

## Feature:

# Point-Counterpoint: Is External Fixation Overutilized?

- [By Lawrence DiDomenico, DPM, and George Vito, DPM](#)

---

Yes, Lawrence DiDomenico, DPM, says technological advances with internal fixation may reduce the need for external fixation. He notes that ex-fix may not be as cost-effective as AO techniques in facilitating early weightbearing, and also cites the anesthesia risks associated with external fixation. No, George Vito, DPM, says that fixators can provide sufficient osseous stability to facilitate bone healing. In addition to improving outcomes with the Charcot foot, external fixation can be beneficial as an adjunct with fracture repair and ankle fusions. The author also emphasizes the need for an improved understanding of the fundamentals of external fixation.

---

**Yes, this author says technological advances with internal fixation may reduce the need for external fixation. He notes that ex-fix may not be as cost-effective as AO techniques in facilitating early weightbearing, and also cites the anesthesia risks associated with external fixation.**

**By Lawrence DiDomenico, DPM**



In recent years, there has been an increase in the use of external fixation in lower extremity care. In the midst of the increased use of this modality, some surgeons have acquired “frame disease” and some patients have developed “cage rage.” This means the surgeons cannot wait to apply the next external fixation device and the patient cannot wait until the external fixation device is removed.

External fixation clearly offers a distinct number of advantages in certain surgical cases over standard AO internal fixation. Despite the increase of indications over the past 20 years, the use of external fixation will not completely replace the standard AO internal fixation techniques. Regardless of the distinct number of advantages, it appears that external fixation may be overutilized in the routine surgical care of the foot and ankle. Foot and ankle surgeons should be judicious and reserve the use of external fixation for the more severe and complex surgical cases.

## A Guide To The Goals And Applications Of Ex-Fix With The Ilizarov Method

With the Ilizarov method of external fixation, one can accomplish a variety of objectives. These objectives include:

- facilitating constant external tension to bone and soft tissue;
- achieving compression in any direction, which can lengthen/compress bone and soft tissue;
- repairing fractures; or
- correcting complex deformities of the foot and ankle.

The Ilizarov method is based on the idea that growing bone changes can be facilitated by external stimuli (Wolff's law). In other words, bone responds to compression and distraction forces from the apparatus.

There are many applications for this method for complex hindfoot and ankle deformities. Appropriate indications for the use of external fixation in foot and ankle surgery include but are not limited to temporary fixation or staged procedures, and patients who have experienced trauma (high energy fractures resulting in significant soft tissue injury, closed or open fractures). Other applications include bilateral lower extremity trauma, osteomyelitis, Charcot arthropathy, clubfoot deformities, equinus, varus and valgus deformities, arthritic conditions, limb length deformities, revision (failed surgery), soft tissue contractures, rheumatoid patients (with diseased upper extremities that will not allow their upper body to be supportive with crutches, walkers, etc.), direct exposure to wounds, nonunions, bone grafting and major reconstruction.

While these external fixation techniques have received fervent support, surgeons must be aware there is a very steep learning curve with external fixation techniques. Foot and ankle surgeons must have a high level of respect for this technique as it takes considerable time to sufficiently conceptualize the technique, which presents in a variety of ways.

## **Early Weightbearing: Is Ex-Fix Truly A More Cost-Effective Option Than Internal Fixation?**

Proponents of external fixation endorse the method as an alternative option to more traditional AO techniques (rigid internal fixation). However, advances in the current technology of the AO locking plate systems may decrease the need and use of external fixation.

When it comes to external fixation, proponents cite early weightbearing as a benefit of using external fixation. For example, there are proponents who perform a Lapidus bunionectomy via external fixation and boast that they can achieve immediate or early weightbearing with their patients. In my experience, one can achieve full weightbearing at two weeks postoperatively with a cast boot in patients who undergo a Lapidus bunionectomy via traditional AO techniques. Accordingly, one should look at the cost comparison of the two techniques and ask if there really is much of an advantage.

Additionally, the surgeon also has to understand the viscoelastic properties of bone and the potential long-term sequelae of a procedure such as the Lapidus bunionectomy performed with external fixation. The astute surgeon should be cognizant of the bone healing process, the fact that bony union is not fully mature at two to three months following removal of an external fixation device, and early weightbearing in these patients can often lead to an elevatus.

In regard to primary ankle and triple arthrodesis, one can use the traditional AO technique and achieve early weightbearing. My personal experience in Europe several years ago allowed me to witness patients who achieved early weightbearing with a cast boot following hindfoot and ankle procedures. For example, the postoperative course for a conventional ankle fusion consisted of partial weightbearing with a protected walking boot at two weeks. The postoperative course for a triple arthrodesis with traditional AO technique allowed partial weightbearing in a protective cast boot at three to seven days.

Given that the medicolegal ramifications in the United States are different than those in Europe, my experience has allowed me to recognize that early weightbearing is reasonable, successful and achievable when one utilizes proper AO technique.

## **A Closer Look At The Use Of Ex-Fix With Arthrodiastasis For Osteoarthritis**

Another commonly described use of external fixation is with arthrodiastasis in the treatment of osteoarthritis. Van Valburg, et. al., performed an animal study to observe the effects of distraction on articular cartilage at a cellular level.<sup>1</sup> In 1995, Van Valburg, et. al., studied arthrodiastasis on a series of

11 patients with posttraumatic arthritis of the ankle.<sup>2</sup> Researchers applied distraction with an Ilizarov external fixator for three months in an effort to prevent or delay the need for a joint destructive procedure.

They found that these changes in hydrostatic pressure stimulate cartilage matrix synthesis and decrease production of catabolic cytokines. Ambulation on a distracted ankle that is relieved of normal mechanical stress creates small fluctuations in the joint fluid pressure that improve a patient's pain and functional ability. The study authors concluded that joint distraction could be a helpful treatment for osteoarthritis.

Regarding the use of external fixation in the treatment of hallux limitus/ rigidus and first metatarsophalangeal (MPJ) osteoarthritis, it appears that most hallux limitus/ rigidus cases with first MPJ osteoarthritis are secondary to biomechanical elevation of the first metatarsal. They are rarely the result of a congruent joint that is posttraumatic in nature.

Given this understanding, distracting a joint that is malaligned will provide limited longevity for the relief of the symptoms. However, it would make more sense if a surgeon reconstructs, stabilizes and plantarflexes the first metatarsal more proximally and couples it with an external fixator in order to distract a well-aligned joint. Using an external fixation alone for an isolated first MPJ arthrodiastasis typically yields less favorable long-term results when one has not addressed the biomechanical etiology.

## **Other Pertinent Considerations**

In regard to possible overutilization of external fixation, there are surgeons who perform major reconstructive surgeries, apply a frame and do not allow patients to bear weight. This goes against all fundamental Ilizarov principles. In these cases, one has essentially applied a very "expensive cast." One of the well known advantages of circular external fixation is that it permits full and immediate weightbearing.

Advocates of external fixation state that wound slough and deep infections are noteworthy risks with standard open techniques and a cause for concern with certain patient populations. External fixation techniques are much less invasive to the soft tissue envelope when one performs this technique percutaneously.

A methodical preoperative assessment of potential operative candidates will support the surgeon with suitable selection criteria. Medically compromised patients such as smokers, obese patients, patients with diabetes, those with rheumatoid arthritis, people with vascular impairment and patients with immune compromise do not fare as well with standard open surgery and are more appropriate patients for ex-fix.

However, one must consider and evaluate anesthesia risks with external fixation. Keep in mind that external fixation typically requires a significantly longer operative time than typical AO techniques (primarily when the surgeon is first acquiring the skills). In most scenarios, a second anesthesia is necessary upon removal of the external fixation device.

Many surgeons who utilize external fixation say it provides a greater amount of compression to a fracture site, osteotomy site or an arthrodesis site compared to customary AO internal fixation. Although this may be true, how much fixation does one need to obtain union? In fact, too much compression can possibly promote reabsorption at a union site.

## **In Conclusion**

External fixation affords the surgeon another option in certain surgical cases over customary AO internal fixation. Based on the increase in indications for the lower extremity and the education being provided on the use of external fixation, use of the modality has grown rapidly but external fixation may be overutilized in some routine surgical care involving the foot and ankle. Surgeons should be judicious and reserve the use of external fixation for the more severe and complex surgical cases, and stay within the standard of care for certain pathological conditions.

*Dr. DiDomenico is affiliated with the Forum Health/Western Reserve Care System in Youngstown, Ohio. He is the Director of the Reconstructive Rearfoot and Ankle Surgical Fellowship within the Ankle and Foot Care Centers and the Ohio College of Podiatric Medicine. Dr. DiDomenico is a Fellow of the American College of Foot and Ankle Surgeons.*

## References

1. Van Valburg AA, Van Roermund PM, Marijnissen CA, Wenting JG, Verbout AJ, Lafeber FP, Bijlsma JW. Joint distraction in treatment of osteoarthritis (II): effects on cartilage in a canine model. *Osteoarthritis Cartilage*. 8(1):1-8.
2. Van Valburg AA, van Roy HL, Lafeber FP, Bijlsma JW. Beneficial effects of intermittent fluid pressure of low physiological magnitude on cartilage and inflammation in osteoarthritis. An in vitro study. *J Rheumatol*. 1998 Mar;25(3):515-20.

**No**, this author says that fixators can provide sufficient osseous stability to facilitate bone healing. In addition to improving outcomes with the Charcot foot, external fixation can be beneficial as an adjunct with fracture repair and ankle fusions. The author also emphasizes the need for an improved understanding of the fundamentals of external fixation.

By George Vito, DPM



In the 1950s, Professor Gavril Ilizarov developed a method in which he attached small-diameter transosseous wires to a modular construct consisting of circular rings. He pioneered his work in the small manufacturing city of Kurgan within the former Soviet Union and later popularized it in Italy and then North America. The original application of the ring fixator was for deformity correction but surgeons later applied it in trauma and reconstructive procedures. I have been fortunate enough to visit the Kurgan Institute 11 times and still have yet to fully comprehend the mysteries of the device.

External fixation now plays an important role in the treatment of foot, ankle and leg deformities. Within the past 10 years, there has been a wave of articles, lectures and presentations directed at the indications for external fixation. The use of external fixation, whether one is utilizing mono-lateral, circular or hybrid (the combination of the two systems) devices, has unquestionably changed the entire surgical approach for the foot and ankle surgeon throughout the world.

## Assessing The Full Range Of Uses For Ex-Fix

When one utilizes external fixation properly, it can provide adequate osseous stability to aid in potential bone healing. The purpose of external fixation is to anchor osseous fragments together through the use of wires and or half-pins. External fixators possess an advantage over other forms of immobilization due to the function of bent wire techniques, which provide superior compression techniques to all other types of internal fixation.

The uniqueness of fixators allows increasing compression over a period of time. One can immobilize multiple areas of the affected limb while applying compression or distraction at varying sites. In the case of large tissue loss, the surgeon can apply the external fixator to avoid potential areas of vascular supply. One may apply the fixator in such a fashion as to allow for the placement of skin grafts if necessary. However, the most important benefit of external fixation is the ability of the patient to attain partial to full weightbearing immediately after the surgery.

However, the use of external fixation has not been without certain obstacles. These obstacles have been placed not only by our competitors within the different specialties but by peers within our same societies. I find it amazing that surgeons whom I have personally trained over the past 17 years in the use of external fixation are the same surgeons who suggest that the overutilization of external fixation is the main contraindication of its current usage.

Not only do our peers create obstacles, hospitals, insurance companies and the companies that supply the external fixators create barriers that each one of us who use external fixation must break in order to secure the best possible care for our patients.

Due to the explosion of treatment options with the use of external fixation, the use of these products has also increased. However, the increased utilization is not due to overutilization but recognition of the uses of the product. Due to the recognized principles of the techniques initially described by Ilizarov and improved understanding and recognition among current surgeons on the use of these methods, we have been able to achieve success in limb salvage and deformity correction. We have also been able to apply external fixation as an adjunct to standard surgical procedures (triple arthrodeses, ankle fusions, Charcot reconstruction and fracture repairs).

However, the Charcot foot is the most recognized indication to date within the world of foot and ankle surgery for the use of external fixation. There is simply no other form of reconstructive surgery that offers the surgeon and patient treatment options with a higher level of success. To offer a patient a surgical procedure that can either correct or reduce the progression of the Charcot foot/deformity with partial or full weightbearing capabilities is simply remarkable.

## **Why Understanding Ex-Fix Principles Is So Vital**

Those who suggest that external fixation is being overutilized are the same surgeons who suggested that screw fixation was overutilized when it was introduced years ago. Surgeons need to recognize the fact that the evil of progression is security in one's current abilities. We as healthcare providers need to strive for new treatment methods that result in outcomes that succeed our current methods of treatment. To suggest that external fixation is being overutilized is an excuse for those surgeons not to learn new methods, not to properly understand the standard techniques of external fixation and to turn a blind eye to those procedures that far exceed the standard success rates.

As with internal fixation, knowledge of the fundamentals and experience with the various forms of hardware are paramount for a successful outcome. Just within the past three to four years, educators have drifted away from teaching the basics of ring fixation. With the onset of more computer-oriented fixation systems, there appear to be numerous surgeons trying to jump on the bandwagon of external fixation without understanding the basic concepts in which all aspects of external fixation are based. Without the teachings of the basic fundamentals, the young surgeon will venture into uncharted waters in which he or she may never understand methods for minimizing complications.

In today's ever cost conscious medical society, in which surgeons are constantly being monitored by hospital and surgical center administrators in reference to cost issues, it still amazes me that surgeons use certain frames based on their need to be noticed rather than the needs of the patient. Therefore, I challenge those who suggest the use of external fixation may be overutilized to break through their own insecurities and learn the standard methods of external fixation and the new techniques presented by those who are considered pioneers in the field of external fixation.

Only then will those who question our abilities open their eyes to methods of fixation that are unquestionably superior to those currently performed in the field of foot and ankle surgery. Within the specialty of foot and ankle surgeons, there remain a dedicated few who desire the basics of external fixation to be taught as the process was originally intended to be taught by our Russian counterparts. The fundamentals must continue to be passed down from surgeon to surgeon without being watered down to suit the egos of those who do not understand the common generalities of the concepts and process of external fixation.

## **In Conclusion**

Unfortunately, those who may have been trained inadequately have been the first to chastise those who routinely perform the procedure to that of the standard methods. The common argument of high complication rates, cost and the lack of documented studies can only go so far for these are the excuses of those who no longer wish to advance their knowledge base. With an adequate knowledge of external fixation, the surgeon will be able to perform the methods with lower costs along with a lower complication rate. Finally, surgeons will only need to open a book or a journal every two to three months to prove to themselves that the lack of documented studies is due to their lack of reading, not the lack of material.

*Dr. Vito is the Director of the Atlanta Leg Deformity Correction Center in Macon, Ga. He is a Fellow of the American College of Foot and Ankle Surgeons, and is a faculty member of the Podiatry Institute.*

---

Podiatry Today - ISSN: 1045-7860 - Volume 20 - Issue 6 - June 2007 - Pages: 72 -  
77