

Effects of tensioning the lumbar fasciae on segmental sagittal motion and instability factor during flexion and extension

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BACKGROUND Contraction of transversus abdominis (TrA) is reported to influence intersegmental stiffness by generating tension in the lumbar fasciae [1, 2]. However, the effects of fascial tension on segmental motion are uncertain. These are useful clinically to assess segmental instability. To model these effects we conducted a biomechanical motion study of unembalmed human lumbar segments.

METHODS Compressive flexion and extension moments were applied to 19 lumbar segments from nine unembalmed cadavers; (4 elderly and 5 middle aged) with 20 N lateral tension applied to the TrA aponeurosis during alternate cyclic loading tests. Segmental sagittal motion was captured using rapid motion photography and compared during repeated compressive loading cycles. The 'instability factor' (ratio of horizontal translation: rotation) calculated and compared between test conditions.

RESULTS Fascial tension shifted the pathway of motion towards the spinous process and in the majority (15/19) this shift was greatest at low loads. During flexion, fascial tension tended to increase both horizontal translation (by median 6% in younger specimens, 16% in elderly) and sagittal rotation (by median 11% in younger, 19% in elderly), with horizontal translation increased to a lesser degree. In extension, it reduced horizontal translation (by median 5% in younger specimens, 19% in elderly) and in the younger specimens increased rotation (by median 21%) but in the elderly decreased rotation (by 15%). The resulting instability factor was reduced in 70% of all tests (flexion and extension), by (mean) 8% in flexion and 22% in extension.

CONCLUSION Tension on the lumbar fasciae simulating moderate contraction of TrA alters segmental rotation and translation, reducing the instability factor in both flexion and extension.

References

1. Barker PJ, Guggenheimer KT, Grkovic I, Briggs CA, Jones DC, Thomas CD, et al. (2006) Effects of tensioning the lumbar fasciae on segmental stiffness during flexion and extension: Young Investigator Award winner. *Spine* 31(4):397-405
2. Hodges P, Kaigle Holm A, Holm S, Ekstrom L, Cresswell A, Hansson T, et al. (2003) Intervertebral stiffness of the spine is increased by evoked contraction of transversus abdominis and the diaphragm: in vivo porcine studies. *Spine* 28(23):2594-601