Hallux Rigidus
Surgical Techniques (Cheilectomy and Arthrodesis)

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SURGICAL TECHNIQUE: CHEILECTOMY
A cheilectomy is performed with use of regional anesthesia. The patient is positioned on the operating table in the supine position. The leg is exsanguinated with an Esmark bandage (Medline Industries, Mundelein, Illinois), which is used as an ankle tourniquet. A dorsal longitudinal incision is centered over the first metatarsophalangeal joint, extending from the middle of the proximal phalanx 3 cm proximally. The dissection is deepened on the medial aspect of the tendon of the extensor hallucis longus. The extensor hood and joint capsule are incised. The capsule is preserved for later repair (Fig. 1). The joint

ABSTRACT
BACKGROUND:
There have been few long-term studies documenting the outcome of surgical treatment of hallux rigidus. The purposes of this report were to evaluate the long-term results of the operative treatment of hallux rigidus over a nineteen-year period in one surgeon’s practice and to assess a clinical grading system for use in the treatment of hallux rigidus.

METHODS:
All patients in whom degenerative hallux rigidus had been treated with cheilectomy or metatarsophalangeal joint arthrodesis between 1981 and 1999 and who were alive at the time of this review were identified and invited to return for a follow-up evaluation. At this follow-up evaluation, the hallux rigidus was graded with a new five-grade clinical and radiographic system. Outcomes were assessed by comparison of preoperative and postoperative pain and AOFAS (American Orthopaedic Foot and Ankle Society) scores and ranges of motion. These outcomes were then correlated with the preoperative grade and the radiographic appearance at the time of follow-up.

FIG. 1
The dorsal longitudinal incision is deepened on the medial aspect of the tendon of the extensor hallucis longus.
is inspected, a complete dorsal synovectomy is performed, and any loose bodies are removed. The percentage of remaining via-
FIG. 4-A
Dorsal osteophytes are removed with an osteotome in line with the dorsal shaft of the first metatarsal.

FIG. 4-B
The first osteotomy (A) is performed in line with the dorsal first metatarsal shaft; the second cut (B) is made, resecting 25% to 33% of the dorsal metatarsal head and enabling increased dorsiflexion.

FIG. 5
The appearance following resection of 25% of the dorsal metatarsal head.
ble cartilage on the metatarsal head is then estimated (Fig. 2). (If it comprises <50% of the metatarsal articular surface, a cheilectomy is contraindicated.) Any dorsal osteophytes on the base of the proximal phalanx are removed with a rongeur (Fig. 3). The proximal phalanx is plantar flexed to aid in the exposure of the metatarsal head. With a 6-mm osteotome, an oblique osteotomy is performed, and dorsal, medial, and lateral osteophytes as well as up to 25% to 33% of the metatarsal head are removed (Figs. 4-A and 4-B). This resection is begun just dorsal to the edge of the remaining viable metatarsal head articular cartilage; thus, in cases of more severe arthritis, a more extensive metatarsal head resection is performed. Too aggressive a resection may increase the risk of metatarsophalangeal joint sub-

**CRITICAL CONCEPTS**

**INDICATIONS FOR CHEILECTOMY:**

1. Grade 1 (mild), Grade 2 (mild+), or Grade 3 (moderate) hallux rigidus.
2. An enlarged dorsal prominence on the metatarsal head that restricts shoe wear.
3. Restricted range of motion of the first metatarsophalangeal joint that is characterized by pain at the extremes of dorsiflexion and plantar flexion.
4. A relative indication is a patient's desire to maintain active motion at the first metatarsophalangeal joint despite substantial degenerative arthritis of the joint. A thorough discussion, however, should cover the fact that, with progressive arthritis, pain relief in this circumstance may not be complete following cheilectomy.

**CONTRAINDICATIONS:**

1. Extensive degenerative arthritis of the first metatarsophalangeal joint for which an arthrodesis is preferable.
2. Articular cartilage degeneration that extends over >50% of the metatarsal head articular surface.
3. A patient's desire simply to retain metatarsophalangeal joint motion (see above).

continued
Bone wax is applied to the dorsal surface on the first metatarsal head following the osteotomy to help control bleeding.

Figs. 8-A and 8-B Lateral radiographs made prior to the cheilec- tomy (Fig. 8-A) and postoperatively (Fig. 8-B).
CRITICAL CONCEPTS

PITFALLS OF THE PROCEDURE:

1. The major pitfall with cheilectomy is pushing the indications for this procedure too far. Adherence to the grading system as described in the original article leads to a reliable result.

2. With more extensive joint arthritis, pain relief is frequently inadequate.

3. Inadequate bone resection from the metatarsal head may prevent restoration of adequate metatarsophalangeal joint motion. If impingement persists, the cheilectomy may be unsuccessful.

4. Excessive resection may destabilize the metatarsophalangeal joint.

AUTHOR UPDATE:

The procedure has not changed at all since we first described it in 1979.

luxation, and, thus, a resection of >33% of the metatarsal head is discouraged (Fig. 5). Typically, all or almost all of the metatarsal head that is denuded of articular cartilage is resected. At the conclusion of the resection, dorsiflexion of at least 70° should be achieved (Figs. 6-A and 6-B). Any irregularities on the metatarsal articular cartilage, including loose cartilaginous fragments, are removed. Should a small area of denuded cartilage remain, it can be perforated with a small drill. The joint is then lavaged.
A Kirschner wire is driven into the center of the first metatarsal head.

The head is reamed with a concave reamer.

Creation of a convex surface for the arthrodesis.
Bone wax is applied to raw bone surfaces to impede further bleeding (Fig. 7). The capsule is repaired beneath the tendon of the extensor hallucis longus with interrupted absorbable sutures, and the skin is closed in a routine fashion (Figs. 8-A and 8-B).

**Postoperative Care**

One week following surgery, passive range-of-motion exercises of the metatarsophalangeal joint are initiated. Patients are encouraged to exercise this joint hourly. Weekly office visits are scheduled to monitor the range of motion. Walking is permitted after surgery with full weight-bearing in a stiff-soled postoperative shoe. Physical therapy may be ordered, depending upon both the patient’s compliance and the success with joint mobilization. Typically, two to three months following surgery, most swelling subsides and, at this point, maximal improvement regarding range of motion can be expected.

**SURGICAL TECHNIQUE: ARTHRODESIS OF THE FIRST METATARSOPHALANGEAL JOINT**

Arthrodesis of the first metatarsophalangeal joint is performed with use of regional anesthesia. The patient is placed on the operating table in the supine position. An Esmark bandage is used to exsanguinate the extremity and then is used as a tourniquet. A dorsal longitudinal incision is centered over the metatarsophalangeal joint. It begins at the middle of the proximal phalanx.
FIG. 14-A
The phalanx and metatarsal are placed in the desired alignment and are temporarily stabilized with a cross Kirschner wire.

FIG. 14-B
An arthrodesis with the hallux in 15º to 20º of valgus.

FIG. 14-C
An arthrodesis with the hallux in 20º of extension.

FIG. 14-D
An arthrodesis with the hallux in neutral rotation is desirable.
and extends 4 to 5 cm proximally. The incision is deepened along the medial border of the extensor hallucis longus tendon (Fig. 9) and is then deepened through the extensor hood and joint capsule. The capsule is preserved for later repair. On occasion, the extensor hallucis
The longus tendon must be incised to obtain adequate exposure; when this is performed, the tendon should be repaired at the conclusion of the procedure. The joint space is débrided, loose bodies are removed, and peripheral osteophytes are resected (Fig. 10). A sagittal saw is then used to remove the medial eminence. In the presence of a long first ray, a thin wafer of bone is removed from the distal first metatarsal articular surface. The proximal phalanx is then plantar flexed, and a 0.062-mm Kirschner wire is centered on the first metatarsal head articular surface and driven in a proximal direction. A power-driven small joint reamer is then used to prepare the metatarsal head surface for arthrodesis. A concave cannulated metatarsal reamer is used to create a convex metatarsal head surface (Figs. 11-A, 11-B, and 11-C). The Kirschner wire is then removed, and attention is directed to the proximal phalanx. Another Kirschner wire is centered on the articular surface of the base of the proximal phalanx and driven distally to prepare for the cannulated reaming. If the surface is quite sclerotic, it is perforated with several drill-holes prior to the reaming (Fig. 12). A convex cannulated phalangeal reamer is used to prepare a concave cup-shaped surface in the proximal phalanx. This surface matches the prepared metatarsal head surface (Fig. 13). The Kirschner wire is removed, and any joint debris is resected. These congruous cancellous joint surfaces are then coapted in the desired position. Typically, the hallux is placed in neutral rotation, 15° of valgus, and 20° of dorsiflexion in reference to the axis of the first metatarsal. After proper alignment is obtained, the arthrodesis site is temporarily stabilized with a single 0.062-mm Kirschner wire (Figs. 14-A through 14-D). Next, a six-hole...
mini-compression plate is placed on the dorsal surface and is fixed with six bicortical screws. The plate is placed just lateral to the midaxial line to maintain 15° of valgus. A dorsal bend of the plate allows better conformity in order to achieve approximately 15° to 20° of dorsiflexion of the proximal phalanx in relation to the metatarsal (Fig. 15). A lag screw is then directed from distal medial to proximal lateral, crossing the joint surface and replacing the Kirschner wire (Fig. 16). If incised, the extensor hallucis longus is then repaired. The closure is identical to that for cheilec-tomy (Figs. 17-A, 17-B, and 17-C).

**Postoperative Care**
Gauze and tape compression dressing is applied at the time of surgery and is changed every ten days for the next eight to twelve weeks until there is radiographic evidence of a successful fusion. The patient is allowed to walk in a stiff-soled postoperative shoe following surgery. Weight-bearing is allowed on the heel and the lateral aspect of the foot. The first ray is protected until there is radiographic evidence of fusion.

**REFERENCE**

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