OVERVIEW
Distraction osteogenesis is a treatment process to lengthen and realign bones to correct a bone deformity and/or a leg length discrepancy. Typically, the process starts with a surgery to apply an external fixator to the bone and to cut the bone at the site of the planned distraction. There is usually a short latency period to let bone healing get started. This is followed by several weeks of slow distraction to obtain the desired length and realignment. The external fixator is then kept in place until the bone consolidates and completes the healing process.

BACKGROUND
There are many pioneering surgeons who developed techniques and devices for lengthening bone over the last century. These pioneers include Dr. Leroy Abbott, Dr. Heinz Wagner, and Dr. Gavril Ilizarov. However, Dr. Ilizarov, who worked in relative isolation in the Soviet Union, refined many aspects of the treatment to make it more successful and more practical. He emphasized minimally invasive technique, gradual distraction, and emphasis on maintaining motion and weight bearing during treatment. These methods were further refined in the United States by Dr. James Aronson, Dr. Dror Paley, and Dr. John Herzenberg.

TREATMENT
Initial Phase: The treatment starts with a surgical procedure. In the operating room, pins and wires put through the skin and drilled into the bone. The placement of these pins depend on the bone and the purpose. The intention is to place enough pins in the best places to hold the bone solidly, but without significant restrictions to the joints and muscles. The pins and wires are then connected to a ring frame or side bar. An incision is then made to cut the bone. Dressings are applied to the incision and the pin sites. These are left in place for the first 2 days. Patients are usually discharged to home after 2-3 days. Family are instructed for pin care prior to discharge.

Distraction Phase: After a short latency period of 5-10 days, the distraction phase starts with daily adjustments of the external fixator. The plan for the distraction process will vary with the specific patient, but generally proceeds at a rate of 1 mm per day, which adds up to 1 inch in 25 days. The adjustments may cause some achiness, but are not especially painful. This rate is usually adequate to let healing progress.
This rate is sometimes too fast or too slow. The progress is monitored by X-rays every 1-2 weeks in the clinic. Adjustments to the distraction rate are made if needed.

Consolidation Phase: Once the bone has been lengthened to the desired position, it is held in a fixed position and the new bone in the distraction zone is allowed to mature and turn into new solid bone. This is sometimes referred to as consolidation. It is important to keep the fixator in place long enough to let the bone get solid. This is helped by maintaining good joint motion and putting weight on the leg. Once the new bone is strong enough, the surgeon removes the distraction device during a second operation.

PROBLEMS

The distraction osteogenesis treatment is tailored to the child and the condition, using the best distraction device and process of distraction. The most common and even expected problem with external fixation treatment is pin site infection. Other problems include loosening of the pins, wire breakage, too slow or too rapid healing at the distraction site, or muscle contractures.

Problems are minimized with good pin care. Pin sites should be kept clean. If the pin site is dry, it can be left open to the air. Many pin sites will have serous drainage and gentle cleaning with regular soap and water is usually enough for most pin sites. If signs of infection develop, such as redness or swelling, the pin sites should be cleaned twice daily with Q-tips and hydrogen peroxide. Antibiotics are also taken if needed. If the infection is not controlled with these measures, it is sometimes necessary to remove the problematic wire.

Moving and using the limb is also important during distraction osteogenesis. Muscles and skin must also get longer during the lengthening process. These structures can get tight and cause joint contracture or subluxation. These problems can be minimized if motion and stretching are done during the treatment, especially during the distraction phase. Weight bearing and motion are also beneficial to stimulate the bone to form and mature during the consolidation phase.

Bone healing progresses slowly and the external fixator is left in place until the bone is solid enough to remove it. At the time of removal, the bone is still at risk for breaking at the distraction site or with a crack through one of the pin sites. A cast or brace is often used after removal of the external fixator. There is usually a gradual return to activity after the the cast or brace is discontinued. Motion and strength will continue to improve with time over the next 6-12 months.
MORE INFORMATION
Further information can be obtained on the internet. Your local public library can help you explore these sources if you are interested. Two good sites for expert and peer reviewed information are the American Academy of Orthopedic Surgeons at www.aaos.org and www.emedicine.com.

FEEDBACK
If you have questions or comments, please contact the office or submit them to the web site at www.pedortho.com.