



Head injury in children: information for families

Children are incredibly active and they have little sense of danger so it is not surprising that they are prone to head injuries. In addition, their heads are large in proportion to their bodies and therefore more vulnerable to damage than adult heads. This information sheet from Great Ormond Street Hospital (GOSH) explains the effects that a head injury can have on a child. It also sets out the treatment and care of any complications following a head injury.

Head injuries may involve the scalp, the skull, the brain or its protective membranes.

Skull fractures

These may be uncomplicated, in which case they can heal without surgical treatment. However, a depressed skull fracture, where part of the skull bone has been pushed inwards, may require surgery to lift the bone and prevent it pressing against the brain.

If the scalp is injured and there is an underlying skull fracture that exposes the brain, an operation will usually be needed to clean the wound and repair the damaged skin and bone.

The force to the head during injury can make the brain move within the skull. As the inside surface of the skull is rough, the following injuries can occur:

Cerebral lacerations are tears to the surface of the brain, which sometimes happen after the skull is fractured. Bleeding can occur in and around the tear.

Cerebral contusions are bruises to the brain, caused when the brain bounces off the inside of the skull. Contusions can cause parts of the brain

to swell, which may make your child irritable, sleepy or sick.

Shearing injuries tear the nerve fibres and blood vessels. These injuries often lead to swelling of the brain, contusions (bruises) or blood clots.

Haemorrhage (bleeding) following head injury

Acute sub-dural haemorrhage can happen at the time of the injury or several hours later. They can be caused by the blood vessels in the brain rupturing, bleeding from bruises on the brain or cuts to the brain.

Blood collects in the sub-dural space, which is beneath the dura and directly on to the surface of the brain. An acute sub-dural haemorrhage will often require surgery as an emergency to remove the blood. In babies, a small needle can be inserted through the fontanelle or 'soft spot' to draw off the blood.

There may be persistent bleeding in the sub-dural space. This sometimes makes it necessary to drain the area several times or a shunt (a drainage tube) can be inserted into the area containing the bleed to drain the blood into another part of the body.

Chronic sub-dural haemorrhage forms more slowly than acute sub-dural haemorrhages and do not always require surgery. They can develop several weeks or months later following a head injury and therefore symptoms may not be noticed straightaway. Surgery may be required to drain the blood or they are left for the body to reabsorb which can take up to three months.

Extra-dural haemorrhage is where blood collects in the space between the skull and the dura. It is usually the result of a tear to an artery in the temporal bone (the bone at the side of the head). This is classed as a neurosurgical emergency and urgent surgery is often necessary to drain the blood from the extra-dural cavity.

Intra-cerebral haemorrhage is bleeding within the brain usually following a contusion or laceration. On most occasions, no surgical treatment will be needed as the body reabsorbs the blood over time, but occasionally an operation may be necessary.

Possible complications of head injury

Swelling of the brain affects most children after a severe head injury. It can occur within hours or it may not happen for a few days. This swelling causes a rise in pressure within the brain (intra cranial pressure or ICP). The way we monitor intra cranial pressure is explained in greater detail later.

Seizures (fits/convulsions) may happen immediately after the injury or several days later. They are generally caused by irritation to the brain from swelling or bleeding. If your child suffers a seizure or a convulsion, it does not mean that they have epilepsy or will continue to have seizures for the rest of their life. Your child will be given medication to help prevent seizures. This medication will eventually be reduced and sometimes stopped completely but this may not happen for some time after the head injury.

Infection may be at risk if the skin or the skull has been broken, both at the time of the injury and afterwards. If we have identified the source of the infection (using a series of blood tests, swabs, urine tests and/or x-rays) we will give your child antibiotics, either by mouth or directly into the bloodstream.

Monitoring your child

While your child is recovering from a head injury it will be necessary to carry out regular observations, sometimes as often as every quarter of an hour, to assess their conscious level.

A nurse will assess your child's limb movements, verbal response, shine a light into their eyes and take their pulse, blood pressure and temperature.

If your child is asleep, the nurse will wake them to perform these observations. This may seem very disruptive but it is vital that we recognise any deterioration in conscious level early so we can take the necessary action.

Assessing a child's head injury

It is routine procedure for all children under the age of two years, who have suffered a head injury to be seen at GOSH by a social worker, consultant neurologist and ophthalmologist as well as having routine bloods and x-rays of the whole skeleton.

There are several methods we can use to better understand the injuries caused to your child's brain and skull.

X-rays allow us to see any fractures in your child's skull. Your child will have to lie still for a few moments while the x-ray is taken.

Computerised tomography (CT) scans show us a cross section of your child's brain and allows us to see any injured areas. Your child will have to lie still for about a minute on a narrow bed that slides into a scanner. The machine is slightly noisy. Sometimes we need to inject a dye into your

child's bloodstream via a cannula to give us a clearer picture, but this is not always the case.

Magnetic resonance imaging (MRI) scans are similar to a CT scan but it is very noisy and can take up to two hours, so if your child needs an MRI scan they will probably be sedated or given a general anaesthetic. An MRI scan gives us a highly detailed, multi-layered picture of the brain. It is not always needed in the early stages of a head injury.

Intra cranial pressure (ICP) monitoring involves the insertion of a fibre optic sensor onto the surface of the brain or dura. The sensor is attached to a monitor that allows us to see the pressure caused by any swelling within your child's skull. The sensor is put in while your child is sedated or under general anaesthetic and can remain in place for a number of days. It can usually be taken out without causing your child much discomfort but sometimes they will need to be sedated.

An **electroencephalogram (EEG)** detects and records electrical signals between nerve cells in the brain. It helps to assess brain activity and detect signs of seizures. An EEG can be done on the ward. Up to 20 leads are attached to your child's scalp using a transparent sticky gel. The signals are transmitted to a computer that records them as waves on a sheet of paper. This test takes between 30 minutes and an hour.

Treatment

There are many forms of treatment that might be needed following a head injury. Which are needed will depend on the severity and effects of the head injury.

Ventilation

Your child may be attached to a ventilator, which assists their breathing. This is often necessary following a severe head injury and also allows

their body to rest and encourages the brain swelling to settle.

Medication

Your child may be given medicines such as steroids or diuretics to help reduce swelling. They may also be given medicines to maintain their blood pressure at a certain level to help reduce the complications caused by raised intra cranial pressure. The nurses or doctors caring for your child will explain the action and side effects of any medicines used fully to you.

Removal of blood clots

Surgery may be needed to remove any blood clots that have formed in your child's brain. If surgery is not carried out, the body usually reabsorbs them over time.

External ventricular drainage (EVD)

This involves an operation to implant a small silicone tube into a ventricle or sub-dural space. The device draws off blood that has formed as a result of the head injury as explained previously or cerebrospinal fluid (CSF), which is the fluid that is continuously made and circulates around the brain and the spinal cord. By draining this fluid off, intra cranial pressure can be reduced. An EVD may exit at the head or abdomen.

After-effects of your child's head injury

It is very common for children to become extremely agitated as they recover consciousness and wake up after a head injury. This agitation can be increased if they have been sedated and on a ventilator as the medicines used start to wear off.

Children may thrash around in bed, pull at tubes or lines and cry or moan. The nurses caring for your child will make sure that they are safe at all times, particularly during this period of agitation.

It is common for children who have suffered even a relatively minor head injury to develop 'post-concussion syndrome', where they experience difficulties with concentration, memory and abstract thinking. They may feel lethargic, experience dizziness or their behaviour and sleep patterns may change. These problems can be difficult to deal with because they are often not immediately obvious and are hard to treat.

Any long-term problems experienced by your child depend partly on the injury itself. If the damage was to the left side of the brain, they may suffer weakness down the right side of the body, and vice versa.

Rehabilitation

A serious head injury can have lasting effects. A team of people will work with you while your child is in hospital or a rehabilitation centre to help them achieve as full a recovery as possible.

If your child has been unconscious, it is important to explain to him that they are in hospital following an accident. We encourage you to bring in familiar toys, pictures and music to help make your child feel less anxious. Sometimes it helps to use a communication board with simple pictures and words.

If your child remains unconscious for a long period, it is important to continue talking to them. It is also important that siblings and friends remain involved; they can be encouraged to send cards, pictures, gifts or tapes with favourite songs, for instance. It is also important that your child has the opportunity to rest or have quiet time during the day.

In some cases it will be necessary to feed your child through a tube. The nursing staff will do this initially but if you wish later on you can learn how to do it. Your child's face, and particularly their mouth, may also be affected by weakness. This can make swallowing difficult and may therefore affect their ability to talk and eat. A speech

therapist will give you and your child advice about this.

The rehabilitation team will include a physiotherapist. They will assess any restrictions in your child's movements or any problems with their balance. They will then do specific exercises with your child to help them move more easily and cope with these difficulties. The physiotherapist may devise a stretching programme and/or make splints for your child's limbs. Physiotherapists will also help your child with breathing exercises and coughing if they have a bad chest.

Your child may also receive help from occupational therapists, who can offer advice about daily activities such as dressing. They may also be able to recommend, and possibly provide, specialist equipment like seating. The physiotherapist and occupational therapist may continue to work alongside you and your child after you have left hospital or they may refer you to local services to continue this work.

The social worker is a member of the multidisciplinary team. Their role is to provide practical and emotional support for parents and carers during the inpatient stay. They recognise that this is a stressful time for the entire family and can give support to siblings and other family members, arranging more specialist input if necessary.

They can liaise with employers, schools and other community professionals. They can advise on childcare issues and if needed, arrange extra support from local teams. The social worker works with social workers at the local hospital to ensure that the discharge from there is planned and coordinated with effective support plans in place.

There is a family support worker in the Social Work department who can offer practical and financial assistance to a family during their inpatient stay.

The play specialist on the ward plays a vital role in your child's rehabilitation. They use play to help prepare your child for investigations and operations and offer support throughout the hospital stay. They can also help with discussing your child's condition with siblings and encourage activities that they can do together.

Your child may become frustrated because of an inability to do things as well as before the injury. It is important to reassure them that things will improve, although it can take many months. It can help to keep a daily diary recording your child's progress. They may be able to help to make the diary, which should create a sense of achievement. A psychologist can assist your child with many areas, including such frustration.

A child who has suffered a head injury needs routine and we try as far as possible to keep to a daily timetable including regular rest periods. Sometimes, however, the level of care required by a critically ill child means that it is impossible to maintain a routine.

It is important that you keep in touch with your child's school throughout their stay. Children who have suffered a head injury often have problems that affect them at school – for example, memory loss and tiredness – and it is vital that their teachers know about this when they go back.

Visits from friends and family, even if they are short, help to make your child feel more "normal". Brothers and sisters of an injured child can feel frightened and excluded and it is important to include them whenever possible. They need to be able to express their feelings and you should try to give them time alone with at least one parent to reassure them that they are still important.

Recovering from a head injury can be a long process and it is important that you as parents look after yourselves, too.

After your child leaves GOSH

Once your child leaves the hospital, they may continue to receive care locally. If they have suffered severe long-term effects as a result of head injury, we may refer you to a specialist rehabilitation centre. Long-term follow up clinics are held at GOSH and your child's progress will be monitored at these appointments for a while after the original injury.

Glossary

You may hear the team use these words when discussing your child's treatment and care:

Anticonvulsant – medicine used to control fits or seizures

Burr hole – surgical hole made in the skull

Cerebrospinal fluid (CSF) – fluid made naturally by the brain that circulates around the brain and the spinal cord

Contrast – dye injected during a CT or an MRI scan

Craniotomy – operation to open the skull in order to reach the brain

Extra-ventricular drainage (EVD) – system used to measure the production of cerebrospinal fluid or relieve pressure within the brain by draining off fluid

Hemiplegia – weakness of the face, arm and leg on one side of the body

Hydrocephalus – an excess of cerebrospinal fluid inside the skull because of a blockage that stops it from flowing normally

Intracranial pressure (ICP) – pressure within the skull

Ventricle - small cavity within the brain that is filled with cerebrospinal fluid

Further information and support

If you have any questions or concerns, please telephone Koala Ward on 020 7829 8826

Child Brain Injury Trust – www.childbraininjurytrust.org.uk

HEADWAY – The National Head Injuries Association = 0800 800 2244 Or www.headway.org.uk

The Children's Trust - 01737 365 000 or www.thechildrenstrust.org.uk

The British Institution for Brain-Injured Children (BIBIC) – www.bibic.org.uk

Young Minds - 0800 018 2138 or www.youngminds.org.uk