Preaxial polydactyly, or thumb duplication, represents a failure of formation and differentiation along the radial/ulnar axis of the hand from abnormal signaling in the zone of polarizing activity of the limb bud. The congenital anomaly, which occurs 1 in 1,000 to 1 in 10,000 births predominantly in the Caucasian population, presents in many skeletal forms most commonly described according to the Wassel classification.1–3 Type IV, followed by type II are the most common variants, and numerous studies have reported on approaches to their surgical reconstruction, such as the Bilhaut-Cloquet procedure.4,5 Few articles have reported on the incidence of the Wassel VI thumb, in which duplication extends proximal to the first metacarpal. Studies that evaluate Wassel VI thumbs tend to report overall surgical outcomes such as growth and aesthetic appearance, with decreased quality seen in Wassel VI and VII classifications.6,7 Additionally, operative techniques are often broadly descriptive for all forms of duplication rather than specific to the Wassel VI.8 Shen et al.9 described a surgical technique for Wassel VI duplications; however, they focused on complex bony reconstruction without addressing soft-tissue reconstructive elements. To our knowledge, there are no studies describing the critical surgical techniques for soft-tissue reconstruction in Wassel VI duplications. In this report, we present 2 patients with Wassel VI duplications of the thumb, the anomalous soft-tissue anatomy, and our approach to reconstruction.

CASE REPORTS

Case 1

A 7-month-old boy presented to our clinic with right-sided thumb duplication requesting reconstruction. He was born full term after an uncomplicated pregnancy and delivery and had normal development for age. Clinical examination revealed a fully developed ulnar first digit and a shorter more hypoplastic radial digit. Given his age, independent function of each digit could not be completely assessed. Plain radiographs revealed appropriate ossification for age and a Wassel type VI thumb, an uncommon variant in which complete duplication begins at the metacarpals has not been extensively discussed in the literature. Here, we present 2 patients with a Wassel VI duplication and a shared soft-tissue variant of anomalous insertion of the opponens pollicis muscle onto the radial hypoplastic digit. A critical component of thenar reconstruction involves preservation and reinsertion of the opponens muscle into the dominant and preserved metacarpal. (Plast Reconstr Surg Glob Open 2018;6:e1996; doi: 10.1097/GOX.0000000000001996; Published online 5 November 2018.)

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carpometacarpal junction. The OP was reinserted into the periosteum on the radial aspect of the remaining metacarpal and the skin was closed with absorbable sutures (Fig. 3). The patient was placed in a long arm cast for 2 weeks and then allowed free range of motion with age-appropriate activity.

Case II

The second patient was a 23-month old boy, born full term after an uncomplicated pregnancy and delivery, presenting with bilateral thumb duplication. Clinically, the patient had normal development with suspected right hand dominance. Plain radiographs revealed a left Wassel IV duplication with a dominant radial thumb, and a right Wassel VI duplication with a dominant ulnar digit. Due to suspected hand dominance, reconstruction of the right thumb duplication was performed first.

Similar to the first case, a curvilinear shaped incision was made over the dorsal aspect of the first metacarpals and carried down to expose the radial metacarpal. An attenuated but distinct extensor pollicis tendon was transected proximally. The OP was again reflected off the volar metacarpal surface. The nondominant digit was resected at the carpometacarpal joint. There was also a
distinct flexor tendon that was resected volarly. As in the first case, the OP was reinserted into the periosteum of the dominant metacarpal and the skin was closed with absorbable suture.

**DISCUSSION**

Studies describing surgical approaches to preaxial polydactyly most often focus on the common variants, namely the Wassel IV and Wassel II forms. However, the incidence and best approach to less common variants are not as well reported in the literature. Shen et al.\(^9\) recently described a surgical technique for Wassel VI reconstruction. At almost 4 years postoperatively, Wassel VI and VII subtypes were significantly smaller and have worse aesthetic outcomes according to visual analog scale assessment by surgeons, psychologists, and caretakers.\(^4\) The description of soft-tissue reconstruction, particularly the incisional approach and OP insertion, may assist surgeons in understanding the relationship between soft tissue and bony structures in Wassel VI duplications and guide restoration of normal anatomy with improvement of aesthetic outcomes.

Goldfarb et al.\(^7\) evaluated 31 thumbs after preaxial polydactyly reconstruction. At almost 4 years postoperatively, Wassel VI and VII subtypes were significantly smaller and have worse aesthetic outcomes according to visual analog scale assessment by surgeons, psychologists, and caretakers.\(^4\) The description of soft-tissue reconstruction, particularly the incisional approach and OP insertion, may assist surgeons in understanding the relationship between soft tissue and bony structures in Wassel VI duplications and guide restoration of normal anatomy with improvement of aesthetic outcomes.

**REFERENCES**

1. Materna-Kiryłuk A, Jamsheer A, Wisniewska K, et al. Epidemiology of pre-axial polydactyly type I: data from the Polish Registry of Congenital Malformations (PRCM). *BMC Pediatrics* 2015;15:1-9.
2. Oberg KC, Feenstra JM, Manske PR, et al. Developmental biology and classification of congenital anomalies of the hand and upper extremity. *J Hand Surg Am* 2010;35:2066–2076.
3. Wassel HD. The results of surgery for polydactyly of the thumb. A review. *Clin Orthop Relat Res.* 1969;64:175–193.
4. Bilhaut M. Guerison d’un pouce bi de par un nouveau procede operatoire. *Congr Fr Chir.* 1890;4:576–80.
5. Tonkin MA, Rumball KM, e Bilhaut-Cloquet procedure revisited. *Hand Surg.* 1997;2:67–74.
6. de Almeida CEF. Analysis of surgical results and of residual post-operative deformities in preaxial polydactyly of the hand. *J Plast Reconstr Aesthet Surg.* 2008;33:1348–1353.
7. Goldfarb CA, Patterson JM, Maender A, Manske PR. Thumb size and appearance following reconstruction of radial polydactyly. *J Hand Surg Am.* 2008;33:1348–1353.
8. Al-Qattan NM, Al-Qattan MM. On-top and side-to-side plasties for thumb polydactyly. *Int J Surg Case Rep.* 2017;39:88–92.
9. Shen K, Wang Z, Xu Y. Reconstruction of Wassel type VI radial polydactyly with triphalangeal thumb using an on-top osteotomy. *Plast Reconstr Surg Glob Open.* 2017;5:e1216.
10. Saito S, Ueda M, Murata M, et al. Thenar dysplasia in radial polydactyly depends on the level of bifurcation. *Plast Reconstr Surg.* 2018;141:85e–90e.