

# Reconstruction for Wassel Type III Radial Polydactyly With Two Digits Equal in Size

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**Purpose** To report the surgical outcomes for Wassel type III radial polydactyly thumbs of equal or nearly equal size treated by excising the radial thumb with augmentation.

**Methods** We have reconstructed 15 cases of Wassel type III radial polydactyly, in which the duplicated digits were equal or almost equal in size, by ablation of a radial digit. The distal articular surface of the radial proximal phalanx was preserved in order to maintain stability of the interphalangeal joint. The stability of the retained thumb was further augmented by tendon repositioning, restoration of the radial collateral ligament, and transfer of soft tissues from the radial digit. Eleven of 15 cases were followed up for more than 2 years and were available for assessment using the Japanese Society for Surgery of the Hand evaluation form. The average age at follow-up was 8 years and 3 months. The size of the nail and distal phalanx was measured to assess the growth of the thumb.

**Results** An average functional point was 12 points (maximum 14 points), and restricted interphalangeal joint motion and extension lag were the disadvantages of this technique. The width of the distal phalanx was increased from 62% of the size of the metacarpal before surgery to 78% at the final follow-up. The cosmetic score averaged 3.6 (maximum 4 points), and slightly small nails without a central ridge were deemed acceptable.

**Conclusions** Our technique can provide a functionally good thumb for Wassel type III radial polydactyly. (*J Hand Surg* 2009;34A:1802–1807. © 2009 Published by Elsevier Inc. on behalf of the American Society for Surgery of the Hand.)

**Type of study/level of evidence** Therapeutic IV.

**Key words** Bilhaut technique, congenital hand, duplicated thumb, polydactyly.

THE AIM OF SURGICAL reconstruction for radial polydactyly is restoring a nearly normal thumb; however, hypoplasia in the original thumbs compromises this aim. The long-term results show that nearly 20% of patients required revision surgeries.<sup>1,2</sup> Overall, 10% of the patients were not satisfied with the cosmetic results.<sup>3</sup> The prognosis differs depending on

the bifurcation types.<sup>4,5</sup> Wassel type III polydactyly, in which 2 digits are equal or almost equal in size, is one of the difficult types for reconstruction. Tada reported that one third of patients experienced a fair or poor outcome.<sup>6</sup> The Bilhaut<sup>7</sup> procedure is one of many procedures performed to reconstruct the hypoplastic radial polydactyly. However, the original technique has often resulted in nail deformity, stiff joint, and recurrence of the deformity.<sup>1,2,8–11</sup> Several modifications for the Bilhaut procedure have been introduced.<sup>1,12–15</sup>

On the other hand, the simple ablation of 1 digit for the Wassel type III polydactyly has resulted in an unstable small thumb. Manske<sup>11</sup> reported a reconstruction technique using a ligamentous periosteal flap with osteotomy, which is technically simple and does not potentially interfere with bone growth. However, the narrowed interphalangeal (IP) joint had a tendency to lose

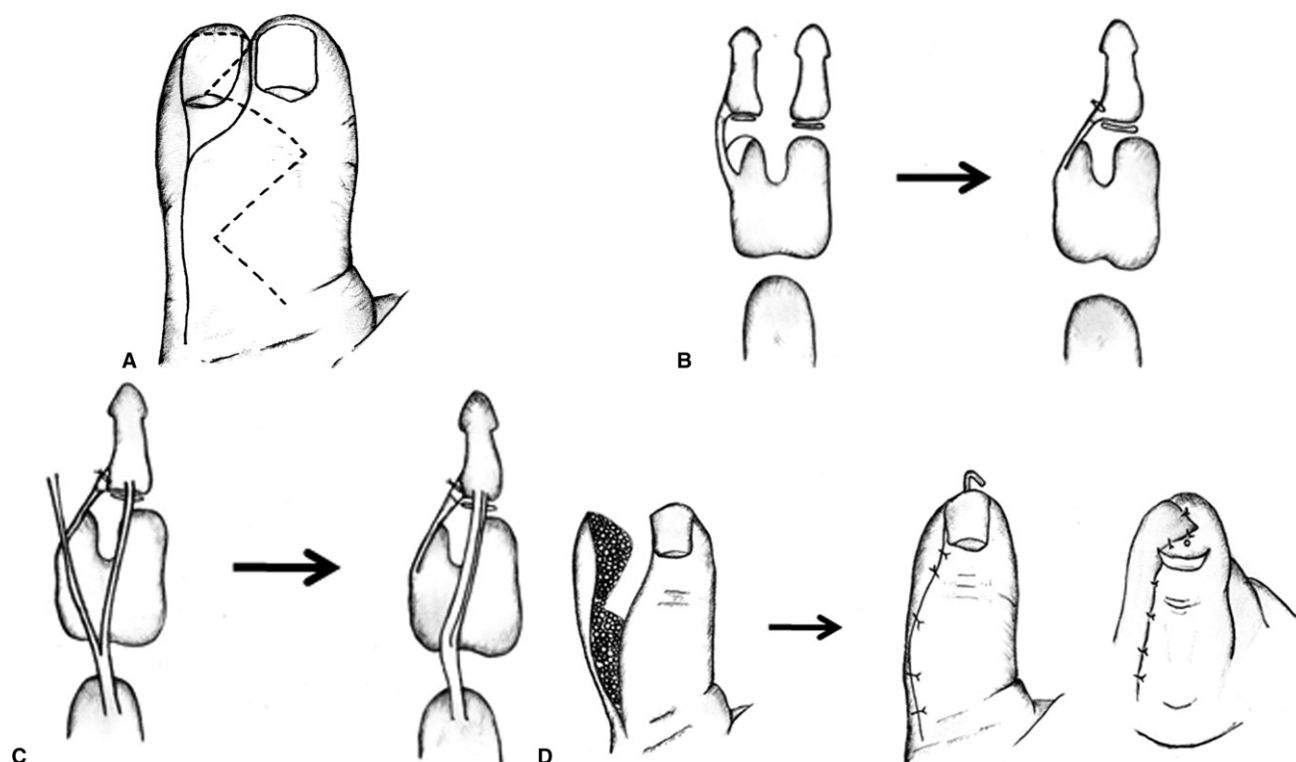
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**FIGURE 1:** Surgical techniques. **A** A curved incision on the dorsal and a zigzag incision on the volar were used for exploration. **B** A part of the distal articular surface of the radial proximal phalanx was excised, but enough joint surface to support the distal phalanx was preserved. The radial collateral ligament along with the cartilage was sutured to the ulnar distal phalanx. **C** The extensor pollicis longus (EPL) tendon of the retained thumb was augmented by the EPL tendon of the excised thumb. **D** Soft tissue augmentation was performed by the skin fillet from the radial thumb. The radial paronychium was also reconstructed by soft tissue from the excised thumb. The IP joint was temporarily fixed by a K-wire.

joint stability in follow-up. We have extended Man-ske's techniques for reconstructing Wassel type III polydactyly with equal size. Instead of narrowing the distal articular surface, we preserved it in order to maintain stability of the IP joints. Tendon repositioning was also done for good alignment. The aim of this paper was to introduce our technique and report the surgical outcomes.

## MATERIALS AND METHODS

### Surgical technique

The principle of surgery was excision of the radial thumb and reconstruction of the ulnar thumb. A dorsal curved incision and volar zigzag incision were made for exploration (Fig. 1A). In earlier cases, the dorsal incision was also zigzag in configuration, but it was later changed to a radial curved incision. Tendon excursion of both the extensor pollicis longus (EPL) and flexor pollicis longus (FPL) was examined in order to determine the tendon balance in reconstructing the thumb. The IP joints of both thumbs were explored. The radial collateral ligament of the radial IP joint with its carti-

laginous insertion was carefully detached in continuity with the adjacent periosteum. The stability of the IP joint of the ulnar thumb was examined. A part of the proximal phalanx of the radial thumb was preserved to augment supports of the small distal phalanx (Fig. 1B). The metacarpophalangeal (MCP) joint itself was left untouched. The retained distal phalanx was centralized and longitudinally aligned. The radial collateral ligament of the radial thumb was resutured to the radial side of the distal phalanx for stability of the IP joint. Chondrodesis of the IP joint was performed for 2 cases with an extremely unstable IP joint. In the majority of cases, both of the EPL tendons were extremely thin, so the radial one was detached and used for augmentation of the ulnar EPL (Fig. 1C). The FPL tendon in the radial digit was excised, and that of the ulnar digit was centralized, if necessary. The radial part of the FPL insertion was cut and then resutured to the ulnar side of the distal phalanx. Soft-tissue augmentation was done using tissue from the radial digit. The skin flap from the radial thumb was trimmed to cover the paronychium and part of the pulp of the reconstructed thumb (Fig. 1D). The IP

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