

Micro manager

Children's surgeon leads a study of when, and if, to fix damaged nerves

At the core of everything a physician does is the question of natural history: if nothing is done to treat an illness or injury, how will it progress naturally? Often, the answer is obvious: if you cut your finger and leave it alone, it will most likely heal itself. But if the wound becomes infected, it will follow another course entirely. Before administering care, a doctor determines if anything can be done to help a patient, then decides what level of treatment, if any, is appropriate.

It is the question of natural history that Peter Waters, MD, and his colleagues around the world consider when taking care of children with injuries to the brachial plexus, a complex bundle of nerves between the neck and shoulder that control motor function in the chest, shoulder and arm. As an orthopaedic surgeon, hand surgeon and director of the Brachial Plexus and Hand/Upper Extremity programs, Waters sees children every day, many only weeks old, who have suffered varying degrees of damage to the brachial plexus during the birthing process. Now he's leading a study to determine the best course of treatment for these newborns.

"These injuries occur when the baby's shoulders get stuck on the pelvic brim during birth," says Waters. "This makes the head and neck go in different directions, causing a tear in the nerves of the brachial plexus. Depending on its severity, this tear can cause these children's arms to hang limply at their side." While the extent of the tear determines the amount of dysfunction, it is the treatment itself — and determining when it should take place — that has been the cause of much debate.

For many years, doctors had few options for treating patients with brachial plexus injuries. Children were usually put on a regimen of physical therapy until they could undergo one of two common surgical procedures (tendon transfer and osteotomy). Neither "cured" the problem, but each gave the child improved use of the arm. Then 25 years ago, a procedure was developed in the burgeoning field of microsurgery (which involves operating on structures as small as hair-sized nerves) that offered a more complete long-term solution.

Known as brachial plexus microsurgery, the procedure is often done in combination with tendon transfer and osteotomy. It involves taking the sural nerve from the back of a patient's leg and surgically placing it in the brachial plexus at the site of the tear. The idea, which is the surgical equivalent of replacing a spark plug, is that a healthy nerve will allow electrical signals to run through the brachial plexus and give the patient improved control of his or her arm.

The difference of opinion among surgeons today isn't about whether the procedure is helpful, but when it should be done. "There's a fairly small window when this procedure will have the greatest effect," says Waters. "Before 3 months of age,

there is the possibility of spontaneous recovery. Beyond 9 months we don't believe the nerves and muscles will recover sufficiently, and once you get beyond a year, the loss of muscle from atrophy is so great that the nerve won't be able to provide enough strength."



Sean Trombly's brachial plexus injury during birth left him with a completely flaccid right arm. At left, he is shown at 5 months old, one month before Dr. Waters performed microsurgery. At right is Sean today, at 9 years old. Besides being able to hang upside down, Sean can raise his arm above his head; something he couldn't do before surgery.

Waters' concern is that, depending on where a child goes for help, the treatment could vary widely. "Some centers will always perform microsurgery at 3 months old; at others it might be at 5, 6 or even 9 months old," he says. "And at some places, a child will never get microsurgery."

In an effort to establish a standard of care at all hospitals and determine the natural history for brachial plexus injuries, Waters will direct a multi-center study over the next five years to determine the appropriate timing of microsurgery, tendon transfers and osteotomies. For the first time since development of the procedure, surgeons will use the same treatment protocol and a Web-based data collection form that will ensure standardized information. Participating centers include brachial plexus programs in the United States, Canada, Australia and Europe, and the study is being sponsored and funded by the American Society for Surgery of the Hand, and the Pediatric Orthopaedic Society of North America.

For more information on brachial plexus microsurgery, families and referring physicians can contact Peter Waters, MD, at peter.waters@tch.harvard.edu or Paula Donahue, RN, at (617) 355-6648.