THE I-LIMB PULSE HAND COMPARED TO THE I-LIMB AND DMC PLUS HAND

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INTRODUCTION

The new generation of multi articulating myoelectric prosthetic hands claims to be more functional than a one joint prosthetic hand. The aim of the study is to establish and compare the functionality of the myoelectric DMC plus, the i-LIMB and the i-LIMB Pulse hand.

CASE REPORT

In 2006, a 43-year-old man suffered from a wrist disarticulation at his dominant left side during work. Initially he was provided with a 2 electrodes myoelectric prosthesis with Dynamic Mode Control (DMC plus, OttoBock©). In December 2008 the patient received an i-LIMB hand (Touch Bionics©) with a ridged wrist and from December 2010 till May 2011 he used the i-LIMB Pulse with a friction wrist.

METHOD

The patient used different hands in a test procedure that covered all functional levels of the ICF. First we tested the DMC plus hand and after four weeks of usage the i-LIMB hand¹. The i-LIMB was measured again after one year. The i-LIMB Pulse was tested after one month of training and daily use and again after three months.

Grip and pinch strength were measured using the Jamar dynamometer and Pinch meter of the e-LINK system.

Prehensile patterns and grip postures were assessed by the Southampton Hand Assessment Procedure (SHAP). A score of 98, ranging form 0-100, is proper for an unimpaired population.

The assessment of Capacity for Myoelectric control (ACMC 2.0) gauges myoelectric control in an everyday activity, packing a suitcase. A score of zero logits refers to an average control ability.

Satisfaction with the prosthesis was measured with the Trinity Amputation and Prosthesis Experience Scales (TAPES).

The functional status of The Orthotics and Prosthetics Users’ Survey (OPUS) was established from a 19 item questionnaire. A score of 27 reflects zero logits and a moderate level of upper extremity function.

Visual Analogue Scale (VAS) scores were used to determine the patient’s subjective opinion on strength, appearance, sound, precision grip, power grip, robustness and grip variety of the prosthetic hand. The patient scored also the relevance of these characteristics.

Finally in a semi structured interview, the patient told about his experiences with the prostheses.

RESULTS

Grip strength of the i-LIMB Pulse is almost equal to the strength of the DMC plus hand, and much higher than the grip power of the i-LIMB. The tripod grip strength is very much in favor of the DMC plus.

The Index of Function Score in the SHAP has improved for the i-LIMB from 52 after a month to a score comparable to the DMC plus score [1]. The Pulse has the highest scores.

In the ACMC the patient has the highest score for the i-LIMB Pulse, and lowest for the i-LIMB.

The prosthesis satisfaction in the Trinity Amputation and Prosthesis Experience Scales is for the DMC lowest and highest for the Pulse. The adjustment to patients limitations is in favor of the i-LIMB Pulse.

The Functional Status in the OPUS is almost equal for the three tested hands.

According to the VAS scores the Pulse is highly valued for its variability in grip patterns, which is important to this patient. The DMC plus hand and i-LIMB Pulse both have a good grip power and are equally robust. The i-LIMB is the most vulnerable according to the patient’s opinion.

In the interview the patient stated that what he liked best about the i-LIMB and i-LIMB Pulse compared to the DMC plus hand, was that he need not be very particular in positioning the i-LIMB hands before picking up every day objects such as a pen, a glass or a T-shirt, due to their fine precision grip.
DISCUSSION

This case report compares the functionality of the DMC plus, the i-LIMB and the i-LIMB Pulse hand.

In the first part of the study in which we compared the DMC plus and the i-LIMB [1], we suggested that the low scores for the i-LIMB hand in the SHAP might be due to the limited training, the extra time the thumb positioning took, the rigid wrist and the limited grip strength. The SHAP scores for the i-LIMB after one year improved to the level of the DMC hand. These suggest that more experience in using the i-LIMB hand improved the control of the hand and therefore took less time in performing the tasks. The i-LIMB Pulse has highest scores in the SHAP. The preset features of the Pulse in combination with the intensive daily training and the friction wrist seem to have contributed to the scores.

In the TAPES, the adjustment to limitation is highest for the i-LIMB Pulse. An explanation might be that the patient told that after the accident he had met new people, found new activities and goals in life which were directly related to his one handedness. He felt eventually that he had gained more in his life than he had lost. The adjustment to limitation might also be related to the lapse of time.

The high tripod grip force and power grip strength of the DMC plus, require high control ability when handling delicate objects. The Pulse has a comparable power grip, but a low tripod grip. This makes handling heavy and delicate objects possible.

CONCLUSION

Within the limitations of this casereport, we conclude, that the i-LIMB Pulse has a functional advantage over the i-LIMB hand. It has more power, is less vulnerable, and the functionality seems higher. The DMC hand is valued for its force and robustness, as is the i-LIMB Pulse. Training and every day use for at least four months is needed to be able to fit in a multi articulating myo electric prosthetic hand in daily activities. The preset features of the i-LIMB Pulse hand require intensive additional training to an experienced i-LIMB user.

REFERENCES