INTRODUCTION: Breast cancer (BC) survivors that have had an axillary lymph node dissection (ALND) have an increased risk of developing upper extremity lymphedema. The problem faced by both patients and clinicians is the decision to proceed with a carpal tunnel release (CTR) if the patient does not respond to non-surgical management. The purpose of this study was to determine the treatment decision that yields the highest quality adjusted life years (QALY) for BC survivors at risk for lymphedema presenting with carpal tunnel syndrome (CTS).

METHODS: A state transition Markov cohort model was used to evaluate the treatment options for BC survivors at risk of upper extremity lymphedema presenting with CTS, as this allowed weighing the advantages and disadvantages of performing CTR or continuing with non-surgical management. The model reflected three treatment strategies: 1) early surgical intervention (mild CTS), 2) delayed surgical intervention (severe CTS), or 3) non-surgical management. QALYs for each strategy were calculated over a lifetime time horizon.

RESULTS: Over a lifetime (30-year) horizon, the preferred strategy was delayed surgery, which resulted in 21.41 QALYs. Early surgery and non-surgical management yielded 20.42 and 21.06 QALYs, respectively. The model was not sensitive to variation in any of the parameters within the clinically plausible ranges.

CONCLUSION: Based on this robust decision analytic model, BC survivors with mild CTS who are at risk for lymphedema would gain the most QALY by delaying CTR until severe CTS develops. This strategy balances the increased risk of lymphedema following CTR to the decreased long-term risk of severe CTS. The model comprehensively assesses a controversial area in the BC and hand surgery literature in order to guide decision making for patients and clinicians.

The Use of a Low-Cost Three-Dimensional Printed Single Channel Myoelectric Interfaced Prosthesis for Transradial Amputees: Preliminary Report

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INTRODUCTION: Among the various types of prosthesis, the myoelectric interfaced prosthetic hand recently has been highlighted and many researchers have tried to improve its functions; however, the high cost is one of the major limitations to its widespread use. There has been greater availability of the manufacturing knowledge source to the public with the goal of allowing more people to develop these prostheses without as great a financial burden. The advent of modern three dimensional (3D) printing technology has facilitated these activities and the development of a low-cost, reliable, and durable prosthesis can have a major social impact on patients. The aim of this preliminary report is to evaluate the clinical impact of low cost 3D printed myoelectric interface prosthetic hand for rehabilitation in patients with amputations.

METHODS: We retrospectively reviewed a total of 5 patients (1 female, 4 male), ages 40 to 67 years old, who previously underwent transradial amputation (all due to traumatic injuries). Patients were fitted with low-cost 3D printed myoelectric interface prosthetic hands (Mark 5™, Mandro, Seoul, Korea). All patients were assessed with standardized evaluations and tested for myoelectric activity in the residual forearm by surface electromyography (EMG). The site of the maximal electrical change was the contact area of the electrode of the interface in the prosthetic socket. The 3D printed prosthesis was custom made for each patient after carefully measuring the shape and length of the remaining forearm using 3D scanning procedure. The most reproducible and strongest myoelectrical signal from the forearm was used to create movement in the prosthetic hand. The times of frequency by the voluntary muscle movement conduct the appointed motion in the hand such as opening and closing.

RESULTS: All 5 patients continue to progress in the training process, final functional outcome measurements after a month obtained using validated instrument (the Orthotics Prosthetics User Survey[OPUS]) demonstrated significantly improved function compared to pretreatment scores.

CONCLUSION: The low-cost 3D printed myoelectric interfaced prosthetic hand may have
significant potential to positively impact quality of life and daily usage. We show that even without multiple channels the single reliable myoelectric signal is useful to patients and can sufficiently modulate the frequency of muscle contraction.

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Enhancement of Voluntary Elbow Movement with a Myoelectric Orthotic Device: Long Term Follow Up of a Novel Application of a Post-Cva Assistive Rehabilitation Orthotic Device

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INTRODUCTION: Free functioning muscle transfers (FFMTs), nerve grafting and nerve transfers have led to improved functional outcomes in brachial plexus injury (BPI) patients. Reports have shown that 39% of FFMTs and 26% of nerve transfers for elbow flexion achieve ≥ M4 elbow flexion strength. However, there remains a substantial number of patients with less favorable functional outcomes that need to be addressed further.

The MyoPro (Myomo Inc., Cambridge, MA, USA) is a FDA-cleared myoelectric elbow-wrist-hand orthosis that uses surface EMG signals from affected muscle groups to control a powered orthosis to assist with the movement of a paretic upper limb. We describe the application of this orthosis for enhancement of elbow flexion and extension in patients with incomplete recovery from BPI.

METHODS: Two patients from a single-surgeon practice have been evaluated for suitability of the myoelectric functional orthotic device. Both patients are 37 year-old men with 14 and 17 years history of left and right BPIs. Patient-1 initially had BP reconstruction by nerve transfers and secondarily a FFMT for restoration of elbow flexion and finger extension. Patient-2 underwent brachial plexus exploration and neurolysis only. Both patients failed to regain voluntary elbow movement. Evaluation showed 0–130 degree elbow passive range of motion in flail arms. Both patients had detectable EMG signals in the biceps or gracilis, and triceps muscles. Patients underwent 30 minutes of training with the device, which provides powered assistance for elbow flexion and extension via motors attached to the exterior of the orthosis. After the training, patients were asked to perform voluntary assisted elbow flexion and extension. Patients were then referred to receive custom orthotic devices. Functional assessment was performed using disabilities of the arm, shoulder and hand (DASH) questionnaire.

RESULTS: Both patients demonstrated voluntary active elbow flexion and extension from 0 to 115 degrees using EMG control signals from the gracilis and triceps in Patient-1, and from the biceps and triceps muscles in Patient-2. Patient-1 quit before getting the custom device. Patient-2 had DASH scores of 44.17 before and 36.6 after 6 months of using the orthotic device.

CONCLUSION: Given the limited options available after definitive reconstruction, this myoelectric orthosis is a valuable option to improve the functional outcome in patients with BPI and poor return of voluntary elbow movement following reconstruction.

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Restoration of Shoulder Motion Using Single Versus Dual Nerve Repair in Obstetric Brachial Plexus Injury

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