

Cheilectomy: Still a Useful Technique for Grade I and Grade II Hallux Limitus/Rigidus

Cheilectomy, as applied to hallux limitus/rigidus, is described as resection of the dorsal osteophytes and lateral/medial margins of the first metatarsal, as well as the dorsal lip of the base of the proximal phalanx. Forty-seven patients underwent unilateral cheilectomy, with an average follow-up of 3.5 years, and an average patient age of 52 years. Dependent upon the progressive nature of the disease, the results varied with the most beneficial results in the early stages of hallux limitus/hallux rigidus, which include symptoms, re-operation, and range of motion.

The indications for cheilectomy are hallux limitus/rigidus in grade I or grade II without sesamoid disease. Late grade II or grade III with sesamoid disease and degenerative joint disease are also described in terms of surgical treatment. The advantages of cheilectomy include early range of motion and rapid decrease in clinical symptoms; cheilectomy obviates the need for healing at an osteotomy site. The disadvantages include not addressing the underlying etiology, potential joint destruction, slippage, or pseudo-articulation at the joint's end range of dorsiflexion. It is not indicated in later stages of the disease.

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Hallux limitus is defined as a decrease, or limitation, in the range of dorsiflexion at the first metatarsophalangeal joint (MPJ) (1). Hallux rigidus refers to an absence of motion at the first MPJ. There is a continuum between the two conditions by clinicians, although subjectively, in terms of discomfort and degrees of motion at the MPJ. The treatment rendered for each patient's symptoms should ideally be dependent upon the underlying etiological and biomechanical factors. The cheilectomy procedure, however, does not address either of these factors, and therefore is purely a symptomatic treatment.

History and Etiology

The etiology of hallux limitus/rigidus (HL/HR) has been described in podiatric literature for decades. There are several anatomical abnormalities in the foot that may be predisposing causes for HL/HR. The ultimate etiologic factor would be metatarsus primus elevatus. This could be either a structurally elevated first ray or functional due to either a long first metatarsal, or

midfoot and rearfoot pathology leading to excess pronation (2-4). These abnormalities can result in a hypermobile first metatarsal that alters the dynamics of the foot (5). Goodfellow (6) reported that an unrecognized cause of hallux rigidus was osteochondritis dissecans in adolescent patients.

There are systemic arthritides that can cause degenerative joint changes of the first MPJ such as gout, rheumatoid arthritis, Charcot's disease, and psoriatic arthritis. Any one of these can lead to destructive changes in the joint. McMaster (7) discussed chondral and osteochondral defects, which appear as a small depression in the metatarsal head. These defects could be overlooked and may be responsible for the degeneration of the first MPJ, leading to HL/HR. Post-traumatic osteoarthritis, secondary to either blunt or repetitive trauma such as sports-related activities and dancing, are also predisposing factors involved in the etiology of HL/HR.

Clinical Findings

The major symptoms of HL/HR consist of pain and stiffness during either ambulation or prolonged periods of standing. The pain is usually progressive and chronic. Upon examination, there is a marked painful restriction of dorsiflexion present, as well as tenderness over the dorsum of the MPJ. The first MPJ is congruent, in most cases, without any hallux valgus component. There are also various degrees of edema and erythema

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over the first MPJ, generally related to the patient's activity level and shoe gear. Other findings include impingement of the extensor hallucis longus tendon secondary to dorsal hypertrophy at the first metatarsal head. Sesamoiditis and lateralization of weightbearing, due to compensation, may lead to an increase in ankle sprains and plantar fasciitis.

Radiographic Features

One cannot fully appreciate the extent of pathological destruction unless visualized during surgical exposure. Radiographically, there is a joint space narrowing with a flattening and widening of the first metatarsal head and base of the proximal phalanx. Changes of the first MPJ often occur, as well as hypertrophy of the lateral aspect of the first metatarsal head. The lateral exostosis of the first metatarsal head develops secondary to the hallux dorsiflexion that occurs while attempting to locate the area of least resistance. Occasional loose osseous joint bodies may be seen as well as subchondral sclerosis and cyst formation.

Materials and Methods

This study reviews cheilectomies performed between January 1980 and January 1990. There were 47 patients, all unilateral, in this series of whom 40 were female (age range: 26-69; mean age: 52 years). Various subjective questions regarding different symptomatology were distributed to the patients. Forty seven patients responded by returning for clinical analysis.

The diagnosis of hallux limitus/rigidus was based on patient history, physical examination, and radiographic findings. The amount of degenerative changes in the first MPJ was graded on a preoperative scale of grade I, II, III. The joint was classified as having grade I changes if there was a history of MPJ pain on ambulation, mild to moderate functional limitation of the first MPJ dorsiflexion, with radiographic signs of mild dorsal osteophytic spurring, and a well-preserved joint space. Grade II changes involve moderate osteophytic formation with joint space narrowing, as well as broadening and flattening of the first metatarsal head and base of the proximal phalanx (Fig. 1). Grade II may also involve moderate functional limitation of first MPJ dorsiflexion and osteochondral defects within the first metatarsal head. Sesamoidal irregularity and hypertrophy with or without narrowing of the articular space between the sesamoid and metatarsal head may also be present (Fig. 2). Grade III changes involve a severe loss of MPJ space and limitation of dorsiflexion with extensive osteophytic spurring of the dorsal, medial, and lateral aspects of the first MPJ, along with moderate to severe osteochondral defects and subchondral cyst formation within the

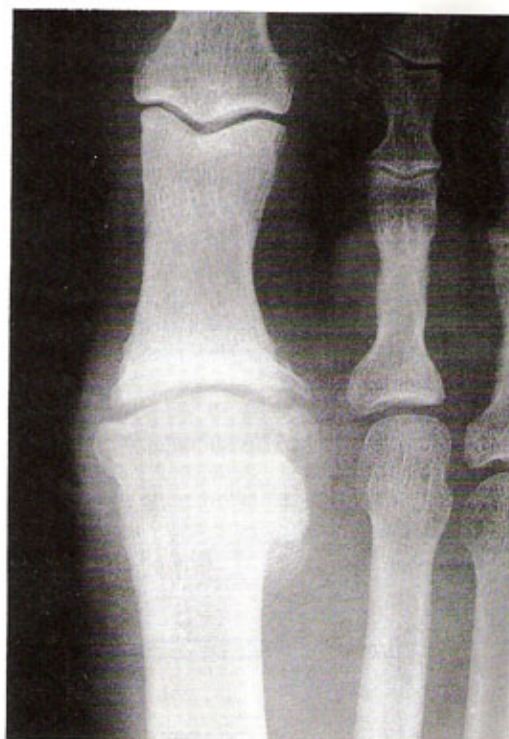


Figure 1. Grade II changes involve moderate osteophytic formation with joint space narrowing, as well as broadening and flattening of the first metatarsal head and base of the proximal phalanx.

head of the metatarsal and/or base of the proximal phalanx. Additionally, joint mice may be present. There is usually extensive sesamoid-metatarsal disease (Fig. 2). Sesamoid-metatarsal disease manifests itself with hypertrophy and irregularity of the sesamoid, along with loss of joint space, approaching ankylosis or actual fusion of the joint.

Surgical Technique

The cheilectomies were performed under either local or general anesthesia in the absence of tourniquet hemostasis. A 4.5-cm. curvilinear incision, immediately medial to the extensor hallucis longus tendon, was performed, extending over the MPJ to the base of the proximal phalanx. Utilizing meticulous anatomical dissection, the incision was deepened. Hemostasis was maintained by electrocautery or 4.0 absorbable ligature. Linear capsulotomy was performed. The joint space was inspected and any loose bodies and hypertrophic synovitis were excised. Occasionally, the articular surface of the first metatarsal head was eroded to subchondral bone, as was the articular cartilage of the proximal phalangeal base, but these abnormalities did not lead to any deviations in surgical technique, except for oc-



Figure 2. Illustration of the presence of tibial sesamoid disease.

casional drilling of the articular defects, in an attempt to stimulate fibrocartilage formation (8) (Fig. 3).

Any osteophytic bone noted dorsally, medially or laterally was excised, along with the dorsal one fourth to one third of the metatarsal head, with the use of a 6-mm. osteotome and mallet, in an attempt to remove any bony block to allow for the maximum amount of hallux dorsiflexion possible. An elevator was placed under the metatarsal head, from distal to proximal with the joint distracted in an attempt to free any restrictive fibrous adhesions (Fig. 4). The remaining surfaces of the first MPJ were then rasped smooth and the base of the proximal phalanx was remodeled as necessary.

After copious lavage with sterile saline, the joint capsule was sutured loosely over the joint with 2.0 absorbable suture. Subcutaneous tissues were reapproximated with 4.0 absorbable suture in a simple interrupted fashion. Skin was closed with 6.0 absorbable suture in a running subcuticular manner, and reinforced with adhesive strips. Postoperatively, a wooden-soled surgical shoe was dispensed. Physical therapy was initiated the second postoperative day.

Results

Patients involved in the study were each given a set of symptoms or complaints preoperatively (Fig. 5). The overall results of the cheilectomy had an average follow-up of 3.5 years (range 1–6 years.) They were categorized within the three grading systems previously discussed. Postoperatively, in grade I, 14 patients had no pain, 15 patients experienced occasional pain, and none of the patients experienced severe pain. In grade II, five patients had no pain, three had occasional pain, and three had severe pain. In grade III, one patient had no pain, one had occasional pain, and five had severe pain



Figure 3. Articular cartilage defect of the first metatarsal head upon intraoperative inspection of the joint space.

following the cheilectomy procedure (Table 1). Ten patients required additional surgery. Two patients from grade I required re-operation secondary to a lack of motion with first MPJ pain. Three patients from grade II required re-operation for range of motion limitation, and five patients from grade III required surgery for both lack of motion and pain (Table 2).

In all patients in the study, first MPJ range of motion improved after cheilectomy. The degree of improve-



Figure 4. A metatarsal elevator was placed under the first metatarsal head with the hallux distracted to free the sesamoid apparatus, in order to increase joint dorsiflexion.

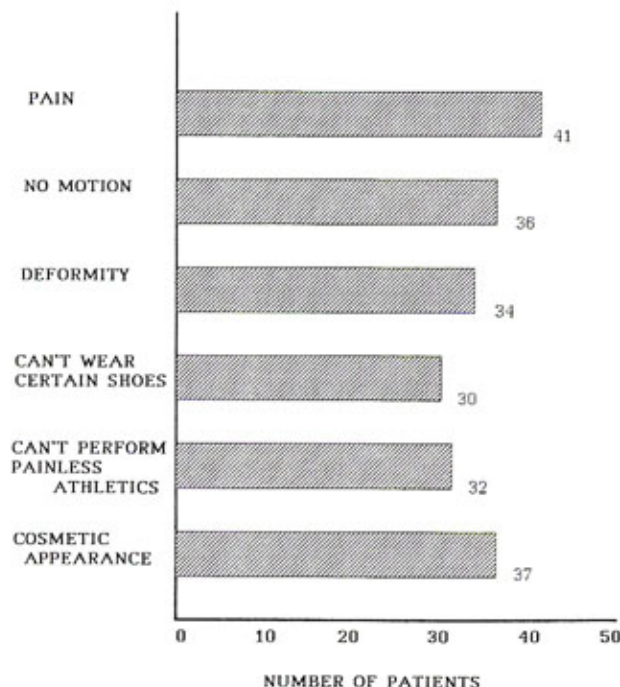


Figure 5. Preoperatively, patients were presented with a standard of complaints or symptoms.

TABLE 1. Postoperative results evaluate the number of patients per grading scale to the amount of pain they experienced

	Cheilectomy		
	No Pain	Occasional Pain	Severe Pain
Grade I	14	15	0
Grade II	5	3	3
Grade III	1	1	5

TABLE 2. Postoperative results regarding symptomatology of the number of patients per grading scale that required re-operation

	No. of Feet	Symptomatology
Grade I	2	Lack of motion, 1st MPJ with occasional pain
Grade II	3	Pain on range of motion
Grade III	5	Lack of motion, with pain

ment correlates with which grading category the patient was placed preoperatively. The less severe the deformity was preoperatively, the greater amount of hallux dorsiflexion was noted postoperatively. There were 29 patients in grade I with a preoperative hallux dorsiflexion of 28 degrees, and a postoperative hallux dorsiflexion of 50 degrees. In grade II, there were 11 patients with preoperative dorsiflexion of 17 degrees, and postoperative dorsiflexion of 32 degrees. Lastly, in grade III there were seven patients with preoperative dorsiflexion of 5 degrees, and postoperative dorsiflexion of 10 degrees (Table 3).

The length of time before the patient first returned to activity ranged from less than 4 weeks to greater than 24 weeks (Fig. 6). Patients were also asked the amount of weeks needed to return to their desired level of activity (Fig. 7). Patients' present activity levels were divided into categories ranging from no restrictions to total limitation of activity (Fig. 8).

Discussion

The authors of this study believe that the critical elements in analysis of results from the first MPJ cheilectomy procedure should be long-term relief of pain, improvement in joint motion, and decreased morbidity. In this study, 39 out of 47 patients who were treated by cheilectomy had partial or complete relief of pain. This compares favorably with those achieved from the Keller procedure, prosthetic replacement, arthrodesis, or osteotomy.

Severin (9) and Wrighton (10) reported improvement utilizing the Keller procedure in 44 of 50 painful joints with HL/HR. Arthrodesis of the first MPJ performed

TABLE 3. A comparison of preoperative and postoperative degrees of hallux dorsiflexion per grading scale

	Cheilectomy	
	No. of Feet	Postoperative Degrees
Grade I	29	50
Grade II	11	32
Grade III	7	10

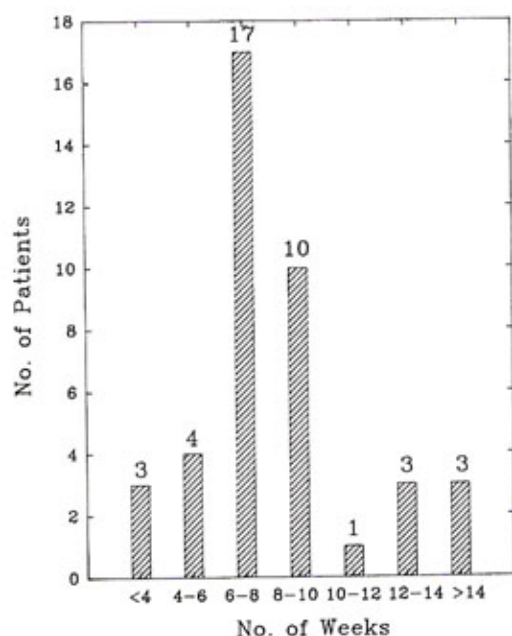


Figure 6. Postsurgical results of the number of patients according to the number of weeks the patients first returned to activity.

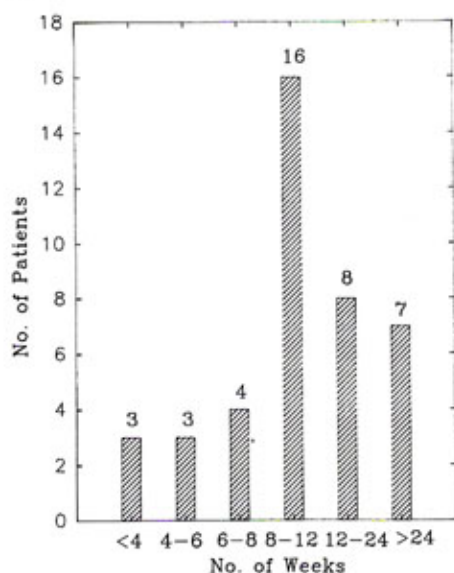
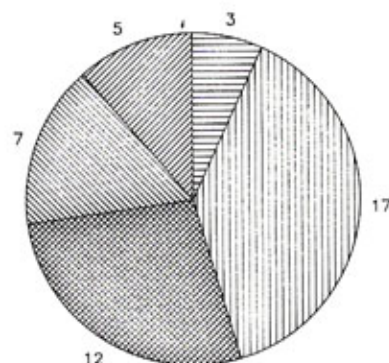


Figure 7. Postsurgical results of the number of patients according to the number of weeks the patients reached their desired level of activity.



- 17 - No Symptoms Pre-surgery Level/No Restrictions
- 12 - Occasional Symptoms No Restrictions
- 7 - Occasional Symptoms Some Restrictions/Intermittent Limitations
- 5 - Constant Symptoms Some Restrictions/Intermittent Limitations
- 3 - Constant Symptoms Total Limitation of Activity
- 1 - Constant Symptoms

Figure 8. Postsurgical results of the number of patients who were presented a standard of symptoms/restrictions at their present activity level.

in 18 of 21 patients with HL/HR exhibited relief of pain. The use of SILASTIC^{®5} implant relieved pain in 76 of 85 patients, and the use of osteotomy relieved pain in nine of 10 joints. These results suggest that while partial or complete relief of pain can be achieved with any of the aforementioned procedures, the cheilectomy technique simultaneously increases joint motion, maintains stability while avoiding shortening of the hallux with loss of purchase power, and avoids the prolonged healing with increased morbidity of an osteotomy or arthrodesis (6).

Indications for the cheilectomy procedure are developed from three grading systems applied to each patient. Overall, the best indications in HL/HR would be grade I or early grade II with no sesamoid disease. The cheilectomy procedure is contraindicated in the presence of sesamoid disease or late grade II and grade III categories. Disadvantages of the cheilectomy procedure include it does not treat the etiology and can be joint destructive; it is not as successful in late grade II or grade III changes; and at the end range of motion of hallux dorsiflexion, there may be a slippage or pseudoarticulation of motion onto the first metatarsal. Advantages include relative simplicity of the procedure, as well as a lower morbidity rate in comparison to other surgical alternatives. Since there is no osteotomy in-

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volved, the procedure is more stable, which helps with early range of motion and muscle strengthening.

Summary

The appropriate surgical procedure for hallux limitus/rigidus should offer as many advantages as possible with the fewest potential risks. The cheilectomy is a technically easy procedure for treatment of grade I, or early grade II, HL/HR. Cheilectomy also avoids the unacceptable cosmetic and functional results of a Keller procedure with or without SILASTIC® implant, as well as the potential complications of malposition, malunion, and non-union possible with arthrodesis or osteotomy. The cheilectomy introduces none of these additional risks and can also be performed on patients with more advanced degenerative joint changes who wish to avoid the morbidity of a more definitive procedure. However, serious consideration in such case is recommended.

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