Morphology and Morphometry of Psoas Minor- A Cadaveric Study

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ABSTRACT
Psoas minor is a slender muscle of posterior abdominal wall, having short fleshy belly and long tendon, lying anterior to Psoas major muscle and covered by iliopsoas fascia and anterior layer of thoraco-lumbar fascia. Psoas minor muscle belongs to the category of vestigial muscle. The anatomy of the psoas minor muscle in human beings has frequently been correlated with ethnic and racial characteristics. The present study was done on 30 embalmed cadavers in the Department of Anatomy of S.M.S. Medical College, Jaipur (Rajasthan) to investigate the anatomy of the psoas minor muscle, by observing its occurrence, distal insertion points and the relationship between its tendon and muscle portions. In this study presence of psoas minor muscle was 36.67% in which bilateral presence was 81.81% and unilateral was 18.19%. In most of the cases, muscle originated from the sides of bodies of T12 & L1 vertebrae & their intervening intervertebral disc. In some cases it also takes origin from subdiaphragmatic fascia, medial arcuate ligament and corresponding crus of diaphragm and also from the psoas major muscle. This muscle inserted at iliopubic eminence and pecten pubis and in the iliac fascia. In this study average length of proximal tendon was 26.097mm, average length of fleshy belly was 87.702mm and average length of distal tendon was 135.797mm. Average width and thickness of fleshy belly were 16.231mm and 3.518mm respectively. In some cases fibers of psoas minor muscle and psoas major muscle were interdigitated with each other. In some cases psoas minor muscle was pierced by genitofemoral nerve.

KEYWORDS: Insertion, Morphology, Psoas minor muscle, Tendon.

INTRODUCTION
Psoas minor muscle is a muscle of posterior abdominal wall. Psoas minor is often absent but, when present, lies anterior to the psoas major muscle¹. This muscle is large and well developed in quadruped animals and in brachiators³. This muscle present as an expansion on the medial border of the psoas major muscle⁴. Although its function is considered to be extremely subtle, it aids in bending of the lumbar spine and also provides stabilization to the hip joint. When it contract unilaterally it cause flexion of trunk¹. It has clinical significance in sports medicine, in football players it get strain with feet off the ground⁵. It arises from the sides of the bodies of the 12th thoracic and first lumbar vertebrae and from the intervertebral disc between them⁶, ⁷. This muscle inserted by a long, flat tendon to the pectineal line and pectineal eminence of hip bone and, laterally, to the iliac fascia⁸⁻¹⁰. It is innervated by ventral ramus of L1 spinal nerve. There is racial and morphometric variations in the presence of psoas minor muscle¹¹, ¹².

The aim of this study to investigate the morphology and morphometric of psoas minor muscle and establishing the frequency of its occurrence according to sex and also the determining the proportional relationship between the tendon and muscular parts of the psoas minor.

MATERIALS AND METHODS
This study was carried out in the Department of Anatomy of S.M.S. Medical College, Jaipur (Rajasthan), 30 embalmed cadavers were used for the present study. All the viscera of abdomen were removed to exposure of this muscle in the posterior abdominal wall. The muscle was cleaned from its origin to insertion. In all the cadavers following variables were evaluated- presence of psoas minor muscle (unilateral or bilateral), length of muscle, length of origin and insertion tendon, length of muscle belly, width and thickness of muscle belly, piercing of genitofemoral nerve and anatomical variations related to origin and insertion of muscle. All measurements were collected with the help of vannier
caliper, measuring tape, thread and scale. Obtained data were tabulated in Microsoft excel sheet.

**OBSERVATIONS**

In this study morphology and morphometric of psoas minor muscle was studied. Psoas minor muscle was present in 11 cadavers (36.67%) out of 30 cadavers. In 81.81% (9 cadavers) cases psoas minor muscle was present bilaterally and in 18.19% cases muscle was unilaterally. In this study in unilateral cases psoas minor muscle always lies on left side. Psoas minor muscle lies on the anterior aspect of psoas major muscle. PMM was covered by psoas fascia and anterior layer of thoraco-lumber fascia.

Psoas minor muscle takes origin as a flat tendon from the sides of T12 & L1 vertebrae and the intervening intervertebral disc. It also takes origin from the sub diaphragmatic fascia and medial arcuate ligament. Some fibers of muscular belly also take origin from the corresponding crus of diaphragm. Psoas minor muscle

<table>
<thead>
<tr>
<th>Side</th>
<th>Total length</th>
<th>Length of fleshy belly</th>
<th>Length of origin tendon</th>
<th>Length of insertion tendon</th>
<th>Width of muscular abdomen</th>
<th>Thickness of muscular abdomen</th>
</tr>
</thead>
<tbody>
<tr>
<td>left(N=11)</td>
<td>Mean 267.22</td>
<td>89.83</td>
<td>25.23</td>
<td>134.90</td>
<td>15.94</td>
<td>3.31</td>
</tr>
<tr>
<td></td>
<td>SD 22.62</td>
<td>22.13</td>
<td>9.02</td>
<td>23.20</td>
<td>3.55</td>
<td>1.61</td>
</tr>
<tr>
<td>right(N=9)</td>
<td>Mean 263.10</td>
<td>85.10</td>
<td>27.16</td>
<td>136.89</td>
<td>16.59</td>
<td>3.78</td>
</tr>
<tr>
<td></td>
<td>SD 21.42</td>
<td>26.61</td>
<td>12.34</td>
<td>26.44</td>
<td>4.47</td>
<td>1.47</td>
</tr>
<tr>
<td>Total(N=20)</td>
<td>Mean 265.37</td>
<td>87.70</td>
<td>26.10</td>
<td>135.80</td>
<td>16.23</td>
<td>3.52</td>
</tr>
<tr>
<td></td>
<td>SD 21.61</td>
<td>23.70</td>
<td>10.39</td>
<td>24.06</td>
<td>3.89</td>
<td>1.53</td>
</tr>
</tbody>
</table>
inserted as a long tendon at the iliopubic eminence and pecten pubic. It is also inserted in the iliac fascia. In this study the average length of origin tendon was 26.097mm, length of muscular belly was 87.702mm and length of insertion tendon was 135.797mm. Average width and thickness of fleshy belly were 16.231mm and 3.518mm respectively. In this study we found that Psoas minor muscle of females were thin, narrow and having long insertion tendon than males.

PMM shows a wide variation with respect to piercing of genitofemoral nerve. In a case genitofemoral nerve also pierces the psoas minor muscle in both sides. In some cases the deep fibers of Psoas muscle and superficial fibers of psoas major muscle were interdigitated with each other. PMM shows a wide variation with respect to piercing of genitofemoral nerve. In a case genitofemoral nerve also pierces the psoas minor muscle in both sides. In some cases the deep fibers of Psoas muscle and superficial fibers of psoas major muscle were interdigitated with each other.

**DISCUSSION**

In this study the psoas minor muscle was present in 36.67% cadavers. This proportion is approximately similar to Kraychete et al. (2007), who found psoas minor muscle in 30% cases. According to Danilo Ribeiro Guerra psoas minor muscle was present in 59% of the human fetuses which is similar to Snell’s finding (60%).

In this study the tendon of psoas minor muscle got inserted at the iliopubic eminence and pecten pubic also in the iliac fascia which was also stated by Gardener et al. (1988) and by Guerra. Bergman and Afifi (1997) showed variations of insertions on the inguinal ligament, femoral neck and lesser trochanter of the femur together with the Psoas Major Muscle. Macalister (1875 Apud Tellez & Acuña, 1998) and Ledouble (1897 Apud Tellez & Acuña, 1998) stated that, with respect to the origin, the tendon may be split and send an extension to the fifth lumbar vertebra and first sacral vertebra, and another one to iliopectineal line; in addition, its insertion may also be continuous with the pelvic fascia or directly with the iliac fascia.

**CONCLUSION**

The present study was conducted on 30 embalmed cadavers in the Department of Anatomy, S.M.S. Medical College, Jaipur (Rajasthan). This study shows the presence of psoas minor muscle in 36.67% cases (11 in 30 cadavers): bilaterally 81.81% (9 in 11) and unilaterally 18.19% (2 in 11). In a case PMM is pierced by genitofemoral nerve. In some cases the deep fibers of Psoas muscle and superficial fibers of psoas major muscle were interdigitated with each other. Concerning the morphometry, our study reports the total length variables of the muscle, length of proximal and distal fixation tendon, width and thickness of the muscular abdomen as well as length from origin to piercing of genitofemoral muscle to psoas major muscle or psoas minor muscle or both.

**CONFLICT OF INTEREST:** None Declared.

**REFERENCES**


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