On the role of transversus abdominis in trunk motor control

av

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Abstract


All trunk muscles are important contributors to spine stability. However, the deepest abdominal muscle, transversus abdominis (TrA), with its characteristically horizontal fibre orientation seems to serve a unique function in trunk motor control. The main mechanical role of TrA is believed to be to contribute to vertebral alignment during imposed moments on the trunk, executed mainly via either regulating the pressure level within the abdominal cavity and/or transmitting forces to the spine via the thoracolumbar fascia. However, the complete function of TrA and what factors affect its activation are still not fully understood. The purpose of the present thesis was to investigate the role of TrA in trunk motor control, specifically in relation to the presence or absence of postural demand on the trunk.

The timing and magnitude of TrA activation were investigated, in relation to other trunk muscles, with intramuscular fine-wire electrodes in different loading situations and body positions with varying postural demand.

In a side-lying position, with no postural demand of keeping the trunk upright, the activation of TrA was delayed relative the superficial abdominal muscles compared to previous experiments performed in a standing position. The timing and magnitude of activation of TrA did not depend upon the direction of perturbation. In the standing position, different static arm positions revealed that the activation of TrA co-varied with variations in the degree of postural demand on the trunk and also the imposed moments, regardless of moment direction. Finally, a study on rapid arm flexion movements confirmed that TrA is part of the pre-programmed anticipatory response in advance of known perturbations. The activation magnitude of TrA was the same regardless if the arm movement induced flexion or extension moments on the trunk.

In conclusion, the activation of TrA is associated with the upright postural demand on the trunk and with balancing imposed moments acting on the spine, regardless their direction. The findings are in support of the beliefs that TrA act as a general, direction non specific, stabilizer of the lumbar spine.

Keywords: Transversus abdominis, trunk muscles, EMG, intramuscular, IAP, motor control, spine stability, postural demand.

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