Reference

Rohlmann, A., Zander, T., Graichen, F., Bergmann, G.

Effect of an orthosis on the loads acting on vertebral body replacement

Clinical Biomechanics 28, 2013: 490-494.
http://dx.doi.org/10.1016/j.clinbiomech.2013.03.010

Products

Lumbo TriStep (LTS), Hyperextension orthosis (HEO, medi 3C)

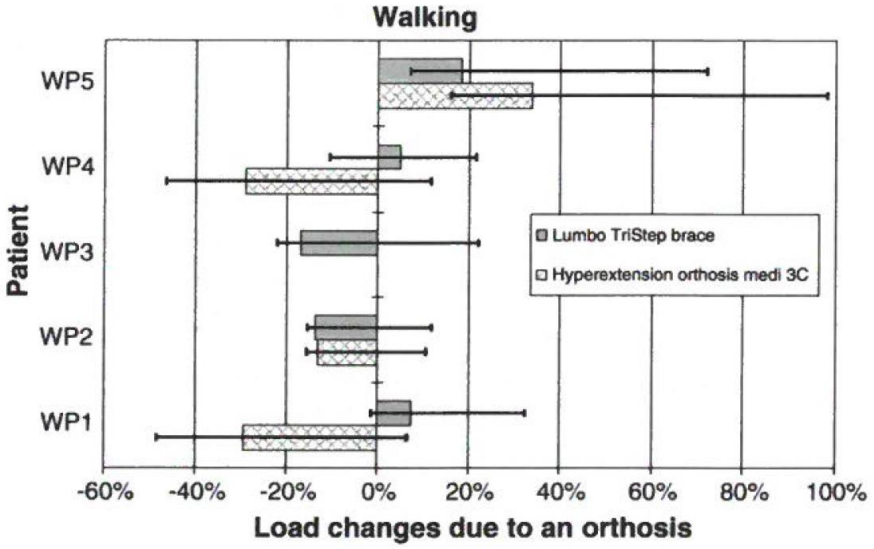
Major Findings

With Lumbo TriStep:

→ The average resultant force on the vertebral body replacement (VBR) 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. The values are related to the situation without an orthosis which was regarded as 100%. The results of the 5 patients are compared.

Population

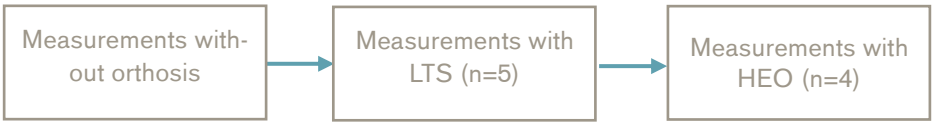
Subjects:	5 patients with a severe fracture of L1 or L3 vertebral body (4 male, 1 female)
Age:	62 to 71 years
Measurement:	Telemeterized vertebral body replacement (VBR) were implanted. The implant allows the measurement of 6 load components acting on it.
Implantation date:	09/2006 - 07/2008
Time between implantation and measurement:	150 to 774 days

Intervention:	For several activities during standing, sitting and walking, implant loads were measured with and without an orthosis.

Study Design

Descriptive, in-vivo:

Measurements were performed in one session



Orthoses:

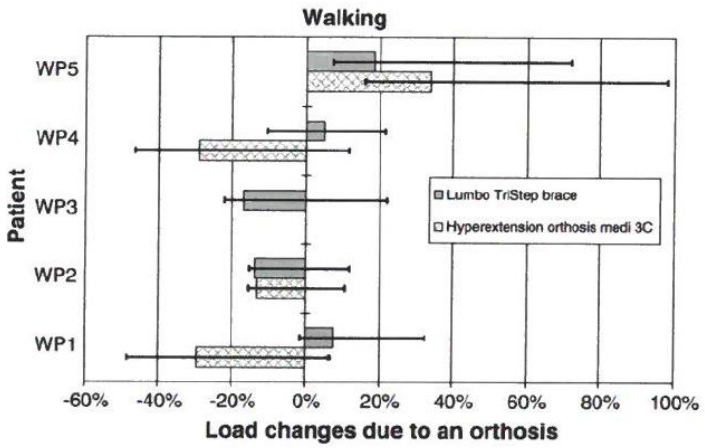
LTS:	Lumbo TriStep:	stabilizing orthosis with mobilizing function
HEO:	Hyperextension brace:	immobilizing orthosis (thoracic and/or lumbar)

Results

Functions and Activities | Participation

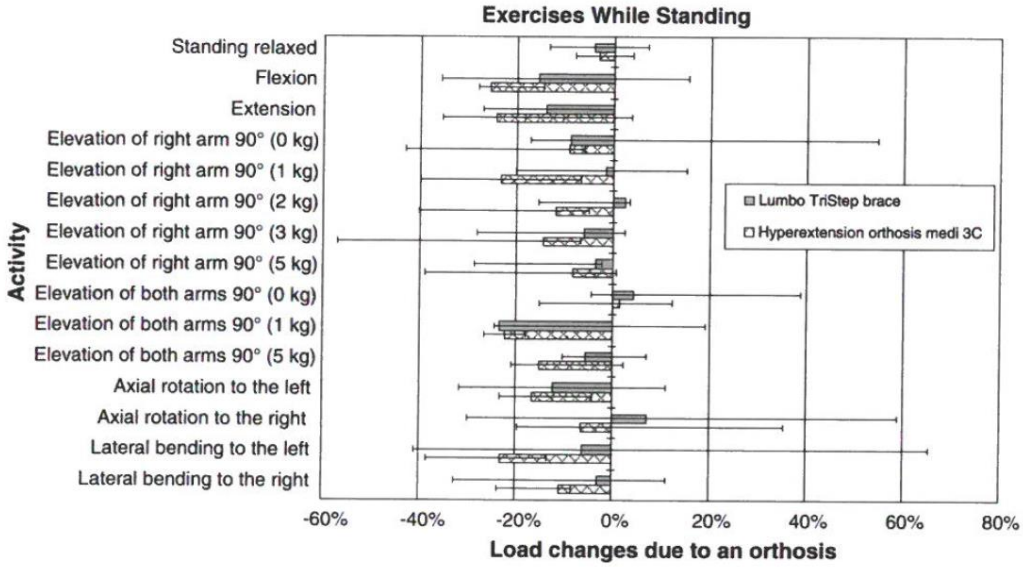
Biomechanics – Static measures | Biomechanics – Gait analysis | X-Ray | EMG | **Functional tests** | Clinical effects | Satisfaction

Category	Outcomes	Results for Lumbo TriStep and hyperextension orthosis
Functional tests	Max. resultant force on VBR	The average resultant force on the vertebral body replacement (VBR) for all 26 activities measured was reduced - by 9% with Lumbo TriStep (LTS) - by 19% with Hyperextension brace (HEO)
Functional tests	Max. resultant force on VBR while walking	Changes of maximum resultant force on a vertebral body replacement (VBR) due to an orthosis during walking. A negative value indicates an unloading of the VBR. Considerable inter- and intra-individual variations were observed.



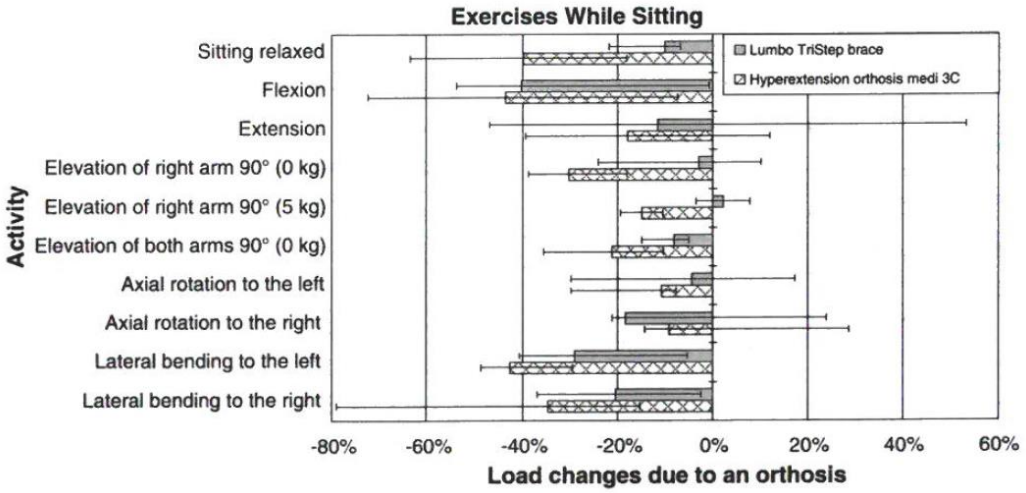
Changes of maximum resultant force on the vertebral body replacement due to an orthosis for walking. The values are relative to the situation without an orthosis which was regarded as 100%. The results for 5 patients (WP1-WP5) are compared.

Category	Outcomes	Results for Lumbo TriStep and hyperextension orthosis
Functional tests	Max. resultant force on VBR while standing	Changes of maximum resultant force on a vertebral body replacement (VBR) due to an orthosis while standing (15 exercises). A negative value indicates an unloading of the VBR. Considerable inter- and intra-individual variations were observed.



Changes of max. resultant force on VBR due to an orthosis for 15 different activities while standing. The median values and the ranges are shown. For LTS n=5, for HEO n=4.

Functional tests	Max. resultant force on VBR while sitting	Changes of maximum resultant force on a vertebral body replacement (VBR) due to an orthosis while sitting (10 exercises). A negative value indicates an unloading of the VBR. Considerable inter- and intra-individual variations were observed.



Changes of max. resultant force on VBR due to an orthosis for 10 different activities while sitting. The median values and the ranges are shown. For LTS n=5, for HEO n=4.

Author's Conclusion

"The forces on a VBR and thus on the anterior column of the spine are on average slightly reduced when wearing a LTS brace and more pronounced due to a hyperextension orthosis. However, large inter- and intra-individual variations exist. Therefore, from the biomechanical point of view, no clear recommendation to wear an orthosis can yet be given since the clinically relevant reduction of the implant force is unknown." (Rohlmann et al. 2013)