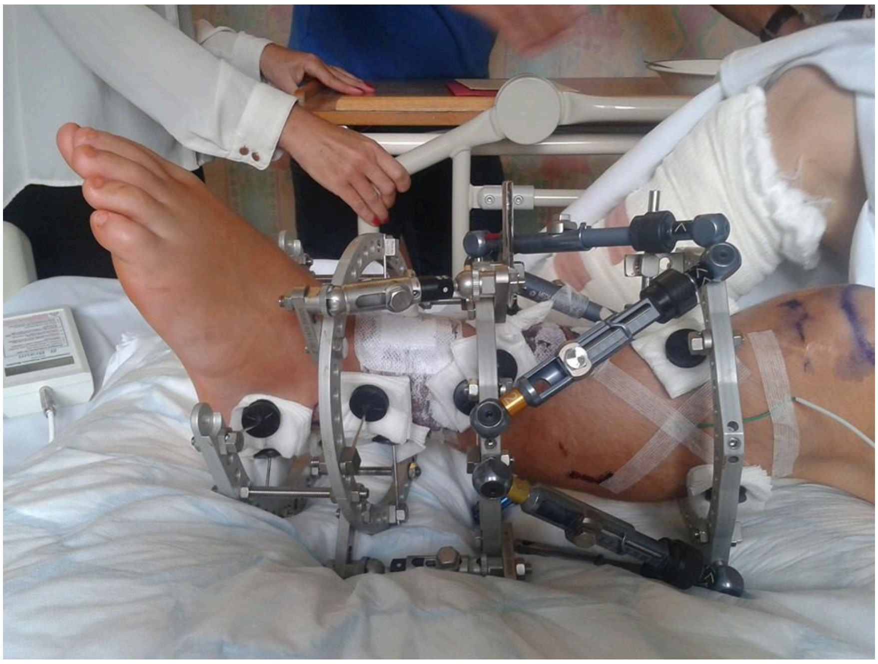
The use of external fixators for limb correction

Some children who have been severely ill with meningococcal septicaemia can be left with damage to their bones causing their limbs to either stop growing, or grow at an irregular angle. This factsheet provides information specifically for children who have been fitted with an external fixator for correcting this. More general information about abnormal limb growth after septicaemia is available in a separate factsheet ‘Bone growth problems after septicaemia’. We recommend that you read both of these factsheets together.

What is an external fixator?

External fixation is a method of immobilising bones to allow a fracture to heal. Once your child has had an operation to surgically break the bone that needs lengthening or straightening, pins from the fixator are attached to the bone above and below the break.

There are different types of external fixation devices, but the most commonly used is the Ilizarov fixator, which is a circular frame that surrounds the limb. The frame may have a combination of wire pins and thicker pins known as half pins which are fixed to both the bone being lengthened and the external frame of the fixator.



© Meningitis Now and Meningitis Research Foundation April 2017. Next review Oct 2018.

The fixator is adjusted on a daily basis to lengthen the bone and/or correct any angular deformity. Gradual lengthening of the fixator enables new bone to grow at the site of the break and the volume of the surrounding soft tissue (such as blood vessels, muscles, nerves and skin) to naturally increase as the bone lengthens.

Once the desired length has been reached, the fixator will need to remain in place so that the limb is kept stable whilst the new bone hardens and heals.

What happens after the fixator has been fitted?

It is likely that your child will remain in hospital for 4 to 5 days after their operation. Adjustments to the fixator will begin after the first few days, and will be made several times a day to open up the gap at the site of the break causing new bone to grow there.

During your child’s hospital stay:

- Staff will teach you and your child how to perform frame adjustments yourselves so that the limb lengthening treatment can continue at home.
- Staff will check and care for your child’s wounds and pin sites (areas of skin around the pin or wire entering the limb). The pin sites are covered with dressings at all times and dressing changes take place on a weekly basis. It can be helpful for you and your child to learn how to perform the necessary pin care and dressing changes ready for when you return home.
- You and your child may be taught how to do various exercises to prevent joints from becoming stiff. They can be time consuming and tedious at times, but are a vital aspect of your child’s rehabilitation. It is very important for your child to keep these exercises up when they return home from hospital.
- It is useful to get advice on how to recognise infection in pin sites before your child is discharged from hospital. Some hospitals may provide you with an emergency supply of antibiotics which can be started as soon as an infection is suspected.

What follow-up appointments will we need?

Whilst the fixator is being adjusted your child will need to attend regular reviews at the orthopaedic clinic. There will always be an orthopaedic surgeon at this clinic and any of the following health professionals may also be present: a physiotherapist, a specialist nurse, a pain specialist, a plastic surgeon. These reviews are often on a weekly or fortnightly basis at first to check that things are progressing as they should, but are likely to reduce to monthly appointments once the frame is no longer being adjusted.

The sorts of things being checked at the orthopaedic follow up appointments are:

- Measuring changes in limb length or correction since the last visit
- Assessing the range of motion of the joints close to the fixator
- Checking pin sites for signs of infection or inflammation
- Checking the fixator for signs of loose wires, nuts and bolts
- Taking X-rays to check progress and assess the quality of new bone growth
- Assessing the condition of the surrounding skin and ensuring the tissue is growing at the correct rate (heavy scarring can cause problems with this)

Your child will have appointments with community physiotherapists as well as seeing a physiotherapist at the orthopaedic follow-up clinics to check progress. Limb lengthening can cause extra pressure on the surrounding joints, so it is important that your child does exercises to prevent these from becoming stiff.

Will the framed limb need special care?

- Infection of the pin sites is a common problem, but keeping pin sites clean can largely prevent this. The pin sites can be cleaned using cotton swabs and saline or other cleaner/antibiotic prescribed by the hospital. All the dressing kit can be supplied when your child leaves hospital and prescriptions for any further dressings can be provided by your GP. If you do not want to perform the weekly dressing changes, the hospital may be able to arrange a community nurse to come out to you and carry out the weekly dressing changes at home.

Detailed advice on pin site care may vary according to the hospital in which your child was treated. The Royal College of Nursing published guidance on pin site care based on expert opinion[1]. The guidance recommends:

- Pin sites should be covered with a sterile dressing at all times
- Pin sites should be cleaned and dressed every seven days
- Dressing changes can take place more frequently than once a week if there is a lot of discharge (which can be orange/yellow sometimes slightly bloody fluid), if an infection is suspected, or if the dressing is wet

- Patients may shower immediately before their weekly dressing changes. Otherwise the dressings should be kept dry

It is important not to allow your child to soak their limb in potentially contaminated water, so swimming or paddling in the sea with the frame on is discouraged.

Your child may be offered hydrotherapy as part of their rehabilitation after the operation. If they do use the swimming pool for this purpose then pin sites should be cleaned and redressed afterwards. Seek advice from the hospital about whether your child can use a public swimming pool recreationally. To keep interference with the pin sites to a minimum it is advised not to get the frame wet more than once a week.

If your child wants to shower more than once a week this is fine but they should keep the limb dry by covering with a bag such as a bin liner. When showering before the weekly dressing change without the bag, it is important to dry the limb and frame afterwards. You can use a clean towel for this or you can dry hard to reach areas with a hair dryer on a cool setting, but do not allow the pin sites to get hot.

The following symptoms are warning signs of infection:

- Swelling, warmth and redness at the pin sites (although a small amount of redness is normal)
- Extremely tender pin sites
- Persistent fever
- Thick, cloudy, white, yellow or green drainage from the pin sites (clear yellow or slightly bloody drainage is normal)
- Odour at the pin sites

If your child has any of these symptoms, call the orthopaedic clinic and tell them about your concerns. Your child may need antibiotics to prevent the infection from spreading.

Will we need any special equipment at home?

During your child's stay in hospital you will have met with an occupational therapist (OT). The OT will make sure that you and your child are able to carry on with as many of your normal daily activities as possible. For example, if the position of the fixator gets in the way of daily self care, the OT can suggest special equipment to help (e.g. toilet seating with a special “cut out” section, or aids to help your child get in and out of the bath easily and safely). Most of the equipment will be available on loan from the OT department, but some may need to be purchased.

For the first few weeks after their operation, your child may need a wheelchair, and this will be supplied by the hospital before your child is discharged home. Crutches may also be required and will be loaned by the hospital.

How long will my child need to wear the external fixator?

This will depend on how much the bone needs to be both lengthened and straightened. On average the frame will need to be on for about 6 months but in more complex cases the frame may need to be on for as long as one year.

As a general rule, a limb can be lengthened by about 1mm per day, making regular small adjustments to the external frame with a spanner (usually a quarter turn adjustment to certain parts of the frame four times per day). As children often have skin damage after meningococcal septicaemia and scar tissue is less stretchy than healthy skin, the limb may be lengthened at a slightly slower rate of ¾mm per day.

Once the lengthening phase is complete, the newly formed bone will need time to heal. The fixator will need to remain in place to support the bone and prevent weight bearing whilst the area of new bone heals. As a general rule it takes at least one month for every 1cm of new bone to harden. If the bone needs to be lengthened by 2cm the frame will need be on for at least 20 days whilst the bone is being lengthened and a further 2 months whilst the new bone heals. Sometimes there are problems that prolong the overall length of time that the fixator needs to stay on.

How soon after the operation can my child return to school?

It is important for children to return to school as soon as they are well enough, so it is a good idea to inform the school once the decision is made to go ahead with your child’s operation. Informing the school should help teachers understand what your child’s needs are likely to be and anticipate any problems they are likely to face when they return. It’s useful to provide the school with pictures of the external fixator which can be helpful for explaining things to class mates and friends.

As your child is likely to need to need a wheelchair for some weeks after the operation the school will need to be wheelchair accessible. The local OT can help the school to prepare for your child's return. Some schools will provide an assistant to help your child.

What follow-up can we expect after the frame has been removed?

Your child will continue to be monitored by the orthopaedic surgeon on a regular basis as they grow. This is important because many children who experience growth plate damage at a young age require several corrective operations throughout their childhood.

Although these procedures can be tedious and disruptive for the family, limb correction with the use of external fixators is beneficial in the long term. Those with limb length discrepancies can have difficulties both physically and psychologically as well as experiencing knock on effects on other parts of the body, especially the joints. Correcting these problems at an early stage will dramatically reduce or prevent future problems.

In consultation with the surgeon, the timing of any further operations can often be arranged to avoid interfering as far as possible with important events in your child's life and help minimise disruption to your child's education.

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

Christine Etheridge, MRF Ambassador and Ben Etheridge, MRF member

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

Stephanie Clark, MRF member

References

1. Timms.A, et al., *Guidance on pin site care: Report and recommendations from the 2010 consensus project on pin site care*, Royal College of Nursing, Editor. 2011.

© Meningitis Now and Meningitis Research Foundation April 2017. Next review Oct 2018.