

Morphological Study of Psoas Minor Muscle in South Indian Population and its Clinical Insight

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ABSTRACT

Introduction: the Psoas minor muscle is a small inconstant vestigial muscle with a small belly and a flat long tendon. When present it lies in front of the Psoas major muscle in the posterior abdominal wall. It arises from the bodies of T12 & L1 vertebrae and inserted into pectineal line and iliopectineal eminence. It helps in bending of the lumbar spine and is supplied by ventral ramus of L1. It is well developed among quadrupeds and leaping animals.

Aims & Objectives: this study is aimed to obtain more detailed information about the incidence of presence and agenesis of Psoas minor muscle among the South Indian population, its clinical and functional significance, since very little information is present in the previous literature.

Methodology: The study was carried out in the Department of Anatomy of JSS Medical College, Mysore. 30 embalmed cadavers were used for this study for a period of 3 years. Its prevalence or agenesis was noted, morphology and morphometric analysis was done.

Result: the prevalence of Psoas minor muscle was found to be higher among males (50%) than females (20%). The mean values of muscle belly length were 70.7mm, width of the muscle belly was 14.8 mm, length of tendon was 138.6mm and thickness of the muscle was 3.8mm. Total average length of the muscle was 212.14mm. No other anatomical variations were noted.

Conclusion: this study provides valuable information about the Psoas minor muscle; its functional and clinical relevance is highlighted. The Psoas minor muscle is not only important for Anatomist, but also for Physiotherapists, Sports medicine & Orthopedic surgeons in reference to Psoas minor syndrome.

Keywords: Psoas minor muscle; Variations; Morphometry.

Introduction

The Psoas minor muscle is a small inconstant muscle with a long flat tendon, frequently absent but when present it lies anterior to Psoas major in the posterior abdominal wall. It arises from the sides of the bodies of the 12th thoracic and 1st lumbar vertebrae and from the disc between them. It gets inserted on the pectineal line and iliopectineal eminence and laterally in the iliac fascia. It is supplied by the ventral rami of the first lumbar spinal nerve¹.

This muscle is large and well developed among quadruped or leaping animals who run very fast and in brachiators².

Its function is extremely subtle; it aids in bending of the lumbar spine and provides stability to the hip joint. When it contracts unilaterally it causes flexion of the trunk³. It has clinical significance in sports medicine especially in football players when it gets strain with feet off the ground⁴.

Among all the muscles in the body, the Psoas minor is well documented as having the greatest propensity for agenesis (56%), which varies with race but not sex².

Materials and Methods

This study was carried out in the department of Anatomy at JSS Medical College after taking

Ethical clearance from the JSS Ethical Committee of JSSAHER. For this cadaveric study 30 embalmed cadavers (20 males & 10 females) were utilized between the age group of 45 to 60 years, during the period of 3 years. After removing all the abdominal viscera and kidneys, the presence or absence of Psoas minor muscle was noted. The length and girth of the muscle belly and its tendon was measured using a manual Vernier caliper, thin measuring tape, scale and a thread. Any variations in the origin and insertion was noted and recorded. The data was collected and analyzed.

Exclusion criteria: Any surgical marks or injury scars over the abdominal wall were excluded from this study.

Inclusion criteria: Normal abdominal wall with intact abdominal organs were utilized for this study.

Results

In the present study, 30 cadavers were studied, 20 were males and 10 were females.

The Psoas minor muscle was present unilaterally in 3 (15%) male cadaver only on the right side and in 2 (20%) female cadaver only on the right side.

The muscle was present bilaterally in 7(35%) male cadavers only.

No anatomical variations were observed in origin and insertion.

The prevalence of Psoas minor muscle was found to be higher among males than females.

The total percentage of prevalence was 40%.

The total percentage of agenesis was 60%.

The mean values of muscle belly length were 70.7mm, width of the muscle belly was 14.8 mm, length of tendon was 138.6mm and thickness of the muscle was 3.8mm.Total average length of the muscle was 212.14mm. (Refer figures 1 & 2) (Refer Tables 1, 2)

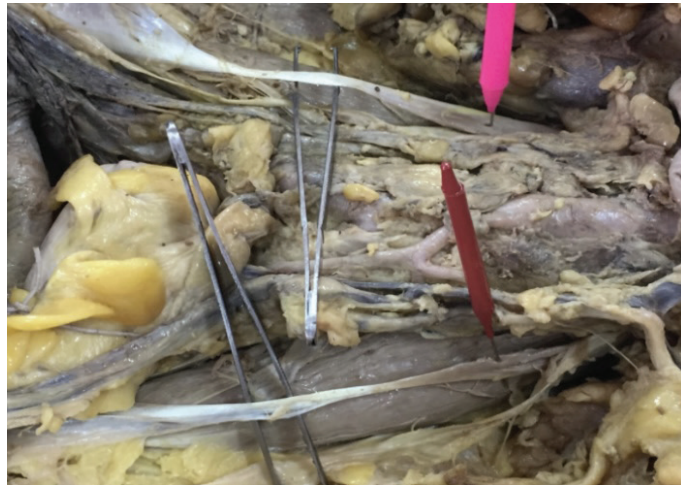


Figure 1: Bilateral Presence of Psoas Minor muscle in a male cadaver.



Figure 2: Unilateral Presence of Psoas Minor muscle in a male cadaver on the right side.

Table 1. Prevalence of psoas minor muscle.

Total Cadavers (30)	Bilateral Presence	Bilateral Absence	Unilateral Presence: Right	Unilateral Presence: Left
Males (20)	07 (35%)	10 (50%)	03 (15%)	00
Females (10)	00	08 (80%)	02 (20%)	00

Table 2. Average morphometric values of psoas minor muscle.

Variables	Average Values (Mmm) with SD
Length of tendon	138.6 ± 3.3
Length of muscle belly	70.7 ± 3.2
Total length of the muscle	212.14 ± 10.02
Width of the muscle	15.8 ± 1.0
Thickness of the muscle	3.2 ± 0.2

Discussion

This study did not establish, by visual inspection, any anatomical variations in terms of both origin and insertion. However, the prevalence of agenesis Psoas minor muscle among the males & females in South Indian population (60%) was quite significant. Racial differences have been observed in the previous studies with respect to its presence or absence. (Refer Table 3)

Mori *et al* in 1964 among Japanese population was found to be 53.4%². Farias *et al* in 2011 studied its absence among Brazilians and was found to be 73.33%¹². Sachin *et al* studied its absence in 2014 among North Indian population and was found to be 65%¹.

Another study conducted by Seib in 1938 among the Americans reported the prevalence of the Psoas minor muscle in 38.6% and concluded that it is more frequently absent among females⁵. This can be correlated to our study where the Psoas minor muscle was present in 40% of cases and more frequently absent among females compared to the males.

The clinical aspect of the Psoas minor muscle is the “Psoas minor Syndrome” and its ability to spread infection and malignancy to the retroperitoneal region of the body. Due to pressure over the neurovascular structures, it can lead to pain in the iliac fossa which is exacerbated by palpation of the taut tendon. The symptoms can mimic appendicitis and diverticulitis.

Table 3. Percentage of agenesis of psoas minor muscle in different ethnic population.

Author	Year	Population	Absence (%)
Mori <i>et al</i> ¹¹	1964	Japanese	53.4
Farias <i>et al</i> ¹²	2011	Brazilians	73.33
Guerra <i>et al</i> (Fetuses) ¹³	2012	Brazilians	40.91
Sachin <i>et al</i> ¹	2014	North Indians	65
Current study	2023	South Indians	60

The accepted treatment for this is tenotomy⁶.

During the course of evolution, some muscles of the human body regress and are called as vestigial muscles, which are recognized by their short muscle belly and long tendon namely Palmaris longus in upper limb, Plantaris in lower limb and Psoas minor in the trunk. Psoas minor is found only in 40-60% of population. However, the incidence varies with race and ethnicity^{7,8}. Psoas minor is found to be consistently absent in those with Trisomy 18. Higher frequency of muscle anomalies in aneuploid is due to the delayed developmental processes in them. Muscles affected in them are generally those that differentiate rather late during embryonic development⁹. (Refer Table 3)

Garg *et al* described the variations of Psoas minor muscle; it originated from the diaphragmatic fascia and medial arcuate ligament, as well as another where fibres of the muscular belly of the muscle originated from the crus of the diaphragm, such variations can lead to infections and malignancies spreading to the

endothoracic cavity¹⁰. No such variations in the origin of the muscle was noted in our study.

Conclusion

This study showed that the prevalence of agenesis of the Psoas minor muscle was seen in 60% of South Indian population. No anatomical variations with respect to origin and insertion were noted. The Psoas minor muscle is not only important for Anatomists, but also for Physiotherapists and Orthopaedic surgeons in reference to “Psoas minor Syndrome”. Further studies can be done by increasing the sample size and by using recent imaging techniques.

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Mini Curriculum and Author's Contribution

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