Validation of an helicoidal versus standard ankle-foot orthosis for patients with unilateral drop foot

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BACKGROUND

Patients with drop foot commonly use ankle-foot orthosis (AFO) as a walking aid [1-3]. The impact on gait abilities of the orthosis design is still unclear [4-7].

The aim was to compare gait abilities and patient satisfaction in patients with drop foot wearing a helicoidal AFO (hAFO) versus a standard AFO (sAFO) or no AFO (noAFO).

POPULATION & METHODS

- ✓ Design = randomized cross-over study.
- ✓ Twenty patients were included:
  - 12 females;
  - Age = 29.5 to 79.4 years;
  - Unilateral drop foot in relation with peripheral neurological deficit (n=14) and myopathy (n=6);
  - Duration of disease = 4 to 558 months.
- ✓ Assessment after 7 days of orthosis wearing.
- ✓ Gait abilities were assessed:
  - In 3 conditions: noAFO (control), sAFO and hAFO using identical shoes (**Fig. 1**);
  - With the 6-minute walk test (6MWT) and the Timed Up and Go (TUG) test.
- ✓ QUEST (*Quebec User Evaluation of Satisfaction with assistive Technology*) assessed the patient satisfaction while wearing sAFO and hAFO.
- ✓ Data was described with median±IQR. Friedman and Wilcoxon tests were used to compare scores between conditions (significant if p<0.05).

Figure 1. ***A-*** *Three experimental conditions.* ***B-*** *Front and profile views of hAFO. In all cases the patients used hAFO and sAFO in the same standard shoes.*

RESULTS

- ✓ The **6MWT** was significantly improved while wearing an AFO, of 15% with sAFO and 32% with hAFO, in comparison with the noAFO condition. Comparing sAFO and hAFO, there was a significant difference of 14% in favor of hAFO (**Fig. 2-A**).
- ✓ The **TUG** was also significantly improved of 21% by wearing the hAFO compared with the noAFO condition. A significant difference of 15% in favor of hAFO was shown compared to sAFO (**Fig. 2-B**).
- ✓ The **QUEST** score was significantly higher for hAFO than sAFO for the *Device* subscale (**Fig. 3-C**), but not for the *Service* subscale (**Fig. 3-D**).

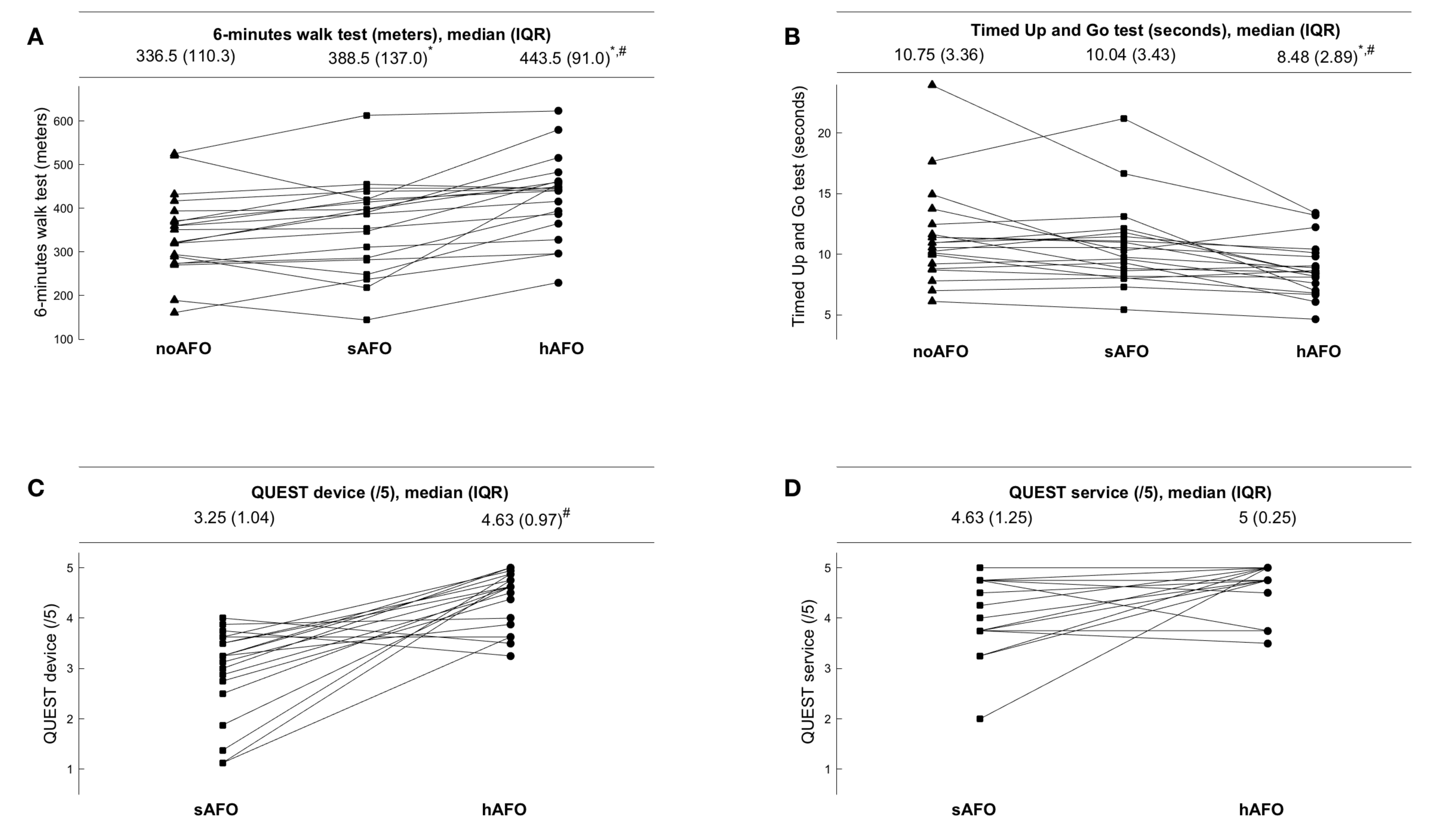

Figure 2. *Individual scores for the 6MWT* ***(A)****, the TUG* ***(B)****, and the subscales Device* ***(C)*** *and Service* ***(D)*** *of the QUEST.* * *Significant difference (p<0.05) between sAFO or hAFO and noAFO conditions.* # *Significant difference (p<0.05) between hAFO and sAFO conditions.*

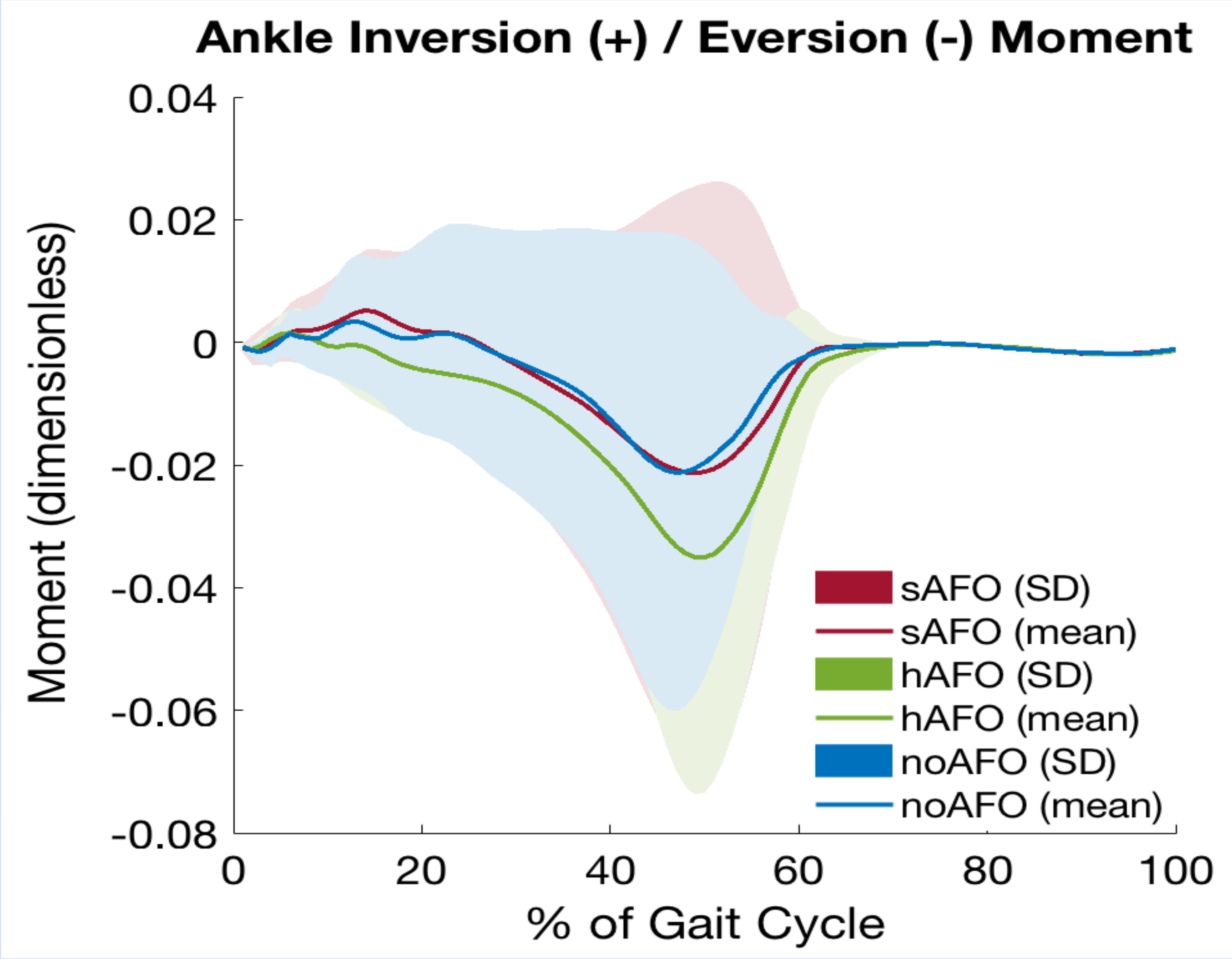

Figure 3. *Ankle inversion/eversion moments during the gait cycle obtained from a gait laboratory analysis. The eversion moment was significantly higher (p=0.03) for hAFO during stance phase.*

DISCUSSION & CONCLUSIONS

The use of hAFO for drop foot improves gait abilities in comparison with sAFO or noAFO, with a higher patient satisfaction. From a biomechanical point of view, in addition to its foot-lift effect (result not shown), the improvement in gait abilities with the helicoidal orthosis could be explained by the better stabilization of the foot in the frontal plane (moment of eversion, **Fig. 3**) compared to a standard orthosis or shoes alone.
The significant clinical effects highlighted in this study allowed the helicoidal orthosis to be included in the list of products and services reimbursable by the Health Insurance.

Keywords: Foot orthoses, Drop Foot Gait, Walk Test.

Conflicts of interest: funding source by InnovPulse®.

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