SHORT COMMUNICATION

Association between hip flexor tightness and lumbar instability in adults

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Abstract

The study aimed to explore the association between hip flexors tightness and lumbar instability in adults. The study design was correlational and 64 subjects of both genders (male and female) with age range from 20 to 50 years were selected with a history of low back pain (LBP) with or without referred pain. Two examiners were assigned for application of the Modified Thomas Test (MTT) for hip flexors tightness and lumbar prone Instability Test (LPIT) and Prone Lumbar Extension Tests (PLET) for lumbar instabilities. The numeric pain rating scale (NPRS) was used for pain assessment. The two examiners were not aware of each other's findings. The lambda value 0.238 which shows there is a weak association between MTT and PLET. The Cramer's V value 0.179 also shows a weak relationship between MTT and LPIT. This study observed that there is a weak association between tight hip flexors and lumbar instability.

Keywords: Back pain, Psoas Muscles, Hip Joint, Lumbar Vertebrae, Joint Instability.

DOI: https://doi.org/10.47391/JPMA.8221
Submission completion date: 15-11-2022
Acceptance date: 15-06-2023

Introduction

The adult population is at high risk for developing low back pain and the reported prevalence is between 50-80%. It is the most common problem which affects the quality of life, causing a decline in work performance.[1] Lumbar stability has been associated with various structures and hip flexors, especially Psoas Major (PM) plays an important role because of its anatomical position and function. Biomechanical model revealed that PM provides spinal stiffness and acts like guy wires and alleviates spine during lifting activities. The PM muscle is also a stabiliser of spine and morphological changes lead to functional disability.[2]

The spine is a complicated and complex system; it is not directly linked with one structure and there are many connected structures which are responsible for its stability. The muscles around the lumbar and hip regions are one of the contributing factors in dynamic stabilities of the spine and PM, being hip flexors coupled with other musculature, prevents from instability and provides segmental stability.[3] The motor control and proprioceptive changes around the lumbar region play a pivotal role in long-term controlling system and musculoskeletal adaptations during low back pain.[4] Previously, in literature lumbar region pain was controversial in establishing its association with different regions of muscles, one study conducted in Lahore, Pakistan, observed no association between low back pain and Piriformis muscle tightness according to Fisher's Exact Test. Hence, Piriformis muscle tightness is not the major cause of LBP, and other factors should be explored.[5]

In literature, certain variations have been observed in arguments of PM tightness association with lumbar instability and LBP. To understand the association of hip joint and low back pain, Sharman's concept of movement impairment theory can be used which described a strong link between limitation in hip movement and LBP.[6] An imbalance of lower limb movement activation and lumbo-pelvic rhythm was also observed in patients with LBP. Anatomically, the hip joint is closely adjacent to the lumbar region, so movement dysfunction at the hip is, directly or indirectly, linked with LBP.[7] Literature supports the contribution of various factors in creating lumbar instability and low back pain but has limited evidence and clarity about the association of hip flexor tightness with lumbar instability. Therefore, the question remains: is there any association between the hip flexors tightness and lumbar spine instability in adults? The purpose of this study is to determine whether there is a relationship between hip flexor tightness and lumbar instability in adults (age 20-50 years). Our hypothesis is that there is a relationship between hip flexor tightness and lumbar instability in adults 20-50 years of age.

Patients/Methods and Results

The study was correlational and conducted at Riphah Rehabilitation Centre, Pakistan Railway General Hospital, Rawalpindi, Pakistan, from June 2019 to December 2019. The calculated sample was 64 participants. The sample size was calculated by using G power sample size calculator.[8] The β was 0.2 and power was 0.80. Purposive sampling technique was used to recruit the study subjects. Subjects of both genders (male and female) with age range between 20 and 50 years were selected with or without a history of low back pain (LBP)/referred pain and with no history of

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trauma or pathological condition to the lumbo-pelvic region and the hip. Subjects with any diagnosed ailment, congenital and acquired deformities, and obesity (BMI >30kg/m^2) were excluded from the study. This study was conducted after approval from the Andrews University IRB via letter number 19-062 and from ethical committee of Riphah College of Rehabilitation and Allied Health Sciences, Riphah International University, Islamabad.

Subjective and objective physical evaluation for screening of each patient was done in the PT department of the university by the first examiner. Two examiners were assigned for application of the Modified Thomas Test for hip flexors tightness and Lumbar Prone Instability and Prone Lumbar Extension Tests for lumbar instabilities. Examiner 1 performed the lumbar instability tests and noted the pain level through Pain Numeric Rating Scale (PNRS)[9] for the enrolled subjects, while Examiner 2 performed the Modified Thomas Test.[10] Examiner 1 was unaware of the results of the Modified Thomas test, while examiner 2 was unaware of the lumbar instability tests results for all the subjects enrolled in the study. The test used for assessment include Lumbar Prone Instability Test (LPIT) Prone Lumbar Extension Test (PLET), Modified Thomas Test Numeric Rating Scale (NRS) for pain. Categorical data was compared by using McNemar test to determine if there was an association. The statistical significance of the findings was set at $p \leq 0.05$. Lambda and Cramer's V was used to check strength of association between variables.

A total 64 participants were included in the study with 34 (53%) males and 30 (47%) females. The mean age of the patients was 36.25±7.78 years and mean pain score on NPRS was 6.20±1.35, (range from 3-9).

The p value of the test was <0.001, which shows that there was an association between hip flexors tightness and lumbar instability in adults. (Table 1)

Table-1: Association between MTT and PLET and LPIT.

	Prone Lumbar extension Test (PLET)		Row Total	*p* value
	Positive	Negative		
Modified Thomas test				
Positive	12	39	51	<0.001
Negative	9	4	13	
Column Total	21	43	64	
	lumbar Prone Instability Test (LPIT)		**Row Total**	***p* value**
	Positive	Negative		
Modified Thomas test				
Positive	10	41	51	<0.001
Negative	5	8	13	
Column Total	15	49	64	

Table-2: Strength of association between MTT and PLET & LPIT.

Independent variable	Dependent variable PLET	Dependent variable LPIT
MTT	PLET	LPIT
Lambda value	0.238	0.000
Cramer's V	------	0.179

The Cramer's V value, 0.179 therefore, knowing the results of the Thomas test reduces the probability of interpreting the results of LPIT by 17.9%. (Table 2).

Discussion

Results of the present study confirmed that there was a weak association between hip flexors tightness and lumbar instability. The Modified Thomas Test reduces the probability of incorrectly interpreting the results of the PLET by 23.8% and the LPIT by 17.9% in adults. While this probability is small, the literature supports the influence of hip mobility on LBP. A study by Malleter et al observed that PM plays an important role in various pathologies of the hip and lumbar spine. It is also evident that it plays a role in stabilising the hip as well as the lumbar spine.[11]

A similar study also suggested that imbalance of the hip joint muscles has been observed in patients with low back pain. It is reported that change in length and strength around the hip joint is one of the key factor in occurrence of low back pain. The stretch to the hip muscles also improves lower back instability.[12]

Lumbar instability could result from a deficit in any one of the three components of the stabilisation system, disc or ligament injuries, muscle weakness/fatigue, and poor motor control.[13,14] This may be another reason for the weak association noted in this current study; multiple components are involved in stabilising the lumbar system and perhaps tight hip flexors alone is not sufficient to cause instability to the lumbar system. Kavcic K et al[15] also support the notion that lumbar spine stability is not dependent on a single dominant muscle rather a group of muscles to enhance the stability. The role of the individual muscle changes continuously based on the task, so recommendation of their study was that for lumbar spine stability, a group of muscles should be trained rather than individual muscle.[15] The results of this study suggests that hip flexors tightness may have some influence on lumbar spine stability. The weak association between hip flexors tightness in lumbar instability, suggests that the MTT alone may not be enough to influence the results of the LPIT and PLET.

Conclusion

This study noted that there is a weak association between the results of the MTT for hip flexors tightness and the LPIT

and PLET for lumbar instability. Thomas test reduces the probability of incorrectly interpreting the results of the PLET by 23.8% and the LPIT by 17.9%. The literature supports the influence of hip mobility on low back pain. Therefore, the MTT is still a useful test in assisting with a differential diagnosis of lumbar instability.

Disclaimer: This manuscript was extracted from the academic thesis for Doctor of Science in Physical Therapy (DScPT) degree from the Andrews University.

Conflict of interest: None.

Funding disclosure: None.

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