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DEVIATION AND ATROPHY OF MIDDLE PHALANX OF HAND FOLLOWING PARTIAL SEPARATION IN SYNDACTYLY PATIENT: THEIR FAULT OR OURS?

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ABSTRACT

Introduction: Syndactyly is failure of differentiation in which the fingers fail to separate into individual appendages. It is the most common congenital hand anomaly, with an incidence of 1 in 2,000 to 2,500 live births. Surgical separation of fingers as early as 6 month-old is indicated when syndactyly involves digits of unequal length (i.e., ring and little fingers). Early separation is also required in complex syndactyly and cases of acrosyndactyly. The timing of surgery of all other cases of syndactyly remains somewhat controversial; most suggest surgical correction before age of 18 months, whereas others prefer to wait until after this age.

Case Illustration: A 13-year old boy, presented with fusion of all fingers of the right hand at birth. Prior to his current visit, he underwent partial separation of the right fingers at the age of 6 y.o. at a local hospital. Following partial separation, the fingers did not grow normally. Current X-ray showed atrophy and deviation of middle phalanx. We performed separation of syndactyly between index and middle finger, and between fourth and small finger in our hospital. Interdigital webbings are released using local flap and the remaining raw surface is covered using full-thickness skin grafts. On follow up, the patient showed good functional and aesthetic outcome. He is able to write with his right hand with better coordination.

Discussion: Complex syndactyly reconstruction is a challenging surgical problem. Common post surgical findings include rotational deformity, angular deformity, and nail deformity. We describe how we have altered our approach in these findings.

Conclusion: Congenital syndactyly should be corrected early in life. Careful dissection, the use of a dorsal rectangular flap in combination with 2 volar triangular flaps, and use of full thickness skin grafts ensure a satisfactory outcome and minimize the number of operations per web.

Highlights:

1. Complex syndactyly reconstruction presents surgical challenges, often resulting in rotational, angular, and nail deformities post-surgery.
2. The early correction of congenital syndactyly, combined with dorsal rectangular flap usage and full-thickness skin grafts, leads to satisfactory outcomes and reduces the need for multiple surgeries per web.

INTRODUCTION

Syndactyly is a condition well documented both in textbooks and current literature mainly because it is the most common congenital hand defect.[1] Coming from the Greek word syn (meaning together)

and dactyly (meaning digits), it describes an embryological failure of finger separation.[2] Commonly found in some species, including birds and kangaroos, it has a large aesthetic and functional significance for humans born with the condition. It is believed to have a genetic component, and this has been the subject of research over the last decade.[1]

Syndactyly is the failure of differentiation in which the fingers fail to separate into individual appendages, usually occurring during the 6-8 weeks of embryologic development. The etiology of syndactyly is approximately 10-60% familial genetic disorder and autosomal dominant. The most common congenital abnormality of the hand is more common in Caucasians with a rate of 1 per 2000-2500 births with a male-to-female ratio of 2:1.[3]

The operative management of this condition has been, aside from a conservative approach, the only definitive care for these patients, but new options are becoming available as our understanding of the condition develops?.[1]

The current mainstay for the treatment and management of syndactyly is surgery. The indications for surgery in general for hand anomalies including syndactyly are: the degree of function required by the patient and whether delaying surgery may alter hand function and grip development.[4]

CASE ILLUSTRATION

A 13-year-old boy was admitted, presenting with a fusion of all right fingers at birth. There are no other co-morbidities and no family members suffer from similar anomalies. Prior to his current visit, he underwent partial separation of the right fingers at the age of 6 y.o. at a local hospital. Following partial separation, the fingers did not grow normally (Figure 1).

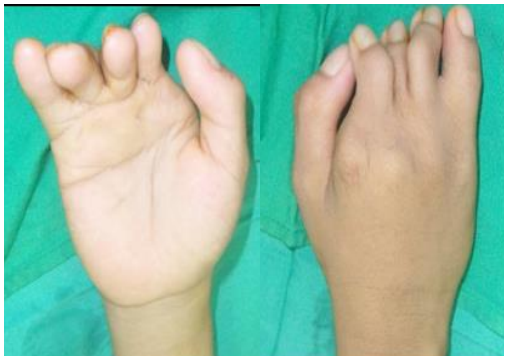

Figure 1. Boy, 13 Years Old With Abnormal Growth of Right Fingers after Partial Separation

Current X-ray showed atrophy and deviation of the middle phalanx (Figure 4). We report separation between index and middle finger, and between fourth finger and small finger, performed in our hospital (Figure 2).

The dorsal and palmar skin flaps were outlined with a marker before dissection. (Figure. 2). Interdigital webbings are released using local flap.

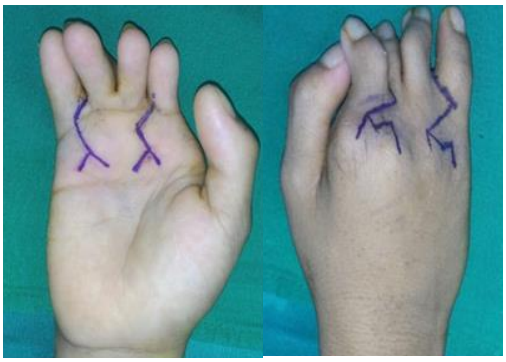

Figure 2. Local Flap Design for Separation of Syndactyly

For the reconstruction of the first web, the skin flaps were altered. A rectangular flap with a broad base was elevated dorsally, whereas from the volar surface, 2 rectangular flaps were elevated. These 2 volar flaps were laterally-based and their proximal side was dissected at the level at which the distal side of the dorsal flap was sutured volarly. [4]

The remaining raw surface is covered using full-thickness skin grafts. The full-thickness skin graft was harvested from the inguinal area and the remaining scar is perfectly sutured.

Associated malformations of the involved fingers were corrected during the separation of the digits in the majority of the patients. Priority was given to the separation of the second and fourth web whereas the third web was reconstructed at a later stage. The time interval between the separation of adjacent webs ranged from 3 to 6 months.

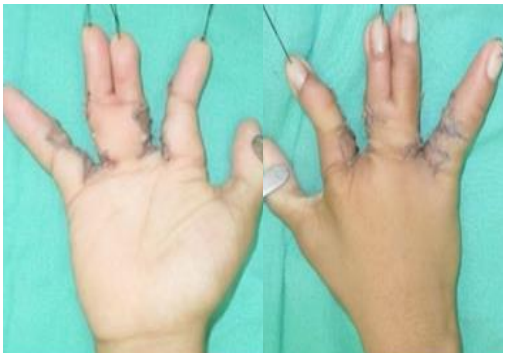

Figure 3. After Separation Surgery Between Index and Middle Finger, and Between Third Finger and Small Finger

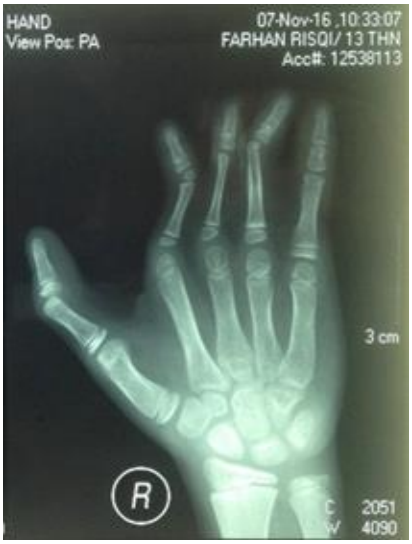

Figure 4. X-Ray of The Right Hand of The Patient (after Partial Separation)

Postoperatively, the hand was immobilized in a bulky dressing. A skin graft was evaluated on the fifth day.

On follow-up visits, the patient showed good functional and aesthetic outcomes. The functional outcomes in hands with multiple syndactylies were impressive. Although the surgery did not return the hand to its normal cosmetic appearance, the improvement in function made these hands useful for daily activities. He was able to write with his right hand with better coordination (Figure 5).

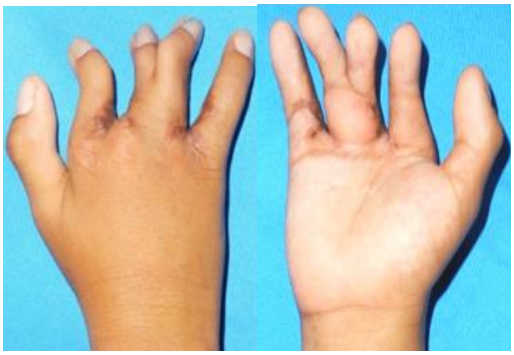

Figure 5. After 3 Months Full Separation between Index and Middle Finger, and between Third Finger and Small Finger

DISCUSSION

Complex syndactyly reconstruction is challenging. Syndactyly between digits with different lengths, such as the thumb and index or the ring and small fingers, should be corrected within the first year of life because the difference of length creates angular and rotational deformity to the longest finger if left untreated for a long time.[1] In addition, the complex complicated syndactyly should be operated upon early in life to correct the bony and articular deformities and prevent further disturbance of the digital function.[2]

For psychological reasons, even simple syndactyly should be operated upon before the beginning of school life, that is, before the age of 5 years old. [1]

The age of the patient during the separation of the webbed fingers is important

and the basic criteria for the timing of operation are the complexity of the syndactyly as well as the length discrepancy between the involved fingers, especially in complete syndactylies.[4]

Common post-surgical findings include rotational deformity, angular deformity, and nail deformity. On deformity, a finger is typically rotated away from and deviated toward the site of the previous complex syndactyly. We describe how we have altered our approach to these findings.

The patients who had complex complete syndactyly in digits of unequal length and came late for reconstruction, needed more surgeries to reach satisfactory results compared to patients that came early and correction of the syndactyly was done simultaneously with the correction of the skeletal deformities. [5]

In addition, the function of these digits were limited and remained so in cases of late correction. In some cases of complete syndactyly with a common nail, a minor rotational deformity of the distal phalanx of the longer digit was present in late follow-up visits. This could be explained either as natural evolution of the bone and soft tissue of the digits with syndactyly or by the pull of pigmented skin graft, which cannot follow the growth of the digit. [3]

The passage underscores the importance of early surgical correction for various types of syndactyly, including complex cases and those involving digits of unequal length. This approach can help prevent angular, rotational, and functional deformities, aligning with the principle of addressing congenital conditions as early as possible. The passage acknowledges the psychological impact of syndactyly and highlights the benefit of addressing even simple cases before a child begins school. This holistic approach to care recognizes the importance of both physical and psychological well-being. The passage provides insights into the authors' clinical experience and how their approach has evolved over time in response to post-surgical findings. This can be valuable for medical professionals seeking to improve their own surgical techniques and patient outcomes.

CONCLUSION

In conclusion, congenital syndactyly is advisable to address congenital syndactyly during the early stages of life, while keeping in mind the fundamental principles of web reconstruction and the concurrent correction of any associated skeletal deformities that may be present. Careful dissection, aided by loupe magnification, the application of a dorsal rectangular flap alongside two volar triangular flaps, and the utilization of full-thickness skin grafts contribute to achieving a favorable result while reducing the necessity for multiple surgical procedures per web.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

FUNDING DISCLOSURE

None.

AUTHOR CONTRIBUTION

DMK, BSN, and RS conceived the study, conducted patient assessments, and performed the surgical procedures described in the case report. IDS and SR collected and analyzed clinical data, contributed to literature review, and drafted the manuscript. DMK provided critical supervision, and guidance throughout the research process, and reviewed the manuscript for scientific

accuracy. All authors contributed to patient care, manuscript revision and approved the final manuscript for submission.

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