Retrospective Study of Surgical Outcomes for Combined Ankle and Subtalar Joint Arthrodesis, Cavovarus Deformity Correction and Ankle Fractures
Orthofix wishes to thank the following surgeons for their contribution to the development of the technique:

Edgardo R. Rodriguez, DPM
Clinical Instructor
Director: Chicago Foot & Ankle Deformity Correction Center

Other Key Contributors:
Jared Overman, DPM
Nick Anderson, DPM PGY-3
Pablo Trevino, DPM PGY-3
Kris Lopez, DPM PGY-3
CASE STUDY 1
Retrospective Study of Surgical Outcomes for Combined Ankle and Subtalar Joint Arthrodesis Utilizing the Ilizarov Bent-Wire Technique

PURPOSE
The purpose of this study is to evaluate the results of ankle and subtalar joint arthrodesis utilizing the Ilizarov bent-wire technique.

METHOD

A total of 81 patients participated in the study. All patients had a history of painful and severe ankle and subtalar joint arthritis. Patients had a 3-ring external fixator applied to the affected lower extremity for approximately 12 weeks in duration. Patients were allowed to be full weightbearing for the post-operative period. Pin sites were cleaned with EtOH 1-3 times per week.

RESULTS

Patients were evaluated using a “Modified” AOFAS scale. The modified scale eliminated grading sagittal and hindfoot range of motion. The goal of the procedure was to achieve fusions at the subtalar joint and at the ankle joint resulting in a plantar-grade and pain free extremity. A fourteen point adjustment was made to compensate for the lack of a motion category. The highest recorded score was 95 with the lowest being 70. Thirteen patients progressed to non-unions. These patients were subsequently revised with an intra-medullary tibial nail. Other significant complications included surgical dehiscence (2 patients), and soft tissue infection with deep space abscess (1 patient). Minor complications included pin tract infection (5 patients) and loose/painful hardware (11 patients). All complications resolved uneventfully with antibiotics, wound care, and hardware adjustment/removal. Co-morbidities encountered in this population included Diabetes Mellitus (48% of patients), obesity (30%), tobacco use (40%), and osteopenia (36%).

CONCLUSION/DISCUSSION

We have found ankle and STJ arthrodesis performed using Ilizarov bent wire technique to yield a reproducible and predictable fusion rate (84%) with a relatively low rate of significant complications (19%). The advantages of using this technique include immediate weightbearing as well as limited soft tissue disruption. If there is failure of this procedure there still remains the option of revision with an intra-medullary nail or internal fixation by any other means. In conclusion, we feel that external fixation using Ilizarov techniques is a viable method of achieving ankle and STJ arthrodesis with results and complications comparable to other methods of fixation.

Key Contributors:
Edgardo R. Rodriguez, DPM Clinical Instructor
Jared Overman, DPM
Nick Anderson, DPM PGY-3
CASE STUDY 2
Retrospective Study of Surgical Outcomes for Management of Ankle Fractures Utilizing the Ilizarov Technique

PURPOSE
The purpose of this study was to evaluate the outcomes of surgical ankle fracture repair with the use of a 3-ring multi-planar external fixator.

MATERIALS AND METHOD
A retrospective analysis was performed on 21 patients (17 males and 4 females) with bi-malleolar or tri-malleolar ankle fractures. Indication for the Ilizarov technique included a radiographic finding of a bi-malleolar or tri-malleolar unstable ankle fracture with the same indication for open reduction internal fixation. All 21 patients had a 3 ring multi-planar external fixator, which consisted of 2 proximal tibial rings and 1-foot plate, applied to the affected limb. Two-wire fixation was used on each of the proximal rings: a medial face wire and a posterior/lateral to anterior/medial wire. The foot plate fixation consisted of two medial and lateral calcaneal wires and 1-2 midfoot and/or forefoot wires. Extra smooth and olive wires were used depending on the fracture condition for proper reduction and realignment of the ankle mortise. All wires were tensioned to the external frame. All ankles were acutely distracted 4-5 mm following reduction and fixation of fracture in order to offload the joint and minimize secondary DJD.

RESULTS
All 21 patients had successful ankle fracture reduction and fixation with the use of the Ilizarov technique. This is based on clinical and radiographic consolidation of the fracture sites without significant malalignment and with evidence of a stable ankle mortise. 18 patients reported satisfactory post-op ankle range of motion with 3 patients complaining of diminished ROM secondary to ankle DJD. All patients healed all fracture sites uneventfully and resumed their regular daily activities without major complications. Minor complications included 5 pin tract infections which resolved with antibiotics and local wound care. From 1998 to present, none of the patients has required a fusion.

CONCLUSION/DISCUSSION
We found the Ilizarov technique to be a viable method for the management of bi and tri-malleolar fractures. The lead author advocates the initial use of multi-planar external ring fixator in order to provide early ambulation to the patient, and at the same time perform an ankle diastasis using the external ring fixator to provide increase range of motion at the ankle joint post ring fixator. We also found it to be beneficial with the morbidly obese patient, which are incapable of following a non-weightbearing protocol. Finally, vascular compromised patients will profit from possible tissue necrosis that might arise from an open reduction internal fixation technique.

Figure 1: Preoperative AP Ankle View
Figure 2: Preoperative Lateral Ankle View
Figure 3: Model of Proper Placement
Figure 4: AP Ankle with External Fixator
Figure 5: Lateral Ankle with External Ring Fixator
Figure 6: Post Operative AP Ankle
Figure 7: Post Operative Lateral Ankle

References

Key Contributors:
Edgardo R. Rodriguez, DPM  Clinical Instructor
Jared Overman, DPM
Pablo Trevino, DPM PGY-3
CASE STUDY 3
Retrospective Study of Surgical Outcomes for Cavovarus Deformity Correction Utilizing the Ilizarov Technique

PURPOSE
The cavovarus foot is a complex deformity with limited non-surgical treatment options. The purpose of this retrospective study was to evaluate the outcomes of patients who had all received surgical reconstruction utilizing Ilizarov multi-planar ring fixator technique.

MATERIALS AND METHOD
A total 27 patient (15 males and 12 females) who were diagnosed with a cavovarus foot deformity were reviewed after their surgical experiences and post-operative course. Mean patient follow-up was 62 months. The patient’s ages ranged from 39 to 64 years. Patients included in this study had a variety of cavus deformity at multiple levels (global, hindfoot, sub-talar joint, and midfoot) which included all neuro-muscular conditions. They were required to complete a questionnaire to evaluate the satisfaction with their surgical outcome. The American Orthopedic Foot and Ankle Society (AOFAS) rating system was used.

RESULTS
Out of 27 patients, the mean AOFAS score was 85 points on a 100-point scale. Five patients required revision secondary to loss of correction. Other complications included 3 pin-track infections, 2 surgical wound dehiscence, and 17 cases of pin site irritation. All complications resolved with antibiotics and local wound care.

CONCLUSION/DISCUSSION
Multiple techniques have been described in the literature for the correction of cavovarus foot deformity. In order to achieve a successful outcome, each reconstruction needs to be tailored to the individual deformity making it necessary to utilize a variety of procedures. We feel that Ilizarov external fixation techniques are advantageous as they allow for minimal dissection, greater compression at fusion/ostectomy sites, early ambulation, the ability to make post-operative adjustments, and absence of internal fixation. A further benefit is the ability to include ankle joint distraction in patients with concomitant ankylosis. We feel that Ilizarov techniques offer the stability and variability of fixation necessary for the successful reconstruction of the cavovarus foot deformity.

REFERENCES

Key Contributors:
Edgardo R. Rodriguez, DPM Clinical Instructor
Jared Overman, DPM
Kris Lopez, DPM PGY-3