

# THE KELLER BUNIONECTOMY FOR THE CORRECTION OF HALLUX RIGIDUS

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Joint destructive procedures are often looked upon poorly for the correction of degeneration of the first metatarsophalangeal joint. Cheilectomy with osteotomy is often attempted to restore as much normal function as possible. However, once the degree of degeneration has progressed to grade III limitus, with near complete absence of joint space, some form of joint resection is usually required.

First metatarsophalangeal joint arthrodesis is the most predictable option. Numerous studies have demonstrated good to excellent postoperative results, with patients not only painfree but ambulating with near normal pressures across the forefoot. The Keller procedure, on the other hand, has well documented complications including loss of propulsive gait, metatarsalgia and a short, floppy hallux. This procedure is successful in a very limited population, to those who are already apropulsive and have no plantar callusing. Attempts to overcome the deficiencies of this procedure include the Renguald modification, hemi- and total implant arthroplasty (one and two component). These modifications, while anatomically corrective do not restore normal function to the metatarsophalangeal joint.

### FIRST METATARSOPHALANGEL JOINT FUNCTION

During the propulsive phase of the gait cycle the peroneus longus contracts and causes the first metatarsal to plantarflex. As weight is transferred to the medial column the retrograde pressure of the hallux helps to maintain this plantarflexed attitude. The proximal tension exerted by the hallux is through the intrinsic musculature (flexor hallucis brevis, abductor hallucis, adductor hallucis), all which attach into the base of the proximal phalanx. Once the hallux is stabilized against the metatarsal the long flexor adds to the stabilization and assist in propulsion. If this stability is lost, the resultant metatarsus primus elevatus and loss of propulsion will lead to a short steppage gait and metatarsalgia. Resection of the phalangeal base will obviously

result in loss of the intrinsic muscles as their insertion is disrupted. Although the long flexor is intact, the resulting shortening will weaken the tendon rendering it essentially nonfunctional.

An anatomic spacer (implant) will place tension on the long flexor tendon, but without the short flexors stabilizing the proximal phalanx in plantar flexion, the proximal tension exerted by FHL will result in buckling of the toe and a malleous deformity.

Attempts to maintain short flexor function by removing a small sliver of the phalangeal base may keep some of the insertion intact but will not sufficiently decompress a degenerative joint. Suturing the short flexors or the long flexor to the base of the proximal phalanx has theoretical advantages, but there is no evidence of their effectiveness. Additionally, by re-attaching these tendons the retrograde pressure against the metatarsal head may be counter productive.

The long extensor tendon also is an important structure. Although anatomically the EHL attaches to the distal phalanx, its functional attachment is to the metatarsophalangeal joint via the hood apparatus, therefore; removal of the phalangeal base does not weaken the EHL. If this tendon is not addressed during surgery the toe will elevate. Since the long flexor is weakened, the hallux will go into elevatus not malleous.

There have been several modifications of the Keller in attempt to counterbalance these potential problems. The remainder of this article will give the author's experience with a modification of the Keller described by Mroczek in *Foot and Ankle International*. He described a "V" shaped Keller with a proximally based capsular flap.

### TECHNIQUE

A standard dorsal skin incision is placed over the joint. The extensor retinaculum is incised and the long extensor is retracted laterally. A rectangular capsular incision is made dorsally. The width of the

flap is about the width of the metatarsal. The capsular flap is raised, beginning proximal and left attached distally. A modified Keller resection is performed. The cut is made on an oblique angle from dorsal distal to proximal plantar. Dorsally, the amount of bone removed is at least one centimeter. The plantar cut exits just distal to the articular surface. This leaves the insertion of the intrinsic muscles intact. The capsular flap is then sutured into the defect created.

### **EXPERIENCE**

The recovery period is certainly more rapid than that of an arthrodesis. The patients are weight bearing in a surgical shoe and can transition into soft, wide shoes usually by a month or so. The post operative course in my six patients has been variable. Most have had more postoperative edema than anticipated. To date all patients are asymptomatic, but has taken many months for full healing. Plantar purchase has been maintained.

The most disappointing aspect of the surgery is the failure in several patients to obtain an increase in the range of motion of the metatarsophalangeal joint. In retrospect, these patients had a noticeable hallux equinus. On preoperative radiographs, the hallux is plantarly displaced under the first metatarsal. Even though a large amount of bone is removed from the dorsal part of the joint, the inferior aspect of the phalangeal base is still under the metatarsal head. As the phalanx is dorsiflexed, there is impingement on the inferior joint surface.

The modification of the Keller described by Mroczek has several advantages over the traditional approach. Length is maintained to the toe keeps it normal appearance. The intrinsic muscles are left intact so the patient is able to propel, eliminating the problem of lesser metatarsalgia. This procedure may not be successful in all cases of hallux rigidus. The sagittal plane position of the hallux in relationship to the metatarsal head appears to play a role in the amount of movement obtained postoperatively.