

*This Information Sheet has been written by Aidan Cosgrove. He is a Consultant Orthopaedic Surgeon at Musgrave Park Hospital in Belfast*

Hemiplegia is caused by damage to nerve tissue in the brain. This leads to a loss of control, especially in the limbs on the side affected by the damage. At present, it is unfortunately not possible to repair the damage within the brain. This doesn't mean that motor control cannot be improved by therapy and training. However, at present most of our surgical efforts are directed towards the physical effects of the neurological damage. Although we cannot take away the underlying abnormality, in situations where this leads to deformity which interferes with the working of the body, significant improvements can be made with surgery.

## Treating children

In children with hemiplegia there is often a disturbance of growth in the affected limbs, particularly of muscle and to a lesser extent of bone. This is most marked further along the limb. For example, we often see the calf muscle in the leg becoming tighter with growth and the child increasingly walking on their toes. This is often more marked in children whose muscles work poorly at the front of the leg. These effects can be reduced with the use of physiotherapy and AFOs (splints). More recently treatment with Botulinum Toxin has been effective in improving leg and arm function for many children. But even with the best care, it is often necessary to think about surgical correction for the best results.

## The physical effects

### The arm

In the arm, deformities tend to be more marked further out. The thumb tends to become tight into the hand, the wrist can become bent downwards, the elbow is flexed and the arm is turned in at the shoulder. The posture of the arm during walking and especially running often makes this appear worse.

Unlike children with other types of cerebral palsy, children with hemiplegia very rarely develop more central deformities such as scoliosis or dislocation of the hip.

### The leg

The actual deformities that occur vary from child to child, depending on the effects of their impairment. The most frequently seen problems in the leg are the turning in of the foot (although in some children the foot turns out), bunions, deformities of the toes, tightness in the calf muscles and tightness in the hamstring muscles leading to bending of the knees. In the bones most children have a slight decrease in length, generally about an inch shorter than the other leg. Occasionally children may also develop a twisting inwards of the thigh bone and also a twist in the lower leg, either inwards or outwards. People with hemiplegia also tend to walk with the affected side of the pelvis a little bit behind.

## Goals of surgery

### The leg

Although cosmetic surgery may not sound terribly rewarding, it is the appearance of their leg which is often the most distressing to children, especially once they reach adolescence and particularly as most children with hemiplegia have very good use of their lower limb. The problems seen in the leg are very different from those in the arm. It is necessary to use both legs for walking and running, and as these are repetitive patterns of movement, it is often possible to achieve a high level of functioning even with a lot of neurological impairment.

### The arm

Unlike the lower limb, each arm can act independently and do very complex and varied tasks. This requires a lot of feedback and perception of the limb. In many children with hemiplegia, the good arm is preferred very strongly, with the affected arm either not used at all or relegated to very simple tasks such as clasping. Therefore, even if deformities are corrected it is very unlikely that this will result in improved function.

This means that the potential for upper limb surgery is very limited compared to lower limb surgery. Upper limb surgery is largely used to improve the appearance of the arm and hand. However, in rare instances deformity in the upper limb can give rise to problems such as a thumb digging into the palm and in these cases surgery can relieve the irritation.

## Surgical Procedures

The surgical procedures used in hemiplegia are generally quite straightforward and involve lengthening or moving the tendons of muscles or stretching the muscle bodies themselves, stabilising joints and sometimes the cutting and re-orientating bones (Osteotomy). The most difficult aspect of surgery is deciding what surgeries to perform and the best time to perform surgery.

*At 12 I had the op where my tendon on my right foot was stretched and straightened because it was going inwards, resulting in my toe-walking. It was very successful, (despite giving me a phobia of needles!) and I now walk with my foot flat, though I cannot do the heel-toe thing physios always go on about.*

Nowadays most surgery of this type is performed by orthopaedic surgeons who specialise in the management of children. Gait analysis is often used to study walking patterns and help decide on the appropriate surgery. This involves attaching sticky markers to the skin and using cameras linked to a computer to build up a three dimensional picture of the child's movements: it's similar technology that filmmakers use for actors to 'animate' creatures in films like King Kong, Lord of the Rings or Narnia. It also uses instruments in the ground to measure the forces involved, and electrodes can be used to measure the activity in the muscles.

*I had it done twice when I was a child, I loved it too, had loads of little silver balls stuck to my legs and hips, had to walk up and down whilst being recorded by sensors and a normal video camera. From that they could determine what action to take for my foot.*

## Timing of Surgery

Timing of surgery is important. If done at an early age when there is a lot of growth left, the deformities can come back. If the surgery is done at maturity, deformities can be quite difficult to correct and rehabilitation can be difficult. Generally the best time is when the patient is between six and eleven years old. However, it may be necessary to perform surgery earlier than this if deformities are quite severe. There is a large window of opportunity, so the surgery can be timed to fit in best with other considerations such as schooling and availability of physiotherapy.

*My daughter had a tendon lengthening operation when she was in reception (she is now 8.5) and it has been successful in keeping her foot flat on the floor. I cannot remember her complaining of any pain, although the hospital were very good with pain relief and we had a supply when she came home*

Orthopaedic Surgery in hemiplegia generally requires an inpatient stay in hospital, the length depending on the extent of surgery. In recent years there have been considerable advances in the management of pain, with the use of regional blocks (such as epidurals) and the use of patient-controlled pumps for post operative pain. Most surgery can now be performed without any significant pain. After surgery, it is often necessary to immobilise the area in a plaster cast, generally for about six weeks. It may then be necessary to use splints to ensure that the correction that was achieved at the time of surgery is maintained.

## Rehabilitation

Rehabilitation after surgery is critical. Without good physiotherapy, deformities can readily come back. The rehabilitation period often takes quite a long time and it may be a year or longer before the full benefits are seen. This all means that before surgery is undertaken a plan should be made to identify the resources that will be needed for rehabilitation. There is not much point in doing surgery if it is then going to take four or five months to get new splints or there is no physiotherapist available.

In summary, surgery will be very helpful for many children with hemiplegia at some stage in their lives but it needs to be part of a whole package of care to ensure that they are able to achieve their full potential.

See also **HemiHelp's** information sheets on **AFOs/DAFOs** and **Lycra Splinting**

*HemiHelp has a range of information sheets for both families where there is a child with hemiplegia and adults with the condition, as well as a Useful Names and Addresses List to help you contact other organisations.*

**Hemiplegia** is a neurological condition that weakens one side of the body and affects one child in a thousand. It is sometimes described as a form of cerebral palsy and the effects are similar to those of a stroke. **HemiHelp** is a membership organisation offering information and support to children and adults affected by hemiplegia and their families.

*HemiHelp is happy for you to make photocopies of any part of this document.*

*Helpline: 0845 123 2372 (Mon-Fri 10am-1pm)*

*Admin: 0845 120 3713 • Fax: 0845 120 3723*

*Email: support@hemihelp.org.uk • Web: www.hemihelp.org.uk*

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