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On-top and side-to-side plasties for thumb polydactyly



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ABSTRACT

INTRODUCTION: “On-top” and “side-to-side” plasties are techniques used for treating thumb duplications in which one thumb is adequate proximally and the other thumb contains a better pulp and nail distally. The detailed functional results of these techniques have not been reported in the literature. We report on two cases.

PRESENTATION OF CASES: The first case had Wassel type VI duplication. The ulnar duplicate had a functioning interphalangeal joint and the radial duplicate had a functioning carpometacarpal joint. “On-top” plasty was done by putting the distal part of the ulnar duplicate on top of the proximal part of the radial duplicate. At 10 years after surgery, the outcome was excellent both cosmetically and functionally. In the second case (Wassel type VII with a zigzag deformity), the radial duplicate had a hypoplastic distal phalanx with no nail. The ulnar duplicate had a functioning interphalangeal joint and the radial duplicate had a functioning carpometacarpal joint. “Side-to-side” plasty was done by joining both thumbs side-to-side at the level of the proximal phalanx. At 3 years after surgery, the outcome we considered acceptable cosmetically and excellent functionally.

DISCUSSION: We could not find similar cases in the literature with detailed long-term postoperative results.

CONCLUSION: “On-top” and “side-to-side” plasties in the management of specific cases of thumb polydactyly obtain excellent functional results with excellent or acceptable cosmetic outcome.

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1. Introduction

Tonkin [1] reviewed the methods of surgical correction of thumb duplication; and these methods are summarized in Table 1. Although “on-top” plasty is a well-known technique, the detailed long-term results have not been reported in the literature. One prerequisite for the “on-top” plasty is absence of zigzag deformity (i.e. each duplicate has a relatively straight axis). The duplicate with the better pulp and nail is placed on top of the other duplicate which has a better carpometacarpal joint function. “Side-to-side” plasty is not mentioned in the literature as a separate entity. Like the “on-top” plasty, it is indicated when one thumb is adequate proximally and the other thumb contains a better pulp/nail distally. However, the main indication for using the side-to-side technique is the presence of a zigzag deformity. The zigzag deformity in congenital thumb duplication means that the two thumbs diverge from each other at the level of the proximal phalanges; and then converge towards each other at the level of the distal phalanges. Furthermore, the deformity is associated with joint instability especially at the interphalangeal joint. Joining the thumbs side-to-side will

simultaneously correct the zigzag deformity and will provide joint stability.

In this paper, we report on two cases of thumb polydactyly treated with “on-top” and “side-to-side” plasties. The work has been reported in line with the SCARE criteria [2].

2. Presentation of cases

2.1. Case 1 “ON-TOP PLASTY”

A 5-year old boy presented to the senior author (MMA) with Wassel type VI thumb duplication (duplicated metacarpals). Family and pregnancy histories were unremarkable and the child had no other anomalies. The ulnar duplicate had a severely deficient web space with the index finger and had no motion at the carpometacarpal joint. However, the ulnar duplicate had a better pulp and nail than the radial duplicate; along with good flexion and extension at the interphalangeal joint. The radial duplicate had an excellent carpometacarpal joint motion, but its tip was hypoplastic with a fixed flexion deformity at the interphalangeal joint (Fig. 1a). X-ray (Fig. 1b) confirmed the deficiency of the metacarpal base of the ulnar duplicate.

An “on-top” plasty was performed. The radial duplicate was amputated at the metacarpo-phalangeal joint (Fig. 1c). Dissection of the thenar muscles and preservation of the tendon of the

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TABLE 1
Methods of surgical correction of thumb duplication.

METHOD	INDICATION/DESCRIPTION
A. Simple excision of one duplicate	This is done if one of the duplicates is floating or severely hypoplastic; which is simply excised
B. Thumb-sharing procedures:	
1. Reconstruction	This is indicated in duplications with unequal size/function. The better thumb is completely retained and is reconstructed with techniques such as collateral ligament, intrinsic muscle re-attachments, extrinsic tendon re-insertions and soft tissue augmentation from the other more hypoplastic duplicate
2. The Bilhaut-Cloquet procedure	Indicated when the two duplicates are equal in size and length; but both are hypoplastic or have a zigzag deformity with instability. The central parts of the duplicates are excised and the outer parts are combined to form the new thumb. Since the nails are shared, a split-nail appearance is expected.
3. Modified Bilhaut-Cloquet procedure	Done for the same indications of the Bilhaut-Cloquet procedure but one of the duplicates has a larger nail. Here, the larger nail is retained and the hypoplastic nail is discarded. This requires unequal bony excision at the distal phalanges. Other modifications of shared bony excisions have also been described.
4. “On-top” plasty	Indicated in duplications in which one thumb is adequate proximally and the other thumb contains a better pulp and nail distally. One thumb is put on top of the other.
5. “Side-to-side” plasty	The same indication of the “on-top” plasty, but the duplication has a zigzag deformity. When the duplicates are united “side-to-side”, the zigzag deformity is simultaneously corrected. The side-to-side plasty allows the surgeon to retain the distal part of one duplicate and the proximal part of the other duplicate.

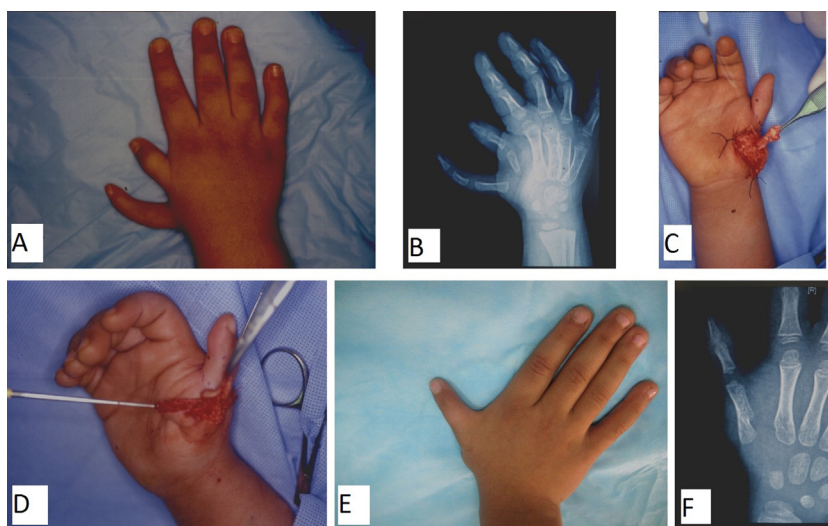


Fig. 1. Case 1 treated by “on-top” plasty. a) Preoperative appearance; b) Preoperative x-ray; c,d) Intraoperative views; e) Short term result at 6 months after surgery; f) X-ray at 6 months after surgery

abductor pollicis brevis was done. The skin was dissected off the metacarpal up to the mid-diaphysis; preserving the insertion of the abductor pollicis longus. An oblique metacarpal osteotomy was done and the distal half of the metacarpal was removed (Fig. 1d). The ulnar duplicate was approached via a mid-lateral incision. An oblique osteotomy was done at the base of metacarpal of the ulnar digit. The ulnar digit was put on top of the radial digit at the level of the metacarpal osteotomies; and fixation was done using K-wires. The tendon of the abductor pollicis brevis was re-inserted into the base of the proximal phalanx of the ulnar duplicate. The patient was put in a thumb spica cast for 4 weeks. The K-wires were removed at the time of the cast removal; and an acrylic splint was used post-operatively to widen the new first web space. The short term result at 6 months showed a functioning thumb with a wider first web (Fig. 1e) and the x-ray showed bony union (Fig. 1f). The patient was lost for follow-up and was recalled to the clinic at 10 years after surgery. At 6 months postoperatively further widening of the first web was done using a z-plasty. Functional assessment of thumb (Figs. 2a-e) was done at final follow-up (10 years after surgery) using the Tada scoring system (Table 2). It is important to note that a Tada score of 5 out of 5 indicates that the function is excellent but not necessarily normal (Table 2). The active range of motion at the interphalangeal and metacarpophalangeal joints was 60° and 65°; respectively. There was no joint instability or mal-alignment. The total Tada score was 5 out of 5. The patient was using the new

thumb in all daily activity. The new thumb was slightly shorter and narrower than the normal contralateral thumb; but the overall cosmetic appearance was considered excellent. X-ray at 10 years showed some remodeling at the union site (Fig. 2f) with slightly more radial deviation of the distal segment when compared to the x-ray at 6 months postoperatively (Fig. 1f). The patient was satisfied with the outcome.

2.2. Case 2 “SIDE-TO-SIDE” PLASTY

A 4-year old girl presented to the senior author (MMA) with Wassel type VII thumb polydactyly (duplicated proximal phalanges with triphalangism). The child was previously diagnosed by the pediatrician as a case of mild mental retardation. Examination of the duplicated thumb (Fig. 3a) showed a zigzag deformity and joint instability at the interphalangeal joints. The ulnar duplicate was triphalangeal (Fig. 3b) and had a deficient web space with the index finger. There was no active motion at the carpometacarpal joint of the ulnar duplicate. However, the ulnar duplicate had an acceptable nail and pulp; along with good flexion/extension at the interphalangeal joint. The radial duplicate had an excellent active motion at the carpometacarpal joint, but its tip was hypoplastic (with no nail) and there was no motion at the interphalangeal joint.

A side-to-side plasty was thought to be more appropriate than the on-top plasty for two reasons. Firstly, the zigzag deformity

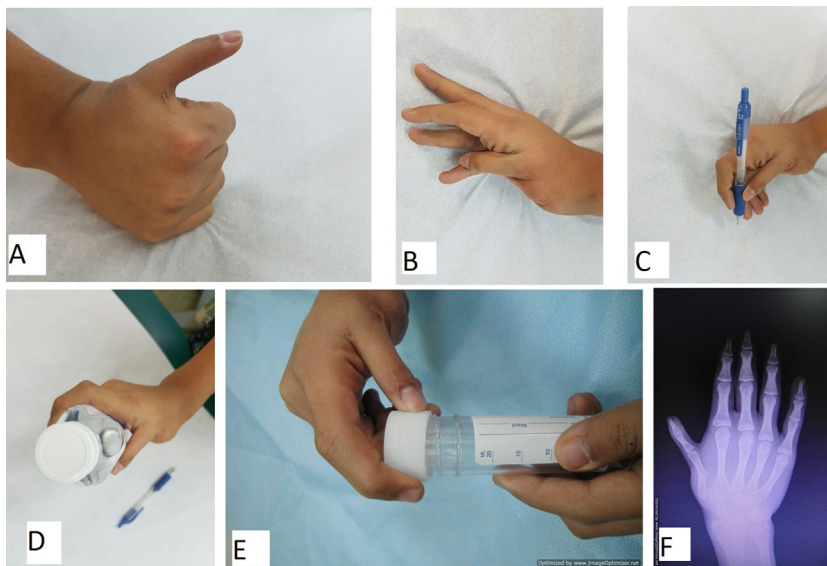


Fig. 2. 10-year follow-up of Case 1. a) Extension; b) Flexion/opposition; c) Holding a pen; d) Holding a bottle; e) Opening the cap; f) X-ray at 10 years after surgery

TABLE 2
Tada functional scoring system for treated thumb duplications.

FUNCTION	SCORING ^a
Combined active motion at the interphalangeal and metacarpophalangeal joints	2 points if active motion is over 70° 1 point if active motion is between 50 and 70° 0 point if active motion is less than 50°
Joint stability	1 point if no joint stability or less than 5° of instability is present with stressing of the joint 0 point if instability is 5° or more
Mal-alignment	2 points if absent or less than 10° 1 point if between 10 and 20° 0 point if more than 20°

^a The total score is calculated: a score of 4–5 is considered as excellent, 2–3 as fair, and 0–1 as poor.

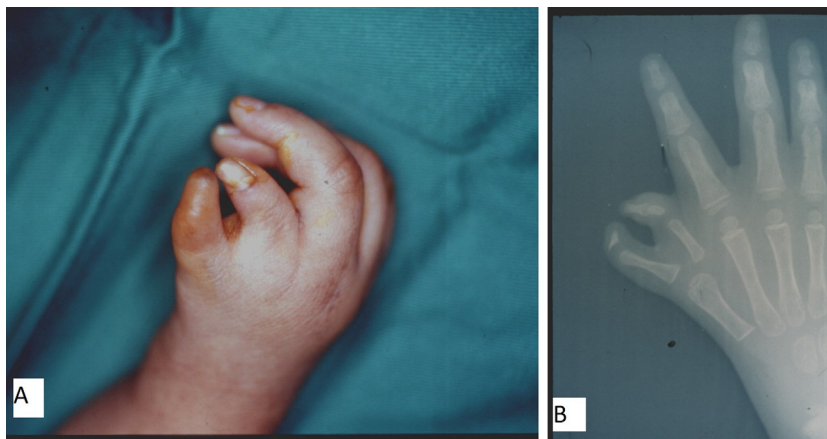


Fig. 3. Case 2 treated by "side-to-side" plasty. a) Preoperative appearance showing the zigzag deformity; b) Preoperative x-ray

made the two thumbs further apart; and hence side-to-side transposition would be easier using the side-to-side plasty. Secondly, the side-to-side plasty would help correct the deviation and provide better joint stability of the retained duplicate when compared to the on-top plasty. The base of the proximal phalanx of the ulnar digit was removed along with resection of the radial cortex of the proximal diaphysis of the proximal phalanx. The corresponding ulnar cortex of the proximal phalanx of the radial digit was also resected. A towel clip was used to approximate the two duplicates together and fixation was done using two transverse K-wires. Distally, the radial digit was amputated at the level of metaphysis of the distal

phalanx; and its skin was shared with the ulnar digit. The hand was immobilized using a thumb spica cast. The cast was removed at 4 weeks and the K-wires were removed at the same time. An acrylic splint was used post-operatively to widen the new first web space. Functional assessment of the thumb (Figs. 4a and b) was done at final follow-up (3 years after surgery) using the Tada scoring system (Table 2). The active range of motion at the interphalangeal and metacarpophalangeal joints was 40° and 45°; respectively. There was no joint instability. There was 20° of mal-alignment. The total Tada score was 4 out of 5. The child was using the new thumb in all daily activity. The new thumb was slightly shorter and wider than



Fig. 4. 3-year follow-up of case 2. a) Postoperative appearance; b) Holding an object; c) X-ray at 3 years after surgery

the normal contralateral thumb; but the overall cosmetic appearance was considered acceptable. X-ray confirmed the bony union and the partial correction of the deviation of the retained thumb (Fig. 4c). The parents were satisfied with the outcome.

3. Discussion

Although there are numerous papers in the literature written on the management of thumb polydactyly [3–10], we could not find any detailed results of the “on-top” plasty. Our first case had detailed functional results with long term follow-up. A functional Tada score of 5 out of 5 was obtained and the cosmetic outcome was excellent. The functional outcome following the Bilhaut-Cloquet procedure (see Table 1) is known to be affected by joint stiffness because the joints are shared [5,7,9,10]. There is no joint sharing in the “on-top” plasty technique; and hence the active range of motion is not compromised.

We labelled our technique in the second case as the “side-to-side” plasty because it did not fit into any of the well-known types of thumb sharing procedures previously described in the literature (see Table 1). One of the duplicates was adequate proximally and the other duplicate contained a better pulp and nail distally. Yet, we utilized the “side-to-side” plasty technique instead of the “on-top” plasty because of the presence of a zigzag deformity. Joining both duplicates side-to-side helped correct the deviation, provided joint stability, and made the procedure simpler to perform. Several authors recommended the Bilhaut-Cloquet procedure for zigzag thumb duplications [11–13]. In our case, the two duplicates were unequal in length and the nail was absent in one of the duplicates. Hence, the Bilhaut-Cloquet procedure was not suitable in our second case. The side-to-side plasty allowed to retain the distal part of one duplicate and the proximal part of the other duplicate.

4. Conclusion

“On-top” and “side-to-side” plasties in the management of specific cases of thumb polydactyly obtained excellent functional results with excellent or acceptable cosmetic outcome. However, documentation of results in similar cases are required to confirm the consistency of the satisfactory outcome using these techniques.

Author’s contribution

All authors contributed significantly and in agreement with the content of the manuscript. The first author did the literature review, collected the data and wrote the initial draft. The senior author performed the surgery and wrote the final draft.

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Ethical approval

The study was approved by the Research Committee of National Hospital (Riyadh Care), Riyadh, Saudi Arabia.

Conflict of interest

None.

Consent

Written informed consent was obtained from the parents for publication. A copy of the written consent is available for review by the Editor-In-Chief of this journal on request.

Guarantor

M M Al-Qattan.

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