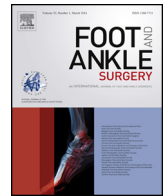




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# Does timing of surgery influence the long-term results of foot polydactyly treatment?

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### ABSTRACT

**Background:** There is an evident lack of research on timing of polydactyly surgery and its effects on treatment results.

**Methods:** Retrospective comparative study on foot polydactyly patients treated at our department from 1995 to 2009. Patients were divided into 2 groups, group A – under the age of 5 at surgery, and group B – 5 years and older.

**Results:** There were 24 patients (8 male, 16 female), 30 feet. Median age at surgery was 1 year (range, 9 months–4.5 years) for group A, and 8.5 years (range, 6–37 years) for group B. Median follow-up was 16.2 years (range, 7–21 years). There were 16 postaxial and 8 preaxial cases. At the last follow-up 12 patients' feet were "excellent" and 12 "good". No significant differences were identified between the two groups at final follow-up.

**Conclusions:** Timing of surgery for foot polydactyly is not crucial for final results.

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## 1. Introduction

Polydactyly, or the presence of supernumerary fingers and/or toes is common, with an incidence of approximately 1.7 per 1000 live births [1,2]. The incidence varies significantly among different ethnicities. Caucasians have the lowest incidence, 0.3–1.3 per 1000 live births, while in the African–American population the incidence is reported to be 3.6–13.9 cases per 1000 live births [3,4]. Watanabe et al. reported the incidence in Japan to be more than 5.1 per 10000 newborns [5]. This developmental anomaly may present as an isolated finding, or as a part of various genetic syndromes [6]. Isolated cases of polydactyly most often have an autosomal dominant inheritance pattern with variable gene penetrance [2]. However, autosomal recessive inheritance has also been reported [7,8].

Foot polydactyly causes both functional and cosmetic problems for the patient. Functional problems relate to shoe fitting difficulties and pain on walking while the cosmetic issues pose more of a concern in cultures with a tendency to be bare foot in public, as is the case in a large part of our country.

An array of classifications have been proposed by numerous authors, trying to stratify the different configurations of polydactyly [1,5,6,9–11]. Classification systems are morphologically based, and all aim to help with the choice of surgical treatment. The Venn-Watson classification focuses on the shape of the associated metatarsal bone [1]. Watanabe et al. devised an extensive system of 3 groups: medial, central and lateral ray, with each group further subdivided [5]. An elaborate classification from Blauth and Olason includes a system used for the hands as well as the feet, based on two axes, the longitudinal and transversal [9]. This study uses the classification of Temtamy and McKusick, in which polydactyly is classified as preaxial, central or postaxial, depending on the location of the duplication [6]. Preaxial refers to duplication of the hallux, postaxial to the most lateral ray duplication, while central or axial duplications apply to the 2nd, 3rd or 4th rays (Figs. 1 and 2).

In the available medical literature on polydactyly there is an obvious disparity regarding the best timing for surgical treatment. For the purpose of this study we hypothesize, in concordance with medical literature, that a child acquires an adult walking pattern by the age of 5 [12–15]. The aim of this study is to evaluate and compare the long-term results of patients with foot polydactyly treated surgically before adopting a normal adult walking pattern to those who were treated after that age.

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**Fig. 1.** AP radiograph showing a 2-year-old patient's feet, presenting with bilateral complex preaxial polydactyly.

## 2. Methods

We retrospectively reviewed medical records of 24 consecutive patients with bony polydactyly of the foot treated surgically at our department from 1995 to 2009. The patients were divided into two groups according to the age at the time of surgical treatment. Patients under the age of 5 at time of surgery constituted group A, while those 5 years of age and older made up group B.

Consecutive cases of complex, bony polydactyly and polysyndactyly, with or without associated polymetatarsia were included in the study. Preoperative radiographs were assessed, and the polydactyly was classified as preaxial, central or postaxial (Figs. 1 and 2). Patients with bilateral foot involvement as well as those with any associated anomalies or syndromes were noted. Patients with simple, soft tissue polydactyly, were excluded.

The indications for surgical treatment were pain, problems with function and/or the appearance. The older patients presented with difficulty with shoe fitting and wear and their feet demonstrated



**Fig. 2.** AP radiograph of an 11-month year-old patient's feet, presenting with bilateral complex postaxial polydactyly.

painful calluses. Patients and their families uniformly complained of the size and an unsightly appearance of the affected feet.

Surgery involved saving the most dominant ray and digit, which means that in most cases of postaxial polydactyly the medial ray was preserved and the lateral one excised. One case of postaxial polydactyly was managed with a hemi-metatarsal transfer according to Ezra et al. (Fig. 3A) [16]. Patients with preaxial polydactyly usually had the medial toe removed, along with the corresponding metatarsal bone, if present. There were exceptions to the rule of removing the outmost toes in both preaxial and postaxial cases, in patients with aberrant hypoplastic bony formations lateral to the 1st, and medial to the 5th toe (Fig. 4A and B).

Radiographically, the feet deformities were assessed using standard non-weight bearing anterior-posterior (AP) and lateral views. All the components of the deformity were noted, and surgery was planned according to the radiographic images. The most recent radiographs, taken at final follow-up, were evaluated for any residual bony deformity after treatment.

All patients were contacted for a specific review at the time of final data analysis, to rate the function and appearance of the surgically treated foot/feet. Clinical outcomes were assessed and evaluated according to the Phelps and Grogan clinical outcome criteria [2]. Feet that had no shoe fitting issues, no pain and no significant residual deformity together with a cosmetically acceptable result were deemed excellent. In feet with occasional pain, difficulty with fitting some shoe styles, non-painful calluses and negligible residual deformity results were good. A poor outcome implied a foot with persistent pain, apparent issues with shoe wearing, painful calluses and considerable deformity.

## 3. Results

There were a total of 24 patients (8 male, 16 female) presenting 30 feet with polydactyly. No patients were lost to follow-up. All of the patients were treated surgically at our department, with the median age at surgery of 1 year (range, 9 months–4.5 years) for group A, and 8.5 years (range, 6–37 years) for group B (Table 1). The median follow-up was 16.2 years (range, 7–21 years). Bilateral duplications were seen in 6 patients, and unilateral in 18.

By clinical and radiographic assessment, we found 16 postaxial and 8 preaxial polydactyly cases (Table 1). In total, there were two syndrome-associated polydactylies. One patient from group A had associated Oral-facial-digital syndrome, and in group B, one patient had Ellis–van Creveld syndrome. All other 22 patients had isolated cases of foot polydactyly and were otherwise healthy. Two patients with preaxial polydactyly (one from each group) had an associated hallux varus deformity of 80 and 20°, respectively (Table 2). The varus component of the great toe was assessed at the time of primary surgery in both patients, by performing a Farmer's procedure.

The postoperative course was uneventful. Patients were discharged on the second day after surgery. Those treated for preaxial polydactyly were placed in a plaster cast for 3 weeks, to protect the wound and allow for soft tissue healing. Those treated for postaxial polydactyly had a heavy bandage fitted. After taking off the plaster cast and heavy bandages, respectively, patients were allowed full weightbearing.

According to Phelps and Grogan criteria, at the last specific follow-up 12 patients' feet were rated as "excellent" and 12 as "good" (Table 2). By reviewing the medical records, two complications were noted in two patients, one from each group, treated for postaxial polydactyly. One suffered a non-union at the site of hemi-metatarsal transfer and had a residual 20° valgus of the 5th toe (Fig. 3B), while the other required a plastic surgery procedure to reduce the hypertrophic and painful postoperative

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