InCore® Lapidus Case Study

Case Study

Michael S. Lee, DPM, FACFAS

Capital Orthopaedics & Sports Medicine, PC
Clive, Iowa

Patient Information

A 48-year-old female presented with a chief complaint of right bunion pain. She had concerns with "bump" pain with shoe gear and certain activities. Additionally, she reported sub-second metatarsal heel pain with exercise. She had failed arch supports, wider shoes, anti-inflammatories, and wearing a toe spacer. She relates developing a bunion when she was a teenager, but it became increasingly symptomatic only over the past 2-3 years.

Clinical Exam

The patient was noted to have a significant hallux valgus deformity of the right foot. There was medial deviation of the first metatarsal with lateral deviation of the hallux and abutment of the 1st and 2nd digits. The great toe joint demonstrated tracking with a mobile sesamoid apparatus. There was excessive motion of the first ray at the metatarsocuneiform joint. Additionally, she was noted to have sub-second MTPJ pain with direct palpation. There was a negative Lachman's (dorsal drawer) and no digital deformity. There was no evidence of equinus or other deformities or concerns on exam.

Radiographs revealed a significant hallux valgus deformity. The 1st intermetatarsal angle (IMA) measured 22 degrees and the hallux abductus angle (HAA) measured 38 degrees. There was not a significant proximal articular set angle (PASA) deformity (Figure 1).

Figure 1

Surgical Case Technique

The patient was placed in the supine position under general anesthesia. A 3 cm dorsomedial incision was created over the 1st MTPJ, and the medial eminence was resected using a sagittal saw. Additionally, a lateral capsulotomy and release was completed through the MTP joint space.

Attention was then directed to the dorsal 1st MCJ where a 6–7 cm incision was placed over the medial cuneiform extending down along the base of the first metatarsal. Subcutaneous dissection is carried down to the capsular structures and the EHL tendon was retracted laterally. Capsular dissection is carried out at the metatarsocuneiform joint and along the dorsal aspect of the medial cuneiform. A small osteotome was utilized to free up a dorsal and distal portion of the intercuneiform joint, taking care not to be overzealous in releasing the intercuneiform space. A larger osteotome was also utilized to mobilize and free up the plantar soft tissues of the 1st MCJ.

Figure 2

The post drill guide from the InCore Lapidus System was then placed dorsally with the large paddle between the medial cuneiform and the first metatarsal base and the small lateral paddle in the intercuneiform space. The post drill guide was aligned down the long axis of the first metatarsal with the pin hole orientated slightly dorsolateral to plantar medial. A 2.0 mm pin can then be placed in the medial cuneiform. Fluoroscopy confirmed placement of the pin parallel to the MCJ line on the lateral x-ray; however, the pin placement was noted to be slightly lateral and proximal in the cuneiform. The post drill guide was removed and a second 2 mm guide pin was then placed parallel to the original but slightly medial and distal to the original. Fluoroscopy confirmed placement of the second pin in the central portion of the medial cuneiform and distal to the "narrowed" portion of the medial cuneiform proximally (Figure 2). The original pin was removed.

The 5.9 mm x 28 mm reamer was then placed over the 2 mm pin and reamed down to the hard stop. The reamer and the 2 mm pin were then removed. The cancellous bone from reaming as well as from the flutes of the reamer were placed in a specimen cup for augmentation of the fusion site later.

The targeting guide and the InCore Post were connected using the post fastener. The post and targeting guide assembly were then inserted into the reamed medial cuneiform. A light mallet was used to fully seat the post below the bone surface. The compression-distraction "foot" was placed within the incision and along the medial aspect of the first metatarsal shaft. Frontal plane correction was then obtained by placing a 2 mm pin dorsally in the base of the first metatarsal and rotating the 2 mm pin over the lesser metatarsals. Holding that frontal plane correction, two 2 mm pins were placed through the compression distraction fixture. The T10 screwdriver was then used to distract the MCJ by opening the compression distraction fixture.

Joint preparation was achieved with a sagittal saw on the cuneiform. Care was taken to minimize shortening and a laterally based wedge off the cuneiform was resected. The base of the 1st metatarsal was prepared using curettage of the cartilage and amalgamation of the subchondral bone using a 1.5 mm drill bit, 3 mm high-speed burr, and a small osteotome for fish-scaling. The compression-distraction device was then returned to the "start" position. The cancellous bone harvested during the post reaming was inserted into the fusion site.

A clamp may be used to correct the IM angle. A point-to-point peri-articular reduction forceps was used to close down the IM angle correction. In this case, the reduction forceps were placed in the first metatarsal head and around the lateral foot to close the IM angle down to near 0 degrees. A 2 mm pin was placed just proximal to the post in the targeting jig to prevent rotation around the post and loss of transverse plane correction.*

After appropriate transverse IM correction was achieved the T10 driver was used to compress across the joint using the compression distraction device. Care was taken to make sure the base of the first metatarsal did not migrate plantarward as the compression was achieved. Correction should be assessed with an X-ray to ensure the desired correction is achieved.

The drill bushing was placed in the medial targeting guide hole and the 3.6 mm drill bit was passed through the drill bushing and down to the step stop on the bit. The drill bushing was then removed and the depth probe was placed flush to the bone through the guide and measured off the back of the guide. Care was taken not to over tighten or advance the screw beyond the obvious hard stop as the screw engaged the threaded post. The drill bushing was then placed in the lateral targeting guide hole and previous steps were repeated. The second screw was inserted into the threaded post.

All 2 mm pins were removed and post fastener was then released and the targeting guide removed. A post plug screw was placed in the post dorsally to prevent boney or soft tissue in growth. Deep closure was achieved using 2-0 and 2-0 Vicryl and skin repaired using a 4-0 Nylon stitch. Intraoperative fluoroscopy confirmed proper correction, placement of the post and screws, and proper locking of the distal screws into the post (Figure 3). The surgical site was infiltrated with Marcaine and a sterile dressing applied. The operative extremity was placed in a CAM boot on the table.

Figure 3

Figure 4

Post-operative Course

Immediately post-operatively the patient was to remain non-weight bearing in the CAM boot with the use of crutches or a knee scooter. The patient was seen for follow-up on post-operative day #8 and dressings and sutures were removed and steri-strips applied. The patient was to remain in the CAM boot but allowed to balance on her heel while standing but otherwise use the crutches or knee scooter. At 4 weeks post-operatively x-rays revealed proper alignment and progressive healing and the patient was allowed full weight bearing in the CAM boot. At 7 weeks the boot was removed, and the patient was allowed to progress into a sneaker. Physical therapy was started (2-3 visits over a 30 day period). Three month radiographs revealed proper consolidation at the fusion site and excellent deformity correction (Figure 4).

Discussion

The InCore Lapidus System offers the surgeon advantages over traditional crossing screws, locking plates, or other contemporary Lapidus fixation systems. The InCore Lapidus System assists the surgeon a great deal in joint preparation and correction of the deformity in all three planes. The compression distraction fixture addresses the frustrations of joint preparation while allowing the surgeon to prep the joint according to his/her preference (saw vs. curettage) and holds pre-compression of the joint prior to screw placement.

Per the surgical technique, an x-ray should be assessed to make sure the K-wire (guide pin) is oriented through the major axis of the cuneiform through the post drill guide. It has also been deemed helpful to assess the K-wire positioning under live fluro aligning the guide pin axially (point on point).

The pin should be placed centrally in the cuneiform from medial to lateral and distal enough to avoid the natural proximal taper noted in most medial cuneiforms. Additionally, when the pin is visualized in this manner, if properly placed, the intercuneiform joint should be easily visible. If not, the guide pin is likely placed too oblique in orientation from dorsal lateral to plantar medial and may need to be adjusted to account for variations in anatomy.

As a general rule, the deeper the post is placed in the cuneiform the longer the locking screws will be and the further down the first metatarsal shaft the screw heads will be located. This is a stable construct and may help avoid a stress riser or cortical fracture from the screw heads being placed too proximal to the joint line. Attention should also be directed to the post prior to compressing the joint space as occasionally the post may migrate dorsally in the cuneiform during the distraction of the joint.

Correction of the transverse plane (IMA) still requires traditional techniques to achieve a properly aligned first ray. In mild to moderate hypermobile deformities manual reduction or reduction using the target device as a "handle bar" will achieve appropriate reduction. In cases of significant deformity, the use of reduction forceps may improve the IMA reduction. This may be achieved in a number of ways, including using the forceps around the first and second metatarsals or as described above around the first and fifth metatarsals. In some cases, particularly when end to end reduction forceps are being utilized, the forceps must be removed to "debulk" the soft tissue dorsally so the lateral drill bushing can be advanced far enough in the targeting guide. In this situation, placement of the medial screw is achieved first then removal of the forceps. This will allow the soft tissues to "flatten" enough that the lateral drill bushing can pass over the soft tissues.

Finally, when measuring screw length with the depth probe it is always better to choose a screw length that is slightly shorter rather than longer when a measurement is in between lengths. Traditionally we are trained to go slightly longer to ensure bicortical fixation with a screw length. With the InCore Lapidus System, once the distal threads are fully engaged into the locking post the screw can no longer be advanced. If the screw is "too long" it will result in a screw head that remains prominent on the first metatarsal shaft. Simply advancing the screw another rotation is not possible.

Conclusion

This case demonstrates the appropriate use of the InCore Lapidus System. This construct offers the surgeon and patient a stable construct, proper joint preparation (curettage or cutting), and minimizes the need for hardware removal due to pain and irritation with traditional external plating constructs of first TMT arthrodesis.[1,2] Use of the InCore Lapidus System for first metatarsocuneiform arthrodesis should be considered.

* The surgical technique recommends surgeons to correct the IM angle before prepping joint. Joint preparation is surgeon dependent.

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2603.1-GLBL-en-REV0619

References

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