CHAPTER **28**

THE LOCK PIN TECHNIQUE - IT'S NOT JUST FOR BUNIONS

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Colleagues who have attended Podiatry Institute meetings have heard of the "lock pin" technique for the fixation of Austin osteotomies, developed and popularized by Dr. Gerard Yu. The author has used Dr. Yu's technique for the fixation of the Austin osteotomy for several years. Prior to using the "lock pin", this author would fixate the Austin osteotomy with a single 0.062 Kirschner-wire (K-wire) which was bent, cut, and then pressed against the metatarsal, yet without any tensioning being applied. This approach worked well and overall there were no problems with pin loosening or retraction. However, the locking technique gives an extra element of stability to the fixation (Figure 1).

There are many benefits to the "lock pin" technique including the pure simplicity of the fixation, low cost, stability provided, and the fact that a lesser degree of dissection is required for the insertion of the pin as opposed to when using screws. The only disadvantage is that in a small number of patients the pin may become irritated by shoes following healing of the osteotomy. This usually necessitates removal of the pin. Although minor in nature, this removal does require another surgical procedure. More recently the author has taken care to insert the pin in close proximity to the extensor tendon. When placed more medially over the metatarsal shaft, the pin is relatively unshielded and more susceptible to irritation and pressure. However, by inserting the wire adjacent to the extensor hallucis longus there is some bulk created by the tendon that helps to reduce the potential for later irritation.

Figure 1. Traditional use of the "lock pin" for fixation of the Austin procedure.

More recently the author has employed the same technique with the slightly smaller 0.054 inch K-wire. This appears to have also reduced some of the bulk of the exposed wire without any significant reduction in overall stability of the fixation.

SUBSEQUENT PERMUTATIONS

More is not always better, but in some cases it can help.

Proponents of screw fixation for the Austin procedure would argue that this type of stabilization allows the surgeon to provide greater amounts of lateral transposition of the capital fragment with greater stability. However, the potential for enhanced stability may also be afforded if two lock pins were employed. The author has used this approach in a number of patients where the Austin procedure has been "pushed" to a greater extent. It has also been used in patients with softer bone. It is possible to crack the dorsal cortex of the metatarsal once the pin is turned and locked into position if a 0.062 inch K-wire is utilized. Therefore, the author has also used two 0.045-inch K-wires in patients with softer bone to avoid this potential problem (Figure 2).

When using two pins, the initial wire is inserted from dorsomedial to plantar lateral. This wire should be inserted medial to the extensor hallucis longus to provide adequate space for the second, more lateral wire. The second wire is then inserted from dorsolateral to plantarmedial. The combination of two lock pins in this manner may give superior stability

Figure 2A. This is an elderly patient with rheumatoid arthritis. Due to the soft bone, a Reverdin-Green-Laird procedure was performed and stabilization provided with two crossing 0.045 inch wires.

Figure 2B.

Figure 3A. Preoperative radiograph of a patient with a significant hallux valgus deformity and an increased IM angle.

Figure 3B. Postoperative radiograph following a large degree of lateral transposition of the capital fragment and stabilization with two 0.062 inch wires.

Figure 3C. Postoperative radiograph.

to screws which are inserted through a long dorsal wing Austin. The wires pass through the metatarsal head itself, particularly along the plantar segment. Studies have shown that stabilization of the plantar arm of the osteotomy is more effective in providing greater protection for the Austin. However, this is not to be misconstrued as meaning that screw fixation is inadequate or inferior from a practical and clinical standpoint. The author has successfully used screw fixation with good results. The point is that by using lock pins, good stability may be achieved quickly, easily, and without the need for specialized equipment or products. Furthermore, the amount of lateral shift of the capital fragment is not dictated by whether or not screw fixation will be employed. (Figure 3)

Fifth metatarsal osteotomies

Reverse Austin procedures have been used by a number of surgeons for the repair of tailor's bunion deformities. The lock pin is well suited to this type of osteotomy as well (Figure 4). Generally the author will use a single 0.045 inch K-wire for this purpose. One caution is that the surgeon may want to orient this wire in more of a linear than oblique fashion. The ability to clearly visualize the more medial aspects of the fifth metatarsal head intraoperatively is rather limited compared to the ability to visualize the lateral aspect of the first metatarsal head in hallux valgus surgery. Therefore, it may be difficult to visualize the wire as it exits the fifth metatarsal head unless the surgeon aims for an exit point in a more central location.

Figure 4. A reverse Austin osteotomy of the fifth metatarsal for a tailoris bunion deformity. Fixation afforded by a single 0.045 inch lock pin.

First metatarsophalangeal joint arthrodesis

Arthrodesis of the first metatarsophalangeal joint is becoming more commonly employed for a variety of problems. A review of the literature will reveal that a large variety of fixation methods are sufficient to provide for adequate fusion. When the author initially began to perform first metatarsophalangeal joint fusion either crossed screws or linear Steinman pins were used for fixation. However, the lock pin technique is another excellent means of stabilization. Typically the author will use three 0.062 inch lock pins, although in the past two wires have been used successfully. This provides excellent stability with a minimum of effort. The first pin is oriented from the medial cortex of the proximal phalanx into the lateral first metatarsal. The second pin is inserted into the medial cortex of the first metatarsal and exits the lateral cortex of the proximal phalanx. The third pin is inserted into the dorsal cortex of the first metatarsal and is oriented linearly into the plantar cortex of the phalanx (Figure 5).

Following surgery the author allows the patients to fully bear weight with a padded surgical shoe to prevent bending forces from being applied to the hallux. This has worked well and no problems have been noted relative to nonunion or disruption of the fixation. This proves to be a very effective, simple, yet sturdy means of internal fixation.

Figure 5A. Arthrodesis of the 1st MPJ fixated with 3 0.062 inch lock pins provides excellent stability.

Figure 5B.

Lapidus arthrodesis

In most cases where a Lapidus arthrodesis is performed K-wires are used as a means of providing temporary stabilization of the fusion site prior to the insertion of screws. If the surgeon elects, at times a wire may be left as an additional fixation device following screw insertion. This may add a considerable amount of additional support. (Figure 6). In other instances, one may prefer to perform the stabilization solely with K-wires. In this scenario, the author employed cross K-wires inserted from distal to proximal with the addition of a third wire oriented from the dorsal surface of the cuneiform distally and plantarly into the first metatarsal. Excellent stability is afforded with a minimum of effort.

Triple Arthrodesis

In recent years, screws and staples have largely been used for stabilization in patients undergoing triple arthrodesis. However, these types of devices are not fail safe, particularly in softer bone. A linear wire may provide good overall support to the midtarsal fusion sites and resist bending forces to some extent, particularly if the wire spans some distance. In this circumstance the wires that are typically used temporarily are bent, cut, and turned flush against the bone following the insertion of the other fixation devices. However, with the larger diameter of the Steinman pins used, achieving a true tension effect from the locking mechanism is more difficult.

Figure 6. Lapidus fusion stabilized with 3 0.062 inch lock pins.

CONCLUSION

The preceding discussion has provided the reader several examples of how this useful fixation technique may be expanded to a wide number of indications. The lock pin form of fixation is quick, easy, stable, and economical. Even if not used routinely, most surgeons at some time would find a case where this technique would be quite helpful.