

Treatment of postaxial polydactyly with plantar plate and medial collateral ligament reconstruction after supernumerary excision: A case report

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Abstract

Introduction: Polydactyly is the most common congenital foot anomaly and consists of partial or complete duplication of a toe. Traditionally, surgical treatment has been amputation. There is little evidence when surgical treatment requires repairing the stabilizing structures of the metatarsophalangeal joint

Objective: Assess the functional and radiologic outcomes of a case of postaxial polydactyly requiring plantar plate and medial collateral ligament reconstruction.

Methods: A 59-year-old female presented at clinic complaining from bilateral fifth toe polydactyly and metatarsalgia. A rudimentary extra toe with bony structures poorly developed was observed in the left foot. An excision was performed on the left foot. In the right foot, a fully developed extra digit was observed with medial and downwards deviation underneath the fourth metatarsal.

Results: Medial fifth-toe excision, plantar plate repair and medial collateral ligament reconstruction were performed due to malformation and widening of the distal surface of the plantar plate. Patient satisfaction and adequate functional status were observed at one-year follow-up.

Conclusion: The plantar plate is the principal stabilizer of the MTP joint; therefore its reconstruction is of paramount importance for forefoot biomechanics.

Keywords

Polydactyly, foot, congenital anomaly, supernumerary toe, plantar plate

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Introduction

Varying widely among populations, polydactyly is the most common congenital malformation of the forefoot congenital syndrome.¹ This anomaly is characterized by a complete or partial supernumerary digit and can present as an isolated condition or as part of a congenital syndrome.² Duplication can occur at several anatomic locations, including distal, middle and proximal phalanges; or at the metatarsal. A wide spectrum of malformations can be observed, from a simple soft tissue problem to a completely developed accessory ray.² Although most cases are treated during early childhood, there are cases of patients who postpone consultation until adult life, when an abnormal cosmetic appearance, pain or difficulty with footwear become their main complaints.³ Therefore, objectives of surgical management of polydactyly are to improve cosmetic appearance, alleviate pain and normalize footwear.⁴

Current surgical treatment guidelines and recommendations regarding the treatment of postaxial polydactyly are limited, particularly if treatment requires reconstruction of the stabilizing structures of the metatarsophalangeal (MTP) joint.

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We report a case of bilateral postaxial polydactyly with plantar plate reconstruction and medial collateral ligament reconstruction in an adult patient.

Case report

A 59-year-old female with a medical record of hypertension, bronchial asthma and hypothyroidism due to an operated thyroid cancer, consulted us for bilateral fifth toe polydactyly. Her main complaint was bilateral forefeet pain and difficulty at walking.

On clinical exam of the right foot, fifth medial toe was downward and medially deviated underneath the fourth toe, leading to skin ulceration of the overlapping surfaces of both toes. The fifth lateral toe was externally rotated, abducted and dorsally displaced. A painful callus in the dorsum of the fifth lateral toe was noted. On the left foot, a hypoplastic lateral supernumerary toe with cutaneous irritation was observed (Figure 1). Plain orthogonal weight-bearing films confirmed a complete bilateral duplication of the proximal phalanges of both fifth rays. The left supernumerary toe was clearly hypoplastic (Figure 2). The patient elected to undergo surgical treatment for her condition. Given the ulcerated lesions of the

fourth and medial fifth toe, the pre-operative plan considered an excision of the right fifth medial toe. Taking in to account the lateral fifth toe deformity (external rotation, abduction and dorsal displacement) and possible instability caused by the excision of the medial fifth toe, a plantar plate repair and medial collateral ligament reconstruction for the right lateral



Figure 1. Bilateral fifth toes polydactyly. A rudimentary supernumerary toe is observed in the left foot. In the right foot, the medial fifth toe is deviated downward and medially underneath the fourth ray.



Figure 2. Feet X-rays demonstrating bilateral duplication of the proximal phalanges of both fifth rays, compatible with the clinical diagnosis. The left supernumerary toe is clearly hypoplastic.

fifth toe was planned. For the left lateral supernumerary fifth toe, excision was decided.

Operative technique

The patient was placed in supine position with a bean bag. Under regional anesthesia, we applied the tourniquet at the thigh area. Both feet were prepared and draped. Antibiotic prophylaxis was given. First, the left foot was operated. A double elliptical incision over the lateral supernumerary toe was performed, followed by complete, careful, excision of the rudimentary toe. Wound closure was performed in a layered fashion. Then, a bandage and a cotton roll were applied on the left foot.

Second, the right foot was addressed. Ulcers observed under the first two phalanges of the fourth and medial fifth toe (Figure 3) prompted excision of the medial duplicated toe. A racquet-shaped incision was performed over the fifth MTP joint, followed by careful dissection of the deep tissue layers and articular capsule liberation. Complete excision of the medial fifth toe was performed, followed by ostectomy of the fifth metatarsal medial head with a micro-sagittal oscillating saw. No disruption of the plantar plate was observed, although widening and laxity were evident. Proximally, the plantar plate was liberated using a McGlamry elevator. Distally, the plantar plate was sectioned, protecting the fifth toe flexor tendons. Reconstruction of the plantar plate was performed by drilling two holes running from the dorsal cortex to the plantar rim of the proximal phalanx. Thereafter, number 2 FiberWire® (Arthrex, Naples, FL, USA) was used to approximate the distal plantar plate to the proximal phalanx and then both suture ends were recovered through the drill

holes at the proximal phalanx (Figure 4). Finally, both suture ends that were tied over the dorsal phalangeal cortex managed to fix the plantar plate onto the base of the proximal phalanx, at the same time rotating the toe back into the desired anatomical position. Medial collateral ligament was reconstructed using the same FiberWire® (Arthrex, Naples, FL, USA). Wound closure was performed in a layered fashion (Figure 5). A sterile compressive dressing (with the toe in slight plantarflexion) with flexible self-adhesive wrap and postoperative shoe was applied. Weight bearing was allowed using multipurpose orthopedic footwear.

Postoperative care included elevating the feet, analgesia and inspection of the wound at 7 days. The compressive dressing in slight plantarflexion of the toe was maintained for 4 weeks. The follow-up X-rays were taken at 3 months after the surgery (Figure 6).



Figure 3. An ulcerated lesion under the first two phalanges of the fourth and over the distal phalanges of the medial fifth toe was observed.



Figure 4. Complete excision of the fifth medial toe followed by exostectomy of the fifth metatarsal medial head. The plantar plate reconstruction was performed by drilling two holes running from the dorsal cortex of the proximal phalanx. Thereafter, 2.5 FiberWire® was sutured to the plantar plate and recovered through the drill holes in the proximal phalanx.



Figure 5. Final view after surgery.



Figure 6. Control X-rays showing adequate correction of the deformities.

After 18 months of follow-up, the patient had no complaints, wore normal shoes and had good functional status (Figure 7). Her Visual Analog Scale (VAS) pain score improved from 7 to 1 postoperatively. At 18 months, her Foot and Ankle Ability Measure (FAAM) score was 80% (higher score represents a higher level of physical function). The Foot and Ankle Outcome Score (FAOS) was 97.3 (out of 100) for pain subscale, 100 (out of 100) for symptoms, 100 (out of 100) for activities of daily living and 87.5 (out of 100) for quality of life. For FAOS higher scores represent better outcome.

Discussion

Polydactyly is an uncommon congenital anomaly that is treated during early childhood in most of the cases.^{1,2}



Figure 7. View at 18 months of follow-up.

Historically, sporadic reports of adults presenting with polydactyly of the feet have been published.^{2,4,5}

Nevertheless, various confusing surgical classifications have been proposed for this condition. The most debatable issue pertaining to the fifth-ray polydactyly is which toe should be excised. Several investigators have emphasized careful surgical planning on a patient-to-patient basis and proposed excision of the most hypoplastic element, regardless of its transverse position.^{1-3,5-7}

The plantar plate has recently gained increasing attention as an essential component of MTP joint anatomy.^{8,9} The role of this structure in stabilization and balance of the MTP joint has been the subject of several recent investigations.^{9,10} According to Chalayon et al.,⁹ the plantar plate is the main stabilizer of the MTP joint. In this particular case, we favored medial supernumerary toe excision given the presence of ulcerative lesions between the medial fifth and fourth toes. However, the lateral supernumerary toe presented with a dorsiflexed, externally rotated and abducted deformity. Therefore, restoration of adequate alignment of the toe was imperative to re-establish if forefoot anatomy and mechanics are to be enhanced. Given this complex clinical scenario, a plantar plate repair and a medial collateral ligament reconstruction were considered. We believe this treatment modality should improve anatomy and forefoot biomechanics for better functional outcomes.

Conclusion

To the best of our knowledge, this is the first report on the preservation of lateral supernumerary toe in foot polydactyly with plantar plate and medial collateral ligament reconstruction. We think that the plantar plate is the principal stabilizer of the MTP joint; therefore, its reconstruction is of paramount importance for forefoot biomechanics. We present an original approach in which reconstruction of the stabilizing structures of the MTP joint provided sufficient stability to restore forefoot balance and patient satisfaction in the short term. More studies are needed to provide evidence of the efficacy of this treatment modality.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Ethical approval

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Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article. M.I.E., as the main author, certifies that the information in this form is valid.

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