



Posterior vault expansion

This information sheet from Great Ormond Street Hospital (GOSH) explains about the posterior vault expansion operation, which is used to treat craniofacial disorders. It explains how to prepare your child for surgery as well as what to expect in hospital afterwards.

What is a posterior vault expansion operation?

A posterior vault expansion operation is a type of operation used to enlarge the space within the skull to allow the brain to grow and develop.

The skull is made up of several 'plates' of bone which, when we are born, are not tightly joined together. The seams where the plates join are called 'sutures'.

As we grow older, the sutures gradually fuse (stick) together, usually after all head growth has finished. When a child has craniosynostosis, the sutures fuse before birth. It can affect one suture or several.

When one or more sutures fuse too soon, the space inside the skull cannot expand as a child grows. This can put pressure on the brain (raised intracranial pressure) which can have significant long term effects on visual function and neurological development.

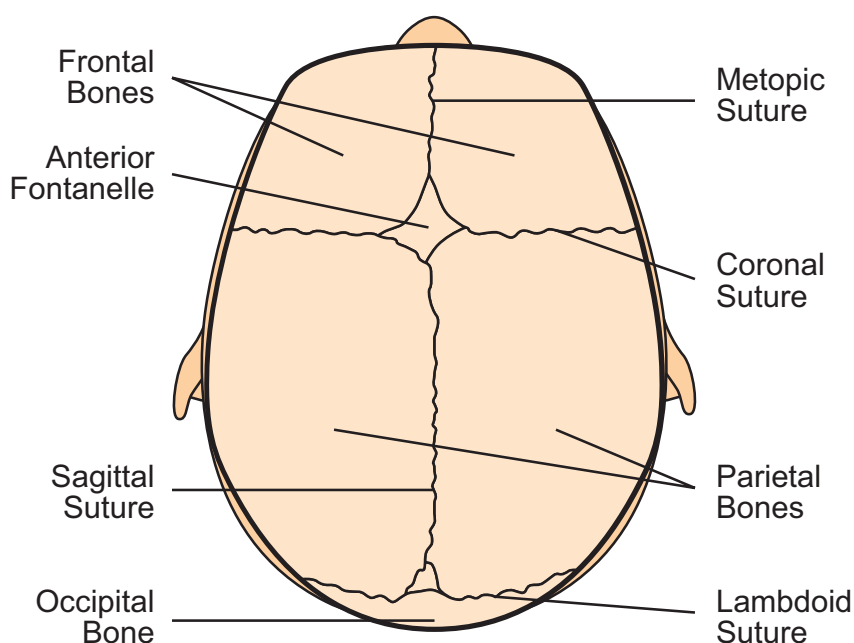
There are two main types of posterior vault expansion operation – the main difference between them is the method used to expand the space inside the skull. The most common method used at GOSH is to insert metal springs that gradually widen a gap made between the skull bones, which encourage new bone to grow in between the two cut surfaces. Another method sometimes used at GOSH is a bone graft – this is bone taken from elsewhere in the skull and fixed in place to fill the gap.

Posterior vault expansion surgery tends to be carried out to treat raised pressure within the skull (intracranial pressure) when it occurs. This can happen at any age throughout childhood although usually before 10 years of age. Raised intracranial pressure can occur in the following types of craniosynostosis.

- Crouzon syndrome
- Pfeiffer syndrome
- Apert syndrome
- Saethre-Chotzen syndrome
- Muenke syndrome
- Bicoronal craniosynostosis

Posterior vault expansion may be the only form of treatment needed or it may be just one in a series of operations carried out throughout childhood and adolescence.

Normal Skull of the Newborn





What happens before the operation?

Pre-admission clinic

Preparing for a planned operation, test or procedure before coming in to hospital avoids delays and reduces the risk of cancellation. The results of any tests and investigations are available in plenty of time and can also be re-checked if they are not within the normal range. Your child may need various blood tests before the operation – this depends on your child's medical condition and the nature of the surgery that is planned.

The doctors and/or nurses will meet you and your child to take down their medical history and any other information needed before your child is admitted to hospital. The nurses will explain about any care your child will need before and after the operation. If your child has any medical problems, particularly allergies, please tell the doctors about these. Please also bring in any medicines your child is currently taking.

You may be seen by one of the team carrying out your child's operation and be asked to give permission for the procedure by signing a consent form. If you give your consent at the pre-admission appointment, you will need to confirm that you still agree to the procedure on the day of admission.

One of the team will explain about the types of anaesthesia that are used at the hospital, and also about options for pain relief after the operation, test or procedure. If there are any questions or concerns about your child's anaesthesia, an anaesthetist may come to see your child in the pre-admission clinic.

The night before surgery

You will be asked to give your child a bath or shower and hairwash before surgery.

It is important that your child does not eat or drink anything for a few hours before the operation. This is called 'fasting' or 'nil by mouth'. Fasting reduces the risk of stomach contents entering the lungs during and after the procedure.

You will be informed the night before the procedure of the time that your child should be 'nil by mouth' – in other words, have nothing to eat or drink before the anaesthetic. In broad terms, this is six hours for food (including milk), four hours for breast feeding and two hours for clear fluids before the procedure.

It is equally important to keep giving your child food and drink until those times to ensure they remain well-hydrated and get adequate nutrition. This may involve waking your child in the night to give them a drink which we recommend.

On the day of surgery

Please come to Puffin at the time stated in your admission letter. One of the nurses will check that your child is well enough for the operation, complete some paperwork with you and take some baseline observations of their temperature, heart rate and breathing. If you did not give your consent for the operation at the pre-admission appointment, a member of the surgical team will visit you to explain about the operation and ask you to sign a consent form. All children are seen by the anaesthetist on the day of the operation.

What anaesthetic is given?

Your child will be given a general anaesthetic by an anaesthetist who specialises in giving anaesthetics to babies and children. Both parents will be able to go with your child to the anaesthetic room and stay until they are asleep. This usually involves your child breathing some anaesthetic gas. Later, a tube is passed into the airway (trachea) to safeguard breathing. A cannula (thin, plastic tube) is put in a vein and usually left in place for a short time after the operation. Fluids can be given to your child through this tube during the operation and afterwards if necessary.



What does the operation involve?

Posterior vault expansion is carried out while your child is under general anaesthetic. When your child is under general anaesthetic, the surgeon will clip your child's hair just over the incision site and fix the rest of their hair out of the way. They will make an incision over the top of the head, from ear to ear and pull the skin downwards over the back of the head to expose the skull.

Next, the surgeon will cut through the skull behind the coronal sutures and move the back portion of the skull backwards, leaving a gap between the cut surfaces of the bone. If springs are being used to expand the posterior vault, these are attached to the two portions of skull bone leaving a thin gap in between the two cut edges. Sometimes two springs are used, sometimes four. The surgeon will judge during the operation what number of springs will give the best shape to the skull. If bone grafting is being used, bone from elsewhere in the skull is taken and fixed into the gap.

The skin is then closed over the incision site and held in place with dissolvable stitches. One or two drainage tubes will be left in place to drain off any fluid that collects after surgery – these will be removed a day or two later when no longer needed. Finally, the surgeon will put

a head bandage over the operation site. Your child will then be taken to the Recovery area to start to wake from the anaesthetic.

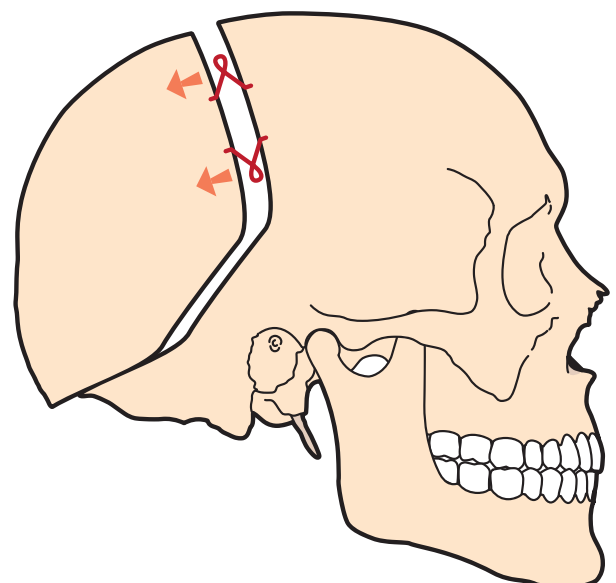
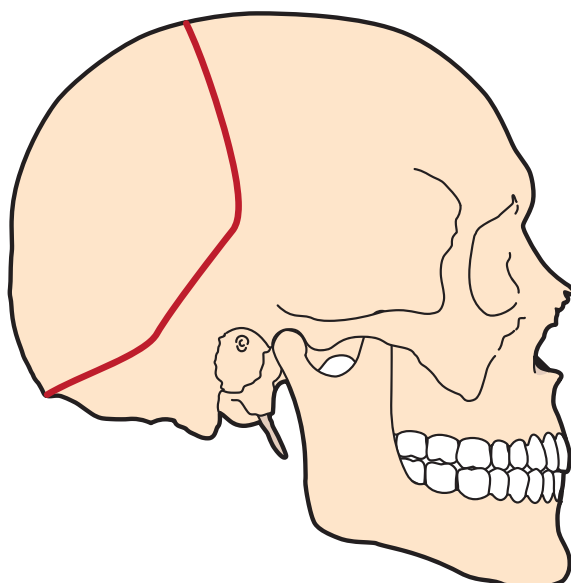
Are there any risks?

Healthy children usually cope well with the anaesthetic, but the risk increases if your child has other problems.

All surgery carries a small risk of infection or bleeding. To reduce the risk of infection, your child will be given an initial dose of antibiotics during the operation. This will continue as an infusion into a vein (intravenously) for 24 hours after surgery.

Your child will be monitored very closely during and after the operation to identify any blood loss. A blood transfusion may be required but the surgeon will have ensured that donated blood of the correct type is available if needed.

This surgery requires separating the skull bone from the protective layer covering the brain (the dura), a process which can, in a tiny proportion of cases, cause brain injury or bleeding inside. Therefore, any craniofacial operation carries a very small chance of causing serious complications such as seizures (fits) or stroke (brain damage), which may in some very rare cases be life-threatening. The overall risk of a major neurological event or





death is much less than one per cent (less than a 1 in 100 chance).

Sometimes small holes can be made in the dura during the operation, which do not pose any risk to the brain, but which can occasionally be the source of a leak of cerebro-spinal fluid (CSF; a clear, watery fluid that surrounds and cushions the brain). The surgeons usually identify and repair (stitch) any holes during the operation. Despite this, sometimes children develop a CSF leak after surgery, which may show up as a fluid-filled swelling at the operation site or a leak of clear, watery fluid from the wound. It will be explained to you what to do if you notice these problems after discharge from hospital, as sometimes further procedures may become necessary to stop the leakage if one occurs.

The incision site will start to heal and will eventually fade until it can hardly be seen. The hair will also start to re-grow in the days following surgery.

Spring insertion carries some specific risks, such as failure or dislodgement of the springs. The springs are made within the hospital by our Biomedical Engineering department and tested thoroughly to ensure that they are strong enough to give the desired result. Failure or dislodgement will not usually be harmful but could mean that the operation needs to be repeated to ensure the space inside the skull expands enough.

Are there any alternatives to this operation?

Posterior vault expansion surgery is the preferred option to enlarge the space within the skull to allow the brain to grow and develop. Without treatment, pressure inside the skull can press on the optic nerve affecting vision and reduce the amount that the brain can grow as your child grows older. It can also lead to a condition called Chiari malformation where the base of the brain (cerebellum and brain stem) is pushed downwards out of the base of the skull.

What happens after the operation?

Once your child has started to recover from the anaesthetic, they will be brought back to Koala Ward to continue recovering. At the end of the day, the doctors will visit you to talk about the operation.

They will spend the first night in the High Dependency Area on the ward, where a nurse will monitor them closely to watch for any signs of bleeding and fluid imbalance. They will carry out regular observations of their breathing, heart rate and temperature throughout the rest of the day and night.

Your child may feel sick after the operation, but the doctors will give them medicines to reduce this. The sickness should pass within a couple of days. Your child will be able to start eating and drinking as soon as they feel like it.

The nurses will also assess your child's pain and give them regular pain relief for the first few days – intravenously to start with and then by mouth when they are eating and drinking. The intravenous infusion of antibiotics will continue for the first 24 hours.

Your child should sit and lie in as upright a position as possible to reduce any swelling. Over the next few days, your child will be able to start moving around. Your child is likely to be in hospital for around five days.

Going home

When your child is recovering well and eating and drinking as normal, you and your child will be able to go home. On the day of discharge, the nurses will wash your child's hair gently with a mild shampoo and show you how to do it safely at home. They will also give you a copy of our discharge information which explains how to look after your child and what signs to look out for over the next few weeks.



Follow up appointments

Your child will have a series of appointments after the operation – we will give you details before you go home.

Removal of springs

If your child has had springs inserted, they will need to come back to GOSH after the operation to have them removed. The timing of removal differs for each individual child but is usually around six months to a year after insertion. This involves a short operation under general anaesthetic lasting about an hour. The surgeon will open the incision made during the first operation and gently remove the springs, checking formation of new bone tissue while they do this. They will then close the incision using dissolvable stitches as before. Your child will spend two nights on Koala Ward.

What is the outlook for children who have had posterior vault expansion surgery?

Posterior vault expansion has good results for reducing raised intracranial pressure, especially in children with complex craniosynostosis. If pressure rises again later in life, the operation can safely be repeated.

Further information and support

Headlines – the Craniofacial Support Group – is the main support organisation in the UK for families of children and young people affected by a craniofacial disorder. Visit their website at www.headlines.org.uk.

If you have any questions, please telephone the Craniofacial Clinical Nurse Specialists on 07768 526 449 (Monday to Thursday from 9am to 5pm). Out of hours, call Koala Ward on 020 7829 8826.

You can also seek medical advice out of hours by telephoning the GOSH switchboard on 020 7405 9200 and asking them to page the craniofacial doctor on call.