Obstetric Brachial Plexus Injury
Information for Parents

Introduction

Each child is affected differently by brachial plexus injury, and each family reacts in their own way. Therefore treatment and care is approached with sensitivity and individualised. Support is provided for the family and child as they grow, develop, and face new challenges.

This webpage aims to give you some basic facts relating to Obstetric Brachial Plexus Injury (OBPI), as well as some more detailed information which you may wish to read.

We have included useful contact information and links to organisations which may be able to support you further.

Overview

A brachial plexus injury is a rare event, but affects approximately one in every 1800 babies born in the UK. It can cause weakness in the baby’s shoulder, arm, and hand, but the effect of the injury is very variable. The speed of recovery also varies, some showing big improvements within days to weeks, while others recover much more slowly, and these children may benefit from surgical treatment.

Another term you may hear used for OBPI is Erb’s palsy, named after a 19th century surgeon, which used to describe the commonest type of injury in children [http://en.wikipedia.org/wiki/Erb's_palsy]

What is the Brachial Plexus?

The brachial plexus is a complicated network of nerves which controls the muscles in your child’s shoulder, arm, elbow, wrist, hand and fingers as well as providing them with feeling.

It starts as five large nerve roots that come out of the spinal cord between the bones in the neck (vertebrae), and are named after the vertebra they pass using letters and numbers: C5, C6, C7, C8, T1. The nerve roots mix together in the neck, and then divide into many important branches as they run under the collarbone, into the armpit and along the length of the arm.
The nerve roots that eventually go to the shoulder and elbow (C5 and C6) lie higher in the neck than those that travel to the hand and fingers. The upper ones (C5 and C6) are those most commonly affected in a brachial plexus injury.

Surgeons and therapists can work out which nerve roots were injured, by examining the pattern of weakness that a child has, and by checking what weakness they had when they were born.

**What are nerves?**

Nerves can be seen with the naked eye, and are cordlike structures formed from a collection of nerve fibres that are too tiny to see without a microscope. Like a telephone cable contains lots of wires, a single nerve may contain thousands of nerve fibres (the whole brachial plexus contains about 425,000). These fibres carry electrical messages both ways between the brain, muscles and tissues. The fibres will stop working if they are bruised or stretched, or if they break.

For a muscle to work (contract), a message must travel from the brain along a nerve that goes directly to the muscle. When a nerve is injured, the muscles that the nerve controls will be weakened, even though the injury is not to the muscle itself.

Nerves outside the spinal cord may be able to repair themselves after injury. This depends on how bad the damage is.

**How does a Brachial Plexus Injury Occur?**

Brachial plexus injuries in newborns (OBPI) usually occur during a difficult delivery. That may be because of a large baby, a breech presentation, or a prolonged labour. They may also happen when the baby must be delivered quickly to prevent more serious harm to the mother and/or the baby, and some force is necessary to pull the baby from the birth canal. The baby’s shoulder may be stretched away from their neck, and injury to the nerves that run from the neck down into the arm may result. A brachial plexus birth injury may therefore be a necessary consequence of being born alive after a difficult situation has arisen.

In older children, brachial plexus injuries may occasionally occur in contact sports, serious falls and car or motorcycle accidents. Very rarely, other conditions such as inflammation or tumours may affect the brachial plexus.

**What are the signs of a Brachial Plexus Injury?**
The nerves which make up the brachial plexus carry electrical signals (like ‘instructions’) from the brain to the arm so that the shoulder, arm and hand can feel and move. If nerves are injured, the muscles do not receive the instructions from the brain to move, so the arm does not move normally and will tend to lie by the baby’s side from the moment they are born.

Most commonly the nerves which control elevation movements of the shoulder and bending of the elbow (C5, C6) are affected. The arm lies with the elbow straight, the wrist bent and the hand pointing backwards. The baby can move his/her fingers. If the C7 nerve root is also affected then there will also be weakness of the wrist, making it drop.

In the most severe cases the nerves to the hand (C8 and T1) are also damaged causing the whole arm and hand to be paralysed.

The baby may not have much feeling (such as hot temperatures or pain) in their arm, may not pay much attention to that side, or may have a change in skin colour (usually more purple or blotchy). Some children with a more severe injury may have bruising and swelling around their neck. Others may have a drooping eyelid and small pupil in the eye on the same side as the injury (“Horner’s Syndrome”).

What Happens to the Nerves and How Does That Affect Treatment?

Whenever brachial plexus injury exists, it simply means that some or all of the nerves that form the brachial plexus have stopped working, so the muscles they supply can’t work. However, nerves can stop working because of very different grades of damage, and only the worse ones need surgery.

In the mildest form (called “neurapraxia”), the structure of the nerve is not affected, but the nerve is stretched and bruised and the fibres stop working for a few days or weeks before recovering fully.

The second grade of damage (called “axonotmesis”) is when the nerve fibres break, but the outer structure of the nerve doesn’t. The nerve fibres die beyond the injury, and then begin to grow again. Recovery of function may take many months as the nerve fibres only grow at a rate of 1mm/day.

The third grade of injury (called “neurotmesis”) is when the whole nerve structure is torn apart and the nerve fibres struggle to find where to grow to and so recovery is very difficult.

The fourth and worst grade of injury is when the nerves are totally pulled out from the spinal cord, an “avulsion injury”. Nerves can’t grow back into or out of the spinal cord and cannot repair themselves.

The grade of injury to the nerves determines the speed and extent of recovery. Nerve repair surgery may be recommended as a baby, for the more
severe grades of injury. Usually that decision is finalised when they are about 3-4 months old.

How is the severity of injury and recovery predicted?

There’s unfortunately no way at the start to tell accurately what the grade of injury is to each nerve that has stopped working. So it is unlikely that on your first visit to a clinic that your specialist will be able to tell you precisely how well your child will recover, or if they’ll need surgery.

There are some ways that your surgeon and therapist can assess the grade of injury to the affected nerves, and best advise on how to look after your child.

1) **The Extent of Paralysis:** In general, the more movements that have been lost, then the more severe the grade of injury to each nerve. The opposite is also true. The fewer movements that have been lost, then the milder the injury to each nerve - the recovery will be better and surgery less likely to be needed. So from the beginning it's important to remember exactly what your baby can and can't do with their arm (can the fingers and wrist bend or straighten, do they bend or straighten their elbow, what movements can they make at their shoulder). Also check whether or not they have one eyelid that hangs slightly more shut than the other, or have one eye with a pupil (the black part in the middle of the eye) that is bigger than the other one (called “Horner’s Syndrome”).

2) **The Speed of Recovery:** Because milder nerve injuries begin to recover faster than worse injuries, your surgeon & therapist will want to see how your child’s movements change over the first 3-4 months. It is also important to remember how old your baby is when lost movements begin to re-appear. The most important movement to note down is if they start to bend their elbow by themselves.

3) **Tests & Scans:** No scans or tests can completely define the injury, but they may be requested since they can add more evidence to help your surgeon judge the best treatment.

   a. *Ultrasound scans* like the ones used during pregnancy, can help judge is your baby’s shoulder joint has been affected early on.
   b. *MRI scans* can help look at either the shoulder joint, or give some more information about the nerves in the neck (mainly to see if there has been “avulsion”)
   c. *Neurophysiology tests:* these use electrical recording to see if muscles have nerve supply, or if nerves are able to carry electrical signals.
What is the outcome of Brachial plexus Injury?

Outcomes are very variable. Some babies recover fully within weeks, others recovery pretty well over a number of months, but in a small proportion recovery is slow and incomplete.

In over half of cases, the injury heals itself within the first month to six weeks. About 80-90 percent of children make a complete or nearly complete recovery within the first year (they regain all movements). In children who don’t get all their movements back, it’s most often some shoulder movements that don’t recover. Loss of use of the hand is rare.

Some children will develop growth problems in the affected shoulder, and need shoulder operations, or muscle transfers to try to normalise growth. Their arms, collarbones, and shoulder blades may end up somewhat smaller than normal, but it is very rare to require any operations for this.

Overall, children with obstetric brachial plexus injuries do very well in life, no matter what the severity of the injury.

What is the Treatment for Brachial Plexus Injury?

It must be remembered that nature’s healing enables the majority of children to improve with time.

1) Physiotherapy

Physiotherapy should be started early for your child. Along with your local therapist, our Specialist Physiotherapist will assess the movement of your child's arm using a special scoring system. They will also show you the movement exercises that you need to do on your child's arm. Because your child can’t move their arm by themselves the joints may become stiff. The exercises will help to stop this happening. If joints remain flexible then there is a better chance of the muscles working well as the child improves.

Different nerves supply different muscles, and may be affected differently. So muscles around the shoulder can become out of balance with each other. That puts the shoulder joint at risk of developing abnormally, or even of gradually sliding out of position (dislocating). It is therefore particularly important that shoulder exercises are done as often as possible.
2) Surgery to Repair the Nerves

Most children will not need nerve repair surgery, but for some it will be of benefit. The decision needs to be made when the baby is 3 - 4 months old, or else the muscles begin to waste and the benefit of nerve repairs becomes lost. Babies usually cope very well with this operation, and of course will have no memory of it.

Nerve operations firstly involve releasing scar tissue, looking at, and testing the brachial plexus nerves to decide if they should be repaired (called the “exploration”). This is the most sensitive way to judge the grade of injury, and so occasionally the surgeon will decide that the nerves are best left alone to continue to recover.

More often the surgeon finds that in fact the nerves are damaged badly enough that they won’t grow back well, and so nerve repairs are done in the same operation. Most often “nerve grafts” are used to repair the nerves, after the damaged parts have been removed. This involves taking a relatively unimportant nerve from another part of your child’s body and “plugging it in” to bypass the damaged portion of brachial plexus nerve. Usually these grafts are taken from the back of the leg. Scars are kept to a minimum.

Even after such surgery there will be a considerable delay before we see the outcome, as the nerves still need to re-grow and repair themselves.

3) Shoulder Surgery

If your child’s shoulder becomes a problem, we may suggest a range of treatments from manipulations, injections, application of plaster casts or even a bigger operation to put the shoulder in the correct place. These can be combined with surgery to the muscles, tendons or bones around the shoulder to provide power to an area which would otherwise be too weak to work properly.

If your child may require any form of surgery, this will be discussed fully with you. The benefits and risks involved will be explained to you and, any questions you have, will be answered. This will let you have the information you need to make the decision about whether to have the operation on your child or not.

4) Occupational Therapy

Occupational Therapy (OT) may be necessary depending upon your child’s development and functional needs. In pre-school or early primary school age children, therapists can assess for the development of normal milestones, and patterns of hand use, writing, and play. They can provide strategies, play, or aids to correct problems, or to make it easier for children who have not regained full function to do more. That may involve work with nurseries, or later on in schools. For older children with specific functional problems they may be able to provide tools to enable them to do more.
Living with a Brachial Plexus Injury

It's normal to feel devastated by the diagnosis of a potentially serious condition in your child. We will endeavour to provide as much knowledge and support as is reasonable to help you to come to terms with the diagnosis. We would also recommend contacting a support group, such as the Erb's Palsy Association. However it's very clear that most children diagnosed with a brachial plexus injury will make very good progress and regain good use of their affected arm.

Children adapt very well, so even those left with some muscle weakness develop ways to take part in most activities along with their friends and classmates.

Unless your child recovers fully at a very young age, they will be offered review on a regular basis at the multi-disciplinary clinic until they outgrow our services at the Children’s Hospital. At particular times in their life, they may require further help, and this will commonly be arranged through our Occupational Therapy colleagues, or Clinical Psychology Service (who specialise in such problems in children). With your help we aim to identify specific problems and help your family and your child to adjust to the impact of a brachial plexus injury.

Please do not hesitate to contact us if you wish for any further advice or information, need assistance or early review.

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Useful Links

Our website:  www.brachialplexus.scot.nhs.uk

Erbs Palsy (UK) Support Group  http://www.erbspalsygroup.co.uk