significant potential to positively impact quality of life and daily usage. We show that even without multiple channels the single reliable myoelectrical 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 quitted 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

Presenter: Alain Joe Azzi, MD
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INTRODUCTION: Expendable donor nerves in obstetric brachial plexus injuries (OBPI) are limited. This study investigates restoration of shoulder external rotation (ER) and abduction following single vs. dual recipient nerve repair in OBPI.

METHODS: Retrospective chart review of single surgeon’s experience following repair of OBPI from June 1995 to June 2015. Twelve patients underwent nerve grafting +/- neurotization of the upper trunk only while fourteen patients underwent repair of the upper trunk and neurotization of the suprascapular nerve. Shoulder abduction and ER were recorded preoperatively and postoperatively in degrees. Postoperative range of motion and the difference gained in degrees following surgery were measured by independent t-test analysis.

RESULTS: Twenty-six patients met our eligibility criteria. Mean follow-up was 41.5 months (min: 12; max: 186; SD:39.5). Mean patient age at time of surgery was 30.1 weeks (min: 7.3; max: 48.7; SD:20.4). Mean degree of abduction gained postoperatively was 77.4 degrees (min: 15; max: 180; SD:53.2) following single recipient repair and 85.4 degrees (min: 20; max: 150; SD:46.5) following dual recipient repair. Mean degree of ER gained post-operatively was 56.5 degrees (min: 0; max: 95; SD:32.6) following single recipient repair and 59.4 degrees (min: 0; max: 95; SD: 37.5) following dual recipient repair.

CONCLUSION: Dual nerve repair of the upper trunk and the suprascapular nerve offers no statistical benefit when compared to single nerve repair of the upper trunk. The additional valuable donor nerve can be used to restore concomitant elbow or hand function in obstetric brachial plexus injuries.

Low Apgar Score As an Indicator for Prompt Referral to a Specialized Multidisciplinary Team in the Non-Operative Treatment of Obstetrical Brachial Plexus Injuries

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INTRODUCTION: Prompt physical and occupational therapy is crucial in managing non-surgical candidates with Obstetrical Brachial Plexus Injuries (OBPI). The objective of our study was to identify newborns suffering from non-operative OPBI in need of a “fast-track” evaluation by our multidiscipline team.

METHODS: Retrospective chart review of single surgeon’s experience of OBPI from June 1995 to June 2015. All non-surgical candidates (Narakas class 1) were included in the study. The Gilbert score and the Medical Research Council grading system were used to measure shoulder and elbow outcomes, respectively. Multiple subgroups analyses were performed to study the impact of time-delay on shoulder and elbow function. The ANOVA test and Welch’s test were used for statistical analysis.

RESULTS: A total of 168 patients were included in this study. Mean follow up time was time 313.8 weeks (min:52; max:1072; SD:228.1). Time delay between birth and the first consult to our clinic significantly correlated with shoulder outcome in the subgroup of newborns with Apgar scores <7 at five minutes. The following subgroups did not have a clinically significant association between shoulder outcome and time delay to consult: maternal diabetes, birth weight >4kg, use of forceps, asphyxia, multiple comorbidities, and Apgar score at one minute. Elbow outcomes remained unaffected by time delay in the total population and in all subgroups.

CONCLUSION: The subgroup of newborns with an Apgar score <7 at five minutes shows improved long-term shoulder outcome when promptly examined by an OBPI clinic. We recommend that this “time-sensitive” population should be recognized and assessed by a multidisciplinary team before 12 weeks of age.

Endovascular Thrombolysis for Extremity Frostbite Decreases Digital Amputations and Hospital Length of Stay (LOS)