



The Effect of Ligamentum Teres Integrity on Hip Scores

Ligamentum Teres Butunlugunun Kalca Skorlarına Etkisi

Ligamentum Teres Integrity and Hip Scores

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Özet

Amaç: Displazik kalçalarda Ligamentum Teres'in (LT) hiperlaksite ve stabiliteye etkisi daha önceki çalışmalarda vurgulanmıştır. LT kesilmiş hastalarda instabilite ve rahatsızlık gözlenmektedir. Duyusal sinir sonlanmalarının varlığı LT'nin eklem propriyosepsiyonu ve nosisepsiyonunda işlevi olduğuna işaret etmektedir. Çalışmamızda kalça eklemindeki LT bütünlüğünün klinik işlevlere etkisinin kıyaslanması amaçlandı. **Gereç ve Yöntem:** Evre 2-3 koksartrozu olan ardışık 92 hastaya LT testi uygulandı. İç veya dış rotasyonda ağrı LT testinin pozitif olduğunu gösterdi. LT testini takiben hastaların, Kalça Kısıtlılık ve Osteoartrit Sonuç Skoru (HOOS) ve Harris Kalça Skoru (HHS) kaydedildi. Her hastanın etkilenen kalçasından Manyetik Rezonans Görüntüleme (MRG) elde edildi. **Bulgular:** MR bulguları ile LT testi etkililiği değerlendirildiğinde, sensitivite % 87.37, spesifite ise % 73.47 iken, pozitif ve negatif prediktif değerler sırasıyla % 74.5 ve 80.4 olarak not edildi. MR bulguları ve LT testine göre bağı intakt olan 36 kalça (grup 1) ile bağı yırtık 38 kalça (grup 2) HOOS ve HHS skorları ile karşılaştırıldı. Her iki skorlama da Grup 1'de Grup 2'ye göre önemli ölçüde daha yüksekti ($p < 0.001$). **Tartışma:** Bilindiği kadarıyla, yırtık ve intakt LT karşılaştırmasıyla bağ bütünlüğünün kalça fonksiyonel skorlarına etkisi literatürde ilk kez çalışmamızda ele alınmaktadır. Ligamentum teres bütünlüğünün bozulması, kalça fonksiyonel skorlarını düşürmektedir.

Anahtar Kelimeler

Ligamentum Teres; Koksartroz; Kalça; Kalça Skoru

Abstract

We aimed to compare the clinical functioning of the hips with an intact Ligamentum Teres (LT) to ruptured LT. Patients with resected LT have feelings of instability and discomfort. The effect of LT on hip stability in dysplastic hips and hyperlaxity has been emphasized before. Existence of sensory nerve endings demonstrates that LT has a function in joint proprioception and nociception. LT test was conducted to 92 consecutive patients with Grade 2-3 coxarthrosis. Pain on either internal or external rotation is consistent with a positive LT test result. Following LT test, Hip disability and osteoarthritis outcome score (HOOS) and Harris Hip Score (HHS) were conducted to all of the patients. Each patient underwent MRI Scanning of the involved hip. The efficacy of LT test was evaluated in comparison to MRI findings, sensitivity of the test was 87.37 % and specificity was 73.47 positive and negative predictive values were found to be 74.51 % and 80.43 % respectively. 36 hips which had intact LT according to MRI and LT test (Group 1) was compared to the 38 hips with ruptured LT in both LT test and MRI (Group 2) regarding HOOS and Harris Hip Scores. HOOS and Harris Hip Scores of Group 1 were found to be significantly higher than Group 2. As far as we know from the literature this is the first clinical study to investigate the effect of LT integrity on hip scores by comparing hips with ruptured LT to hips with intact LT.

Keywords

Ligamentum Teres; Hip; Coxarthrosis; Hip Score

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Introduction

Studies performed on ligamentum teres (LT) regarding its biomechanical functions and histology are limited in number [1-2]. Mechanoreceptor studies show that the ligament contains free nerve endings (Type IVa mechanoreceptors) [2]. Existence of these sensory nerve endings demonstrates that LT has a function in joint proprioception and nociception. From a biomechanical aspect, LT becomes tight at the flexion, adduction, and external rotation position of the hip joint [3]. This is the least stable position of the joint. The effect of LT on hip stability in dysplastic hips and hyperlaxity has been emphasized before [4-6]. In their study Martin et al. reported that patients with resected LT had feelings of instability and discomfort [5]. The prevalence of LT tears detected at hip arthroscopy varies between 4% and 15% [7]. Papers regarding the effect of ruptured LT on hip pain are limited in number [8-9]. As far as we know from the literature, this is the first clinical study to investigate the effect of LT integrity on hip scores by comparing patients suffering coxarthrosis with ruptured versus intact LT.

Material and Method

The prospective, randomized study was approved by the ethics committee of Ondokuz Mayıs University and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All patients gave their informed consent prior to their inclusion in the study. In total, 92 patients with unilateral Grade 2-3 coxarthrosis of the hip joint for persistent hip pain were evaluated. Coxarthrosis diagnosis was made by clinical examination and by a plain roentgenogram of the involved hip. History of lumbar spinal pathologies, contralateral hip pain, multiple joint involvement, knee pain, fixed flexion deformity of the hip, and lumbar pain were the exclusion criteria. The LT test [10] is a reproducible and simple test for clinical diagnosis of LT tears. The LT test was conducted on each of the 92 patients with Grade 2-3 coxarthrosis. The LT test was performed on the patients by 2 independent examiners. The LT test is conducted with the hip flexed at 70° and 30° short of full abduction; the hip is then internally and externally rotated to its limits of motion. Pain on either internal or external rotation is consistent with a positive LT test result. Following the LT test, Hip Disability and Osteoarthritis Outcome score (HOOS) and Harris Hip Score (HHS) were conducted on all of the patients. The HOOS is an adaptation of the KOOS [11] and is intended to evaluate symptoms and functional limitations related to the hip. The HOOS consists of 40 items, assessing 5 separate patient-relevant dimensions: Pain (P) (10 items); Symptoms (S) including stiffness and range of motion (5 items); Activity limitations-daily living (A) (17 items); Sport and Recreation Function (SP) (4 items); and Hip Related Quality of Life (Q) (4 items). The Harris Hip Score [12] was originally developed in 1969 to evaluate the results of hip replacement and has been widely used for comparing results and to assess hip pathology. Patients are scored up to a maximum of 100. Factors assessed are: pain (total score of 40); function (total score of 47); range of motion (total score of 5); and absence of deformity (total score of 8). Function is further broken down into daily activities (14 points) and gait (33 points).

Each patient underwent MRI scanning of the involved hip

(Figure 1-2). Hip MRI examinations were performed on a 1.5

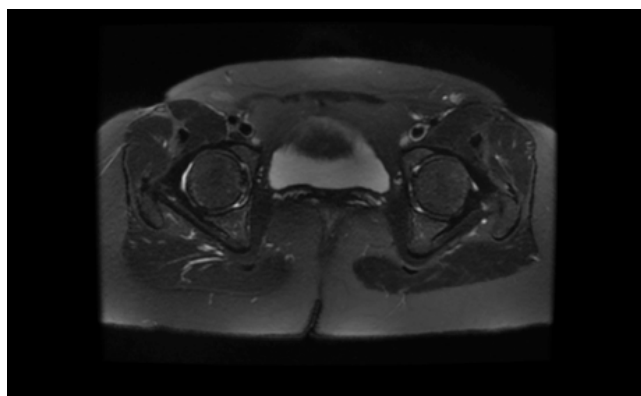


Figure 1. Bilaterally intact LT (T2 fat sat axial MRI Scan)

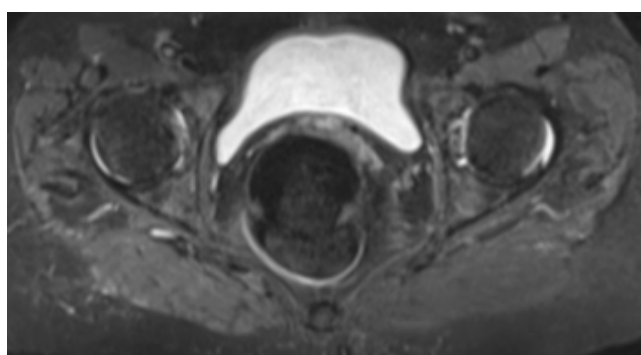


Figure 2. Ruptured LT of the left hip (T2 fat sat axial MRI Scan)

T scanner (GE Optima MR360) using a 16-channel body coil. MR images, covering both hips, were taken for patients whose radiography results showed moderate osteoarthritis. The MRI protocol included intermediate-weighted fat suppressed fast spin-echo (FSE) sequences in a sagittal, coronal, and axial orientations with repetition time (TR) 2500-3900ms, echo time (TE) 85ms, field of view 20-35cm, matrix 320x288, slice thickness 3mm, and acquisition time 2'20"-2'50" per sequence. The entire examination took approximately 15 minutes. IBM SPSS 22 (IBM SPSS, Turkey) programme was used for statistical analysis. The Shapiro Wilks test was used for evaluation of normal distribution and parameters were found to be normally distributed. Student t-test and Chi-square tests were used in comparison of the two groups. $P < 0.05$ was accepted as significant.

Results

Demographic data of both groups were similar (Table 1). The efficacy of the LT test was evaluated in comparison to MRI findings; sensitivity of the test was 87.37% and specificity was

Table 1. Demographic data of the patients.

	Grup I	Grup II	p
¹ Age _{Means±SD}	58,80±5,67	57,58±6,65	0,404
² Sex _n			
Female	18 (%50)	19 (%50)	1,000
Male	18 (%50)	19 (%50)	

¹Student t test, ²Chi-square test

Table 2. LT test results compared to MRI findings of the two groups.

		MR				p		
		Tear		No Tear		Total		
		n	%	n	%	n	%	
LT	Tear	38	41,3	13	14,1	51	55,4	0,096
	No Tear	5	5,4	36	39,1	41	44,6	
	Total	43	46,7	49	53,3	92	100	

Mc Nemar test

Table 3. Comparison of HOOS vs Harris Hip Scores of patients with intact LT (Group 1) and ruptured LT (Group 2)

	Group I (n:36)	Group II (n:38)	p
	Mean±SD	Mean±SD	
HOOS Hip Score	63,35±6,14	40,34±2,78	0,001**
Harris Hip Score	60,00±5,72	40,03±6,16	0,001**

Student t test ** p<0.01

Group I: intact LT according to LT Test and MRI

Group II: ruptured LT according to LT Test and MRI

73.47%. Positive and negative predictive values were found to be 74.51% and 80.43% respectively (Table 2). Fifty-one hips were found to be LT test positive. Thirty-eight of these 51 hips had ruptured LT, according to the MRI. Forty-one hips were found to be LT test negative and MR imaging indicated LT rupture in 5 of these hips. Thirty-six patients with negative LT tests and intact LT on MR images were accepted as intact LT (Group 1) and were compared to 38 patients with positive LT test and ruptured LT on MR images that were accepted as ruptured LT (Group 2). Statistically significant difference was found between HOOS and HHS of both groups. HOOS and Harris Hip Scores of Group 1 were found to be significantly higher than Group 2 (Table 3).

Discussion

LT is developed from the mesenchymal tissue within the chondrogenic layers of the developing hip [13-15]. The collagen content of LT increases its tensile strength and decreases the risk of dislocation in utero [13,16]. From a biomechanical point of view, LT is thought to have a stabilising role. Demange et al., in their cadaveric study, demonstrated increased adduction after resection of LT [17]. In various previous studies, injured ligamentum teres has been indicated as likely responsible for persistent hip pain [8]. In the current study, patients with intact LT had better scores than patients with ruptured LT. These results were consistent with the prior studies. In a recent study [18] LT tears were suspected in 51% of patients who underwent hip arthroscopy indicating a high percentage of LT involvement in symptomatic hips. Gray and Villar classified the ruptures of LT into three types: Type 1 tears are complete, Type 2 tears are partial, and Type 3 tears are degenerative. Degenerative tears of LT are usually associated with osteoarthritis [19]. Acute hyperabduction of the hip may cause avulsion of the ligament from acetabular fovea causing Type 1 or Type 2 tears [20]. Acute injury to the ligament may occur by minor trauma and most of them are femoral avulsions [21,22]. Preoperative diagnosis of LT tears is notoriously difficult. O'Donnell et al. have reported the sensitivity and specificity of the LT test to be 90% and 85% respectively. In the current study, we performed the LT

test on our patients and compared the results with MRI findings of the same hips. Our results were consistent with prior results and we found the LT test to be an effective tool in detecting LT tears at the outpatient clinic. LT tears associated with symptoms of instability, increased external rotation of the involved hip [23], or tears with accompanying hip joint pathology such as labral tears, patulous capsular tissue, or femoroacetabular impingement may be candidates for reconstruction [24]. Debridement for LT tears is widely considered in current practice; Byrd and Jones [8] and Haviv and O'Donnell [25] have reported satisfactory results for debridement. The results of the current study confirm the effectiveness of the LT test in detecting LT rupture and, secondly, rupture of the ligamentum teres may decrease hip scores of the involved hips indicating decreased activity levels and increased pain. Hips with ruptured LT may undergo arthroscopic debridement or reconstruction and the first step of the treatment may be the LT test performed at the outpatient clinic.

Competing interests

The authors declare that they have no competing interests

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