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Doubling Down on Maximizing Functional and Aesthetic Outcomes: Modified Technique for Pediatric Wassel Type I Thumb Duplication: A Case Report

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Abstract

Background: *Given the rare occurrence, there is a paucity of literature characterizing surgical management of Wassel Type I thumb duplications, especially at an older age where psychosocial factors become a more significant consideration.*

Case Presentation: *We present a 5-year-old girl with right Wassel Type I thumb duplication with delayed initial presentation for treatment. We performed a modified Wassel Type I radial thumb ablation, percutaneous pinning, and nail reconstruction preserving radial nail fold and transferring to ulnar nail plate and fold.*

Conclusions: *This modified approach maximizes functional and aesthetic outcomes and highlights the significance of considering surgical management to improve quality of life in delayed presentations of Wassel Type I thumb duplication.*

Keywords: Thumb duplication; Wassel Type I thumb; thumb reconstruction; congenital hand surgery; pediatric hand surgery

Introduction

Polydactyly of the hand is one of the most common congenital anomalies, with radial polydactyly having a reported incidence of 0.08 to 1.4 in 1,000 live births [1,2]. Radial polydactyly, also known as preaxial polydactyly, refers to congenital duplications involving the thumb. While pediatric cases of thumb duplications can have a syndromic presentation or positive family history, most cases are isolated, sporadic, and unilateral [2]. The Wassel classification is the most common classification system utilized for radial polydactyly characterization, and is dictated by the level of bony duplication, whether the components are proximally attached (bifid) or completely separated (duplicated), from distal to proximal phalanx as evidenced by radiographic images [2]. A Wassel Type I thumb duplication represents a bifid distal phalanx, and is one of the least common types of radial polydactyly [2].

With Wassel Type I thumb duplications, the impetus for seeking surgical treatment is usually aesthetic more than functional in nature, and surgery is usually performed at the age of 1 year old. Historically, the gold standard management for symmetric Wassel Type I thumb duplications was a Bilhaut-Cloquet procedure [1,2,3]. However, in recent years, the most commonly performed procedure for thumb duplication, including asymmetric cases of Wassel Type I, has evolved to an ablation of the diminutive thumb, interphalangeal joint reconstruction, transfer of the collateral ligament, and centralization of the extensor tendon [2,3,4]. Given the rare occurrence of Wassel Type I thumb duplications, there is a paucity of literature on the surgical management of this congenital hand condition, and particularly in the pediatric patient with a delayed presentation for initial reconstructive hand surgery.

Case Report

A 5-year-old healthy girl presented with a right thumb duplication (Wassel Type I, bifid distal phalanx), seeking right thumb reconstruction with no prior history of reconstructive hand surgeries. She had full function of her right thumb with no pain, meeting all developmental milestones in school, and sought aesthetic improvement for her right thumb to match the appearance of her contralateral left thumb. There was no family history of thumb duplication, and she had no past medical or surgical history. Clinically on exam, a right Wassel type I thumb duplication was present with the right ulnar thumb more developed than the right radial thumb; fused dual nail plate between the two distal phalanxes; sensation intact on radial and ulnar digital nerves; two-second capillary refill; very broad interphalangeal joint; EPL and FPL both intact (Figure 1). Radiographic imaging revealed a right thumb with common bony epiphysis, fusion of the metaphysis, and two distinct distal phalangeal tufts consistent with a Wassel Type I thumb duplication (Figure 2). After discussion with the patient and her parents, the reconstructive goal was to preserve right thumb function, and to maximize the aesthetic outcome, namely related to optimizing nail appearance.

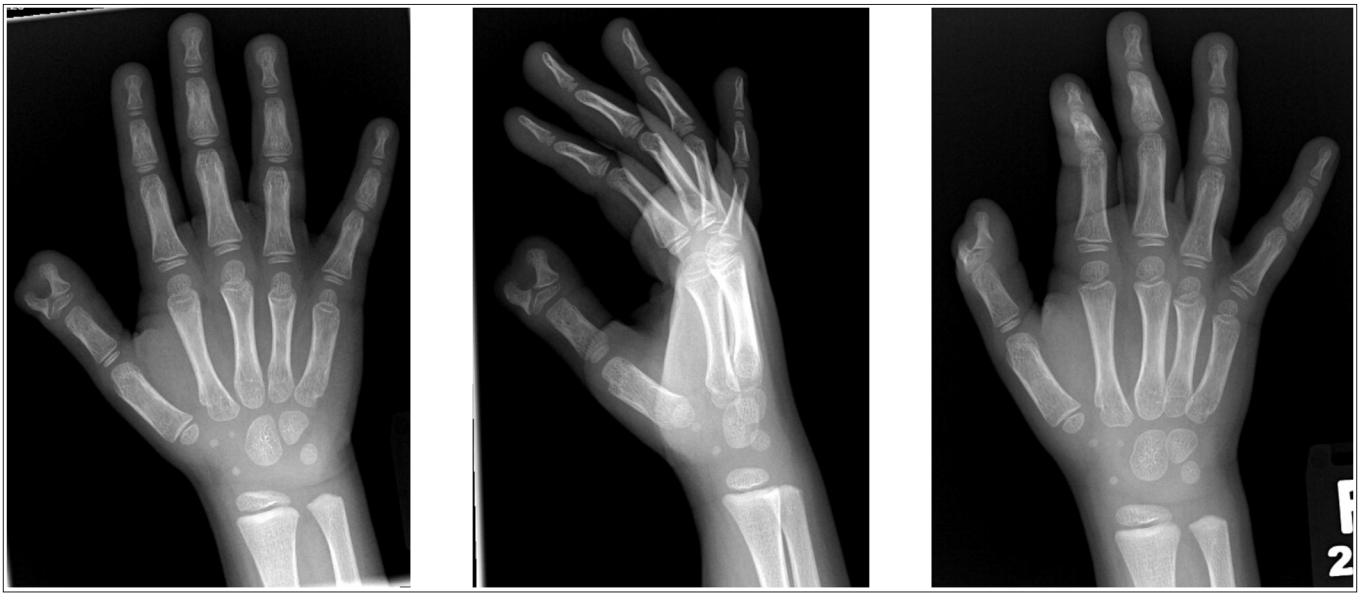

Figure 1: Clinically on exam, a right Wassel type I thumb duplication was present with the right ulnar thumb more developed than the right radial thumb; fused nail plate between the two distal phalanxes; sensation intact on radial and ulnar digital nerves; two-second capillary refill; very broad interphalangeal joint; EPL and FPL both intact.

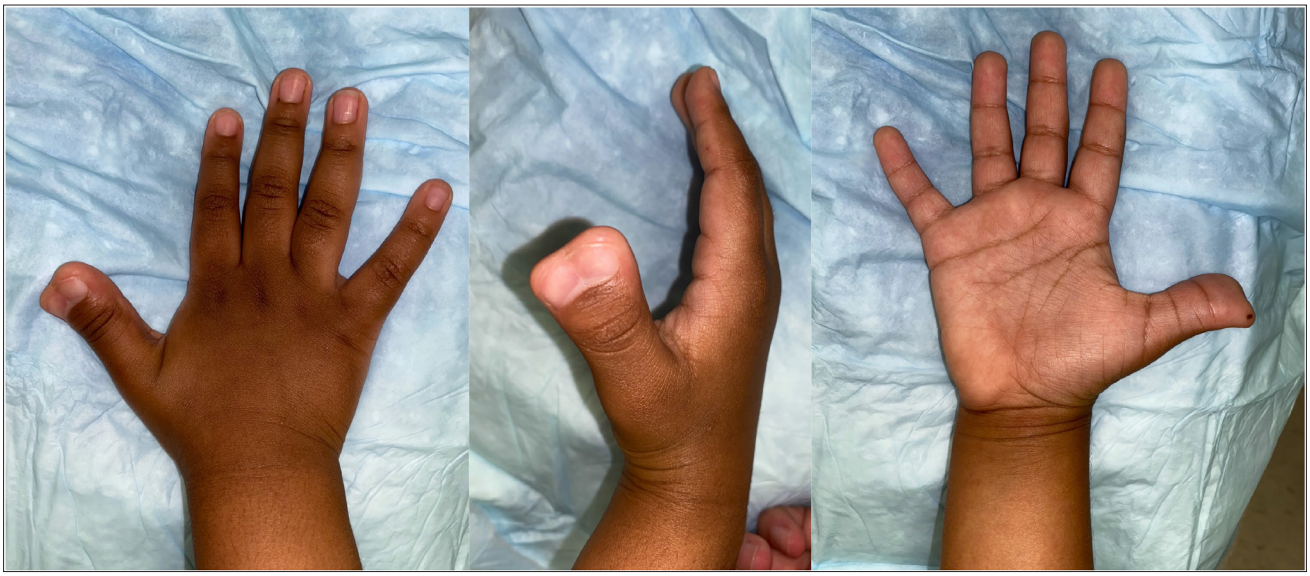

Figure 2: Radiographic imaging (3-views of right hand XR) revealed a right thumb with common bony epiphysis, fusion of the metaphysis, and two distinct distal phalangeal tufts consistent with a Wassel Type I thumb duplication.

In terms of surgical approach, the plan was for modified Wassel Type I right radial thumb ablation, proximal phalanx corrective osteotomy, interphalangeal joint open reduction percutaneous pinning technique, and nail reconstruction with preservation of the radial nail fold and transfer to the ulnar nail plate and nail fold in order to maximize both the functional and aesthetic outcomes, namely normal nail appearance and future growth (Figure 3). First, a 67 Beaver Blade was used to incise the marked wedge of the radial thumb, preserving the radial aspect of the nail fold for cosmesis. Littler scissors were used to bluntly dissect the radial distal phalanx bone out, and then a small osteotome was used to remove the radial distal phalanx, while preserving a radial periosteal sleeve and the associated ligaments to insure interphalangeal joint stability, confirming with intraoperative fluoroscopy. Then, attention was directed to the proximal phalanx, and an osteotome was again used to remove a small piece of the distal radial proximal phalanx in order to debulk the size of the native broad interphalangeal joint. The interphalangeal joint was confirmed to be stable. Next, a 0.028-inch Kirschner (K)-wire was placed under direct visualization across the right thumb interphalangeal joint retrograde through the proximal phalanx, but not to the second cortex. The preserved radial distal phalanx periosteal sleeve was sutured to the ulnar distal phalanx with 4-0 vicryl interrupted suture (Figure 4). The wound was copiously irrigated. The radial-side skin flap was advanced distally, under no tension, and inset with 4-0 plain gut simple interrupted sutures. One 5-0 FAST gut suture was used to tack the radial side of the nail border to the nail plate with meticulous care to not include the nail matrix in order to mitigate any post-operative nail deformity. Final intra-operative fluoroscopy images were obtained, and confirmed anatomic right thumb alignment as well as the proper K-wire placement (Figure 5). The right thumb was dressed with xeroform, Telfa, and a thumb spica splint. The total tourniquet time was 73 minutes.

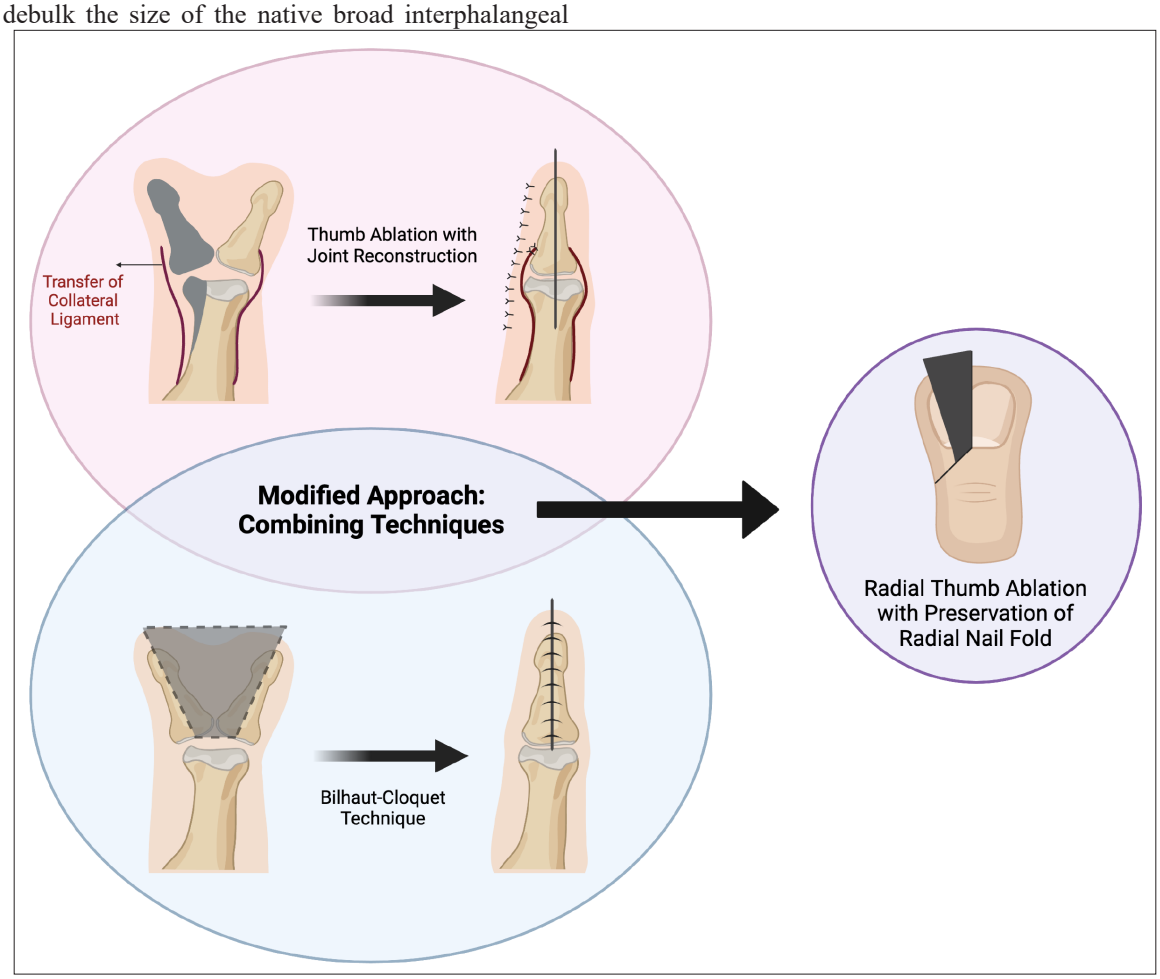

Figure 3: Our pre-operative plan for the case utilizing a combination of aspects of two previously described procedures in addition to our own modification with the corrective osteotomy and nail reconstruction. Our modified technique involves the bony approach from the top and soft tissue approach from below. Figure created with BioRender.com.

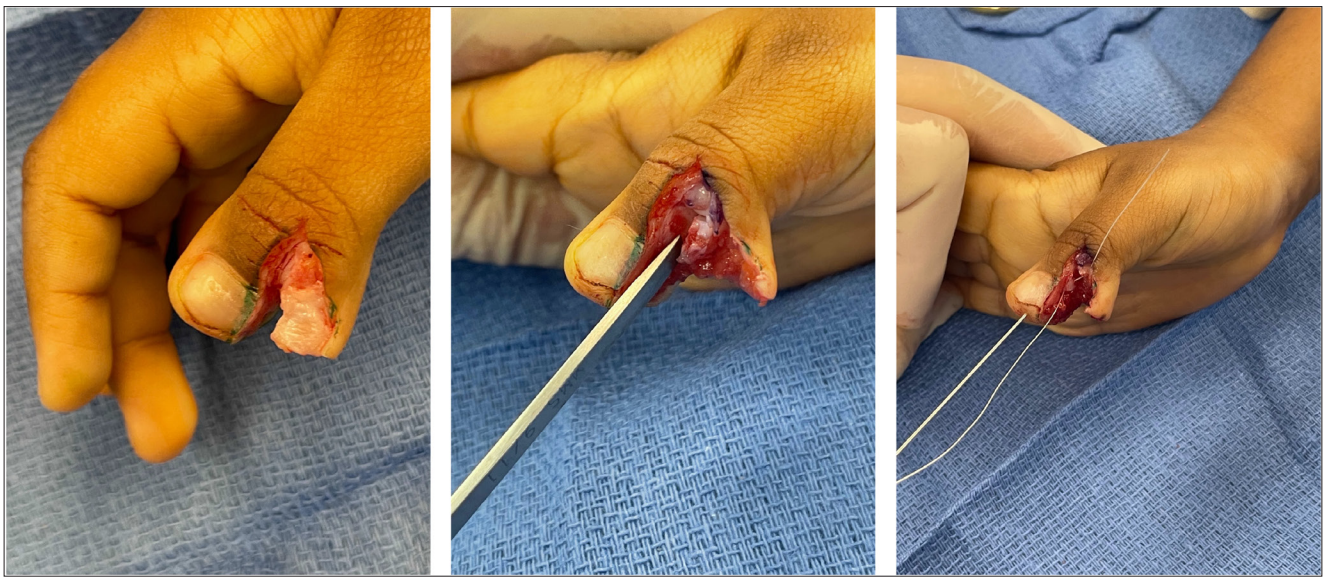

Figure 4: Intra-operative right thumb dissection, including demonstrating how the radial distal phalanx periosteal sleeve was preserved and sutured to the ulnar distal phalanx with 4-0 vicryl interrupted suture.

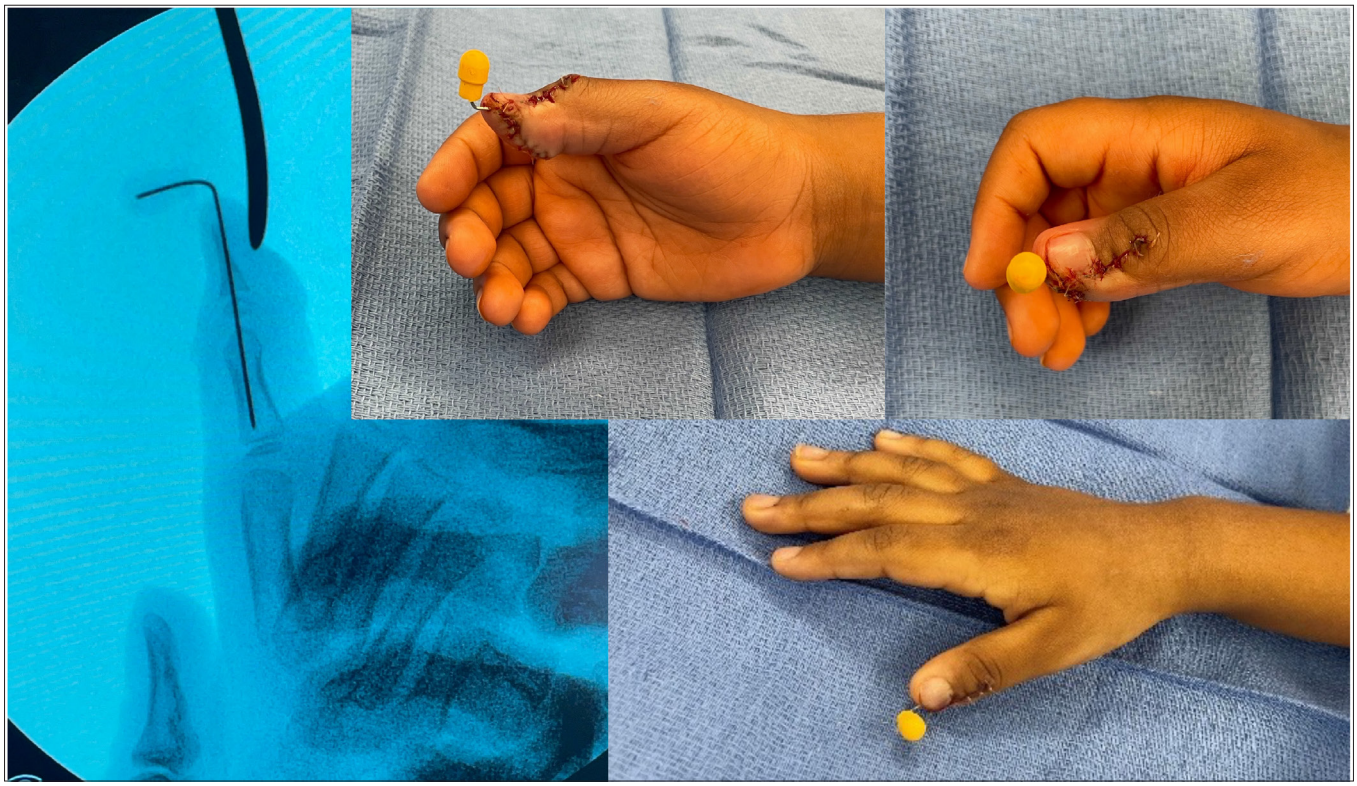

Figure 5: Final intra-operative clinical photographs and final intra-operative fluoroscopy images were obtained, and confirmed anatomic right thumb alignment as well as proper Kirschner wire placement.

Post-operatively, the patient was discharged home the same day with oral pain medications, and remained splinted in the thumb spica, which was transitioned from plaster to a thermoplastic occupational therapy splint at one week. The Kirschner wire remained in situ for four weeks total post-operatively, and the patient tolerated this pin very well with a protective pin cap in place at all times. Upon removing the K-wire at four weeks post-operatively, the patient's right thumb reconstructive outcome was successful (Figure 6). At the six-month and ten-month follow-up, the patient's right thumb was fully healed with a full range of motion and intact sensory function, showing the long-term success of the reconstruction from both an aesthetic and functional outcome (Figure 7).

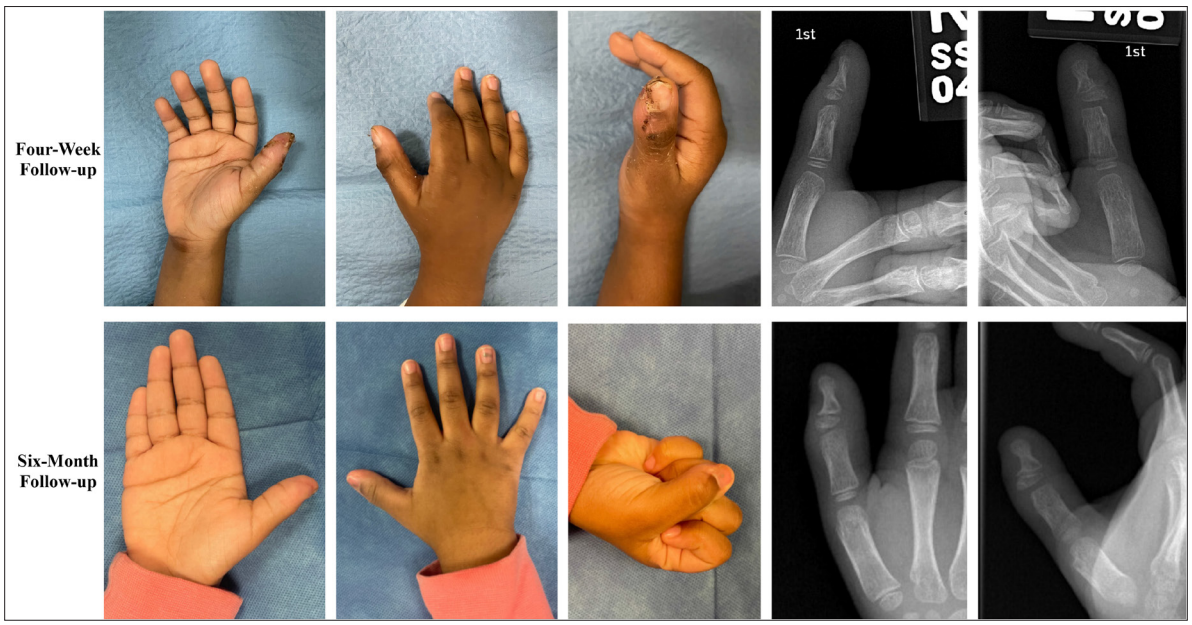

Figure 6: Clinical photos and XRs were obtained at four weeks post-operatively, when the patient's Kirschner wire was removed, and long-term at the six-month follow-up. The patient's right thumb reconstructive outcome was successful from both an aesthetic and functional perspective.

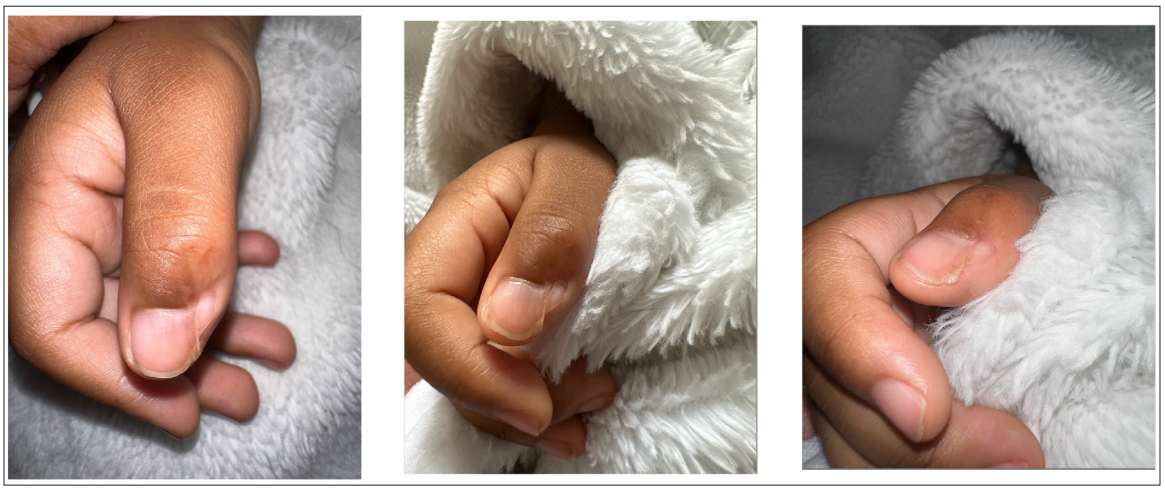

Figure 7: Clinical photos at ten-month follow-up.

Discussion

Wassel Type I thumb duplication represents 2 to 6% of all thumb duplications [3]. Given the rare incidence, there are few studies specifically evaluating the management and outcomes of Wassel Type I thumb duplications. Martinot-Duquennoy et al. published on three cases of Wassel Type I thumb duplication in 1993: two were considered minor anomalies managed conservatively, and one was managed via ablation with longitudinal osteotomy, which was complicated by joint stiffness [6]. Similarly, a study by Ganley and Lubahn in 1995 included six cases of Wassel Type I thumb duplications, in which one was managed with ablation alone and the remainder with observation [7]. Furthermore, in this cohort treated with ablation alone, all required revision procedures due to joint instability. Despite its technical simplicity, ablation alone has been deemed a less favorable surgical approach due to the high rate of complications related to joint instability.

In recent years, two surgical techniques have emerged as the mainstay for Wassel Type I surgical management: The Bilhaut-Cloquet procedure, and thumb ablation with joint reconstruction. Historically, the Bilhaut-Cloquet procedure was utilized to address symmetric cases of thumb duplication [2,6,8]. In a study by Maillet et al. in 2007, the Bilhaut-Cloquet procedure was used to treat cases of Wassel Type II and IV duplication. The technique was associated with well aligned, stable thumbs with good volume, equal mobility, and preserved strength compared to other techniques [8]. However, despite being effective in symmetric and hypoplastic cases of thumb duplication, studies have shown that the Bilhaut-Cloquet procedure is associated with interphalangeal joint stiffness and poor aesthetic outcomes related to nail deformities, such as nail fissures [2,4,6,8]. Hence, thumb ablation with joint reconstruction has become the most common surgical technique performed to correct most thumb deformities, including cases

of Wassel Type I [2].

The goal of surgical correction for thumb duplication is to have a stable, mobile thumb with the appropriate size and shape to optimize aesthetic appearance and function. In order to facilitate motor development and reduce anesthesia-related risks, the recommended age for surgical correction of thumb duplication is between 1 and 2 years of age [9]. While in these cases the goal of surgical management is simple to define, in cases of delayed initial presentation, where the patient may be old enough to be aware of the congenital deformity, the psychosocial factors become a primary consideration when planning surgical correction. In this case report, we present a 5-year-old girl with right Wassel Type I thumb duplication, who is aware of her deformity and, despite her functional compensation, desired to seek treatment to enhance the thumb's aesthetic appearance. The psychosocial impact, such as reducing the risk of being teased by her peers and being able to join in normal activities like getting a manicure with friends and family, was a priority for the patient. Therefore, aesthetic outcomes were of utmost importance when planning the surgical correction.

Overall, there is a paucity of data on the management and outcomes of Wassel Type I thumb duplications and reconstructions. In fact, recent reviews on thumb duplications do not even include Wassel Type I patients in the cohort, further emphasizing the need for new literature on techniques and outcomes of this condition [8]. Additionally, studies have suggested that age at the time of surgery may influence surgical outcomes, highlighting the importance of presenting the surgical management of cases with initial reconstruction at an older age [9]. Herein, we present a Wassel Type I thumb duplication with delayed initial presentation that was managed with a modified Wassel Type I right radial thumb ablation, proximal phalanx corrective osteotomy, interphalangeal joint open reduction percutaneous pinning technique, and nail reconstruction with preservation of the radial nail fold and transfer to the ulnar nail plate and nail fold. This approach allowed optimal functional and aesthetic outcomes, specifically normal nail appearance.

Declarations

Ethics approval and consent to participate: This study is exempt from institutional review board approval. Written informed consent was obtained from the patient's legal guardian for participation in this case report.

Consent for Publication

Written informed consent was obtained from the patient's legal guardian for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of Data and Materials

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

KM conceived the idea for the case report and was a major contributor in writing the manuscript. SPO was a major contributor in writing the manuscript and preparing the figures. AL and JH revised the final manuscript. All authors read and approved the final manuscript.

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References

1. Comer GC, Potter M, Ladd AL. Polydactyly of the Hand. *J Am Acad Orthop Surg. 2018;26*(3):75-82. DOI:10.5435/JAAOS-D-16-00139.
2. Wolfe SW, Pederson WC, Kozin SH, Cohen MS. Green's Operative Hand Surgery. 7th ed. Philadelphia: Elsevier Health Sciences; 2016.
3. Cohen MS, Thumb Duplication. *Hand Clin. 1998;14*(1):17-27.
4. Tonkin MA. Thumb duplication: concepts and techniques. *Clin Orthop Surg. 2012;4*(1):1-17. DOI:10.4055/cios.2012.4.1.1.
5. Van Wyhe RD, Trost JG, Koshy JC, Pederson WC. The Duplicated Thumb: A Review. *Semin Plast Surg. 2016;30*(4):181-188. doi:10.1055/s-0036-1593736.
6. Martinot-Duquennoy V, Lahouel K, Herbaux B, Debeugny P. The treatment of duplication thumbs in children. About a series of 32 patients. *Eur J Pediatr Surg. 1993;3*(1):37-40. DOI:10.1055/s-2008-1063505. (0939-7248 (Print)).
7. Ganley TJ, Lubahn JD. Radial polydactyly: an outcome study. *Ann Plast Surg. 1995;35*(1):86-89. DOI:10.1097/00000637-199507000-00017.
8. Maillet M, Fron D, Martinot-Duquennoy V, Herbaux B. Results after surgical treatment of thumb duplication: a retrospective review of 33 thumbs. *J Child Orthop. 2007;1*(2):135-141. DOI:10.1007/s11832-007-0019-3. (1863-2521 (Print)).
9. de Almeida CEF. Analysis of surgical results and of residual postoperative deformities in preaxial polydactyly of the hand. *J Plast Reconstr Aesthet Surg. 2017;70*(10):1420-1432. DOI:10.1016/j.bjps.2017.05.031. (1878-0539 (Electronic)).