

Gradual Correction of Traumatic Hallux Varus With Metatarsal Hemicallotasis



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ABSTRACT

Traumatic hallux varus associated with osseous deformity, especially in the case of a decreased distal metatarsal articular angle, is an extremely challenging, but rewarding, deformity to treat. To the best of our knowledge, no previous reports have referred to surgical correction of traumatic hallux varus using first metatarsal hemicallotasis. We report the case of a 54-year-old male with traumatic hallux varus associated with medial subluxation of the second metatarsophalangeal joint and second metatarsocuneiform joint arthrosis. The patient was successfully treated with metatarsal hemicallotasis with medial soft tissue release, a proximal second metatarsal shortening osteotomy, and second metatarsocuneiform joint arthrodesis. After 1 year and 6 months, the correction had been maintained in a suitable position, no discomfort or pain was present, and the patient was completely satisfied with the surgical results. Metatarsal hemicallotasis can safely determine the angle of correction and minimize the risk of avascular necrosis of the metatarsal head even in deformed halluces with previous traumatic injuries and/or surgical treatment. This technique should be indicated only for hallux varus with a decreased distal metatarsal articular angle, an angular-type metatarsal head, and good metatarsophalangeal joint congruence.

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Hallux varus is a deformity, either congenital or acquired, characterized by medial deviation of the great toe at the first metatarsophalangeal (MTP) and/or interphalangeal (IP) joints (1). Hallux varus is usually a postoperative complication after correction of hallux valgus (2,3). Other causes have included congenital (4–7) or idiopathic (2,8) defects, inflammatory arthritis (2,4,9), trauma (2,3,10,11), poliomyelitis (12), Charcot-Marie-Tooth disease (13), avascular necrosis (14), and contractures due to burns (15). Of these etiologies, traumatic hallux varus associated with osseous deformity, especially in the case of a decreased distal metatarsal articular angle (DMAA), is an extremely challenging, but rewarding, deformity to treat.

Hemicallotasis is the continuous, asymmetric callus distraction of the metaphysis and is commonly used to correct proximal tibial deformities for medial gonarthrosis (16–18). This technique has been less commonly applied in the distal femur (16,19), distal radius (20), proximal fifth metacarpal (21), or calcaneus (22). However, to

the best of our knowledge, no previous reports have referred to surgical correction of traumatic hallux varus using first metatarsal hemicallotasis.

We report the case of a 54-year-old male with traumatic hallux varus associated with medial subluxation of the second MTP joint and second metatarsocuneiform joint arthrosis. This represents the first report of a debilitating hallux deformity successfully treated with metatarsal hemicallotasis and concomitant procedures.

Case Report

A 54-year-old male presented to our outpatient clinic with a chief complaint of a painful right great toe. He was also experiencing insidious pain on the dorsal aspect of the midfoot when he wore rubber boots. He had had an open type 3b injury of the distal one third of his right first metatarsal in a motor vehicle collision at the age of 23 years, for which the initial treatments had included wound debridement and removal of the fracture fragments by a local physician. Subsequently, he was transferred to a university hospital, where he received cross pin fixation, followed by a full-thickness free-skin graft obtained from the groin. Gradual contraction of the hallux with progressive medial deviation had been noted over a period of time after complete bone healing. Although he had been

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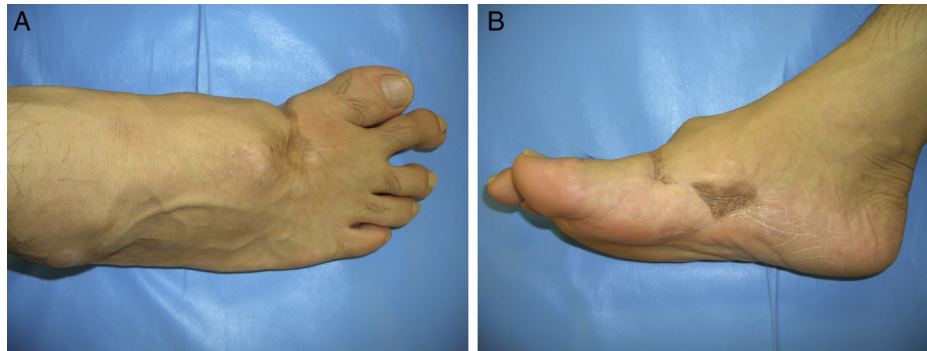


Fig. 1. (A and B) Preoperative clinical photographs showing medial deviation of the hallux and the second toe. Note the skin graft scars over the dorsomedial aspect of the forefoot.

treated conservatively by several local physicians, his symptoms had not improved.

The physical examination revealed a nonreducible medial deviation of the hallux without adequate purchase (Fig. 1). However, the characteristic “cock-up” deformity—often caused by flexion contracture of the IP joint—was not observed. Skin graft scars were noted over the dorsomedial aspect of the forefoot. He had a painful protuberance over the dorsal aspect of the midfoot that made wearing shoes difficult and painful. However, the patient did not express any discomfort around the second or third metatarsal head, and no plantar callosities were seen. He had no relevant family or other medical history, except for the previous fracture treatment. The blood laboratory results were reported as normal. He mentioned that he had quit smoking cigars 6 years earlier and had been consuming 2 to 3 beers every day for an unknown period.

The anteroposterior right foot radiograph showed a clinically significant deformity and shortening of the first metatarsal. The first metatarsal ended approximately 22 mm proximal to the second metatarsal head. The radiograph also revealed medial subluxation of the second MTP joint. On the lateral weightbearing radiograph, we observed a hyperostotic bone reaction (i.e., degenerative arthritis) on the dorsal aspect of the second metatarsocuneiform joint that had probably been induced by the relatively long second ray (Fig. 2). The left foot did not exhibit any abnormalities.

Surgical correction was indicated for the right foot. The goal of the procedure was to correct the deformity and maintain the first MTP and IP joint motion. If this could not be achieved, arthrodesis would be required at a later date. The initial surgery consisted of medial soft tissue release, distal first metatarsal incomplete osteotomy, a proximal second metatarsal shortening osteotomy, temporary pin fixation of the second ray, and second metatarsocuneiform

joint arthrodesis (Fig. 3). For hemicallotasis, the lateral cortex of the first metatarsal was preserved with care to act as a hinge. Next, a short MiniRail™ lengthener (Orthofix, McKinney, TX), accommodating 3-mm shaft diameter bone screws, was applied for hemicallotasis of the first metatarsal. An optional T-clamp was attached for the insertion of the screws close to the joint, in a plane at a right angle to the longitudinal axis. The distal fixator screws were placed parallel to the joint surface to reduce abnormal joint inclination during gradual distraction. The shortened first metatarsal could not accommodate both fixator clamps, even when the fixator was set at its shortest length. Therefore, the proximal fixator screws were placed in both the metatarsal and the medial cuneiform (i.e., joint bridging). The contracted extensor hallucis longus and brevis were left untouched.

After surgery, the patient's leg was kept non-weightbearing using crutches. Continuous callus distraction began after a latency period of 15 days at a rate of 0.125 mm every 12 hours (i.e., 0.25 mm/day). At 3 weeks, the temporary pin was removed, and heel walking was initiated as tolerated. At 7 weeks, the radiographs indicated that an approximately 9-mm asymmetric distraction had been accomplished; therefore, the lengthening was stopped. It was thought that additional distraction would increase the risk of iatrogenic avascular necrosis of the metatarsal head and subsequent nonunion. Because of poor callus formation in the distraction gap, supplemental internal fixation, which had not been initially planned, was administered at 9 weeks postoperatively to avoid correction loss or fracture (Fig. 4). The patient underwent physiotherapy and low-intensity pulsed ultrasound to accelerate callus maturation 13 weeks after the intervention until full weightbearing of the hallux was permitted. At 15 weeks, consolidation of the hemicallotasis site was confirmed, and the external fixator was



Fig. 2. Preoperative (A) anteroposterior and (B) lateral weightbearing radiographs of the foot. Note the decreased distal metatarsal articular angle, angular-type metatarsal head, and good first metatarsophalangeal joint congruence. The hyperostotic bone reaction protruding from the second metatarsocuneiform joint made wearing shoes difficult and painful.

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