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Kalça Osteoartritli Hastalarda Kalça Abduktor Kas Kuvveti Fonksiyonel Beceriler ile İlişkili Midir?

Is Hip Abductor Muscle Strenghth Related to Functional Capabilities in Patients with Hip Osteoarthritis?

Dilek ŞAHİNOĞLU[1 A,B,C,D,E,F], Burak Çağrı AKSU[2 C,D], Nilgün BEK[3 B,G], Fatma Gül YAZICIOĞLU[4 G]

[1]Yeditepe Üniversitesi, İhtisas Hastanesi, Fizik Tedavi ve Rehabilitasyon Bölümü, İstanbul, Turkey

[2]Yeditepe Üniversitesi, Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, İstanbul, Turkey

[3]Lokman Hekim Üniversitesi, Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Bölümü, Ankara, Turkey

[4]Hacettepe Üniversitesi, Fizyoterapi ve Rehabilitasyon Fakültesi, Protez Ortez ve Biomekanik Bölümü, Ankara, Turkey

ÖZ

Amaç: Bu çalışmanın amacı ileri seviye unilateral kalça osteoartriti olan bireylerde kalça abduktor kas kuvveti ile fonksiyonellik arasındaki ilişkiyi incelemektir.
Yöntem: Çalışmamıza yaş ortalaması 63.45±10.50 olan 44 ileri seviye unilateral kalça osteoartriti olan birey dahil edildi. Tüm bireylere Oxford kalça skoru, her iki kalçaya abduktor kas kuvveti testi, görsel ağrı skalası ve süreli kalk yürü testi uygulandı.
Bulgular: Yapılan korelasyon analizinin sonucuna göre sağlam kalçanın kas kuvveti ile Oxford kalça skoru (r:0.28 p:0.03), aktivite sırasında hissedilen ağrı (r:-0.41 p:0.003) ve dinlenme sırasında hissedilen ağrı (r:-0.33 p:0.01) arasında orta dereceli ve istatistiksel olarak anlamlı ilişki saptandı.
Sonuç: Unilateral kalça osteoartritli bireylerin sağlam kalça abduktor kas kuvveti ile Oxford kalça skoru ve görsel ağrı skalası arasında orta seviyeli bir ilişki bulundu. Kalça osteoartritli bireylerin ağrıya bağlı hareket kısıtlılığı sebebi ile azalan fonksiyonel seviyelerinin ilerlemesinde sağlam kalçanın kuvvetlendirilmesi önem kazanmaktadır. Aynı zamanda unilateral kalça osteoartritine bağlı ağrının azalması, fonksiyonelliğin kazanılmasında belirleyicidir.

Anahtar Kelimeler: Osteoartrit, Kalça, Kas kuvveti.

ABSTRACT

Objective: The aim of this study is to investigate the relationship between hip abductor muscle strength and functionality in individuals with hip osteoarthritis.
Method: Forty-four individuals with end-stage unilateral hip osteoarthritis having a mean age of 63.45±10.50 were included in this study. Oxford hip score (OHS), abductor muscle strength test of both hips, visual analogue scale, and timed up and go test were applied to all individuals.
Results: The correlation analysis revealed a moderate level and statistically significant relation between the muscle strength of the healthy hip and the OHS (r:0.28 p:0.03), pain during activity (r:-0.41 p:0.003), and pain at rest (r:-0.33 p:0.01).
Conclusion: In patients with unilateral hip osteoarthritis, a moderate relationship between healthy hip abductor muscle strength and the OHS and visual analogue scale was found. To increase the functional level of patients with hip osteoarthritis, which is reduced due to pain-related limitations of motion, strengthening the healthy hip is crucial. In addition, the reduction of pain due to hip osteoarthritis is key to achieve functionality.

Key words: Osteoarthritis, Hip, Muscle strength.

Corresponding Author: Dilek ŞAHİNOĞLU
Yeditepe Üniversitesi İhtisas Hastanesi Fizik Tedavi ve Rehabilitasyon Bölümü, Koşuyolu Mah. Koşuyolu Caddesi No: 168 Kadıköy, İstanbul, Turkey.
fztdilektemel@gmail.com
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1. INTRODUCTION

The hip joint is a ball and socket type joint, commonly affected by degenerative changes that lead to osteoarthritis (OA) (1). Hip OA is a non-inflammatory arthrosis which causes progressive cartilage loss on the femoral head and acetabulum surface (2). Cartilage changes forming on the joint surface cause degeneration, which leads to pain, movement limitation, and loss of strength and function. These are the primary clinical symptoms of hip OA (3).

Patients with hip OA generally suffer groin pain from the early stages onwards. The pain starting in the groin is often reflected in the knee joint if in the anterior thigh and in the trochanter major and gluteal region if in the lateral thigh (4). The pain is felt at the lowest level in the morning and at rest and worsens throughout the day towards the evening; in other words, pain increases with activity. Nocturnal pain is rarely seen (5). During the end stages of the disease, pain severely restricts mobility and daily living activities, which may result in loss of physical activity and workforce and social isolation of individuals with OA (6-8).

The periarticular muscle groups are extremely important in minimising the negative effects of vertical stress loaded on the joint. Loss of muscle strength is accepted as a risk factor which may cause progression of hip OA (9). The hip abductor muscle groups play an important role in absorbing the load and in the biomechanics of the hip joint (9,10). In many studies of patients with hip OA, weakness has been reported in the muscle groups around the hip (11-13). Muscle weakness has been shown to be due to muscle atrophy because of abnormal joint biomechanics, inhibition, and reduced participation in activity due to pain (13).

To control the pain and other symptoms and minimise the negative effects of the disease, hip abductor muscle strengthening exercises help patients with hip OA (14). Studies related to hip abductor muscle strength in individuals with hip OA often focus on ambulation, while the relationship of a weak hip abductor muscle group with functionality and daily living activities restricted because of pain has not been investigated (15,16). Thus, the aim of this study is to investigate whether hip abductor muscle strength affects the functional level of patients with unilateral end-stage hip OA.

2. METHOD

Participants

This cross-sectional study conducted in the Physiotherapy and Rehabilitation Unit of Yeditepe University Medical Faculty Hospital included 44 patients with unilateral hip OA. The patients included in the study were diagnosed with OA by an orthopaedist. The study inclusion criteria included a diagnosis of unilateral end-stage hip OA, no symptoms in the healthy contralateral hip, and no hip surgery or analgesic injections within the last six months. Patients who had a diagnosis of any neurological disease, attended physical therapy sessions within the previous six months, and were receiving treatment for cancer were excluded from the study. Figure 1 illustrates the flow chart of the study. To evaluate the severity and progression of the disease or the efficacy of treatment if applied to patients with hip OA, self-reported scales of the functional status were used. The Oxford Hip Score (OHS) is a widely used scale for the evaluation of pain and functional status in patients with hip OA (17). Functional performance

measurements, such as the Timed Up and Go Test (TUG), were also used as objective evaluation parameters in patients with OA (18).

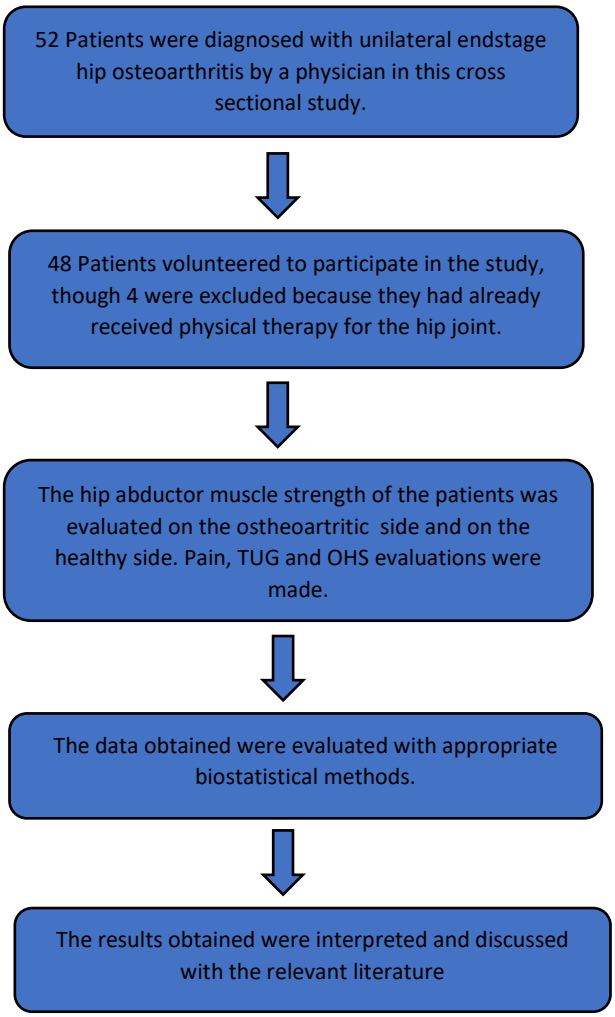

Figure 1: Study Flow Chart.

Evaluation Parameters

The study participants were evaluated as follows:

Sociodemographic Evaluation

A record of each patient's age, height, weight, and body mass index was made.

Pain Evaluation

A visual analogue scale (VAS) was used to evaluate the pain felt by the study participants. The participants were instructed to mark the level of pain felt at rest and during 10 meter of walking on the scale graded from 0 to 10, where 0 represents no pain and 10 represents intolerable pain (19).

Evaluation of Hip Abductor Muscle Strength

A microFET®2 (Digital Hand-held Dynamometer, Hoggan Scientific, LLC; Salt Lake City, Utah) Hand-Held Dynamometer was used to measure muscle strength. Using the break

test method, which reveals isometric muscle contraction during the muscle test, force was applied in the opposite direction until a joint movement occurred exceeding the maximum power applied with the dynamometer. The strength of the healthy and osteoarthritic hip abductor muscles was evaluated with the patient in supine position. The measurements were recorded as Newton (N) units (20,21).

Oxford Hip Score

The scale has been shown to have good reliability, validity, and senstivity to clinical change (22). The OHS comprises of twelve items related to pain and functional status as perceived by the patient. Each item is scored from 0-4 with Likert-type responses. The total score ranges from 0 to 48, with 0 representing the worst result for symptoms and dysfunction and 48 representing the best possible result. The validity and reliability studies of the Turkish version of OHS were conducted by Tugay et al (23).

Timed Up and Go Test

The TUG test, which assesses dynamic balance and functional performance, is frequently recommended for clinical use in cases of hip and knee OA. It is a practical test that takes a very short time to apply, thus it is recommended that the test be performed twice with the best time being recorded. In the test, the patient is seated upright on a standard 45cm stool with his feet flat on the floor. On the command of "start," the subject stands up, walks three meters to the finishing line, turns around, returns, and sits on the stool again (18).

Statistical Analysis

Data obtained in the study were statistically analyzed using SPSS 20.0 software. The conformity of the data to normal distribution was assessed using the Shapiro-Wilk test. As normal distribution was not determined, non-parametric tests were used in the statistical analyses. Continuous variables were stated as arithmetic mean ± standard deviation values, while categorical variables were stated as number (n) and percentage (%). Correlations were examined with Spearman's correlation analysis. A value of $p<0.05$ was accepted as statistically significant. A correlation coefficient of 0-0.25 indicates a "poor correlation," 0.26-0.50 a "moderate correlation," 0.51-0.75 a "good correlation," and 0.76-1 a "very good correlation" (24).

Sample Size

The sample size was calculated using G*Power version 3.0.10 software (Universität Düsseldorf, Düsseldorf, Germany). The primary outcome measure was hip abductor muscle strength and TUG test. It was calculated that a total of 44 subjects were required to provide power of 0.80, effect size of 0.80, and α value of 0.05.

3. RESULTS

The current study included 44 individuals consisting of 28 females and 16 males. The mean age of the individuals was 63.4±10.5. The demographic data and descriptive statistics are shown in Table 1. The mean score of abductor muscle strength value of the healthy hip (83) was higher than the osteoarthritic side (48.5). The mean score of OHS was 9.18, while the mean

score of TUG was 15.43. The mean of the VAS score was 8.9 for the pain felt during activity and 4.1 for the pain felt during rest. The mean score, minimum and maximum values, standard deviation of the muscle strength values, TUG score, OHS score, and VAS pain values are shown in Table 2.

Table 1. Demographic Data of the Participants

	mean	SD
Age (years)	63.45	10.50
Height (m)	1.64	0.08
Weight (kg)	75.22	12.05
BMI	28.05	4.83

*SD: standard deviation, BMI: body mass index

Table 2. The Muscle Strength Values, Timed Up and Go Score, Oxford Hip Score, and VAS Pain Values

	Mean	Min.	Max.	SD
OHAMS	48.51	0	105	20.66
HHAMS	83.07	34	145	28.89
Resting Pain	4.18	0	10	2.89
Activity Pain	8.9	2	10	1.56
OHS	9.18	1	27	6.51
TUG	15.43	10	24	3.49

OHAMS: osteoarthritic hip abductor muscle strength, HHAMS: healthy hip abductor muscle strength, OHS: Oxford Hip Score, TUG: Timed Up and Go test score

A moderate-level correlation was found between the abductor muscle strength of the healthy hip and the OHS score (r=0.28), VAS activity score (r=-0.41), and VAS rest score (r= -0.33). The osteoarthritic hip's abductor muscle strength did not significantly correlate with OHS, TUG, or pain scores. The correlation values between the hip abductor muscle strength values of the osteoarthritic side and the healthy sid as well as the TUG, OHS, and VAS scores at rest and during activity are shown in Table 3.

Table 3. Correlations Between the Hip Abductor Muscle Strength Values of the osteoarthritic Side and the Healthy Side, and Other Variables

	TUG		OHS		VAS rest		VAS activity	
	r	p	r	p	r	p	r	p
OHAMS	0.24	0.05	0.21	0.07	-0.23	0.06	-0.46	0.06
HHAMS	-0.15	0.1	0.28	0.03*	-0.33	0.03*	-0.41	0.01*

OHAMS: osteoarthritic hip abductor muscle strength, HHAMS: healthy hip abductor muscle strength, OHS: Oxford Hip Score, TUG: Timed Up and Go test score, *:p<0.05,

4. DISCUSSION

In this cross-sectional study, the relationship between hip abductor muscle strength and physical function was examined in patients with unilateral end-stage hip OA through evaluations of self-reported physical function with the OHS, functional performance with the TUG test, hip abductor muscle strength with a hand-held dynamometer, and pain at rest and during activity with VAS scores. The most important finding of the study was that the self-reported function, notably OHS score and pain, was related to the hip abductor muscle strength of the healthy side in patients with unilateral hip OA. Suetta et al. and Shih et al. demonstrated that the absence of pain during functional activities throughout the day can result in enhanced muscular function in the healthy hip (6,25). These findings are consistent with the results of the

present investigation. According to the results of Zacharias et al., atrophy of hip abductor muscle group is related to the symptoms and severity of end-stage hip OA (26). However, the results of this study, unlike the results of Zacharias' study, showed that the abductor muscle strength of the healthy hip is related to the functionality of the patients with unilateral hip OA. Pain has been recognized as a key factor in reduced muscle strength in other studies (7,8). Moreover, no correlation was found in the current study between the strength of the abductor muscles and pain in the osteoarthritic hip during activity. However, other researchers reported that pain on the ostheoarthritic side in end-stage hip OA affected muscle contraction and muscle exertion (27,28).

Compared to their healthy hip, patients with hip OA have a significantly reduced muscle strength in the osteoarthritic hip (16). In the current study, a difference of approximately 30% was found between the hip abductor muscle strength of the healthy side and the osteoarthritic side. This result was similar to the findings of the studies of Marshall et al., Arokoski et al. and Rasch et al (29-31). In contrast to the findings of this study, Dalen et al. reported a difference of only 15% in muscular strength between the osteoarthritic and healthy hips (16).

An increasing amount of evidence shows that performance-based outcome measures, as opposed to self-reported measures alone, are more likely to accurately describe a change in body functions (32). Thus, in addition to the OHS test, the TUG test was also used in this research. No correlation between the TUG test and the hip's abductor muscle strength, whether healthy or osteoarthritic, was found. In contrast to this study's findings, Zeni et. al.'s study discovered a moderate correlation between the TUG test and hip abductor muscle strength and pain (28). The mean time for the TUG test in this study was 15.43±3.49 seconds, which is similar to the values reported for individuals with hip OA by Arnold et al., Gasparutto et al., and Holstege et.al. (33-35).

The present study is limited by the insuffient number of healthy individuals within the same age range. This situation was caused by the covid 19 pandemic. The strongest aspect of this study is that it states that functionality is associated with muscle strength and pain in endstage hip osteoarthritis.

5. CONCLUSION

The functional decline caused by pain and motor restrictions certainly makes hip arthroplasty surgery a very effective treatment option for end-stage hip OA. However, it is crucial to consider each patient's needs when choosing an appropriate rehabilitation strategy, particularly for the elderly or individuals who cannot undergo hip artroplasty surgery because of other medical issues. The impact of muscle strength on hip OA pain and functionality, which has always been of interest to specialists, influences rehabilitation strategy. The healthy hip should be part of the rehabilitation program in order to facilitate a pain-free return to normal activities and to enhance patients' functionality.

Ethical Consideration of the Study

Approval for the study was granted by the Clinical Research Ethics Committee of Yeditepe University (decision no: 1145). The research was carried out in accordance with the declaration of Helsinki.

Conflict of Interest Statement

The authors have no conflict of interest to declare.

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