

Bone growth problems after septicaemia

This factsheet describes how bones might be damaged when a child is ill with meningococcal septicaemia. It also describes how bone growth problems can be identified and then treated as children grow.

Children who recover from septicaemia with no visible skin scarring are very unlikely to have damaged bones as a result of disease. However, children with visible skin scarring - especially, if this scarring lies over the joints, are at increased risk. This factsheet explains how bones can become damaged, how damage can be recognised and the ways that it can be treated. More information about skin scarring is available in a separate factsheet called 'skin scarring after septicaemia'.

How does septicaemia damage skin, muscle and bone?

When the bacteria that cause meningitis and septicaemia invade the bloodstream they produce toxins that make the person infected feel ill and feverish. The bacterial toxins attack the lining of the blood vessels so they start to leak, causing the rash of septicaemia, which can develop into larger purple areas of skin. This leaking of blood means that there is not enough blood to carry oxygen to all parts of the body. At the same time, the toxins cause blood clots to form throughout the network of tiny blood vessels in the skin, making it even harder for blood to access all areas of the body. To maintain circulation to the vital organs (the brain, liver, kidneys, heart and lungs), the circulatory system reduces the blood supply to the extremities such as the hands, feet and the surface of the skin. When skin loses blood supply, it is starved of oxygen so that patches of it die off and blacken. This most often happens to tissue on the fingers, hands, toes and feet because the blood has further to travel to reach these areas.

In the same way that areas of skin can die off when blood supply to the area is interrupted, growing bones can also become damaged if the blood supply is cut off. Children have areas of cartilage, called growth plates at each end of their long bones. Cells divide at the growth plates forming new bone, and this is how bones grow longer. In some severe cases the growth plates can die off completely causing bone growth to stop altogether. In other cases, the growth plate can be partially damaged (for example cell division may stop on one side of the growth plate, but not the other) causing the bone to grow at an irregular angle.

Because bones grow slowly, it can take months or even years after the initial illness for problems to appear. Younger children who still have a lot of growing to do are likely to be more severely affected by growth plate damage than older children. After adolescence the growth plate turns from cartilage to bone so adults and children who have finished growing at the time of the acute illness will not suffer growth plate damage as an after effect.

How might growth plate damage affect my child?

Damage to the growth plates in the long bones can cause the bone to grow slower, not grow at all, or to grow at an angle. This type of bone growth can cause problems with the surrounding joints and with your child's posture, or mean that they develop an abnormal walking pattern (gait) or limp. Poor posture or gait can cause strain in other parts of the body and may lead to problems such as joint stiffness and back pain.

How do I know if my child's illness has damaged their bones?

It is not always possible for the doctors who treated your child to tell whether there has been any growth plate damage whilst your child is still in hospital because damage to growth plates cannot always be seen on X-ray or MRI scan images. The more severe the damage to the growth plates, the earlier any growth deformity is likely to become noticeable.

Skin scarring over the joints (particularly the ankle, knee or wrist) may indicate damage to the bones under the scarred area. If your child has scarring in these areas it is a good idea for them to have their limb length regularly measured by their GP or paediatrician as they grow. If there is scarring over the wrist, the doctor measuring your child should also regularly check that there is no loss of wrist or forearm movement. Regularly checking the length and rotational movement of your child's limbs will mean that any problems are likely to be identified early. Early identification and treatment can improve outcome.

How is growth plate damage treated?

If there is a concern that your child's limbs are not growing as they should then your child should be referred to hospital to see a paediatric orthopaedic surgeon. This is a doctor that specialises in the diagnosis and treatment of childhood musculoskeletal (bones, joints and supporting tissues) problems.

At the hospital, your child will be examined by the orthopaedic surgeon and may need to have an x-ray or MRI scan to help find out what the problem is.

If the damage to the growth plates is mild there may be no need for any corrective treatment. Instead, your child may have regular appointments with an orthopaedic surgeon to monitor their growth. Teenagers going through a growth spurt (usually between the ages of 12 to 14 for girls and 14 to 16 for boys) are likely to need more frequent appointments than younger children. If you or your child notices problems or abnormalities between orthopaedic appointments, you should contact the orthopaedic department and ask to be seen sooner.

Some cases can be treated non-surgically by the use of a built-up (orthotic) shoe to correct the child's gait. In some other cases it may be beneficial for the child to undergo corrective surgery. Corrective treatment and the various options available to you will be discussed fully with you and your child during your appointments with the orthopaedic surgeon.

If my child requires surgery is there an optimum age to have this?

Many surgeons prefer to operate on children who are slightly older (aged from 6 years onwards). This is because it can be hard for very young children to understand the implications of surgery and associated recovery. In many cases physiotherapy is an important part of the treatment and recovery so children need to co-operate with any physiotherapy regime prescribed for them. It is easier for a child to comply with their exercise regime if they are old enough to understand why they need to do them.

Some problems may be so severe that it is best for the child to have corrective operations as soon as possible. Your child's surgeon should be able to explain why they are suggesting operating on your child at a very young age or waiting until they are older. They should also explain the risks and benefits associated with both options.

What will the surgery involve?

If you decide to go ahead with corrective surgery, the exact procedure that your child has will depend on the location, type and severity of the growth plate damage. Surgery might involve lengthening or straightening the damaged bone, or even operating on an undamaged limb to prevent future differences in limb length.

Some children who experience growth plate damage at a young age may need to have several corrective operations throughout their childhood.

Your child's surgeon will explain the operation in full, outlining the benefits and risks of surgery. Take every opportunity to ask any questions that you have about the surgery. Prior to surgery key topics to discuss with your child's surgeon include:

- The length of the operation
- Time in the hospital
- The length of recovery time at home
- The rehabilitation plan

A common technique used for lengthening or straightening a limb is to surgically break the bone and then manipulate it into the desired position. In some cases the bone will be fixed into place using pins and a plaster cast applied to keep everything in place whilst the bone heals. In some circumstances, an external fixator might be used. This is an external frame which is attached to the bone above and below a break and regularly lengthened to encourage new bone growth. External frames tend to be used in more severe cases where a lot of extra length is required. More information about external fixators is available in a separate factsheet 'the use of external fixators for limb correction'.

Will my child be in pain after surgery?

There is likely to be some pain after surgery. This is usually at its highest for the first couple of days following the operation. Medical staff will aim to keep your child as comfortable as possible whilst they are in hospital, assess your child's pain and choose the most appropriate treatment to help manage it. This might mean that they are provided with intravenous pain killers to start with and then switched to oral pain killers once the pain lessens.

It is likely that your child will be supplied with painkillers when they return home from hospital and if taken as directed they should remain reasonably comfortable and be able to return to school.

If your child has an external fixator fitted, they may feel an ache, sometimes described as like a nagging toothache, after adjustments are done. If your child experiences any significant increase in pain then it is important to report this back to the hospital or to the GP straight away so that they can investigate the likely cause and try to resolve this.

Acknowledgements

We would like to thank the following people whose expert comments have been invaluable:

Fergal Monsell, Consultant Orthopaedic Surgeon, Bristol Royal Hospital for Children

Sharon Carrie, Paediatric Orthopaedic Nurse Specialist, Bristol Royal Hospital for Children

Alistair Murray, Consultant Orthopaedic Surgeon, Royal Hospital for Sick Children,
Edinburgh

Stephanie Clark, Meningitis Research Foundation (MRF) member

Christine Etheridge, MRF Ambassador and Ben Etheridge, MRF member

Sarah and Peter Bailey, MRF Ambassadors and Ella Bailey, MRF member