

TENSION IN THE LUMBAR MYOFASCIAL RING: EFFECTS OF RECTUS ABDOMINIS CONTRACTION ON THE LUMBAR SPINE

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Introduction: Throughout the lumbar trunk, there is no bony construction to protect the abdominal contents. Instead, the contents are protected by a continuous myofascial ring, extending from the linea alba to the vertebral column. This ring includes the rectus sheath and thoracolumbar fascia (TLF).

Purpose/Aim: To better understand low back pain (LBP), it is essential to appreciate how forces, act through this myofascial ring to influence lumbopelvic stability. This research aims to determine the relationship of rectus abdominis, paraspinal muscles, and intraabdominal pressure (IAP) on the fascia of the lumbar spine.

Materials/Methods: Axial slabs (2 cm) of the lumbar region of embalmed cadavers were cut. The rectus abdominis muscles were taken out of the rectus sheath and abdominal contents were removed with care to preserve the surrounding fasciae.

Custom-made inflatable butyl tubes were inserted in each rectus sheath and in the abdominal cavity. The tubes were then inflated to simulate muscle contraction and/or IAP. Left and right common tendons of the transversus abdominis and internal oblique (CTrA) were tensioned bilaterally via self-locking hemostats bound to a known load. Inflation of tubes in the rectus sheath and abdominal cavity were manipulated to simulate varying levels of rectus abdominis muscle contraction and IAP. Tension load cells were used to quantify the percentage of tension that is passed either through anterior and posterior lamina of the rectus sheath.

Results: Incremental increases in IAP created stepwise tension of both the anterior and posterior layers of both the rectus sheath with a greater proportion of the tension passing through the posterior part. Incremental increases in IAP had a similar effect on the TLF, creating stepwise increases in tension of its anterior and posterior layers. Again, a greater proportion of the tension passed through the posterior layer. With IAP held constant, incremental increase of pressure in the rectus sheath resulted in increased tension of both the anterior and posterior layers of the rectus sheath. The increased pressure in the rectus sheath also results in increased tension through the CTrA to the TLF.

Conclusions: These data indicate IAP and rectus abdominis contraction can play an integral role in tensioning the lumbar myofascial ring, thereby aiding in the stabilization of the lumbar spine. It also indicates that tensioning the CTrA has a direct effect on the rectus container. These findings imply fascial structures like the TLF, rectus sheath, and CTrA form one integrated fascial sheath.