 0.15	0.01
Step length (m)	0.98 ± 0.13	1.00 ± 0.12	0.34
Knee excursion in sagittal plane (in degrees)	42.3 ± 9.3	42.3 ± 10.7	0.86
Knee extensor moment (Nw/kg)	0.23 ± 0.17	0.18 ± 1.3	0.32
Knee adductor moment (Nw/kg)	0.10 ± 0.02	0.08 ± 0.01	0.45
Vertical ground reaction force 1 <sup>st</sup> peak (Newtons/%bodyweight)	89.6 ± 4.0	90.7 ± 5.5	0.89

## Discussion

Previous studies has been shown the benefits of isokinetic strengthening to patients with knee osteoarthritis in terms of pain and functioning (2). However, we could not find a statistically significant improvement in biomechanical gait characteristics of patients with knee ostaoarthritis after six weeks of isokinetic exercise program. Strengthening of the quadriceps and hamstring muscles for six weeks did not improve the adductor and extensor moments which are the major determinants of the higher loading at the knees with OA.

## References

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