

Correction of Congenital Hallux Varus Deformity Using Modified Farmer's Technique: A Case Series

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ABSTRACT

Aim and background: Congenital hallux varus deformity is an uncommon entity. There are various reasons for the development of the deformity. It can be primary without any underlying pathology, secondary (preaxial polydactyly), or tertiary (dwarfism). The medial aspect of the great toe at the metatarsophalangeal (MTP) joint region is explored to address the tightness of the abductor hallucis and the joint capsule. After the soft tissue release, with or without osteotomy for correction of the deformity, there will be a resultant defect. Farmer's technique is a surgical procedure to correct hallux varus, where the defect on the medial aspect of the great toe is covered using the "skin-fat" flap raised from the first web.

Case description: We report two children with hallux varus deformity associated with preaxial polydactyly. They were brought to us with difficulty in wearing closed shoes and for cosmesis. Radiographs were taken, and the MTP or varus angles were measured. Preoperative varus angles for our patients were 47.1° and 69.6°.

Farmer's technique was used for soft tissue balancing after the correction of the deformity in both our cases. We used a modified technique; the great toe and second toe were not syndactylized. Results were analyzed using the Phelps and Grogan method. Good to excellent correction of the varus deformity with good cosmesis was attained. Postoperative varus angle measurement showed a correction of 39.4° and 52° in our cases.

Conclusion: Farmer's technique is a good option to correct congenital hallux varus deformity and can be combined with bony procedures. The lax first web skin-fat flap covers the medial soft tissue defect.

Clinical significance: Congenital hallux varus is a difficult condition to treat as the chance of recurrence is high. Farmer's technique shifts the redundant skin and soft tissue in the first web to the medial aspect of the great toe that lacks soft tissue. This prevents recurrence.

Keywords: Case report, Congenital, Farmer's technique, Hallux varus, Polydactyly, Toe deformity.

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INTRODUCTION

Hallux varus is the medial deviation of the great toe at the metatarsophalangeal (MTP) joint. Among the etiological reasons, congenital hallux varus is extremely uncommon, with varus deformity following a failed valgus correction (iatrogenic) being the most common cause.¹ This deformity can be corrected by soft tissue and/or bony procedures, including the release of the contracted medial structures, osteotomies, bony realignment, and soft tissue cover for the residual defects.

We have treated four cases of pediatric hallux varus at our plastic surgery center from May 2007 to July 2024. Three of the four cases were due to congenital causes, while one was due to overcorrection of the hallux valgus deformity performed elsewhere.

We report the surgical technique proposed by Farmer for the correction of hallux varus in two of our pediatric patients² (Fig. 1). Both children had preaxial polydactyly with hallux varus deformity. While the first child required a wedge osteotomy to correct the deformity, the second child did not need a bony procedure. Both children required soft tissue cover for the defect on the medial aspect of the MTP joint of the great toe.

Postoperative results were analyzed using the Phelps and Grogan method.^{3,4} The outcomes are graded as excellent, good, and poor depending upon the presence of pain, difficulty in wearing shoes, callus formation, and cosmesis. The pre- and postoperative varus angles were compared. The varus deformity was assessed by measuring the metatarsophalangeal angle (MTPA) or hallux varus angle on an anteroposterior radiograph; the angle between the longitudinal axes of the first metatarsal and proximal phalanx of the great toe.

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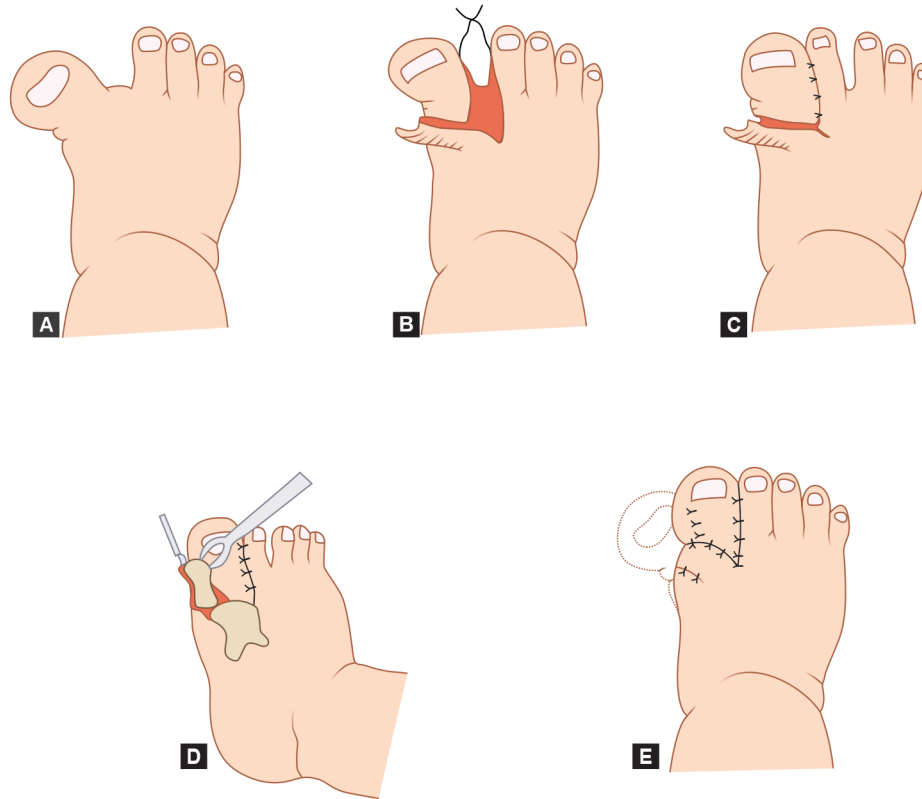
Conflict of interest: None

Patient consent statement: The author(s) have obtained written informed consent from the patient's parents/legal guardians for publication of the case series details and related images.

CASE DESCRIPTION

Case 1

A two-year-old female child from the Maldives, with known glucose-6-phosphate dehydrogenase (G-6PD) deficiency and glial astrocytoma, was brought to us with a broad great toe with severe medial deviation at the MTP joint on the right side (Fig. 2). Antenatal history was uneventful. The mother expressed concern about the child's ability to wear closed shoes for school. Clinical examination revealed a broad great toe with a duplicated nail plate, indicating the presence of a preaxial polydactylous toe. Radiographs revealed



Figs 1A to E: Farmer's technique: (A) Hallux varus deformity in a hidden duplicated great toe; (B and C) Skin-fat flap raised from the first web with syndactylization of the great and second toes; (D and E) Removal of the extra toe phalanx with inset of the first web flap



Figs 2A to J: Clinical pictures and radiographs of patient 1. (A to C) Preaxial polydactyly with severe hallux varus deformity. The first web is wider than normal; (D) Incision markings for raising the first web flap using Farmer's technique; (E) Marking for closing wedge osteotomy of the proximal phalanx; (F) After wedge osteotomy; (G) Correction of the varus with axial Kirschner wiring; (H) Flap inset and skin closure; (I and J) Clinical photo and radiograph at final follow-up showing satisfactory varus correction with good cosmesis

a hypoplastic extra toe on the medial side of the great toe with severe varus deformity. The preoperative MTPA was 47.1° varus.

She was operated under general anesthesia and regional anesthesia to the right lower limb. After raising the flap on the medial aspect of the duplicated great toe, the extra phalanges were removed. The tight fibrous bands were divided. Capsulotomy of the MTP joint was done. To cover the anticipated raw area on the medial aspect of the MTP joint, Farmer's technique was used. A proximally based first web flap was raised from the dorsum of the foot.

Closing wedge osteotomy was performed on the lateral side of the proximal phalanx to correct the varus deformity. The size of the wedge osteotomy was judged visually during the surgery. The primary cut was made on the proximal phalanx 67 mm distal to the MTP joint. A wedge of 5 mm (base of the triangle) was removed.

The great toe was repositioned on the first metatarsal head using a 1.25 mm Kirschner wire. The wire was passed axially through the interphalangeal (IP) and MTP joints. The first web flap was used to cover the medial aspect of the great toe. A plantar split-thickness skin graft harvested from the nonweight bearing instep area of the foot was used to cover a small area proximal to the flap. The leg was immobilized in an above-knee Plaster of Paris (POP) slab for a total of 6 weeks. The wounds healed well. The flap settled well with full take of the graft. At 6 weeks, the Kirschner wire was removed.

At the final follow-up, 2 years after surgery, the foot looked cosmetically good. The postoperative MTPA was 7.7°, and a varus correction of 39.4° was attained. The child could wear closed shoes of the same size for both feet. The parents were extremely satisfied with the results. According to the Phelps and Grogan method of postoperative assessment, she had excellent results—no pain, no

difficulty in wearing shoes, no callouses, no significant deformity, and satisfactory cosmesis.

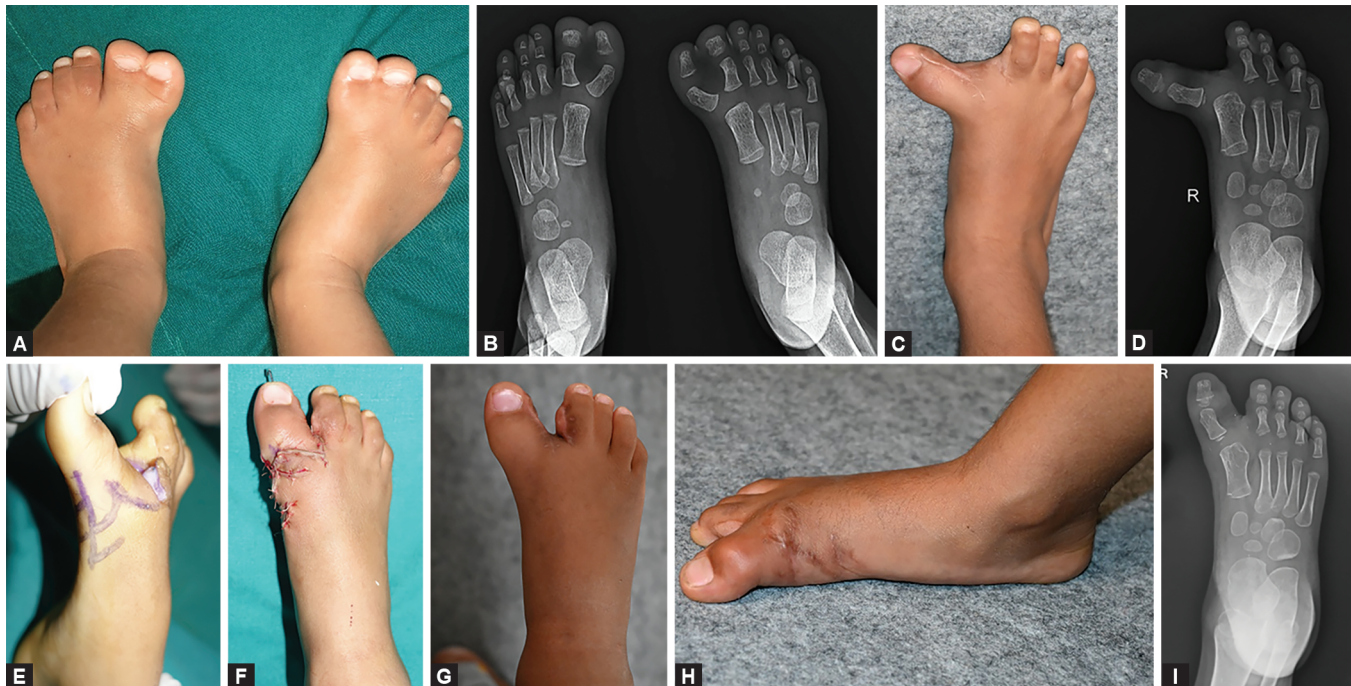
Recently she underwent excision of a small extra distal phalangeal remnant that was on the medial aspect of the right great toe.

Case 2

A 4.5-month-old male child was brought to us with preaxial polydactyly affecting both feet, noticed at birth. He had a duplicated great toe at the MTP joint level with syndactyly of the second/third toes on both sides. The medial components of the duplicated great toe had hallux varus deformity (Fig. 3). At 15 months of age, we removed the extra great toe component in the feet. On the left foot, the medial duplicated component, and on the right side, the lateral component, were removed.

One year after the first surgery, he was brought to us with exaggerated varus deformity of the right great toe, with a medial deviation of 69.6° at the MTP joint. He had difficulty in wearing shoes. However, the left great toe did not have any deformity after excision of the duplicated component.

To correct the varus deformity, we performed multiple Z-plasties on the medial aspect of the great toe. The tight, contracted fibrous structures on the medial aspect of the MTP joint were divided. The taut abductor hallucis tendon was lengthened by Z-lengthening. Capsulotomy of the MTP joint was done to bring the great toe to neutral. The toe was placed over the metatarsal head using a 1.25 mm Kirschner wire. A dorsal flap was raised from the first web space and rotated to cover the medial aspect of the MTP joint. The first web was closed primarily. The above-knee POP slab was retained until the removal of the Kirschner wire at 6 weeks.



Figs 3A to I: Clinical picture and radiographs of patient 2. (A and B) Preoperative photo and radiograph of both feet with preaxial polydactyly. The great toes are duplicated at the metacarpophalangeal level; (C and D) The severe varus deformity of the right great toe after excision of the extra toe; (E) Incision markings for Z-plasty on the medial aspect of the great toe to gain access as well as for contracture release. The first web flap is shown; (F) After varus correction and flap inset; (G to I) Postoperative photos and radiograph of the right foot showing satisfactory deformity correction and good cosmesis

The surgery resolved the patient's footwear problem. The postoperative MTPA was 17.6°. A correction of 52° was achieved at a follow-up of eight months. He had a good result following varus correction—no pain, no difficulty in wearing shoes, no calluses, and satisfactory cosmesis, but with residual varus deformity. The correction achieved during surgery could not be maintained, probably due to an overactive abductor hallucis.

DISCUSSION

Congenital hallux varus can be of three types: primary, secondary, and tertiary.^{1,5} Both our patients had secondary hallux varus, where the deformity was associated with congenital preaxial polydactyly. The primary type has no underlying cause, and the tertiary type is associated with skeletal abnormalities like dwarfism.^{1,5-7} Normally, the MTP joint of the great toe is in 15° valgus.⁷ The main difficulty with varus in the pediatric population is in wearing closed shoes that will crowd the toes. This can lead to pain.

The varus deformity can be flexible or rigid. Flexible deformities can be corrected with soft tissue release and tendon transfers, such as adductor hallucis tendon release with reattachment, abductor hallucis tendon transfer, split extensor hallucis brevis transfer, and extensor hallucis longus tendon transfer. Arthrodesis of the MTP joint or wedge osteotomies of the metatarsal or proximal phalangeal bone are needed to correct the rigid type. Clinical evaluation and radiographic assessment help us to assess the type as well as the severity of the deformity. Longitudinal epiphyseal bracket in the first metatarsal should not be overlooked in congenital preaxial polydactyly or hallux varus deformity, and wedge osteotomy may be needed. A short, broad metatarsal may be a delta phalanx in its early stage, where the longitudinal epiphysis is not visible radiographically.⁸

The surgical procedure is chosen based on the type of deformity: flexible or rigid, the presence of delta phalanx, and hence is individualized.⁴ The skin contracture can be addressed using Z-plasties. The soft tissue balancing can be achieved using Farmer's technique or McElvenny's technique.^{2,9} Farmer's technique is an excellent option to correct varus deformity. Farmer published his technique of correcting the congenital hallux varus deformity in eight patients in 1958.² In his article, he described three techniques: using a dorsal proximally based skin-fat flap from the region between the great and second toes to cover the medial aspect of the MTP joint, using a ventral flap, and the third using the skin flap after removal of the skeletal elements of the extra medial toe of the great toe.²

We have followed Farmer's technique for both our cases. After release of the contracted elements on the medial side of the MTP joint of the great toe, there was a resultant soft tissue defect, and it was covered with a flap from the first web space. An added advantage of this technique is that by taking the flap and primarily closing the defect, we obtain a "dermodesis" effect, which also brings the varus hallux into alignment. The flap from the first web can cover areas of possible tendon or bone work as well. An additional skin graft can be used to cover any raw area present. This technique can be combined with wedge osteotomy, as in case 1. Farmer syndactylized the great and second toes after rotating the flap medially. This was to prevent the great toe from deviating medially. In our cases, we have not syndactylized the great and second toes. He recommended the use of a skin graft if needed for the donor site, but we could close the donor area primarily. We could get enough skin to suture the flap donor site and create a

decent first web space, and hence this would be a modification of the original Farmer's technique.

This procedure is simple and effective. It utilizes the extra skin-fat tissue in the first web space to cover the neighboring defect that results from varus correction. In our cases, the feet had an adequate first web space after closure. However, recurrence of the deformity is a possible complication of this procedure. The child may need further procedures at a later stage. The complications of hallux varus corrective surgery are infection, delay in wound healing, over- or undercorrection, shortening of the medial column, MTP joint stiffness, nonunion, or malunion.

Shim et al. concluded in their study that a combined osteotomy-soft tissue procedure was a reliable option for managing congenital hallux varus.⁴ They utilized Farmer's technique with or without bony procedures in six out of the ten feet with hallux varus deformity. According to Phelps and Grogan scoring, they had good ($n = 5$) to excellent ($n = 1$) results at a mean follow-up of 6.8 years. Mills and Menelaus, in their study on 20 great toes operated for varus deformity, had satisfactory results in two out of the four patients who had Farmer's procedure at a mean follow-up of 11.1 years.¹⁰ We analyzed the results using MTPA and the Phelps and Grogan method used by Shim et al.^{3,4} A varus correction of 39.4° and 52° were achieved in our cases 1 and 2, respectively. They had good to excellent results. All the wounds healed well. Both children could wear closed shoes of the same size for both feet, without any discomfort. The parents were satisfied with the appearance of the foot.

CONCLUSION

The modified Farmer's technique is a good option to cover the medial aspect of the great toe after varus correction. The excess skin and fat in the first web enable the raising of a skin-fat flap. The flap can be rotated to reach the medial site. When combined with the varus deformity corrective steps, such as Z-plasty of the contracted skin, medial soft tissue release, capsulotomy, wedge osteotomy, and abductor hallucis procedures, this technique gives satisfactory results.

Clinical Significance

Congenital hallux varus can be challenging to treat due to a high chance of recurrence. Typically, there is a lack of soft tissue on the medial side of the big toe after correcting the deformity. The Farmer's technique involves transferring the excess skin and soft tissue from the first web to the area that requires it, helping to prevent the deformity from recurring.

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