

## REPAIR OF HALLUX LIMITUS/RIGIDUS

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Hallux limitus occurs when there is a functional or structural deformity of the first ray that results in loss of motion and/or arthrosis of the first metatarsal phalangeal joint. Hallux limitus was first described in 1887 by Davies-Colley.<sup>1</sup> The term hallux rigidus is reserved for conditions of severe loss of motion and arthrosis of the joint. Often times patients develop pain in or around the first metatarsal phalangeal joint as a result of dorsal impingement of the joint. The presence of other symptoms can occur, such as lesser metatarsalgia, increased motion and pain of the interphalangeal joint of the hallux, exostosis in and around the joint, lateral column pain, and gait disturbances. The most common etiologies of hallux limitus are a long or short first metatarsal, elevated first metatarsal, one of the arthritides, iatrogenic deformities, trauma, hypermobility, neuromuscular disorder, or may be a result of a varus or valgus condition of the foot or ankle.

There are a number of classification schemes that are based on clinical and radiographic findings that grade the severity of the hallux limitus.<sup>2,3</sup> All of these classifications are good at assessing the severity of the condition, but the treatment for each stage is highly debatable. It is important with all of these schemes to identify the etiology of the hallux limitus to formulate the most effective treatment plan. After the etiology has been determined then there are factors that must be taken into consideration, such as the patient's age, activity level, and quality of the bone. In the literature there are a number of proposed surgical treatment options that have been discussed.<sup>2</sup> Any one of these procedures may work well in any given surgeon's hands, given their experience. However, there are some techniques that have more advantages than others. The different types of procedures can be divided into joint salvage or joint destructive. The joint salvage procedures range from the simple cheilectomy, osteotomies of the proximal phalanx of the hallux, osteotomies of the first ray, and arthrodesis of the first metatarsal cuneiform joint. The joint destructive procedures consist of joint replacement, joint fusion, and joint arthroplasty. With any of these procedures the patients must be instructed on the risks and

benefits as they relate to hallux limitus and the long-term effects.

In cases of mild hallux limitus, a cheilectomy is often times very effective in improving the condition.<sup>4</sup> The procedure is followed with early, active range of motion of the first metatarsal phalangeal joint. The patient must be prepared for the possibility of reoccurrence of the condition and further surgery. A cheilectomy should not be performed in the presence of structural malalignments, unless there are extraordinary circumstances. A cheilectomy is an integral component of all surgical cases, regardless of the procedure.

In the presence of structural deformities of the first ray, a first metatarsal osteotomy can be very effective in improving or restoring range of motion of the first metatarsal phalangeal joint as well as reducing pain (Figure 1). An osteotomy can be performed in simple, moderate, or severe hallux limitus deformities. The osteotomy can be technically demanding in severe cases of first metatarsal elevatus or a long first ray (Figure 2). A modified Austin procedure can effectively plantarflex and/or shorten the first ray with the appropriately positioned axis guide.<sup>5</sup> If there is limitation in the amount of lateral transposition of the capital fragment, then the capital fragment can be shortened and/or plantarflexed by making two cuts parallel dorsally to remove a bone wedge or two saw blades can be used when making the dorsal cut.<sup>6</sup> It is important not to make the dorsal cut too short; otherwise the osteotomy will be unstable and difficult to fixate. In order to begin early range of motion of the joint, a stable form of fixation is imperative with any first metatarsal osteotomy. The sesamoid apparatus is important to assess when performing a first metatarsal osteotomy.<sup>7</sup> The mobility of the sesamoids can be limited in moderate to severe cases of hallux limitus. Adequate sesamoid mobility is necessary to improve the outcome of the procedure. Another key aspect of the procedure is the evaluation of the cartilaginous surface of the first metatarsal head. If a defect is present, then the surface should be drilled with a small Kirschner wire to promote fibrocartilage



Figure 1A. Dorsiflexion of the first MPJ pre-operatively.



Figure 1B. Dorsiflexion of the first MPJ following a modified Austin procedure.



Figure 2A. Preoperative AP radiograph of hallux limitus with multiple exostosis and long first metatarsal.



Figure 2B. Preoperative lateral radiograph of hallux limitus with exostoses and first metatarsal elevation.



Figure 2C. Postoperative AP radiograph following a modified Austin procedure. Note shortening.



Figure 2D. Postoperative lateral radiograph following a modified Austin procedure. Note plantarflexion.

formation (Figure 3). A lateral release is typically not performed with this type of first metatarsal osteotomy, unless there is a hallux valgus component present. An important aspect of the surgery is the performance of range of motion exercises postoperatively to maintain joint mobility. A noncompliant patient can dramatically reduce the effectiveness of the procedure.

A joint destructive procedure is often very effective in improving or resolving a severe hallux limitus deformity. There are a number of variables to consider when performing these types of procedures. The patient's age, activity level, and bone quality are important factors in the decision making process. The older less active patients function very well with a Keller arthroplasty.<sup>8</sup> The advantage in this population is the ability to ambulate without pain in a flat surgical shoe postoperatively. There may be some argument for joint replacement in the same type of patient, as long as there is sufficient bone mass and no underlying structural abnormalities. The longevity of the implanted device should be discussed with the patient. The younger more active patients function very well with a first metatarsal phalangeal joint arthrodesis. The presence of elevation of the first

ray must be considered whether it is functional or structural before an arthrodesis of the first metatarsal phalangeal joint is performed. Secondary complications, such as lesser metatarsalgia or stress fractures may occur if the elevation is not recognized. The outcome of the procedure may be less than satisfactory, if these issues are not appropriately addressed.

Hallux limitus may seem like a straightforward condition, though there are many variables that must be considered when determining the appropriate treatment plan. The underlying etiology must be determined in each patient because it may need to be addressed at the time of surgery. The patient's age, activity level, and bone quality are important factors in any surgical patient. In order to improve the expectations of the patient following surgery, a detailed discussion concerning the severity of the hallux limitus should be undertaken, including the possibility of future surgery if the arthrosis progresses. During the preoperative period, each patient must be instructed on proper range of motion exercises. A successful outcome for hallux limitus/rigidus surgery occurs when the appropriate procedure is performed in the right deformity, given that particular patient and situation.

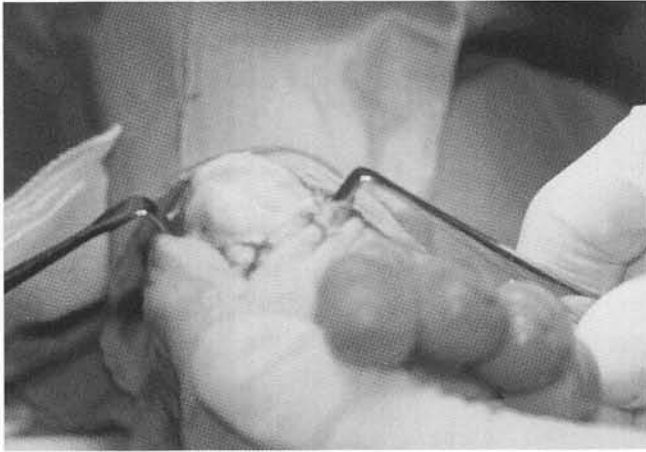


Figure 3A. Cartilaginous defect of the superior portion of the first metatarsal.

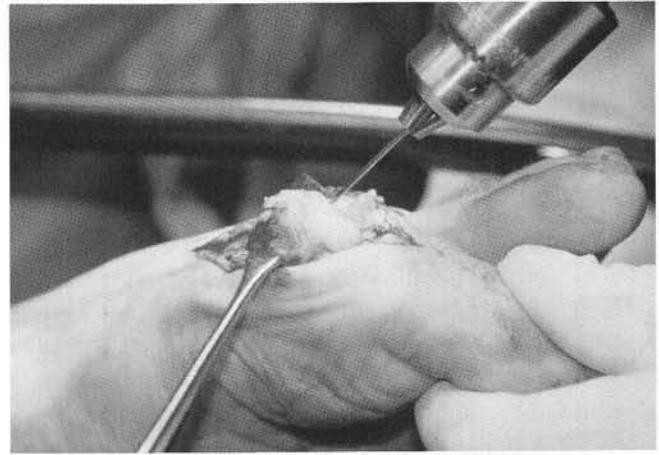


Figure 3B. Drilling of the first metatarsal head.

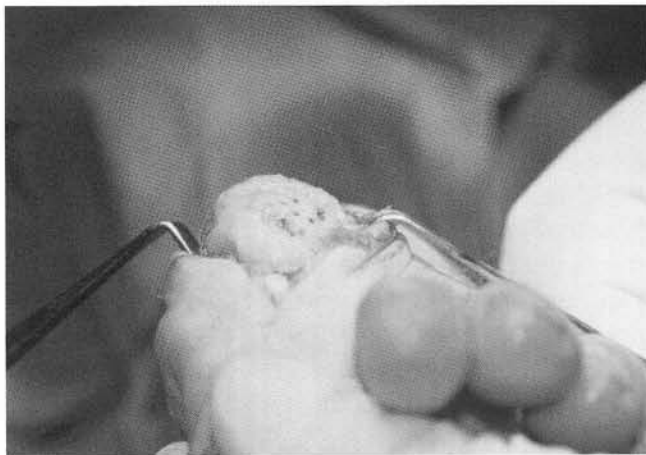


Figure 3C. Fenestrated first metatarsal.

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