CHAPTER **36**

CIRCULAR WIRE FIXATION IN RHEUMATOID ARTHRITIS FOR FIRST METATARSOPHALANGEAL JOINT FUSION

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INTRODUCTION

Forefoot pathology and rheumatoid arthritis present the podiatric surgeon with interesting challenges both intraoperatively and postoperatively. Severe hallux valgus deformities along with dislocations of the lesser metatarsophalangeal joints (MPJs) are often noted. Many patients present with a chief complaint of painful rheumatoid nodules causing the inability to wear shoes comfortably. Additionally, the skeletal deformities are combined with an autoimmune disease that must be accounted for in the postoperative process. The disease often causes the bone to become thin or osteoporotic in nature. In some cases fixation with screws or wires can fail due to the soft bone. Circular ring fixation with transosseous wires offers a very stable form of fixation in patients with notoriously thin or osteoporitic bone.

TECHNIQUES

The use of the circular external fixator gives the stability for thin bone that the surgeon requires and allows for added compression or distraction if necessary. The mini Ilizarov circular fixator, in this case, is a non-weightbearing fixator. However, the fusion time is often 5-6 weeks. The short fusion time coupled with the ability to adjust the fixator during the postoperative process makes up for the non-weightbearing characteristic. When the fusion is complete and the fixator is removed the patient is immediately able to bear full weight in a surgical shoe.

Fusion of the first MPJ offers long term stability and can be coupled with lesser metatarsal head resections. The technique is based on the use of trans-osseous wires and circular rings (Figure 1). The incision and the resection of the first MPJ is accomplished in any of the standard variations according to the surgeon's preference. Once the position of the first MPJ is satisfactory, a K-wire is used to hold the position. The skin is closed using a standard multi-layered closure. The circular fixator is then applied. With practice, the fixator application should take about 15 minutes.

The mini Ilizarov 3/4 circular fixator technique is based on a 3-ring configuration. Application of the fixator is accomplished by establishing a stable proximal base of fixation and then adding additional wires in distal positions. The olive wires are placed in a delta or "X" type fashion. One olive wire is placed at the plantar and one at the dorsal aspect of the foot. The wires are attached to the fixator with slotted bolts and posts as necessary. Each wire is tensioned using a tensomiter or with a "Russian" twisting method. The final two wires are placed in the hallux. Once all of the wires have been placed the distal ring is then compressed on the two proximal rings. This adjustment is accomplished by moving the proximal and distal nuts located on the threaded rods on both sides to the distal ring in a proximal direction. The distal ring is compressed approximately 1 cm on the middle ring. When the already tensioned wires begin to bend the compression should be sufficient. Finally, a dressing is placed on the incision and the postoperative course begins. The technique is illustrated on bone models in Figures 2-8.

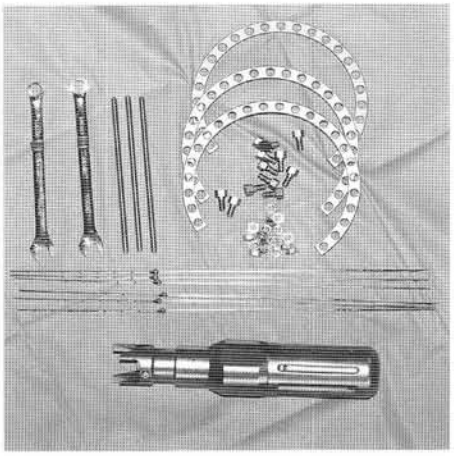

Figure 1. Mini Ilizarov fixator components.

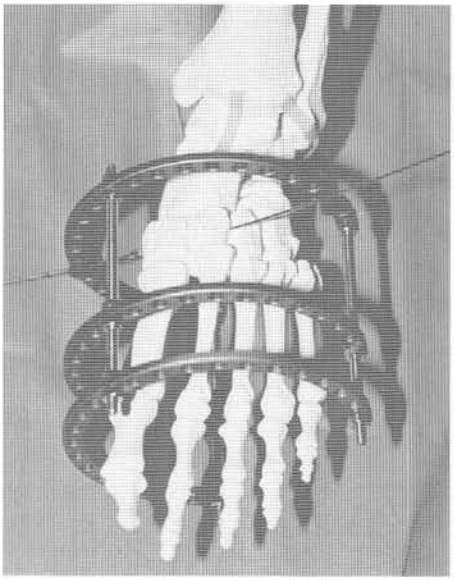

Figure 2. Trans-osseous base wire fixation

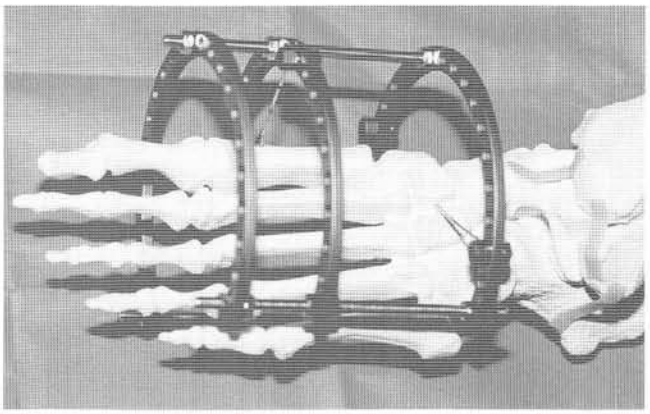

Figure 3. Second ring and olive wire fixation in a different plane from the first. This locks the fixator in place for the other wires.

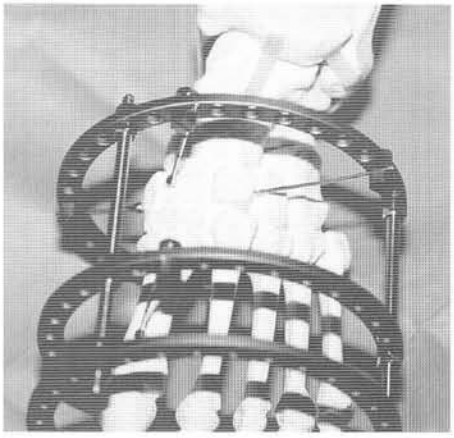

Figure 4. Delta or cross olive wire fixation at the proximal ring. This prevents shifting is all planes.

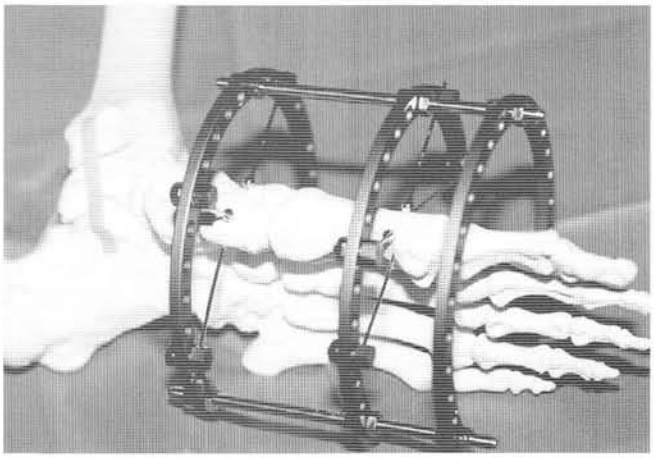

Figure 5A, B. Delta configuration wire fixation at the proximal and middle rings.

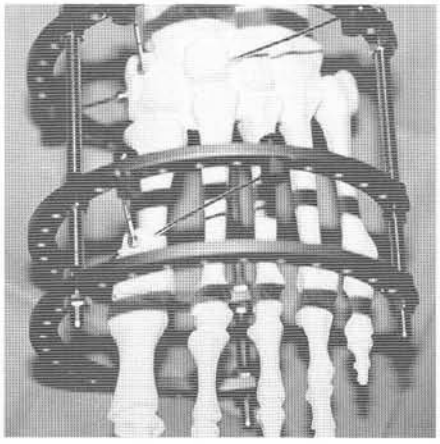

Figure 5B.

Figure 6A. Cross wire fixation of the hallux at the distal ring.

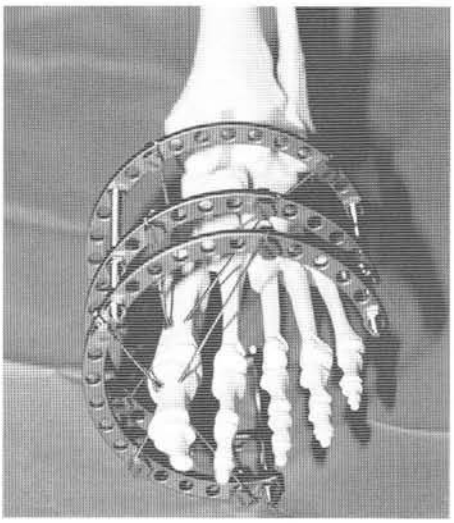

Figure 6B.

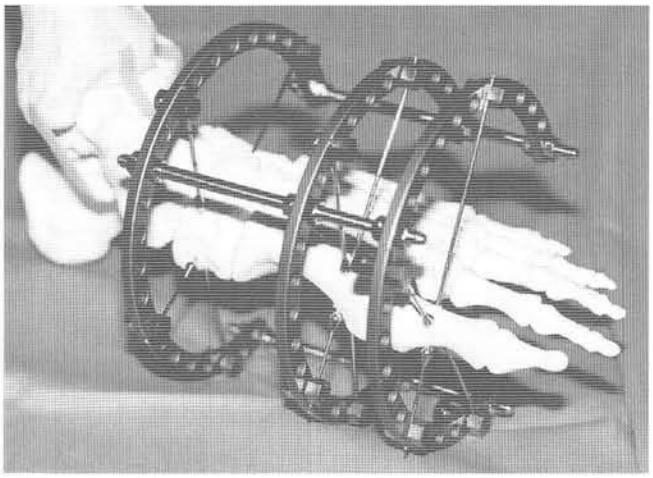

Figure 7. Cross wire fixation of the hallux first metatarsal and the mid foot prior to compression of the distal ring on the middle ring..

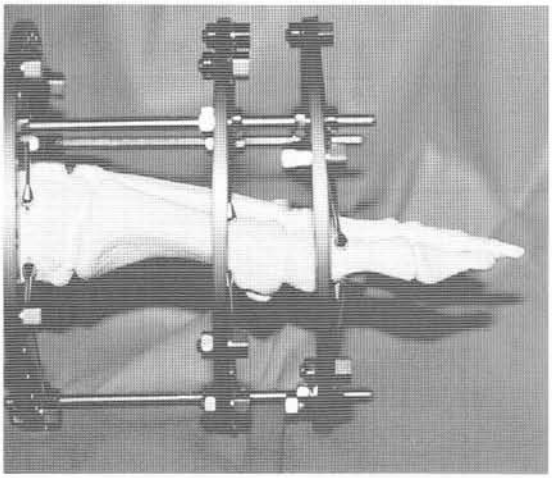

Figure 8. Compression of the distal ring on the proximal rings causing the distal wires to bend.

RESULTS

At this time the author has used this technique for first MPJ fusion 10 times. In each case a dorsal medial incision was made followed by bone resection using a sagittal saw. The joint was then fixated with a 0.62 k-wire and the skin was closed. The fixator was then applied. The C-arm is used to maintain the position of the MPJ prior to the application and during the fixation process. The time to fusion is approximately 6 weeks in each case. Following radiographic evidence of the fusion the fixator is removed and the patients are all permitted to walk full weight bearing. Follow up has been 6 months to 1 year and at this time there has been no evidence of dorsal drift of the hallux. All of the fusions are completely solid and asymptomatic at this time.

DISCUSSION

There are many techniques to fuse the first MPJ. Use of the mini Ilizarov fixator offers an advantage for the rheumatoid patient or the patient with osteoporosis. The trans-osseous wires offer fixation that will not slip or fail due to the lack of bone quality. Additionally, it offers the ability to adjust the fixator in the case of a delayed or nonunion. True axial compression is achieved only with a circular fixator. The down fall of the technique is the non-weight-bearing status. The technique requires some knowledge of circular fixation. If the surgeon is unfamiliar with circular fixation some Ilizarov course work prior to the application of the fixator would be advised.

Finally, the technique is very effective for the fusion of the rheumatoid arthritis patients' first MPJ. External fixation is not the panacea for the fixation of all joints. It should be used by the podiatric surgeon as another useful tool for the treatment of patients bone and joint deformities.