Materials and Methods

Patient: male (180cm, 81kg), post-polio syndrome (weak plantar flexors/quadriceps), knee hyperextension [3]; old KAFO: no defined DS, new KAFO: DS at 5° SVA [4]

Measurement: 2D gait analysis; 3 conditions: w/o KAFO, KAFO_30, KAFO_05, full gait cycles each; evaluation of knee/ankle kinematics and timing of gait events

Discussion and Conclusion

Due to the weak quadriceps the patient compensate missing plantar flexor strength with excessive knee extension. Restricting dorsiflexion in the KAFO_05 activates the forefoot lever whereas w/o KAFO and KAFO_30 the forefoot lever remains inactive in terminal stance. Thus, stance is prolonged and the heel remains on the floor [9]. An active forefoot lever reduces ankle ROM, which a) prevents excessive dorsiflexion and b) enables physiological heel lift [10]. If the heel lifts in time, the proportion of stance phase is reduced which leads to improved gait symmetry. Results show that orthoses for patients with weak plantar flexors should provide a DS to restore gait symmetry.

Sagittal plane kinematics of knee [5] and ankle [6] are shown in the graphs. Knee (23.3°) and ankle ROM are significantly reduced with KAFO_05 (13.6°) as well as max. ankle dorsiflexion [23.3°] [7]. Max. dorsiflexion occurs at 73.5% (w/o KAFO), 63.0% (KAFO_30) and 46.5% (KAFO_05) of GC. As shown by vertical lines in both graphs, heel lift is at 67.5% (w/o KAFO), 57.5% (KAFO_30) and 44.5% (KAFO_05) of GC. Proportion of stance phase with KAFO_05 (70.9%) is reduced compared to conditions w/o KAFO (78.8%) and KAFO_30 (72.3%) [8].

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Keywords: orthotics, plantar flexor weakness, dorsiflexion stop, gait analysis, gait symmetry

Literature