

# Utilization of the X-Fuse™ Superelastic Implant for Hallux IPJ Arthrodesis

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## ABSTRACT

*Hallux interphalangeal (IPJ) joint problems can be caused by a number of events including congenital deformity, trauma, arthritis, or neurological deformity. When diagnosis calls for arthrodesis, traditional solutions have been limited to screw fixation or k-wire treatment. The fixation was modified by using the X-Fuse™ Superelastic Implant ([www.mmi-usa.com](http://www.mmi-usa.com)) as an alternative to the commonly performed screw fixation. The X-Fuse™ offers an intramedullary solution for arthrodesis of the Hallux IPJ joint. The X-Fuse™ implant affords the surgeon a solution that offers dynamic compression across the osteotomy, eliminates distal tip exposure, and prevents rotation around the screw axis. There is no risk of screw back-out and it eliminates the inter-office k-wire removal. The X-Fuse™ provides a flat, rigid construct in achieving arthrodesis across the Hallux IP joint.*

## INTRODUCTION

Arthrodesis of the interphalangeal joint (IPJ) of the hallux is indicated in the presence of IPJ symptoms including pain and deformity of the great toe. These symptoms often present secondarily to conditions affecting the stability of the hallux. These include: saggital, transverse, and frontal plane deformity, trauma, arthritis, and neurological conditions that affect the intrinsic and extrinsic musculature to the hallux. Arthrodesis of the IPJ is indicated in patients where intrinsic muscle function has been compromised and digital and MPJ stability are lacking. Fixation of the IPJ has been performed using many different methods of fixation including the use of cancellous screws, cortical screws, k-wires, and monofilament wire. Many studies show high rates of pseudoarthrosis with k-wire and monofilament fixation methods, and screw fixation may result in distal tip exposure and screw head irritation or prominence whether inserted from distal to proximal or at an angle from proximal to distal. There have also been problems cited with rotation of the hallux around the screw axis. The X-Fuse™ Superelastic Implant allows for intramedullary fixation with dynamic



compression across the fusion site and prevents rotation in the frontal plane.

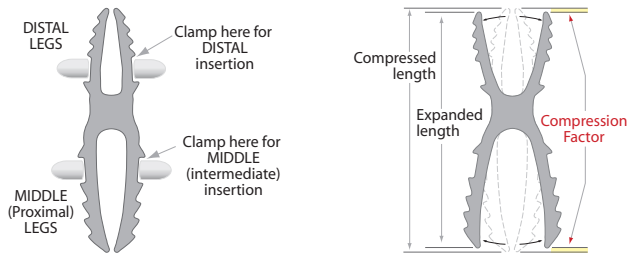
## PATIENT HISTORY

The patient is a 50 year old female who suffered a stroke 5 years prior, which affected her entire left side. She related that subsequently the toes on her left foot became contracted within 6 months of the stroke. The problem continued to worsen and she noticed that the great toe became especially painful. She presented with a Hallux Malleus deformity that was rigid in nature. She had extension at the MPJ, which was manually reducible, but the flexion at the IPJ was non-reducible and upon weight bearing the dorsal IPJ became very prominent. She had already tried padding and shoe modification without relief, the decision was made to perform an IPJ fusion to provide a stable lever on which the long and short flexors can function to assist in MPJ stability.

## SURGICAL TECHNIQUE

An “S” shape incision was utilized and extends proximal-medial to distal-lateral with a transverse arm at the level of the IPJ. A layered anatomical dissection approach was used to expose the interphalangeal joint with a distal transverse tenotomy of the extensor hallucis longus tendon. An oscillating bone saw and rongeur were used to prepare

## CONTRACTION / EXPANSION DESIGN



The notched legs help achieve a stable bony union after fixation.



X-Fuse IP Implant with Smart Toe Implant

the joint surfaces for fusion. The provided 2mm drill bit was used to ream the medullary canal of the proximal phalanx and distal phalanx. Next, the provided broaches were inserted and removed to prepare the

canals for the implant. The broaches are specific to the size of the implant and clearly marked for proximal and distal. The 16mm non-angulated X-Fuse™ device was then loaded onto the provided forceps and the proximal legs were inserted into the proximal phalanx and the forceps released. The arms of the implant expand securing the device in the bone. The forceps were then used to grasp the distal legs and insert them into the distal phalanx by distracting the hallux and sliding into the medullary canal. The forceps were then released when the hallux was in the desired position. The distal legs expand, effectively compressing across the fusion site as they provide rigid fixation. Intraoperative fluoroscopy was utilized to confirm arthrodesis position, correction of deformity, and correct placement of the implant. Deep and superficial closure was then performed with re-approximation of the extensor tendon.

## OUTCOME

The patient had an uneventful post-op course. She was allowed to ambulate in a fracture boot after surgery and progressed to a surgical shoe 6 weeks post-op and regular shoe gear 8 weeks post-op. Upon weight bearing, the hallux was stabilized, no buckling or lack of purchase was present, and she had normal ROM at the MPJ. She had radiographic fusion at eight weeks, and there were no complications.

## DISCUSSION

The X-Fuse™ Superelastic Implant provides an attractive alternative to other fixation methods for arthrodesis of the hallux interphalangeal joint. The X-Fuse™ offers compression due to the spring-loaded legs of the implant and elastic memory. Prior to insertion the legs of the implant are held together and post insertion the legs expand due to the memory nature of the alloy, and dynamic compression is achieved across the arthrodesis site. The device is intramedullary, which prevents any irritation post-operatively as is commonly seen with screw fixation, and the notched legs of the implant prevent any axial rotation and help achieve a stable union. The compression achieved means less chance for pseudoarthrosis as shown in studies with k-wire fixation.

The X-Fuse™ is quickly and easily inserted across the IPJ after joint preparation. There is no need for difficult alignment of the device, it is simply inserted into the medullary canal after a small amount of reaming. The X-Fuse™ implant reduced operative time compared to other methods. There are two sizes available, large (16mm) and x-large (20mm), with angle options of 0° or 15° in each size.