



Case Report

A Rare Foot Duplication; Mirror Foot - Case Report

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Abstract

Polydactyly is a congenital extremity malformation defined by the presence of additional digits. The mirror foot anomaly, regarded as a rare variant of preaxial polydactyly, is characterized by a mirror image duplication of the foot. Due to the variability of mirror foot patterns reported in the literature, defining the term "mirror foot" remains challenging. In this case study, we present the treatment of a five-year-old male patient with a mirror foot anomaly who was admitted to our outpatient clinic. There is no consensus on the optimal surgical management strategy, and very few cases have been documented in the literature.

Keywords: Congenital foot deformity, mirror image polydactyly, polydactyly.

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Polydactyly (extra digits) is a common congenital anomaly with a familial tendency, and its incidence varies widely according to many factors such as race, geographical distribution, and familial inheritance. It is a congenital anomaly that can affect both the hands and feet. Polydactyly can be categorized as preaxial (on the radial side), central, or postaxial (on the ulnar side) based on the location of the deformity. Approximately 80% of patients usually have asymmetric postaxial polydactyly.

Mirror foot anomaly, which is considered a rare variant of preaxial polydactyly, is characterized by the presence of a mirror image duplication of the foot.^[1]

Research on understanding the embryology of mirror foot anomalies has increased since the early studies of Saunders and Gasseling in 1968. Saunders and Gasseling produced chicks with mirror foot anomalies by grafting a small piece of the posterior border of the mesoderm to

the anterior border in chick embryos. Mirror foot duplication is thought to be caused by abnormal positioning of the "polarization activity region." The "polarization activity region," which expresses the sonic hedgehog gene, regulates limb formation along the anteroposterior axis toward the apical ectodermal ridge during limb bud development at five weeks of gestation. In humans, mirror foot deformities have been observed when there is ectopic expression of polarization activity zone cells or the sonic hedgehog gene.^[2]

Mirror foot anomalies may occur in isolation or as part of a syndrome involving fibular dimelia, nasal anomalies, and tibial hypoplasia, as seen in Laurin-Sandrow syndrome and Martin syndrome. Fibular dimelia with mirror foot is an uncommon abnormality that can be associated with other anomalies such as ulnar dimelia, facial irregularities, and sacrococcygeal teratoma.^[3]

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There is no consensus on the definition of a mirror foot anomaly. Some authors argue that it refers to a mirror image of a foot exhibiting polydactyly, while others suggest that it should involve mirror duplication of all skeletal elements of the foot extending in the tibial direction.^[4]

Radiographic examinations are important for a better understanding of the preoperative anatomy and for surgical planning. Treatment of polydactyly is usually indicated for psychological and cosmetic reasons and to improve function. There is no consensus on the surgical management of this rare deformity.^[5]

Case Report

The patient, a five-year-old boy, presented to our outpatient clinic with the complaint of an extra toe on the left foot (Fig. 1). The patient did not have any accompanying anomalies. He had no history of previous operations or chronic diseases. According to the anamnesis obtained from the patient and his relatives, there was no family history of polydactyly or mirror foot anomaly. On physical examination, both lower extremities were of equal length, and no discrepancies were noted. Movement at the level of the hip, knee, and ankle joints was normal in both lower extremities.

Examination of the left foot revealed two extra toes on the tibial side, while the other toes were normal. A radiological examination of both legs was performed to exclude associated tibial deformities. No pathology was observed in the right foot on radiographic examination. In the left foot, seven toes were fully developed along with the metatarsal bones (Fig. 2). A diagnosis of polydactyly (mirror foot) was made based on clinical and radiological findings. During the outpatient clinic evaluation, it was understood that the patient presented primarily due to cosmetic concerns, and an operation plan was formulated after detailed assessment.

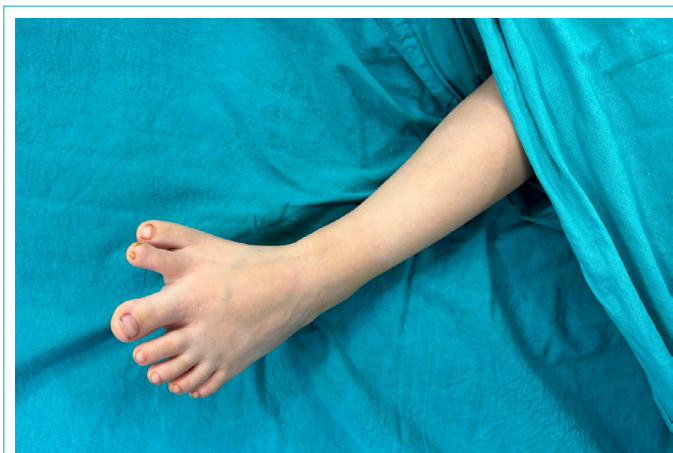


Figure 1. Preoperative clinical photograph of the patient's left foot demonstrating a mirror foot.



Figure 2. Composite preoperative images showing clinical photographs of the left foot and plain radiographs. The radiographs demonstrate seven well-formed toes with corresponding metatarsals on the medial (preaxial) side.

To excise the extra toes on the left foot, bilateral fasciocutaneous flaps were elevated along the perioperatively determined incision line to reach the tarsometatarsal (TMT) joint. Two digits and two metatarsal bones were excised en bloc from the TMT joint level. The skin flaps were revised to prevent linear scarring. The patient's limb functions were normal in the early postoperative period. He was discharged on the third postoperative day and was followed up clinically and radiologically in the outpatient clinic.

The total operative time was 2 hours. The main intraoperative challenges included ensuring adequate vascularization of the skin flaps and achieving precise alignment of the remaining structures to preserve functionality.

No functional decline was observed during postoperative follow-up. The skin flaps were found to have adapted safely, and the family expressed satisfaction with the cosmetic outcome (Fig. 3).

Written informed consent for publication of the clinical details and images in this case report was obtained from the patient's legal guardians.

Discussion

Polydactyly is a congenital anomaly whose etiology remains poorly understood. The anomaly known as mirror foot is rare and typically described as an isolated defect. Its association with tibial agenesis and fibular dimelia is extremely uncommon.^[6] It may occur as an isolated genetic defect or in association with other congenital anomalies such as syndactyly, anorectal anomalies, cleft lip and palate, and cardiac defects.^[7] It can appear in both the hands



Figure 3. Postoperative clinical photographs and plain radiograph of the left foot following excision of the two medial supernumerary rays at the tarsometatarsal level and soft-tissue flap rearrangement.

and feet. Temtamy and McKusick classified polydactyly according to the location of the extra digit as preaxial, central, or postaxial.^[8] The mirror foot anomaly, regarded as a rare variant of preaxial polydactyly, is characterized by a mirror image duplication of the foot. Patients may present during childhood or later in adulthood, often due to cosmetic concerns or discomfort when wearing shoes.

The definition of this variant of polydactyly remains controversial. According to some authors, the definition of mirror foot consists only of mirror-image polydactyly, whereas others argue that all skeletal elements of the foot must be duplicated in the form of a mirror image.

Our case involved a five-year-old patient with a mirror foot anomaly who presented due to functional and cosmetic concerns of his family and fit more closely with the second definition above. However, given his age, this patient can

be considered a late presentation. So much so that the patient had spent the last two years wearing only slippers and similar footwear on his deformed foot.

Conclusion

Mirror foot anomaly is an extremely rare condition and represents an extreme form within the preaxial polydactyly spectrum. Very few cases of this anomaly have been reported in the literature, and there is no consensus on the most appropriate surgical technique. Surgery should be planned on a case-by-case basis according to the age of presentation and the type of deformity, which can vary widely.

Disclosures

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent for publication of the clinical details and images in this case report was obtained from the patient's legal guardians.

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