CASE REPORT

DOI: 10.5336/caserep.2024-104079

The Effect of the Musculus Psoas Quartus, a Variant Muscle Band, on Daily Life

Yelda PINAR[a], Figen GÖKMEN[a], Raushan MYRZABAYEVA[a]

[a]Ege University Faculty of Medicine, Department of Anatomy, İzmir, Türkiye

ABSTRACT The erector spinae muscle in the dorsal part of the spine and the quadratus lumborum muscle in the anterior part maintain the stability of the lumbar region and lumbar lordosis. The psoas and iliacus muscles transfer the load of the spine from the lower back and pelvis to the thigh. An abnormal muscle bridge between the psoas and iliacus muscles can affect independent movement and the femoral nerve. In the training cadaver, it was observed that the medial half of the iliacus muscle in the pelvis originates from a higher level, from the fascia covering the quadratus lumborum muscle. A review of the literature showed that this part of the iliac muscle is a variant muscle and is called psoas quartus. The effect of the presence of this muscle on kinesiology was investigated. Reviewing the literature suggested that it may play a role in pelvic tilt.

Keywords: Psoas quartus muscle; human; anatomy; kinesiology

Musculus (m) psoas major, m.iliacus and m.guadratus lumborum (QL) are the muscles responsible for spinal flexion, rotation and pelvic tilt. The QL is critically located between the pelvis, spine and thorax skeleton. It therefore acts as a junction point for the forces exerted by neighboring muscles and influences the vectors of the different stresses generated.[1,2]

QL begins on both sides of the waist, on the posterior abdominal wall, from the 12th rib and lumbar vertebra, and connects to the iliac crista. QL plays a role in spinal stabilization and lateral bending in upright posture.[2-4]

QL consists of muscle fibers with different vectors. This feature makes the muscle a kinesiological key muscle between the spine, ribs and pelvis. For the QL, which is considered an accesory respiratory muscle; the lateral arcuate ligament of the diaphragm relies on the QL and can probably be said to assist the respiratory muscle with this relationship: the QL can act as a pivot.[2,4,5]

The QL muscle contracts when sitting, walking and standing and is therefore very susceptible to pain. At the same time, weakness of the extensor muscles of the back also puts strain on the QL muscle, so pain can be unavoidable and constant.[4-6]

M.iliacus enables the forward tilt of the pelvis (anterior pelvic tilt) and side-bending. It produces hip movement that encourages walking, running, and climbing stairs. In the anterior pelvic tilt that occurs during walking and sitting, we see that the quadratus lumborum muscle is stretched and the iliacus muscle is contracted. Therefore, a muscle variation involving these two muscles will cause limitation and pain during movement (Figure 1). Posture disorders, muscle weakness, and sedentary life disrupt the pelvic posture. Anterior pelvic tilt increases to camouflage low back pain and anterior abdominal wall weakness.[2]

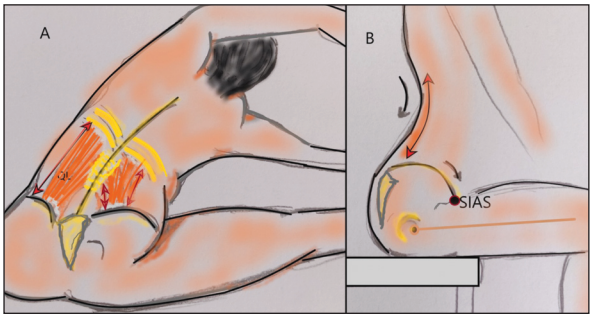
As seen in our case, it was understood that the medial half of the iliacus muscle starts from the an-

TO CITE THIS ARTICLE:
Pınar Y, Gökmen F, Myrzabayeva R. The effect of the musculus psoas quartus, a variant muscle band, on daily life. Turkiye Klinikleri J Case Rep. 2024;32(4):95-8.

Correspondence: Yelda PINAR
Ege University Faculty of Medicine, Department of Anatomy, İzmir, Türkiye
E-mail: yeldapinar@gmail.com

Peer review under responsibility of Turkiye Klinikleri Journal of Case Reports.

Received: 23 May 2024 ***Accepted:*** 24 Sep 2024 ***Available online:*** 30 Sep 2024



FIGRUE 1: A) Contraction and stretching of the quadratus lumborum muscle with physical exercises. **B)** Development of anterior pelvic tilt with increasing lumbar lordosis. Weak anterior abdominal wall muscles accompany this condition.
SIAS: Spina iliaca anterior superior.

terior aspect of the musculus quadratus lumborum at a higher level at the entrance of the pelvis, which is a very important component region in kinesiology. When this subject was investigated, it was found that it was a rare muscle variant and was defined as musculus psoas quartus by Tubbs et al.[7]

CASE REPORT

During training dissections in the anatomy laboratory of Ege University Faculty of Medicine, a difference was observed in the pelvis of an adult male cadaver over 60 years of age, fixed with 10% formaldehyde. It was observed that the medial half of the left iliac muscle did not start from the iliac crest but from the fascia of the anterior aspect of the quadratus lumborum muscle. This muscle band originated from the transverse process of the L3 vertebra and the anteromedial aspect of the quadratus lumborum (Figure 2). It continued distally in the iliapsoas muscle. There was no remarkable difference in the vascular-nerve relationship of the muscle band. This variant muscle

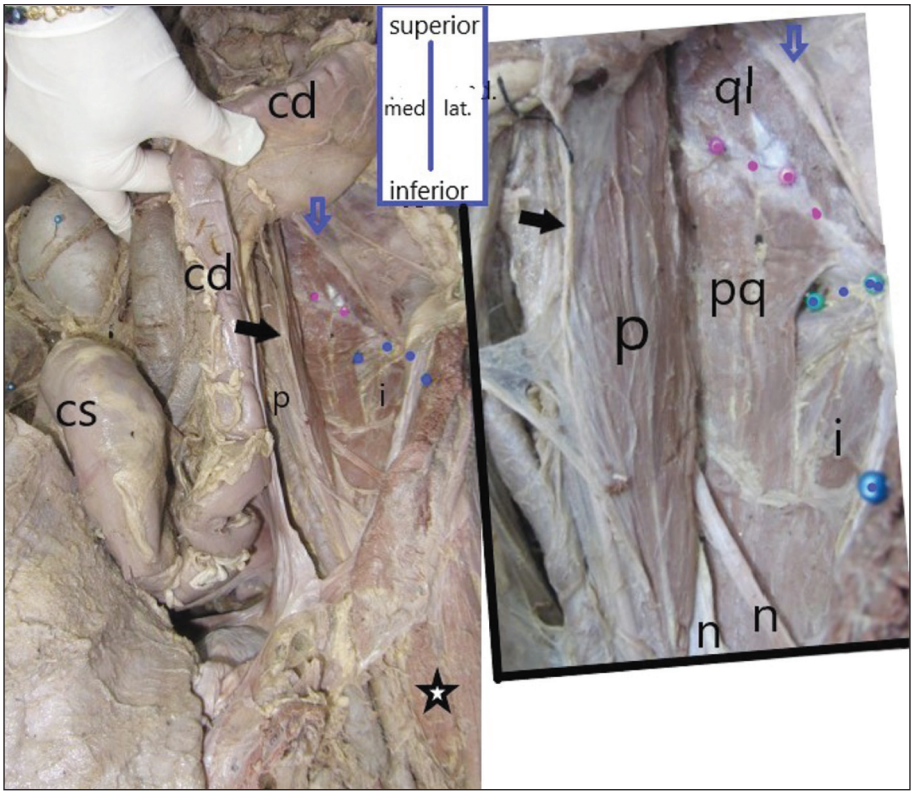


FIGURE 2: A) The colon descendens has been removed in the left pelvis, the posterior wall of the lumbar region and the pelvis are visible. **B)** Muscle fibers extending upward from the iliac muscle are observed. In a closer view, the psoas quartus muscle and other structures in the pelvis can be seen.
Cd: Colon descendens; cs: Colon sigmoideum; p: m.psoas major; i: m.iliacus; ql: m.quadratus lumborum; n: Nervus femoralis; black arrow: n.genitofemoralis; blue arrow: N.iliohypogastricus and n.ilioinguinalis; star: Anterior aspect of thigh, blue points: iliac crista line, pink points: line of attachment of the muscle to the anterior surface of the quadratus lumborum muscle. In the picture, a transverse vessel can be seen where the psoas quartus muscle joins the iliac muscle.

band was reported and photographed by the team working on the cadaver as content to the training team. Conducted ethically in accordance with by Helsinki Declaration.

DISCUSSION

As one of the spinal stabilizer muscles, the QL is often a trigger point and cause of low back pain. Straining the quadratus lumborum can cause deep pain in the lower back and a stabbing sensation in the buttocks. It can also cause a sharp pain when coughing or sneezing.[8,9]

There have been studies focusing on the effects on pain and respiration depending on the position of the QL muscle. The QL helps with expiration. It stabilizes the twelfth rib and stabilizes the diaphragm. A contracted rigid QL prevents the rib cage from fully expanding to take a deep breath and pulls on the diaphragm and surrounding tissues. This leads to faulty postural adaptation and a consequent impairment of breathing patterns. The aim of these studies was to evaluate the effect of QL muscle energy technique on pain and diaphragmatic activity in individuals with nonspecific low back pain.[10]

Tubbs et al. were the first to describe this variant muscle and named it the psoas quartus muscle. However, the muscle they described progressed to the inguinal ligament and participated in the formation of the iliopsoas. However, the psoas quartus muscle in our study was shorter and joined the iliac muscle. That was the only difference. Tubbs and his team mentioned the possibility of femoral nerve compression between psoas quartus and psoas major. However, we did not consider such a possibility in our cadaver. We thought that this variative muscle would hinder the function of the quadratus lumborum muscle and weaken the function of the iliac muscle.[5,7]

Clarkson and Rainy reported a rare case with four psoas muscles: the psoas major and minor and psoas tertius and quartus.[11]

Wong et al. identified the psoas quartus muscle as the second case in 2019. It was similar to the muscle described by Tubbs and joined the psoas major muscle. There were no other articles describing this rare psoas quartus muscle.[12]

Aleksandrova and her team, based on the information they obtained by reviewing the literature, defined and illustrated the variations in the iliacus and psoas muscles in 10 groups. The variation they defined as type D in these 10 different variations overlapped with ours. These classifications were important in terms of both their kinesiological effects and their relations with the femoral nerve.[8]

An over-contracted QL muscle can disrupt pelvic and spinal balance and cause acute and chronic hip or low back pain. Conversely, inhibition of adequate contraction also impairs pelvic kinesiology. In anterior pelvic tilt, a weakened quadratus lumborum as opposed to a contracted iliopsoas will further disrupt balance in the presence of an unusual muscle band between them. Pelvic tilt is increased in women carrying children and in golfers. Many other posture disorders also cause this. Lumbar lordosis increases. These people are given regular stretching exercises of QL. It is allowed to reach a neutral position. Could excessive stretching in these exercises cause variative muscle tearing?

Pelvic tilting exercises in the sagittal plane are generally used to correct the of lumbar spine alignment of patients with chronic lower back pain. A posture that makes lumbar lordosis difficult has been identified as one of the main causes of low back pain.[9,11]

Patients presenting with hip fracture are usually elderly and complicated patients. They have clinical conditions such as diabetes and blood pressure. It is very important to be able to treat these patients without general anesthesia. QL block has shown clinical efficacy. When used alone or in combination with other analgesic methods, success in perioperative pain control has been achieved in these patients.[10,13,14]

If radiological imaging studies are performed on people with anterior pelvic tilt pain during daily movements, can true incidence and effect of this muscle be revealed? Are the ratios given by anatomical variation studies sufficient?[11,14,15] It should be taken into consideration that there may be anatomical dif-

ferences in these people who are frequently given exercise and medication.

This article was presented as an oral presentation at the 11th Anatomy Winter Meeting, National Congress. Its abstract was published in An International Journal of Experimental and Clinical Anatomy. (http://dergipark.org.tr/en/pub/anatomy)

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Yelda Pınar;* ***Design:*** *Yelda Pınar;* ***Control/Supervision:*** *Yelda Pınar;* ***Data Collection and/or Processing:*** *Yelda Pınar;* ***Analysis and/or Interpretation:*** *Figen Gökmen;* ***Literature Review:*** *Raushan Myrzabayeva;* ***Writing the Article:*** *Yelda Pınar, Figen Gökmen;* ***Critical Review:*** *Figen Gökmen;* ***References and Fundings:*** *Yelda Pınar, Figen Gökmen;* ***Materials:*** *Yelda Pınar, Raushan Myrzabayeva.*

REFERENCES

1. Oshikawa T, Adachi G, Akuzawa H, Okubo Y, Kaneoka K. Activity of the quadratus lumborum and trunk muscles relates to pelvic tilt angle during pelvic tilt exercises. Am J Phys Med Rehabil. 2020;99(12):1109-15. [Crossref] [PubMed]
2. Takaki S, Kaneoka K, Okubo Y, Otsuka S, Tatsumura M, Shiina I, et al. Analysis of muscle activity during active pelvic tilting in sagittal plane. Phys Ther Res. 2016;19(1):50-7. [Crossref] [PubMed] [PMC]
3. Govsa Gokmen F. Sistematik Anatomi. 1. Baskı. İstanbul: Nobel Yayıncılık; 2023.
4. Bordoni B, Varasolla M. Anatomy, Abdomen and Pelvis. Quadratus Lumborum. EuropePMC. 21 Dec 2018. [Link]
5. Park RJ, Tsao H, Cresswell AG, Hodges PW. Changes in direction-specific activity of psoas major and quadratus lumborum in people with recurring back pain differ between muscle regions and patient groups. J Electromyogr Kinesiol. 2013;23(3):734-40. [Crossref] [PubMed]
6. Park RJ, Tsao H, Cresswell AG, Hodges PW. Differential activity of regions of the psoas major and quadratus lumborum during submaximal isometric trunk efforts. J Orthop Res. 2012;30(2):311-8. [Crossref] [PubMed]
7. Tubbs RS, Oakes WJ, Salter EG. The psoas quartus muscle. Clin Anat. 2006;19(7):678-80. [Crossref] [PubMed]
8. Aleksandrova J, Malinova L, Jelev L. Variations of the iliacus muscle: report of two cases and review of the literature. Int J Anat Var (IJAV). 2013;6:149-52. [Link]
9. Sirh SJ, Sirh SW, Mun HY, Sirh HM. Importance of quadratus lumborum muscle trigger point injection and prolotherapy technique for lower back and buttock pain. Front Pain Res (Lausanne). 2022;3:997645. [Crossref] [PubMed] [PMC]
10. Akerman M, Pejčić N, Veličković I. A review of the quadratus lumborum block and ERAS. Front Med (Lausanne). 2018;5:44. [Crossref] [PubMed] [PMC]
11. Clarkson RD, Rainy H. Unusual arrangement of the psoas muscle. J Anat Physiol. 1889;23(Pt 3):504-6. [PubMed] [PMC]
12. Wong TL, Kikuta S, Iwanaga J, Tubbs RS. A multiply split femoral nerve and psoas quartus muscle. Anat Cell Biol. 2019;52(2):208-10. [Crossref] [PubMed] [PMC]
13. Yi KH, Lee KL, Lee JH, Hu HW, Kim HJ. Guidance to trigger point injection for treating myofascial pain syndrome: Intramuscular neural distribution of the quadratus lumborum. Clin Anat. 2022;35(8):1100-6. [Crossref] [PubMed]
14. Xiong H, Chen X, Zhu W, Yang W, Wang F. Postoperative analgesic effectiveness of quadratus lumborum block: systematic review and meta-analysis for adult patients undergoing hip surgery. J Orthop Surg Res. 2022;17(1):282. [Crossref] [PubMed] [PMC]
15. Fabriziq PA. Anatomic variation of the iliacus and psoas major muscles. Int J Anat Variations. 2011;4:28-30. [Link]