

What is a hexapod frame?

- 2 or more rings
- Pins and/or wires that attach the rings to the bone segments
- 6 “struts” that connect the central rings to each other
- There are many variations of how the pins and wires are attached and how the particular frame is constructed, but the basics are always the same



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Hexapod external fixators may be used to correct certain limb deformities and to lengthen bones. In some cases, bone deformities cannot be corrected quickly, because surrounding nerves, blood vessels and muscles would be injured. In these cases, an external fixator is used to gradually move the bone and allow the soft tissues to stretch slowly and safely. In other cases, a bone might be too small to accommodate an internal lengthening nail. This is usually the case for our younger patients.

Hexapod external fixators allow us to move the bone segments in all directions to correct deformities in multiple planes, all during the same treatment phase.

Treatment

- Surgery and hospital stay
 - Surgery includes cutting the bone and applying the external fixator. In some cases, screws and/or plates may be inserted, and tendon lengthening performed at the same time, depending on your child’s individual treatment plan.
 - Your child will undergo surgery and then be admitted to the hospital for post-surgical care. That will include intravenous antibiotics, pain control, mobilization with physical therapy, and preparation for discharge. Patients usually stay 2-3 nights.
 - Your child will be discharged home with pain medication, instructions on physical therapy exercises, home care instructions, and their follow up visit instructions.

- Your child will be provided with any braces or stretching straps necessary at this time.
- If your child requires assistive devices (walker, wheelchair, crutches, bedside commode) that process will have been initiated prior to the surgical admission.
- Your child will not be permitted to put weight on the affected limb after surgery.
- You will not need to perform any dressing changes or pin site care unless you have specifically been instructed to do so prior to discharge.
- First follow up visit
 - At that first visit, all dressings will be removed, and you and your child will be educated on pin site care, and external fixator adjustments.
 - You will be provided with paper copies of your external fixator adjustment schedule. It is advisable to take pictures of your schedules in case you lose the paper copies, or if you need to electronically share the schedule with others who are caring for your child.
 - External fixator adjustments are performed 3-5 times per day by a caregiver, unless the child is old enough to do so on their own. It may be difficult for them to access all the struts, so it is best to have someone else available to help.
 - If you have any questions or concerns about the adjustments, pin site care, pin site appearance or any other issues, you should contact the clinic for assistance.
 - During this visit we will confirm that you have already started outpatient physical therapy or have an initial appointment scheduled.
- Second follow-up visit
 - Please bring your adjustment schedules with you to every visit. The staff will check that your child's struts have been adjusted appropriately.
 - X-rays will be taken to assess the progress of the correction and/or lengthening of the bone.
 - Any necessary adjustments will be made to your child's schedule and new schedules provided to you if necessary.
 - At approximately 3 weeks following the initial surgery, your child will be allowed to start weight bearing on the affected extremity. Patient specific instructions will be provided.
- Additional follow up visits
 - During the lengthening and correction process, your child will need to be seen in clinic every 2 weeks. If there is concern that the bone is healing too quickly or too slowly, more frequent visits may be necessary.

- At each visit, the staff will check that your child's struts have been lengthened appropriately.
- Sometimes, we need to change a strut out for smaller or larger one as part of the correction schedule. That procedure involves placing a temporary strut on the fixator and switching out the existing strut for a new one. This process is not painful and takes about 10 minutes to complete.
- Once the lengthening/correction process is complete, your child will need to be seen in clinic every 4 weeks. X-rays will be taken to assess how completely the bone has healed. Once healing is complete, we will schedule the removal of the external fixator. If temporary internal screws have been placed, those will be removed during the same surgery.
- External fixator removal
 - The external fixator will be removed in surgery.
 - Your child may go home the same day, no hospital admission is required.
 - Your child will not be allowed to bear weight on the leg for 4 weeks.
 - Dressings will be applied in surgery. They should be kept clean and dry for at least 2 weeks. Your child may be immobilized in a cast, depending on his/her specific case.
 - Your child will be seen in the clinic 2-4 weeks after the surgery to ensure that all incisions and pin sites have healed, and x-rays may be performed.

Important considerations pre-procedure:

- Good nutrition is very important for bone healing. Your child may benefit from vitamin D and calcium supplementation. We will discuss this during your initial evaluations. Your child should also be taking an age-appropriate multivitamin.
- Optimal general health is very important, as this is a lengthy process. You should have a pediatrician established for your child who can assist with any general health concerns.
- Physical therapy combined with the prescribed home exercise program is **ABSOLUTELY ESSENTIAL** to the success of this surgery and treatment process. You must be able to access formal physical therapy at least twice per week during the lengthening process. If your child develops any joint contractures (reductions in range of motion) we may need to increase the number of physical therapy sessions per week.
- Your child will require frequent visits to our office. It is best to schedule this procedure during a time when you and/or members of your support network will be available to take your child to clinic for all necessary visits.

- Your child will likely be able to attend school with assistive devices (walkers and wheelchairs). We will supply notes to allow for accommodation such as increased time between classes, extra sets of books, the use of their assistive devices, elevator use, and other available modalities that will help them remain safe and engaged. If your child cannot safely attend school during this treatment, you should contact their school and inquire about a hospital homebound program.

Complications:

Lengthening and deformity correction surgery is a highly specialized treatment that has potential complications. Most are easily treatable non-operatively, but occasionally surgery is required. Complications must be addressed quickly to ensure a successful treatment outcome. It is imperative that you, your child, and your support network are prepared for the treatment process and that you communicate with our clinic if you have any questions or concerns.

- Infection
 - Incision site infection, though infrequent, is always a risk of surgery. You will be educated on signs and symptoms of infection.
 - Pin site infections may occur at the site of pine/wire entry into the skin. They are the most common problems associated with external fixation. You will be educated on what signs and symptoms to look out for and how to communicate with a provider at the clinic to help determine if there is an infection and what to do. Typically, a course of oral antibiotics will fully address the issue.
 - Very rarely an infection can occur in the bone, usually at a pin site. We will be evaluating your child's pin sites externally at each visit, as well as using x-rays to visualize the bone quality at the site of each pin internally to make sure the bone is healthy. If there is a concern that a pin is loose, which can cause an infection, the pin will need to be surgically replaced. If the bone becomes infected, then the pin will need to be surgically replaced and the bone infection treated with intravenous and/or oral antibiotics.
- The new bone may grow too slowly. In that case we may need to slow down the rate of correction/lengthening. A new schedule will be provided.
- The new bone may grow too quickly. In this case we may need to speed up the rate of correction/lengthening. A new schedule will be

provided. If the bone heals completely before the correction/lengthening process is complete, then the bone will need to be surgically re-cut to allow treatment to continue.

- Fractures can occur at pin sites as the result of a fall. In this case, the fixator will need to be adjusted surgically to stabilize the fracture and allow treatment to continue.
- Joint contractures can occur during the lengthening/correction process. We carefully evaluate each patient to identify those at risk for contractures and address those issues during preparatory surgeries or at the time of external fixator application surgery, depending on the child's specific case. Braces and/or stretching straps are provided to stretch muscles. Physical therapy and a home exercise program are ABSOLUTELY ESSENTIAL to maintaining muscle and joint flexibility. If you are unable to access formal physical therapy for your child for the duration of treatment, then the procedure is not advised.

External fixators are very effective in the treatment of limb deformities and deficiencies. The expertise and experience of your surgeon, combined with excellent communication between you, your surgeon and your child's care team are crucial to the success of this treatment.