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Correction of Postaxial Metatarsal Polydactyly of the Foot by Percutaneous Ray Amputation and Osteotomy

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ABSTRACT

Polydactyly of the foot is a congenital anomaly characterized by the appearance of all or part of 1 or more additional rays. The patient with this condition might complain of an abnormal cosmetic appearance or difficulty with footwear. A minimally invasive technique for correction of postaxial metatarsal polydactyly of the foot is presented in this techniques report.

Polydactyly of the foot is a congenital anomaly characterized by the appearance of all or part of 1 or more additional rays (1,2). The patient may present in infancy or later in adult life complaining of an abnormal cosmetic appearance or difficulty with footwear (1,3). The aims of surgical management for polydactyly are to improve cosmesis, alleviate pain, normalize footwear, and reduce the risk of fracture (1). In the present brief report, a minimally invasive approach to excision of a duplicated pedal ray (metatarsal and toe) is described.

Surgical Technique

The patient was placed in the supine position with a thigh tourniquet to provide a bloodless operative field. A small incision was made at the proximal end of the metatarsal of the ray to be excised. Two millimeter oblique bone tunnels were made at the fused interface between the adjacent metatarsals. The interface was osteotomized using an Isham straight flute burr (Vilex®, Inc., McMinnville, TN) from the medullary side outward (Figs. 1 and 2). In the case of a long fused interface, the distal part can be osteotomized through the phalangeal wound, at the surgeon's discretion. To excise the separated supernumerary toe, an elliptical incision was made at the base of the toe to be removed, after which the intermetatarsal ligaments, flexor and extensor tendons, lumbricales, and interossei were all released using the scalpel; the digital vessels were electrocoagulated and the digital nerves cleanly sectioned, as far distally as possible, and the muscle attachments along the metatarsal shaft were stripped using a small periosteal elevator. The extra ray (metatarsal and corresponding digit) was then removed by distal traction (Fig. 3). The wide intermetatarsal space was reduced using a medially based closing wedge, and percutaneous osteotomy of the shaft of the lateral metatarsal, again using the Isham straight flute burr (Fig. 4) (4). The osteotomy site was not fixated. Reapproximation of the deep transverse metatarsal ligament or collateral ligament was not performed (5). Gently compressive postoperative bandaging was then used to splint the digits in an effort to prevent the development of angular deformities and to encourage normal forefoot contouring (6). The initial postoperative management entailed immediate weightbearing as tolerated in a surgical shoe, after which the patient was allowed full weightbearing walking in sport shoes by the 2-month postoperative visit (Fig. 5).

In the case of complete duplication of the metatarsal, osteotomy at the proximal shaft can be performed and the tarsometatarsal articulation preserved. In the case of polysyndactyly, the toe and metatarsophalangeal reconstruction can be individualized and a flap designed, instead of elliptical excision of tissue (7–9).

Discussion

A number of morphologically and anatomically based classifications of the polysyndactyly exist (2,5,6,10,11). The Venn-Watson system (6) describes polydactyly in terms of the associated metatarsal, which ranges from a normal metatarsal with a more distal malformation to a complete duplication of the metatarsal. Blauth and Olason (10) classified the malformation longitudinally according to the level at which the bifurcation begins. They also considered rudimentary forms and classified them according to the level at which the

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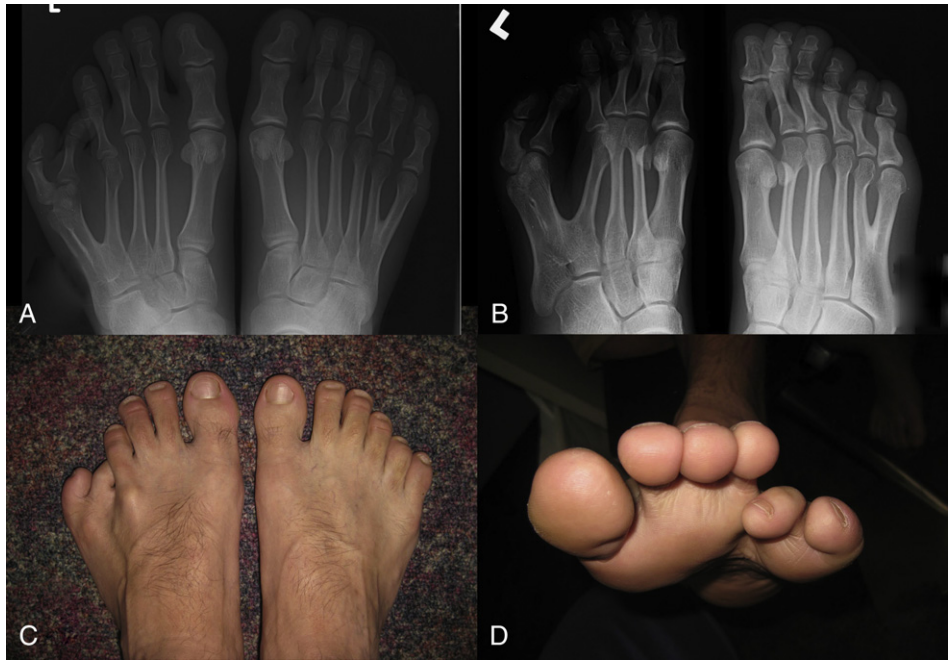

Fig. 1. Illustrated case of metatarsal type of postaxial polydactyly of the foot. (*A*) Dorsoplantar view. (*B*) Oblique view. (*C*) Dorsoplantar clinical photographs. (*D*) Coronal clinical view.

duplication of tissues begins (1). As a rule, the aims of surgical management of this condition are to improve cosmesis, alleviate pain, normalize footwear, and reduce the risk of metatarsalgia and metatarsal stress fracture (1). In the case of polydactyly of the fifth ray of the foot, some investigators have suggested that the most lateral digit should be excised, irrespective of whether this is the more fully formed digit (8). In contrast, Kojima et al (12) recommended fifth toe excision, because sixth toe excision carried a greater risk of circulatory compromise when the fourth interdigital space is separated, and because the lateral scar might lead to the eventual formation of a potentially painful hyperkeratosis secondary to weightbearing or shoe contact. Phelps and Grogan (13) also advocated excision of the medial toe and metatarsal in the phalangeal type of polydactyly, in which the alignment of the phalangeal bone is abnormal and the associated tendon structures hypoplastic.

Recently, a number of investigators have emphasized individualization of the surgical approach (1,13–17), and excision of the most hypoplastic element is generally considered favorable, regardless of its transverse position (1,9,13,15). Although this approach to polydactyly involves more complex surgery than straightforward excision

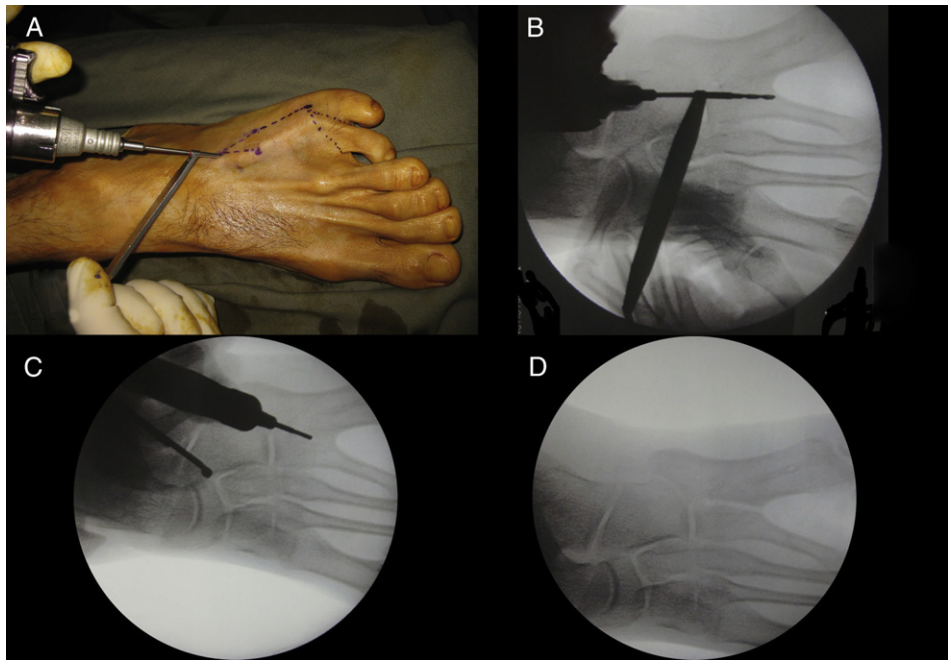

Fig. 2. (*A* and *B*) A small incision was made at the proximal end of the metatarsal of the ray to be excised. Two millimeter oblique bone tunnel was made at the fused interface with the fourth metatarsal. (*C* and *D*) The interface was osteotomized with an Isham straight flute burr from inside out.