A Review of the Anatomy, Physiology and Function of Psoas Major

A new model of stability

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**Introduction** Psoas major is the largest muscle in cross section at the lower levels of the lumbar spine and has fibrous attachments to all lumbar vertebrae and disks with the exception of L5-S1. Despite this, a review of literature reveals that little is known about its mechanical capacity with respect to the lumbar spine, and hips. Dissection was performed and the existing literature was reviewed. From this, a new hypothesis was developed.

**Anatomy** Psoas has two fibrous and one fascial attachment on the spine. Fascicles attach posteriorly to the L1 to L5 transverse processes and anteriorly from the T12 – L1 disc to the L4-L5 disc. Fascial arches extend across the lumbar bodies between the fascicles. Within the same specimens, the fascicles are almost the same length (range: 12-15cm). An important point is that psoas is a unipennate, not a fusiform muscle, as previously believed. The fiber length ranges between 3-5 cm within fascicles. The fascicles rotate medially so the posterior fascicles become anterior and the anterior become posterior. Psoas has attachments to the diaphragm and pelvic floor. The medial arcuate ligament is a tendinous arch in the fascia covering psoas major. Its fibers converge to a tendon that ascends to the diaphragm. At the inferior aspect of the muscle, the fascia blends with the pelvic floor fascia. The nerve supply of psoas is segmental. It is supplied by the ventral rami of the lumbar spinal nerves, T12, L1 2, 3 and 4.

**Atrophy** Dangaria et al (1998) assessed the cross sectional area of psoas major in unilateral sciatica caused by disc herniation. There was significant reduction in the cross sectional area of psoas at the level and the site of disc herniation on the ipsilateral side. Similar findings of specific atrophy at the level of low back pain were found by Hides et al (1994) in multifidus. The same mechanism of inhibition due to perceived pain may be responsible for the psoas atrophy.

**Function** Most of the published literature on psoas major is based on theory and personal opinion. Of the remainder, many researchers have failed to separate psoas from iliacus. In the lumbar spine, psoas plays a stability role largely through axial compression. It also controls lateral flexion, rotation and extension. Psoas contributes to hip flexion and provides stability by abutting the hip into the acetabulum and controlling hip movements.

**Model** Psoas has two consistent attachment points of fibers. The posterior fascicles from the transverse processes are smaller, less vertical and are located closer to the axis of rotation. After rotating medially and sitting anterior, the posteriorly attaching fascicles now come into contact with the psoas fascia. These characteristics make the posterior fascicles more suitable to play a local stability role for the lumbar spine and hip. The anterior fascicles are larger, more vertical and more suited for acting on the hip. Iliacus is the dominant hip flexor and the anterior fibers of psoas work with iliacus to control hip flexion and lumbar movements.

**Lumbar Cylinder** There is a common model of stability in the lumbar spine that a cylinder mechanism takes place. The top of the cylinder is the diaphragm, the bottom is the pelvic floor and the middle is the transversus abdominis muscle with the thoracolumbar fascia. Psoas is ideally suited to act as a link between the top and bottom of the cylinder through the medial arcuate ligament to the diaphragm and the psoas fascia to the pelvic floor. This kind of mechanical stability is used in engineering. The placement of a rod in a cylinder will resist displacement in all directions.