



Original Research Article

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## Incidence and Morphometric Dimensions of Psoas Minor Muscle in South Indian Population - A Cadaveric Study

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### Abstract

The present study was conducted in thirty two cadavers from the Department of Anatomy, Government Theni Medical College, Theni, Tamil Nadu, India. The psoas minor was found in two of the thirty two cadavers with an incidence of 6.25% in the present study. Apart from that, the muscle belly was longer than the tendinous part in contrast to other authors where the muscle belly was shorter than the tendon. In both the cadavers, the muscles derived its innervation from the ventral rami of first lumbar nerve on both sides. The study highlights the presence of psoas minor in South Indian population.

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Morphometric dimensions  
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### Introduction

The muscles of the posterior abdominal wall include psoas major, quadratus lumborum and iliopsoas. In addition to the aforementioned muscles, an additional muscle named psoas minor may be present lying anterior or medial to psoas major muscle (Pooja et al., 2016; Sachin, 2015). The muscle is considered a vestigial muscle in humans. This muscle remains relatively larger in size in quadrupeds, playing a role in flexion of lumbar vertebra. This muscle is found to be even larger than psoas major in certain mammals including rabbit. It gained evolutionary significance by assuming smaller size in humans adapting bipedal posture (Somnath and Srivastava, 2015).

When present, the muscle takes origin from the sides of the bodies of twelfth thoracic and first lumbar vertebra along with the intervening intervertebral disc (Strandberg, 2008; Tank, 2005). One author has observed the origin of

the muscle extending till medial arcuate ligament and subdiaphragmatic fascia. The muscle consists of usually a small muscle belly and a thin long tendon. It can get inserted into any one of the following structures including fascia iliaca, pectineal line or iliopubic eminence (Guerra, 2012). The tendon may sometimes split and send slips to bodies of fifth lumbar and first sacral vertebra. Very rarely, the tendon may pass alongside the tendon of psoas major to get inserted into the lesser trochanter. The muscle is innervated directly by the ventral primary rami of first lumbar nerve (L1) and occasionally from the ventral rami of second lumbar nerve (L2). Sometimes another muscle is found to take origin from the deeper aspect of the tendon of psoas minor muscle and it is named psoas accessorius muscle (Sonali, 2013).

The various actions performed by the psoas minor include assistance in forward flexion and lateral flexion of vertebral column. It also plays a role in helping the

stabilization of hip joint (Bali, 2014). The knowledge of psoas minor gained momentum following reported incidence of psoas minor spasm due to subluxation of twelfth thoracic or first lumbar vertebrae. Since the ureter lies in close relation to the muscle, passage of ureteric stone may cause spasm of the muscle. This is an inconstant muscle and is often observed to be absent. Sometimes it can be doubled or replaced by a tendon. There can be a difference of incidence between males and females (Seib, 1934). Hence this study is aimed at studying the incidence and the dimensions of the muscle in South Indian population along with its relation to ureter.

### Materials and methods

The present study was conducted in thirty two cadavers from the Department of Anatomy, Government Theni Medical College, Theni. An incision was made in the midline extending from the xiphoid process till the pubic symphysis. The incision is extended laterally from the pubic symphysis till anterior superior iliac spine and from the xiphoid process till midaxillary line. The skin, superficial fascia, muscles of anterior abdominal wall were reflected. After removing the stomach and small intestine along with its mesentery, the posterior abdominal wall remains exposed. The following parameters were studied in relation to psoas minor muscle.

1. Presence or absence of psoas minor muscle.
2. Origin.
3. Insertion.
4. Nerve supply.
5. Total length of the musculotendinous unit.
6. Length of the muscle belly.
7. Length of the tendinous unit.
8. Relationship with ureter.

### Results

The following observations were made in the present study with regards to the psoas minor muscle using a digital vernier caliper.

1. The muscle was found to be present in two cadavers and was absent in thirty cadavers, thereby amounting to its incidence to 6.25% in this study.
2. In both the cadavers, it was bilaterally present.
3. In the first cadaver, it took its origin from the body of first lumbar vertebra on both the sides. Then it got inserted by merging with the

iliopsoas fascia and by spreading out into an aponeurosis close to the pecten pubis (Fig. 3). It was innervated by the ventral rami of first lumbar nerve (Fig. 1). The muscle was lying anterior to the psoas major muscle. The ureter passed medial to the muscle in the upper part and then crossed to the lateral side by passing superficial to the tendon opposite the first sacral vertebra (S1) (Fig. 2).



Fig. 1: The arrow shows the ventral ramus of first lumbar nerve(L1) supplying the psoas minor muscle.



Fig. 2: The arrow points at the ureter crossing superficial to the tendon of psoas minor.



**Fig. 3:** The distal tendinous portion spreading out as an aponeurosis before getting inserted at iliopubic eminence.

- In the second cadaver, the muscle took origin from the sides of bodies of twelfth thoracic and first lumbar vertebra and got inserted into the iliopubic eminence. It also derived its nerve supply directly from ventral rami of first lumbar nerve. The muscle passed medial to the psoas major muscle. The ureter was found passing medial to the muscle throughout its course.

The morphometric dimensions of the muscle in both the cadavers is shown in Table 1.

In the present study, the muscle belly was observed to be longer than the tendinous part except the left side of one cadaver.

**Table 1.** Morphometric dimensions of psoas minor muscle.

S. No.	Dimensions	Cadaver 1		Cadaver 2	
		Right side	Left side	Right side	Left side
1.	Total length of the MTU* (cm)	20	19	18.5	19
2.	Length of the muscle belly (cm)	12	10.5	10	9.5
3.	Length of the tendinous part (cm)	8	8.5	8.5	10
4.	Width of the muscle belly (cm)	1.3	1.2	1.4	1.4

\*MTU- Musculotendinous unit.

### Discussion

On comparing the results of both cadavers where the psoas minor was present, there was difference in relation to the insertion point along with mode of insertion and its relation to the ureter. The morphometric dimensions were almost similar in both the cadavers except for the tendon being longer than the muscle belly in the left side of one cadaver. The results regarding the incidence and various morphometric

dimensions of the present study was compared with those of the other authors. Bergman et al. (2002) and Macalister (1875) had found variations in relation to the insertion of the psoas minor tendon as to some fibres inserting into the inguinal ligament. The incidence of absence of the muscle was compared with those of the previous studies (Table 2). The results of the present study correlated with that of Hanson et al. (1999) study especially that of the absence of incidence in black people.

**Table 2.** Comparison of incidence of absence of psoas minor muscle.

S. No.	Study	Incidence of absence of muscle
1.	Anson et al. (1966)	41%
2.	Williams et al. (1995)	50%
3.	Telez and Acuna (1998)	40-66%
4.	Hanson et al. (1999)	91% in black people 13% in white people
5.	Bergman et al. (2002)	51%
6.	Snell (1999)	40%
7.	Sonali et al. (2013)	60%
7.	Donald and Neuman et al (2015)	60%
8.	Present study	93.75%

**Table 3.** Comparison of morphometric dimensions of psoas minor muscle.

S. No.	Study	Length of the MTU(cm)	Length of the muscle (cm)	Length of the tendon(cm)	Width of the muscle belly(cm)
1.	Farias et al. (2012)	23.9	7.12	15	1.7
2.	Sonali et al. (2013)	20.2	7.85	13.13	1.93
3.	Joshi et al. (2010)	23.6	8.23	15.48	-
4.	Present study	19.2	10.5	8.75	1.3

Then the morphometric dimensions were also compared with those of the other authors (Table 3). In contrast to the other studies where the muscle belly was shorter than the tendinous part, in the present study the muscle belly was longer than the tendon.

### Conclusion

The psoas minor was found in two of the thirty two cadavers with an incidence of 6.25% in the present study. Apart from that, the muscle belly was longer than the tendinous part in contrast to other authors where the muscle belly was shorter than the tendon. In both the cadavers, the muscles derived its innervation from the ventral rami of first lumbar nerve on both sides. The study on the psoas minor muscle is clinically relevant in that the spasm of this muscle is implicated in several of the patients presenting with low back ache symptoms (Kraychete, 2007) especially in athletes (Andrea et al., 2012) and in psoas minor syndrome resulting in compression of adjacent neurovascular structure (Gandhi, 2013). Hence this study throws light on the incidence and morphometric dimensions of psoas minor in cadavers belonging to South Indian population.

### Conflict of interest statement

Authors declare that they have no conflict of interest.

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