Lumbo TriStep

Functional tests

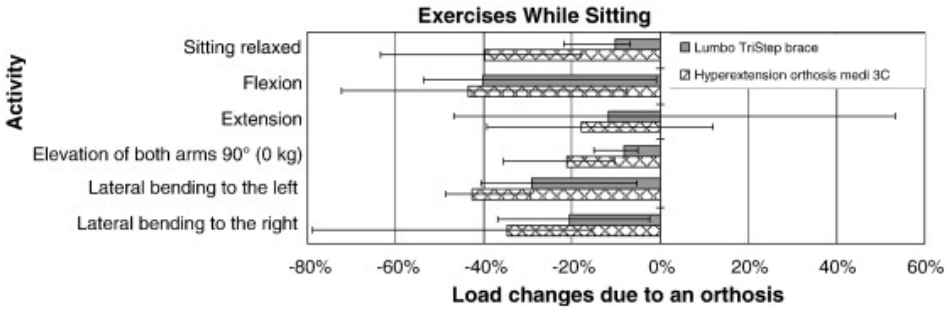
Major Findings

With Lumbo TriStep:

→ **The average resultant force on the vertebral body for 26 activities was reduced**

- by 9% with Lumbo TriStep (LTS)
- by 19% with hyperextension orthosis (HEO)
- The force reduction is usually more pronounced for activities performed during sitting

Load changes due to orthosis use



Changes of max. resultant force on vertebral body replacement (VBR) due to an orthosis for some activities while standing. The median values and the ranges are shown. For LTS n=5, for HEO n=4. (Rohlmann et al., 2013)

Clinical Relevance

Lumbo-sacral-orthoses (LSO) or hyperextension orthoses (HEO) are intended to support and/or to immobilize the spine. The goals may be any combination of support, rest, immobilization, protection, correction and reminder. The effect of an orthosis increases with increased stiffness of the product (Cholewicki et al., 2010; van Poppel et al., 2000). Orthoses with a high stabilization potential are used not only for the treatment of severe back pain, but also for stabilizing stable vertebral body fractures and after surgical stabilization of the spine (White & Panjabi, 1990).

Back pain is one of the most common conditions in industrialized countries. In Germany alone, between 80% - 85% of the population develop at least once in their life complaints in the back. In one tenth of the affected patients, the pain manifests itself as chronic. (Brömme et al., 2015)

There are an estimated 700,000 osteoporotic vertebral compression fractures in the United States each year, of which more than one third become chronically painful (Liebermann et al. 2001). Severe, unstable compression fractures of a vertebral body are often posteriorly stabilized with a pedicle-screw-based implant and anteriorly with a vertebral body replacement (Rohlmann et al. 2013).

The spinal load reduction by an orthosis is still a matter of debate. Some studies predicted a load reduction while others found no effect.

Summary

Lumbar orthoses are often utilized to restrict lumbar motion as part of a treatment regimen for a wide range of degenerative or musculoskeletal conditions in an attempt to provide mechanical support and to enhance patient comfort. Aside from limiting the range of motion of the spine, lumbar orthoses may also unload the spinal column indirectly by acting as an external splint. (Jegede et al. 2011)

Rohlmann et al. (2013) measured the in vivo effect of the Lumbo TriStep (LTS) and a hyperextension orthosis (HEO) on spinal impact load with telemeterized vertebral body replacement (VBR). The average resultant-force reduction for the 10 activities while sitting and the 15 activities while standing was 14% and 6% for LTS and 26% and 14% for HEO, respectively. Averaged over all 26 activities (walking, 10 exercises while sitting, 15 exercises while standing) assessed, the maximum resultant force was 9% lower when wearing LTS and 19% lower when wearing HEO.

Rohlmann et al. (2013) showed, that the Lumbo TriStep was effective in reducing the load in a vertebral body replacement (VBR) during different tasks while sitting, standing and walking.

References of summarized studies

Rohlmann, A., Zander, T., Graichen, F., & Bergmann, G. (2013). Effect of an orthosis on the loads acting on a vertebral body replacement. *Clinical Biomechanics*, 28(5), 490-494.

Other References

Brömme, J., Mohokum, M., Disch, A. C., Marnitz, U. (2015). Interdisziplinäre, multimodale Schmerztherapie vs. konventionelle Therapie. Der Schmerz, 29(2), 195-202. DOI: 10.1007/s00482-014-1508-1

Cholewicki, J., Lee, A. S., Peter Reeves, N., Morrisette, D. C. (2010). Comparison of trunk stiffness provided by different design characteristics of lumbosacral orthoses. *Clinical Biomechanics (Bristol, Avon)* 25, 2, 110–114.

Jegede, K. A., Miller, C. P., Bible, J. E., Whang, P. G., Grauer, J. N. (2011). The effects of three different types of orthoses on the range of motion of the lumbar spine during 15 activities of daily living. *Spine*, 36(26): 2346-2353.

Lieberman, I. H., Dudeney, S., Reinhardt, M. K., Bell, G. (2001). Initial outcome and efficacy of “kyphoplasty” in the treatment of painful osteoporotic vertebral compression fractures. *Spine*, 26(14), 1631-1637.

van Poppel, M N, de Looze, M P, Koes, B. W., Smid, T., Bouter, L. M. 2000. Mechanisms of action of lumbar supports: a systematic review. *Spine* 25(16), 2103–2113.

White, A. A., & Panjabi, M. M. (1990). Clinical biomechanics of the spine (Vol. 2, pp. 108-112). Philadelphia: Lippincott.