First Metatarsophalangeal Arthrodesis for Hallux Rigidus

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KEYWORDS

• Hallux rigidus • Arthrodesis • Metatarsophalangeal joint

Hallux rigidus leads to a restricted and painful motion at the first metatarsophalangeal (MTP 1) joint. The symptoms mainly occur in the final phase of the gait cycle (push-off phase), when the toes are passively forced in dorsiflexion. The underlying pathologic condition is discussed controversially. Altered biomechanics of the MTP 1 joint (lack of gliding motion during dorsiflexion) may be attributed both to the dorsal osteophytes at the metatarsal head and to a contracture of the plantar soft tissues involving the sesamoids. Therefore, pain is prompted by standing on tiptoes, climbing stairs, and wearing shoes with high heels or a flexible sole. Additional discomfort results from dorsal osteophytes at the metatarsal head, which lead to shoe-fitting problems involving local pressure, bursitis, and skin irritation.

To avoid painful joint motion at the MTP 1 joint, patients try to reduce load bearing at the first ray by active supination of the foot. Consequently, the hallux disorder leads to lateralization of load bearing during propulsion, which may result in transfer metatarsalgia and painful plantar callosities.

If conservative measures (such as use of rocker bottom shoes, intra-articular corticoid injections) fail, operative procedures can be taken into consideration. Decision making of the appropriate surgical procedure mainly refers to the stage of hallux rigidus. Advanced stages of osteoarthritis can be addressed by resection arthroplasty, joint replacement, or arthrodesis. The differential indication is influenced by the patient's age and physical demands, the underlying cause, concomitant diseases, and the surgeon's personal experience.

Arthrodesis of the MTP 1 joint (first described by Clutton in 1894) is widely accepted as the gold standard for end-stage hallux rigidus. Furthermore, patients with painful and stiff MTP 1 joints benefit from arthrodesis, even if the radiological arthritic changes are minor. Fusion results in a reliable clinical outcome with obvious biomechanical

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benefits. With the MTP 1 joint arthrodesis performed in an appropriate position (25° dorsiflexion), the medial ray is stabilized, so that even the windlass mechanism works.[1]

However, fusion of the MTP 1 joint limits the use of fashionable footwear and alters the gait. Gait analysis after MTP 1 joint arthrodesis revealed a significant decrease in step length, plantar flexion of the ankle, and power at the push-off phase.[2,3]

PREOPERATIVE CONSIDERATIONS

The physical examination should not be limited to the MTP 1 joint. It is essential to further evaluate the entire foot (hindfoot alignment), neurovascular status, first interphalangeal (IP 1) joint, and adjacent lesser toes.

Standard radiographs include weight-bearing anteroposterior and lateral views; oblique views are optional. If women insist on wearing special shoes, a lateral radiograph may be taken in the standard shoe to evaluate the desired amount of great toe dorsiflexion.

Patients should be informed preoperatively that the rehabilitation protocol comprises marked restrictions for all physical activities during the first 6 weeks. Attributed to the surgeon's preference, postoperative ambulation includes a short leg cast, Lopresti slipper, or postoperative shoe. Furthermore, crutches may be necessary to reduce weight bearing on the concerned foot.

PLANNING THE OPERATION

Hallux Valgus et Rigidus

In patients with hallux valgus et rigidus deformity, the surgeon should take into consideration that MTP 1 joint arthrodesis reduces the first intermetatarsal angle up to 6°.[1,4,5] Therefore, an additional metatarsal osteotomy is not necessary for mild and moderate splayfoot deformities.

Lesser Toe Deformities

Concomitant lesser toe deformities have to be addressed simultaneously because intraoperative alignment of the great toe is closely related to the position of the adjacent toes. Therefore, it is mandatory to finish the realignment of the lesser toes before the MTP 1 joint is fixed with implants.

Central Metatarsalgia

Patients with hallux rigidus frequently complain of central metatarsalgia, which can be associated with calluses beneath the metatarsal heads. If the lesser toes present with sufficient ground contact and do not reveal any sagittal deformity, that is, dorsal subluxation, osteotomies of the lesser metatarsals are not required. It can be expected that MTP 1 joint arthrodesis regains normal load bearing of the first ray and subsequently reduces transfer metatarsalgia.

Toe Length

Preoperative planning should also focus on the length discrepancy between the great toe and the second toe. Regardless of the technique of cartilage debridement (flat cuts or cup and cone reamers), MTP 1 joint arthrodesis results in marked shortening (5–6 mm) of the great toe.[6] If a patient presents with a Greek foot (first toe<second toe), preoperative planning should include length balancing to avoid the onset of lesser toe deformity later. Length adjustment can be achieved by interposition of