



Mobile Tech Posture: Profile View



Mobile Tech Posture: Hands

13

Varieties of Pediatric Brachial Plexus Pathogenesis and Treatment: Case Series

J. WERNER¹, S. CHINN², G. KIM¹, K. LOFFREDO¹, M. PASCUAL¹

¹Children's Hospital Los Angeles, Los Angeles, CA, United States

²University of Southern California, Los Angeles, CA, United States

Purpose: The purpose of this study is to describe the scope and distinct presentations of brachial plexus pathologies in children. Injury or obstruction to the brachial plexus in pediatric patients

presents unique challenges. Literature is scarce in this area, with the exception of information pertaining to perinatal injury. In addition to knowledge of unique presentations in children, hand therapists must be aware of pediatric adaptations to motor and sensory testing and techniques to engage children and parents in therapy. More research is needed to explore the diversity of brachial plexus injury within the pediatric population and to reveal similarities and differences to existing guidelines for adult patients.

Methods: We performed a descriptive case series analysis to catalog the variety of brachial plexus pathology and outcomes in pediatric patients. Cases were consecutively sampled from a hand therapy clinic within a pediatric hospital and chosen for inclusion based on their representativeness of the population and educational utility. Cases were excluded once a representative of that diagnosis was identified. We created a matrix of cases according to etiology, initial presentation, medical or surgical intervention, therapy intervention, change in active movement on standardized scoring metrics such as the Toronto Active Movement Scale (AMS) and Medical Research Council (MRC) Scale, and similarities and differences to homologous adult presentations.

Results: We identified five patients (4 female, 1 male; age at onset 0-14.5 years) representing a spectrum of pediatric brachial plexus etiologies: (1) neurogenic thoracic outlet and pectoralis minor syndrome associated with hypermobility syndrome, (2) Parsonage-Turner syndrome, (3) perinatal injury, (4) synovial sarcoma, and (5) acute flaccid myelitis associated with enterovirus D68. Each case was compared to its homologous diagnosis within the adult population. This process revealed variations in initial presentation, course of treatment, and long-term outcomes. Five out of five patients required intensive hand therapy services at the frequency of at least one time a week for a duration ranging from 6 months to 2 years. Four out of five patients required surgical intervention with two out of five patients requiring nerve grafting and two out of five patients requiring nerve transfers. All patients benefitted from therapy utilizing motor learning and developmental approaches. Patients who underwent nerve transfers benefitted from surface EMG biofeedback. Younger patients (infant and 7-year-old) benefitted from classic or modified constraint-induced movement therapy to combat developmental disregard, despite a dearth of formal evidence that this technique is supported for peripheral nerve conditions. The Active Movement Scale (AMS) and Medical Research Council (MRC) Scale were utilized to assess motor function over the course of treatment. No single muscle grading scale was sensitive enough to detect and monitor change spanning from flaccidity to normal strength, so a combination of the AMS and MRC were required. Patients diagnosed with Parsonage-Turner syndrome and acute flaccid myelitis post-nerve transfer demonstrated the greatest gains in active motion while patients diagnosed with sarcoma and thoracic outlet syndrome showed least improvements.

Conclusion: Common to all cases is the need for detailed understanding of brachial plexus anatomy, the effects of denervation on children's growth and development, an understanding of developmental disregard, and strategies for family-centric therapy. Each of these unique cases demonstrate the importance of understanding the pattern of injury to determine prognosis for recovery, team-based care planning with a brachial plexus surgeon, rate of progression of therapy, and the most suitable treatment methods. Collaboration among hand therapists, surgeons, patients and their families is crucial for effective rehabilitation. Future research should focus on prospective cohort studies or case-control observation studies of specific intervention strategies such as multimodal biofeedback and constraint induced movement therapy.