



Difficulty of Performing Activities of Daily Living with the Michelangelo® Multigrip and Traditional Myoelectric Hands.

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INTRODUCTION

Most myoelectric prosthetic hands offer only the tripod grip to allow for pinch grasping of objects. This is a dramatic limitation of function as compared to that of the sound human hand. The purpose of this study was to investigate whether the Michelangelo® multigrip hand (Otto Bock HealthCare, Duderstadt) offering three grip modes and seven functional hand positions as well as a flexible wrist improves function and reduces perceived difficulty of performing activities of daily living (ADL) in comparison to single grip myoelectric hands.

METHOD

16 experienced users of regular transradial prostheses gave informed consent and participated in this cross-over observational study. The validated Orthotics and Prosthetics User Survey - Upper Extremity Functional Status (OPUS-UEFS) (1, 2) was used as the primary outcome measure for perceived difficulty of performing 23 (original version) and 19 (revised version) activities of daily living (ADL), respectively (2). As secondary outcome measure the same 23 and 19 ADLs were rated using the scoring system of the Prosthetic Upper Extremity Functional Index (PUFI) (3) for the way of doing an activity (function) and usefulness of the prosthesis. Patients completed the OPUS-UEFS and PUFI at baseline for their existing device as well as after a minimum of 4 weeks of use of the Michelangelo hand. Statistical analysis was conducted using the Wilcoxon signed rank test with $p < .05$ and a power of 80%.

RESULTS

16 male transradial amputees using conventional prosthetic hands with an average age of 41 ± 14 years participated. Six patients had congenital deformities, 8 patients underwent amputation due to trauma, one to cancer, and one to an elective amputation. Mean time since amputation was 12.8 ± 16.8 years, with 11 left and 5 right hands, 13 non-dominant and 3 dominant hands affected.

Mean duration of Michelangelo use was 12.4 ± 7.3 weeks. Michelangelo hand use significantly improved perceived difficulty of

performing the 23 ADLs of the original OPUS-UEFS version from 27.0 ± 9.7 to 36.4 ± 12.7 ($p = .03$) and showed a trend towards Michelangelo in the 19 ADLs of the revised version ($p = .07$). Difficulty of bimanual activities decreased significantly with Michelangelo ($p = .01$) whereas there was no difference in monomanual ADLs. Function and usefulness of the prosthesis also improved significantly with Michelangelo. In significantly more activities amputees used the Michelangelo hand to actively grasp objects ($p = .04$) and rated it "very useful" ($p = .01$).

DISCUSSION

Limited function of conventional myoelectric hands is an important reason for rejecting an upper limb prosthesis (4). The results of this study suggest that a multigrip prosthetic hand (Michelangelo®) may improve prosthetic function and reduce perceived difficulty to perform many ADLs. However, proper training of and accommodation to the new functions is necessary.

CONCLUSION

Multigrip prosthetic hands may improve prosthetic hand function and perceived difficulty of activities of daily living.

CLINICAL APPLICATIONS

Multigrip prosthetic hands may reduce perceived difficulty of ADLs and may thus increase upper limb prosthesis acceptance.

REFERENCES

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