Surgical correction of ankle-foot deformity in people with upper motor neuron syndrome

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Summary

The aim of the study was to assess the effect of surgical correction of ankle-foot deformity on the attainment of personalized goals and barefoot gait in individuals with upper motor neuron syndrome (UMNS). Forty-six adults were included and their personalized goals and barefoot gait were evaluated before and one year after surgery. Following surgery, a clinically meaningful improvement in personalized goal attainment was found and participants with relatively low pre-surgery gait speeds showed significant improvements in gait speed after surgery. Furthermore, the surgical intervention resulted in an increase in step length and ankle dorsiflexion on the paretic side, as well as an increase in peak ankle power on the non-paretic side. These findings support corrective surgery as an effective treatment for ankle-foot deformities in people with UMNS.

Introduction

Pes equinovarus is a prevalent ankle-foot deformity following upper motor neuron syndrome (UMNS), like stroke or traumatic brain injury [1]. It often severely hampers gait, manifesting as a range of personalized symptoms, including difficulty with walking barefoot, pain while walking, and difficulty with walking on uneven terrain. Surgical correction of pes equinovarus through tarsal fusion and, when necessary, combined with Achilles tendon lengthening, has yielded promising clinical results. However, scientific research on this surgical intervention is sparse [2]. For that reason, this study aimed to investigate the effect of corrective surgery for pes equinovarus on personalized goal attainment and barefoot gait in people with UMNS.

Methods

Forty-six adults with UMNS who underwent corrective surgery for pes equinovarus deformity were included in the study. Before and one year after surgery, performance of and satisfaction with personalized goals were assessed with the Canadian Occupational Performance Measure (COPM). Additionally, three-dimensional instrumented gait analysis was performed to assess barefoot gait in relation to the surgical intervention. Paired samples t-test were performed to compare pre- and post-surgery outcomes.

Results and Discussion

After surgery, clinically meaningful improvements in performance of and satisfaction with personalized goals were found (change COPM performance: +3.4±1.8, $p<0.001$; change COPM satisfaction: +3.9±1.8, $p<0.001$) [3, 4].

Regarding gait, 22 participants were not able to perform instrumented gait analysis prior to surgery due to their inability to walk barefoot. Notably, after surgery, 18 of these 22 participants were able to perform instrumented gait analysis barefoot. Improvement in gait speed following surgery was found to be correlated with pre-surgery gait speed, with larger improvements in participants with lower pre-surgery gait speeds (Figure 1). Additionally, gait analysis revealed a significant larger step length (change: +0.04±0.08 m, $p<0.05$) and increased dorsiflexion at the ankle joint during the loading response and the swing phase of gait ($p<0.05$) on the paretic side following surgery. Furthermore, increased peak ankle power was observed on the non-paretic side after surgery (change: 0.38±0.65 W/kg, $p<0.05$). These findings suggest improved prepositioning and subsequent loading of the paretic foot following the surgical intervention.

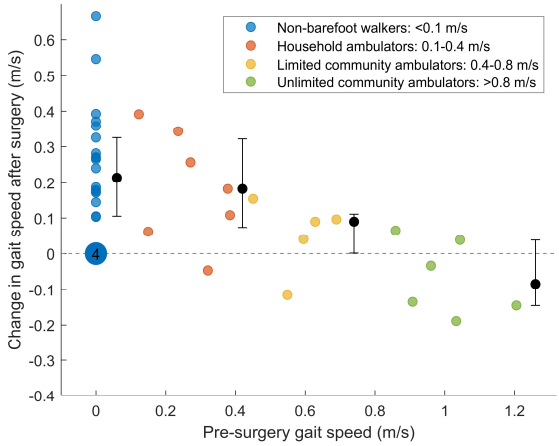

Figure 1: Change in gait speed after surgical correction of pes equinovarus deformity in relation to pre-surgery gait speed.

Conclusions

Surgical correction of ankle-foot deformity should be regarded as an effective intervention for achieving personalized goals and improving gait in people with UMNS.

References

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