

## **Division of Pediatric Orthopaedics**

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## **Limb Lengthening**

### **Introduction**

Limb lengthening techniques were developed by Dr. Ilizarov in Russia in the 1950's and introduced into North America in the 1980s. The method uses gradual distraction, or distraction osteogenesis, to lengthen bone and/or correct a deformity. The procedure has been used on both children and adults with limb length discrepancies due to birth defects, diseases or injuries.

### **Who is a candidate for limb lengthening surgery?**

Children and adults can be appropriate candidates for the procedure. The most common conditions which make patients eligible for this surgery are:



### **Congenital deformities**

- pseudoarthrosis
- hemiatrophy

### **Post-trauma**

- growth plate fractures
- malunion
- nonunion
- shortening and deformity
- bone defects

### **Short stature**

- achondroplasia and other skeletal dysplasias
- constitutional short stature

### **Post-tumor**

- bone defects ie from resection

### **Post-infection**

- osteomyelitis
- polio

### **How does it work?**

There are three phases in limb lengthening: Surgery phase (Osteotomy), Distraction phase, and Consolidation phase.

### **Surgery phase (Osteotomy)**

For lengthening and deformity correction, the bone is usually cut through a small incision and an external fixator is attached to the limb. In most cases, the fixator is circular and consists of a frame around the limb with a series of rings, pins and wires that help control bone position and provide external support. It encircles the limb and holds the limb to the frame with wires and pins which are inserted into the bone. The rings are linked to each other through threaded rods or struts which allow for the ability to move and position the bones.

After surgery, most patients remain in the hospital for 1-2 days. While in the hospital, physical therapists begin rehabilitation sessions the day after surgery. Before discharge, patients (unless young children) are usually able to transfer from bed to chair and walk using assistive devices. Upon discharge, it is usually arranged for patients to have a wheelchair for travelling long distances.



### **Distraction Phase**

Lengthening of the bone usually begins five to ten days after surgery. In this phase, the bone that has been cut in surgery is very slowly pulled apart in a process that promotes new bone growth at the site of the osteotomy. Continued growth of new bone is accomplished by the patient or family member turning the dial on the struts between the fixator rings on a daily basis. This turning distracts (pulls apart) the bone approximately 1mm per day. As the space between the bones opens up, the body produces new bone in the gap until the desired length of bone is generated. Time in the external fixator varies depending on the length of bone needed. In general, the average time in the fixator is one month per centimeter of bone lengthened. This time encompasses both the distraction and consolidation phase.

Physical therapy is a **very important** requirement during the distraction phase. These sessions are designed to stretch muscles to help them grow and maintain joint flexibility. In most cases, patients are required to partially or completely bear weight on their limb. Weight bearing actually stimulates the new bone to mature.

During the distraction phase, patients need to have x-rays and be examined every 1-2 weeks to evaluate bone growth, nerve and muscle function and examine pin sites for infection. Most patients do not experience much pain during this phase since the distraction is so gradual (1mm/day). Patients are encouraged to proceed with their normal activities including going to school or work. In most cases, patients are allowed to shower and swim with their fixator in place.

### **Consolidation Phase**

After the desired length of bone has been achieved and the limb has been straightened, no further rod turns need to be made. At this stage, the fixator is left in place to allow the new bone to harden and mature. It is still important for the patient to keep the pin sites clean during this stage. Frequently, the fixator is slowly and partially disassembled during office visits to increase the strength of the bone prior to completely removing the fixator. Once the new bone is completely healed, as confirmed by x-rays, the fixation device is removed. This is done in a same day procedure under general anesthesia. A cast or brace is placed on the limb after the fixator is removed for an additional several weeks in order to further protect the bone.



For more information on limb lengthening, you can visit the following websites:

[www.umdj.edu/umcweb/hstate/sum00/pulse/pulse04.htm](http://www.umdj.edu/umcweb/hstate/sum00/pulse/pulse04.htm)

[www.theuniversityhospital.com/healthlink/october2003/print/1.htm](http://www.theuniversityhospital.com/healthlink/october2003/print/1.htm)

[www.theuniversityhospital.com/limblength](http://www.theuniversityhospital.com/limblength)

[http://orthoinfo.aaos.org/fact/thr\\_report.cfm?Thread\\_ID=312&topcategory=General%20Information](http://orthoinfo.aaos.org/fact/thr_report.cfm?Thread_ID=312&topcategory=General%20Information)

<http://www.asaminorthamerica.org/>