CHAPTER 9

NON-SURGICAL AND SURGICAL MANAGEMENT OF HALLUX LIMITUS IN THE ATHLETE

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INTRODUCTION

The differential diagnosis of first metatarsophalangeal joint (MPJ) pain in the athlete may include acute traumatic injuries, chronic micro-trauma including sesamoiditis, systemic disease such as gouty arthritis, and structural deformities such as hallux valgus. Common conditions for an athlete or active person to seek treatment for at the first MPJ are hallux limitus and hallux rigidus. Both hallux limitus and hallux rigidus are clinical and diagnostic terms that represent progressive phases of the same process with no distinct markers to separate the phases. Limitation of motion at this joint can result in direct pain at the first MPJ or compensation elsewhere on the foot or lower extremity, significantly affecting the ability to participate in sport and fitness activities and even normal walking.

HISTORY

Hallux limitus was first reported in the literature in 1887 by Davies-Colley who coined the termed hallux flexus. They described a degenerative condition of the first MPJ, which lead to swelling and a decrease in sagittal plane range of motion. Hallux rigidus was later described by Cotterill in 1888 and correlated pain in association with limited dorsiflexion of the hallux on the first metatarsal. The prevalent condition has been discussed in the literature since the first publications in the late 1880s (1).

ETIOLOGY

Hallux limitus is associated with an extensive list of possible etiologies. The Clinical Practice Guideline developed by the First MPTJ Disorders Panel of the American College of Foot and Ankle Surgeons categorizes the causes for hallux rigidus into 6 groups: traumatic, structural, metabolic, biomechanical, neuromuscular, and post-surgical (2).

GRADING

Multiple classification systems have been developed over the years describing hallux limitus. Those systems that correlate clinical and radiographic findings, while offering potential treatment options, are the most useful. Ragnauld developed a 3-stage classification system in 1986 based on clinical findings and radiographic deformity of the first MPJ. Drago, Oloff, and Jacobs later added a fourth stage to address a functional limitation in joint movement without evidence of joint destruction on radiographs. A combination of these classifications is most widely utilized (2-4).

Stage I. Functional Limitus. The proximal phalanx of the hallux is unable to extend on the first metatarsal head during gait; no radiographic evidence of degenerative joint changes.

Stage II. Joint Adaptation. Pain on end range of motion with a small dorsal exostosis and flattening of the metatarsal head visualized on radiographs.

Stage III. Established Arthrosis. Pain and crepitation with full range of motion. On plain films, asymmetric narrowing of the joint space, large dorsal spurring and severe flattening of the metatarsal head are present.

Stage IV. Ankylosis. Secondary pain likely from skin irritation from underlying osteophytes; obliteration of joint space with severe osteophyte formation and loose bodies.

EVALUATION

Patients usually present with reports of pain and/or joint stiffness at the first MTPJ. The pain is usually exacerbated with activity, especially following barefoot walking, wearing high-heeled shoes, or flexible athletic shoe gear. Compensatory symptoms may include pain and/or callus formation beneath the hallux interphalangeal joint or the presence of lateral column pain (1).

On clinical examination, observation of the nonweight-bearing foot typically reveals the hallux in rectus alignment in both the transverse and sagittal planes. Available motion

and the degree of pain throughout range of motion at the first MTPJ is indicative of the degree of arthrosis present. Other common structural deformities include short or long first metatarsal, elevated first metatarsal, flat foot, hypermobile first ray, metabolic conditions (such as rheumatoid arthritis and gout), and acute or repetitive trauma. Accurate assessment of the causes of hallux limitus will guide the conservative, as well as surgical, treatments for the patient (1).

CONSERVATIVE TREATMENTS

The nonsurgical treatment for hallux limitus is directed to reducing pain, potentially slowing down the progression of further joint damage and allowing for improved function at the first MPJ when possible. In determining what conservative options may be appropriate, the grading of the hallux limitus, symptom level, and underlying etiology need to be taken into consideration. The use of nonsteroidal anti-inflammatories and corticosteroid injections although effective from a symptomatic standpoint may actually result in a more rapid progression of the hallux limitus as a result of suppressing any feedback that pain may be providing.

An assessment of underlying structural deformities (long first metatarsal, metatarsus primus elevatus) or biomechanical dysfunction (flexible pes valgus) can lead to intervention from a biomechanical standpoint especially in stage 1 or 2 hallux limitus. Modifications to a functional orthotic device such as a Morton's extension, or a cutout under the first metatarsal head (Figure 1) can sometimes be used to accommodate these structural or biomechanical deficiencies with relief of symptoms and a reduction of the deforming forces occurring at the first MPJ.

SURGICAL TREATMENTS

Joint-Salvage Procedures

Cheilectomy. An isolated cheilectomy for first-line surgical treatment of hallux rigidus has been described in the literature for over 75 years. Basic surgical technique includes debridement of hypertrophic synovial tissue and loose bodies along with resection of osteophyte formation on the dorsal, medial, and lateral aspects of the first metatarsal and the base of the proximal phalanx. Cheilectomies are the mainstay of joint-salvage procedures because they are the least invasive, have a minimal postoperative recovery, and allow for conversion to other procedures if needed (5).

Most often indicated for less severe cases (grades I and II), the cheilectomy has proved beneficial in the late stages of hallux rigidus. After an extensive literature review in 2010, Roukis found a low incidence in revisional surgery after isolated cheilectomies and recommended they serve as a first-line surgical treatment for hallux limitus (6).

Figure 1. Dancer pad with first ray cut-out.

Soft Tissue Interpositional Arthroplasty. Autogenous soft tissue interpositional arthroplasty is one of the many different surgical procedures for preserving the joint in hallux rigidus. Multiple methods for soft tissue flaps are utilized, which include dorsal and medial capsule and/or periosteum from the proximal phalanx or first metatarsal or free periosteal, capsular, or tendonus grafts from anterior tibia, EHL or plantaris tendon, or gastrocnemius aponeurosis (7).

Phalangeal Osteotomy. Another surgical option for hallux rigidus is a dorsiflexory osteotomy at the base of the proximal phalanx. Most often these are performed in conjunction with a cheilectomy. Recent literature supports the idea that cheilectomy with phalangeal dorsiflexory osteotomy demonstrates pain reduction and improved patient satisfaction with a low overall incidence of the need for revisional surgery (8).

Metatarsal Osteotomy. Isolated osteotomy of the first metatarsal is another common method of surgical treatment for hallux rigidus. This option is intended to decompress the first MPJ through shortening while achieving plantar displacement of the metatarsal head to correct for elevatus. In 2010, Roukis found these procedures demonstrate a high incidence of complications requiring surgical intervention and revealed minimal improvement in patient satisfaction. Postoperative complications, such as lesser metatarsal pathology, were difficult to manage as well (9).

Joint Destructive Procedures

Resection Arthroplasty. Resection arthroplasty involves resection of the base of the proximal phalanx and/or the first metatarsal head. Excision of the joint increases the joint space and allows movement. Due to common complications such as postoperative metatarsalgia and floating toe, this procedure is reserved for older, more sedentary patients with severe arthrosis (2).

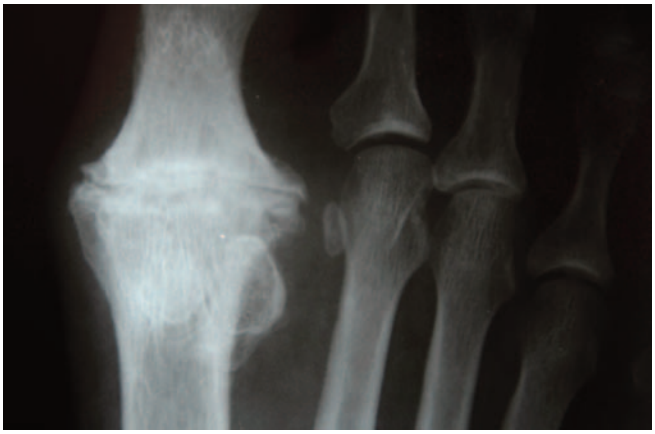

Figure 2A. Case Study 1. Preoperative AP radiograph.

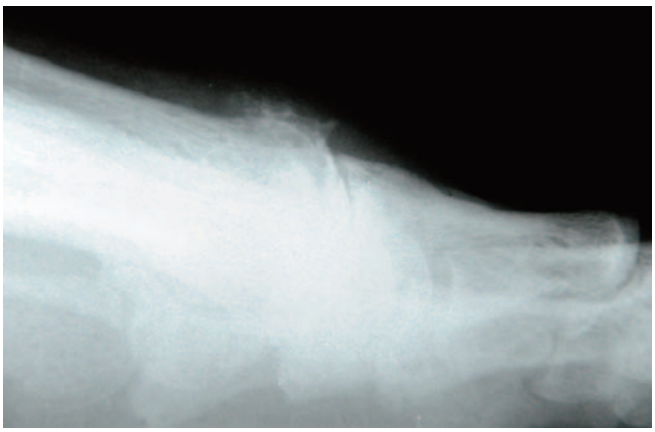

Figure 2B. Case Study 1. Preoperative lateral radiograph.

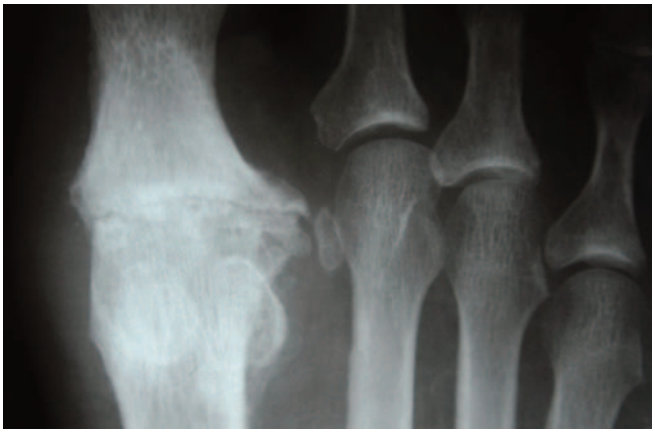

Figure 3A. Case Study 1. Postoperative AP radiograph.

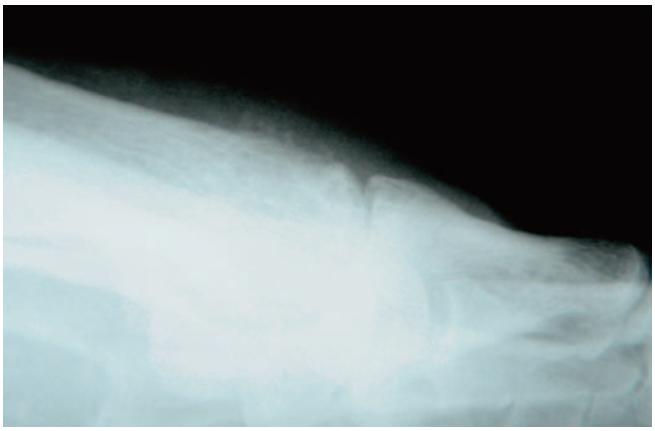

Figure 3B. Case Study 1. Postoperative lateral radiograph.

Implants (Total versus Hemi). Different types of implants have been used within the first MPJ for the past few decades. The most recent generations of hemi or double stem implants are metallic and require less bone resection for implantation. The long-term clinical effectiveness is yet to be determined for total joint replacements. Failed implants lead to complex revisional arthrodesis procedures with bone grafting (2).

Arthrodesis. The first MPJ arthrodesis has become an accepted procedure for the treatment of severe arthrosis even in the younger, more active population. Many studies have shown durable results, but arthrodesis can still be criticized for eliminating all of the motion of the first MPJ, overloading at the hallux interphalangeal joint, and possible delayed or non-unions (2).

CASE REPORTS

Case 1

WG is a 67-year-old obese man with a 10-year history of first MPJ pain with activity. The pain was mild to moderate on range of motion and significant with footwear. Radiographically and on clinical examination, the patient presented with a stage IV hallux rigidus with less than 10 degrees of dorsiflexion. A course of conservative treatments, which included NSAIDs and over the counter arch supports was unsuccessful in relieving the pain. Despite clinical findings, the patient did not want an arthrodesis and consented to a cheilectomy. A six-month postoperative follow-up visit revealed 25 degrees of dorsiflexion with 95 percent relief of pain during all activity. He has scheduled the opposite foot for a cheilectomy in 2012 (Figures 2, 3).

Figure 4A. Case Study 2. Preoperative AP radiograph.

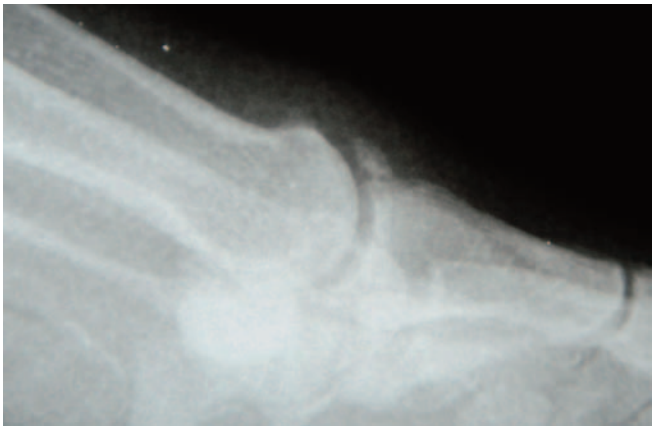

Figure 4B. Case Study 2. Preoperative lateral radiograph.

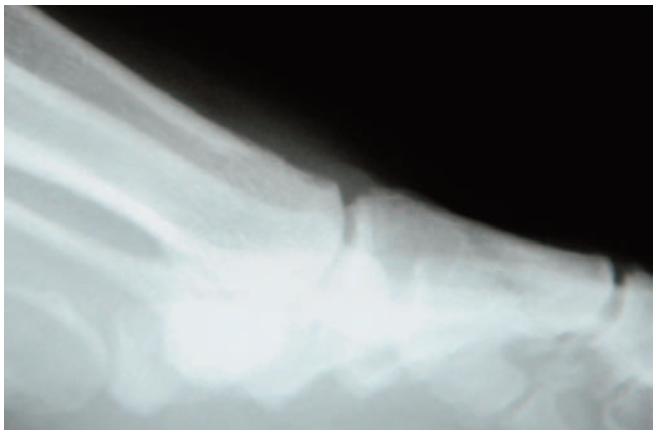

Figure 5A. Case Study 2. Postoperative AP radiograph.

Case 2

KC is a 47-year-old woman with reports of first MPJ pain after injuring her foot when stepping off her bike one year previously. Pain and crepitation were present on physical examination with approximately 30 degrees of total range of motion at the first MPJ. A loose osseous fragment and dorsal spurring was evident on radiographs. Pain was unrelieved with corticosteroid injection and Voltaren Gel prescribed by her orthopedic surgeon. After a cheilectomy, she had an increase of 10 degrees in range of motion and 100 percent pain relief at 8 months postoperatively (Figures 4, 5).

Case 3

JB is a 51-year-old woman with "years of pain in her big toe joint." Preoperative range of motion was 20 degrees. Intra-operatively she had 30 percent full-thickness loss of articular cartilage at the first metatarsal head. Postoperatively at 6 months she had 35 degrees range of motion with approximately 60 percent improvement of her pain. Despite this she still was able to return to full activity with a noticeable improvement in both her pain level and function (Figures 6, 7).

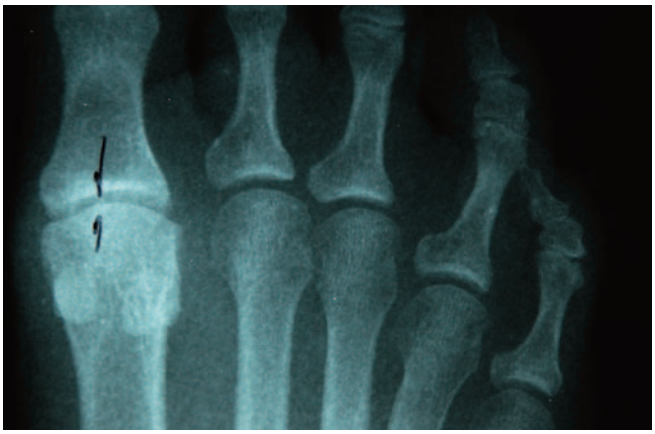

Figure 6A. Case Study 3. Preoperative AP radiograph.

Figure 6B. Case Study 3. Preoperative lateral radiograph.

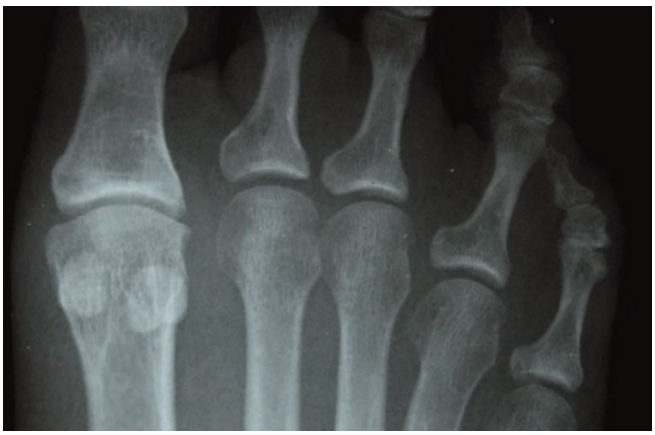

Figure 7A. Case Study 3. Postoperative AP radiograph.

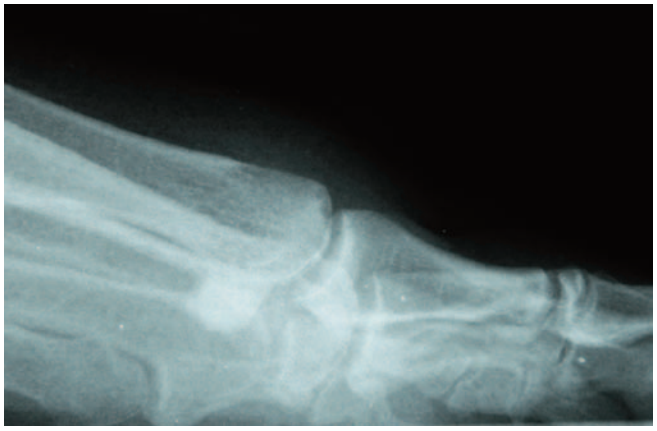

Figure 7B. Case Study 3. Postoperative lateral radiograph.

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