Gillette Children's Specialty Healthcare

A PEDIATRIC Perspective

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Birth Brachial Plexopathy: Early intervention is crucial

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When an infant sustains a brachial plexus injury during birth, early intervention is imperative if the child is to regain optimal function. Sometimes called “birth palsy,” birth brachial plexopathy refers to an injury of the brachial plexus nerves during the birth process. This is the result of lateral traction of the neck away from the shoulder, causing bruising, stretching or tearing of the nerves.

Many babies who sustain brachial plexus injuries are larger than average at the time of birth and have difficulty passing through the birth canal. However, brachial plexopathy can occur in babies of all sizes, even premature infants. There have also been cases of brachial plexopathy in infants delivered by cesarean section, although these are rare (1% of all birth palsy cases).[1]

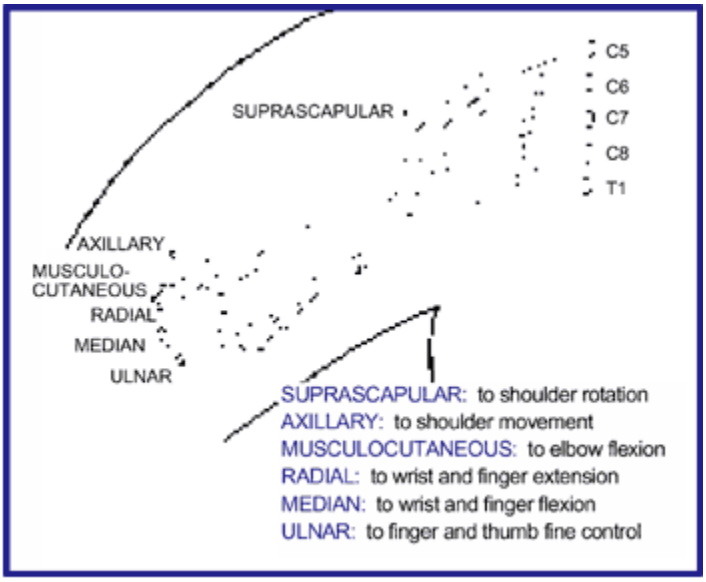

Fig. 1 Brachial Plexus Anatomy

The overall incidence of birth brachial plexopathy is approximately 2 per 1,000 births. Only about one in ten of these babies need surgical treatment, while the others recover complete nerve function through therapeutic exercise alone.

How is the brachial plexus injury evaluated?

The degree of a brachial plexus injury can fall within a wide range. Depending on the level at which the injury occurs, it may result in partial or complete paralysis of the child’s shoulder, arm, elbow, wrist and/or hand (see fig. 1).

The extent of the nerve injury is evaluated by repeat examinations to determine whether nerve re-growth has occurred or is occurring. Sunderland's Classification of Nerve Injury grades brachial plexus injuries according to severity (see fig. 2):

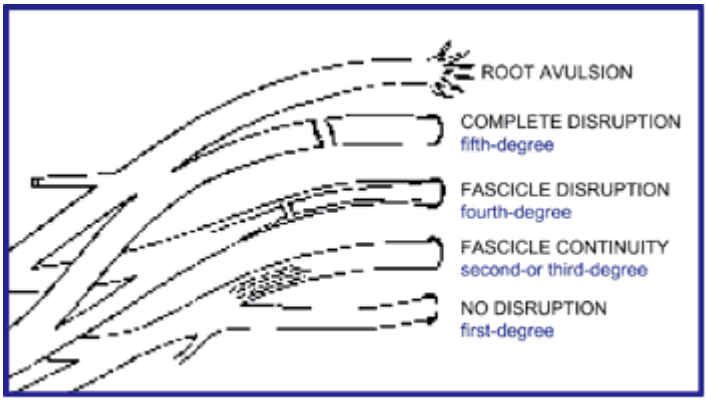

Fig. 2 Nerve Injury

First-degree: Injury shows no physical disruption of the nerve. The nerve is temporarily "bruised" and usually recovers within a few days to a few weeks.

Second-degree: Injury to the fascicles within the nerve, but the larger nerve tube is not disrupted. The fascicles extending from the brain need to re-grow down the nerve tubes to restore function. Return of nerve function is usually nearly complete, but requires time (three to six months).

Third-degree: Injury to the fascicles within the nerve, as well as their individual casings. The fascicles extending from the brain need to re-grow down the nerve tubes but may show some incomplete return of nerve function. This may be due to scarring or mix-up of the nerve fascicles as they re-grow.

Fourth-degree: Injury to all contents of the nerve, except that the larger outer nerve tubing has not been disrupted. The fascicles extending from the brain need to re-grow down the nerve tube, but have little guidance for direction of growth. Significant impairment of nerve function is observed, and surgery is usually recommended.

Fifth-degree: Complete disruption of the nerve. No return of function is seen without nerve surgery.

Beyond these five degrees of injury, some patients may experience nerve root avulsion. As seen on an MRI scan (or previously, a myelogram) the nerve root is avulsed directly off the spinal cord and is not repairable surgically. No return of nerve function will be seen.

Physical examination is the most effective method of evaluating peripheral nerve function. This includes assessment of motor function as well as sensory function for each nerve.

Other necessary studies may include:

- electromyography/nerve conduction testing to assess patterns of injury and reinnervation
- MRI scan of the cervical spine to assess for nerve root avulsions

Treatment options

In cases of mild injury to the brachial plexus, the problem may resolve within a few days to a few weeks. However, if the baby's function has not returned to normal by the age of 3 months, intervention may be necessary. Periodic examination by a specialist is the most effective tool for evaluating the level of functional recovery and the possible need for surgery.

Treatment ranges from simple daily exercises to help the muscles and joints develop normally as the nerves are re-growing, to surgical repair of the nerves (see table 1). Surgery is usually recommended for children who have not recovered nerve function with exercise by 6 months of age. Surgery is most effective when done before the baby is 1 year old.

For some babies, nerve surgery is not recommended because partial nerve function has returned or a complete avulsion of the nerve root has occurred. In these instances, tendon transfer surgery can be done at an older age to re-balance the muscles that have returned function with those that remain paralyzed.

The most common tendon transfer for incomplete return of function is surgery on the shoulder. In this instance, the muscles that rotate the arm inward have returned function, but the muscles that rotate the arm outward do not (see fig. 3). Shoulder movement and development may be affected as the child grows. Tendon transfer surgery can be done to transfer a muscle to improve shoulder rotation.

Risk in subsequent pregnancies

Various authors have reported cases of women who have had more than one child born with brachial plexus injuries. For example, in a 1996 article by Al-Qattan et al, the authors presented a case study of a woman whose fifth and sixth children were both born with brachial plexus injuries.[2] The babies were delivered by different obstetricians. The authors noted that the injuries probably occurred as the result of the babies' high birth weights (4.4 and 4.6 kilograms respectively).

Table 1
Treatment Options

Physical therapy exercises: • maintain joint mobility and prevent contracture. • provide sensory input for sensory stimulation. • should be initiated for all newborns with brachial plexus injury. • are a prerequisite for successful subsequent surgery, if surgery is necessary. • are usually sufficient for first-, second- and third-degree injuries.
Nerve surgery plus therapy exercises: • is recommended for babies who have not recovered appropriate nerve function by 6 months of age. • is usually for fourth- and fifth-degree injuries. • is most successful if done prior to 1 year of age.
Tendon transfer surgery: • is recommended as a secondary reconstructive procedure for children who have incomplete return of full function or in cases of nerve avulsions. • is usually performed when the child is older (>5 years) to re-balance the muscles that have returned function with those that remain paralyzed. • may be recommended in a younger child if muscle imbalance leads to shoulder joint malformation.

Such studies suggest that women who have previously delivered a large infant with a brachial plexus injury are at risk for having another child with a similar injury. During subsequent pregnancies, these mothers should be closely monitored. In some cases, it may be prudent to consider delivery by cesarean section.

Risk factors associated with brachial plexopathy include:

- high-birth-weight baby
- breech presentation during delivery
- a mother who has previously given birth to a child with a brachial plexus injury
- vertex delivery with shoulders that do not pass easily through the birth canal
- prolonged labor
- a multiparous mother (two or more prior births)

According to the Institute for Neurology and Neurosurgery in New York City, there is a 175-fold increase in risk of injury to the plexus nerves with breech deliveries. There is also a 14-fold increase in risk of injury to succeeding infants of mothers who have previously given birth to a child with brachial plexopathy.

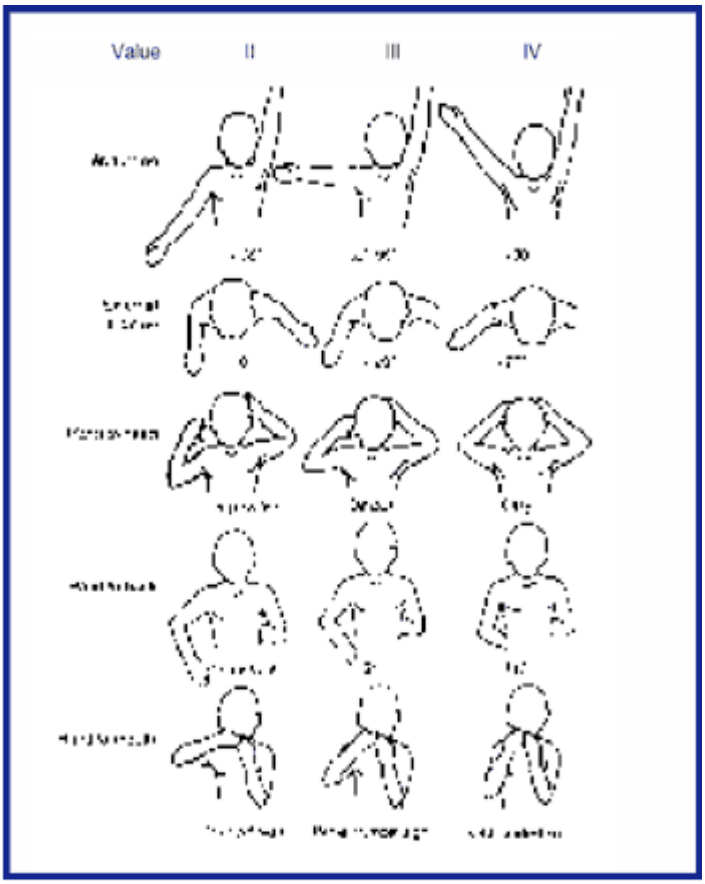

Fig. 3 Functional Assessment of the Shoulder —Modified Mallet Classification
Value I - totally paralyzed shoulder
Value V - normal shoulder

1. Al-Qattan MM, El-Sayed AAF, Al-Kharfy TM and Al-Jurayyan NAM. Obstetric brachial plexus injury in newborns delivered by cesarean section. J Hand Surg 1996; 21B:263-5.
2. Al-Qattan MM, El-Sayed AAF, Al-Kharfy TM and Al Jurayyan NAM. Obstetric brachial plexus injury in subsequent deliveries. Can J Plast Surg 1996; 4(4):203-204.