# Peripheral nerve injury in children

## Epidemiology

In children, peripheral nerve injury (PNI) are commonly associated with trauma during birth Malessy and Pondaag [1] have shown the prevalence of birth-related brachial plexus injury to be around 0.1%. Other traumatic causes of PNIs in children have rarely been investigated. Dorsi et al., in a registry study, identified brachial plexus injuries in 0.1% of trauma victims younger than 20 years [2].

PNIs are more common than previously identified for the pediatric trauma population. These injuries are associated with older age and increased severity of the overall injury [3].

## Treatment

Operative exploration of an open wound when there is a potential for nerve injury in an uncooperative child is the only sure way of determining the status of the nerves. Primary repair of cleanly divided nerves in tidy wounds is advocated if it can be done competently. Secondary repair is indicated for avulsion injuries, gunshot wounds, crush injury, and human or animal bites. Delicate, atraumatic technique and accurate repair of the divided nerve are stressed. The more exacting technique of funicular repair may yield better results. Interfascicular cable grafting is a useful alternative to extensive mobilization in closing nerve gaps. Nonoperative treatment of nerve injuries associated with closed fractures is advocated unless there are no signs of nerve regeneration in two to three months. Obstetrical brachial plexus injuries of the upper plexus carry a better prognosis than lower plexus or total plexus injury. Early range of motion exercises to prevent contractures are stressed. Maximal recovery takes place within two years. The acute nerve compression syndrome should be considered an emergency and may require surgical decompression if it is severe and if rapid return of function does not occur following reduction of the fracture [4].

Considering the rate of spontaneous recovery of postinjection nerve injuries of the sciatic nerve and early onset of skeletal deformities, a closed nerve injury of the lower limb with no recovery within 3 months should always undergo surgery, even if complete functional outcome is not always guaranteed [5].

## Outcome

Recovery after peripheral nerve injuries in children is more complete than in adults and is inversely related to the age of the patient [6].

The prognosis for the return of sensation following laceration of the median, ulnar, or digital nerve depends upon recovery of two point discrimination (in millimeters approximately equal to the child's age) at the time of nerve repair. The better results in children probably reflect the greater adaptability of the immature central nervous system to the nerve injury [7].

Early surgical intervention, age less than 10 years, and incomplete motor palsy were the best predictors of a superior functional outcome [8].

The evaluation of the outcome in children less than 10 years of age with an upper extremity

peripheral nerve injury includes careful observation of preferred prehension patterns, examination of muscle atrophy and sudomotor function, provocative tests, manual muscle testing and tests of sensory threshold and tactile gnosis [9].

## Case series

### 2017

Retrospective study of epidemiology, operative findings, and surgical outcomes over the period of 2000-2016 in 102 children with peripheral nerve injury.

Intramuscular injections were the most common cause (52.9%), followed by entrapment (15.6%). The most common nerve involved was the sciatic nerve (54.9%), followed by the common peroneal nerve (13.7%), the ulnar nerve (10.8%), and the radial nerve (10.8%). Perineural adhesion was the most common intraoperative finding (74.5%), followed by a neuroma in continuity (14.7%) and gap (10.8%). Most of the children with peripheral adhesion underwent external and internal neurolysis (75.5%). Follow-up was available for 67 children. The median follow-up period was 7 months (range 3-36). The outcome was assessed according to MRC grading. Favorable functional improvement was noted in 76.1% of the children. Age less than 10 years ($p = 0.06$), injury before 6 months ($p = 0.03$), and MRC motor grade (<3) ($p = 0.01$) were positive predictive factors related to the final outcome.

This study can serve as a guide to determine the epidemiology, duration of intervention, and surgical outcome of traumatic peripheral nerve injuries in the pediatric population [10].

### 2007

Among 136 traumatic peripheral nerve injuries in the children we treated, 31 nerve injuries of the lower limbs were observed. Causes of injury and time to recovery were evaluated. The sciatic nerve was involved in 19 cases, peroneal nerve in 11, root avulsions of the spinal cord in 1.

Senes et al. observed complete recovery in 12 cases and incomplete or no recovery at all in 19. The mean time to recovery in patients who underwent surgery was 18 months (range: 1-32). Considering the rate of spontaneous recovery of postinjection nerve injuries of the sciatic nerve and early onset of skeletal deformities, a closed nerve injury of the lower limb with no recovery within 3 months should always undergo surgery, even if complete functional outcome is not always guaranteed [11].

### 1981

Thirty-eight children in whom a peripheral nerve injury of the hand had been repaired from 2 to 18 years earlier (mean 7.5 years) were examined. All repairs had been performed with the conventional technique with epineural sutures, and nearly all were primary neurorrhaphies. Sensory recovery was evaluated by using the two-point discrimination test (2 PD). The results were considered good if the 2 PD value was less than 6 mm and poor if this value was more than 15 mm. Of the 20 repairs of an ulnar or median nerve, or both, results were good in eight (40%), fair in 10 (50%) and poor in two (10%). Of the 18 digital nerve repairs, results were good in 14 (77.8%) and fair in four. The results in this series are better than results reported for adults series [12].

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