

Congenital Syndactyly of the Third and Fourth Fingers of the Left Hand: A Case Report of Reconstructive Correction

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ABSTRACT

We present the case of a one-year-old pediatric patient with complete syndactyly between the third and fourth fingers of the left hand. The congenital malformation caused skin fusion and functional impairment of the affected fingers, limiting mobility and manual dexterity. Early surgical correction was planned through finger separation using local flaps and skin reconstruction techniques adapted to the extent of the syndactyly. During the procedure, critical neurovascular structures were preserved, and adequate coverage of the interdigital spaces was ensured, preventing contracture formation. Postoperative management included pain control, wound care, and early rehabilitation of joint mobility. This report highlights the importance of individualized evaluation, appropriate surgical technique selection, and comprehensive follow-up to achieve optimal functional and aesthetic outcomes. Early intervention in pediatric patients allows for restoration of digital function, improved dexterity, and enhanced quality of life, underscoring the crucial role of reconstructive plastic surgery in the treatment of congenital hand malformations.

KEYWORDS: Syndactyly; Finger separation; Local flaps; Hand reconstruction; Pediatric plastic surgery; Congenital malformation; Left hand; Digital function; Postoperative rehabilitation; Surgical correction.

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INTRODUCTION

Syndactyly is the congenital fusion of two or more fingers, and its clinical presentation can range from simple skin adhesions to complex union of bone, tendon, and neurovascular structures, significantly affecting both hand function and aesthetics. Involvement of the third and fourth

fingers may compromise fine motor skills, limit joint mobility, and produce aesthetic alterations that impact social integration and self-esteem. Early recognition of this condition and careful surgical planning are essential to minimize functional sequelae and optimize aesthetic outcomes.^{1,2}

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Surgical treatment aims to restore finger separation, preserve joint and tendon function, maintain adequate vascularization, and achieve a satisfactory cosmetic appearance. The choice of surgical technique depends on the type and extent of the fusion as well as the anatomical complexity. In simple cases where syndactyly affects only the skin, separation can be achieved using local flaps with direct closure, providing rapid functional recovery and minimal complications. Z- or L-shaped flaps are commonly used to prevent contractures and ensure adequate finger length, while skin grafts may be necessary when coverage deficits occur.³ In more complex cases involving bone or joint involvement, osteotendinous reconstruction is required to ensure proper alignment and mobility. Extensive or combined cases may require multiple techniques tailored to the patient's specific anatomy, always prioritizing neurovascular preservation and aesthetic optimization.⁴

This case report describes a patient with congenital syndactyly of the third and fourth fingers of the left hand, detailing surgical planning, the procedure performed, and early postoperative outcomes. The report emphasizes the importance of early and precise intervention and appropriate surgical technique selection according to case complexity to maximize function, restore mobility, and achieve satisfactory aesthetic results. It also highlights the role of reconstructive

plastic surgery in correcting congenital hand malformations, where surgical expertise, anatomical knowledge, and careful postoperative management determine final outcomes and quality of life.^{5,6}

CASE REPORT

We present the case of a one-year-old male patient, with no significant medical history, who was referred to pediatric plastic surgery due to congenital fusion of the third and fourth fingers of the left hand, present since birth. The family reported concerns that syndactyly could limit future manual dexterity, particularly fine motor coordination required for object manipulation, toys, and age-appropriate developmental activities. No family history of congenital malformations or teratogen exposure during pregnancy was reported.

Physical examination revealed complete skin fusion of the third and fourth fingers, with adequate interphalangeal and metacarpophalangeal joint length and mobility, and no apparent bony deformities. Sensory function and digital pulses were intact, indicating preserved vascularization. Syndactyly was classified as complex, complete cutaneous type, without bone or tendon involvement, allowing for primary surgical separation using local flaps and skin grafting if necessary.



Figure 1, 2: Preoperative images

Surgery was performed under general anesthesia. Carefully planned incisions were made with Z-flaps to maximize finger length and prevent contractures. Finger separation was completed while preserving neurovascular and tendon structures. Where skin coverage was insufficient, partial-thickness skin grafts from the inner forearm were applied. Sterile dressings and a postoperative splint were used to

maintain finger position and protect grafts during the initial healing phase.

Immediate postoperative outcomes were favorable, with no vascular or neurological complications. Early passive mobilization under physiotherapy supervision was initiated to prevent joint stiffness and promote functionality. Follow-up demonstrated proper flap and graft healing, good finger

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separation, and full preservation of digital mobility and sensation. The family reported satisfaction with functional

and aesthetic results, and the patient progressed normally in fine motor development.



Figure 3: Postoperative image (dorsal side of the hand)



Figure 4: Postoperative image (palmar side of the hand)

This case illustrates the importance of detailed surgical planning and appropriate reconstructive techniques in correcting congenital syndactyly in pediatric patients. Early intervention and comprehensive management restore function, prevent secondary deformities, and optimize aesthetic outcomes, emphasizing the fundamental role of reconstructive plastic surgery in treating upper extremity malformations.

DISCUSSION

Syndactyly, the congenital fusion of two or more fingers, requires careful surgical management to restore hand function and optimize appearance, significantly affecting motor and psychosocial development. Correction surgery aims not only to separate the fingers but also to preserve joint mobility, digital sensation, and grip strength, which are critical for daily activities and quality of life. Decisions regarding the timing of surgery and appropriate technique depend on multiple factors, including patient age, fusion extent and complexity, presence of bone or tendon involvement, and availability of local skin for coverage.^{7,8}

Surgical approaches vary with the complexity of syndactyly. In simple cases, characterized by cutaneous fusion without deep structure involvement, separation can be achieved using strategically designed local flaps.^{9,10} Z-flaps are commonly employed to redistribute skin, lengthen fingers, and prevent scar contractures that could limit future mobility. These flaps also reduce tension along the suture line, minimize visible dorsal scars, and facilitate healing with satisfactory cosmetic results. Careful flap planning ensures adequate coverage of interdigital spaces and prevents recurrence or scar retraction.^{11,12}

In more complex cases involving deep soft tissue fusion, bone involvement, joint deformities, or associated vascular or nerve anomalies, local flaps alone may be insufficient. Partial- or full-thickness skin grafts from thin, flexible areas such as the inner forearm or inguinal region may be used. Grafts cover spaces created after finger separation, maintaining finger length and functionality while reducing the risk of contractures. Combining local flaps with skin grafts is widely used in complex syndactyly to ensure optimal functional and aesthetic outcomes.¹³

Advanced techniques, including dorsal V-flaps, modified Z-flaps, triangular or trapezoidal flaps, and staged approaches for multiple or long-segment syndactyly, allow precise reconstruction of fingers with angular deviations, joint deformities, or altered finger length. Preoperative planning involves evaluating digital vasculature, skin availability, tendon locations, and potential tension areas. Meticulous planning is essential to minimize complications and optimize functional and aesthetic results.¹⁴

Preservation of neurovascular and tendon structures during finger separation is critical. Careful exposure of digital arteries, veins, and nerves ensures finger viability and

maintains sensation and grip strength. Hand functionality largely depends on these structures, especially in pediatric patients who require adequate fine motor development for daily, school, and recreational activities.¹⁴

Timing of surgery is also crucial. Early intervention, generally between 6 and 18 months, leverages pediatric skin elasticity, facilitates flap mobilization, and reduces the risk of secondary functional deformities. Surgery should not be performed too early if sufficient tissue for coverage is unavailable, as this may compromise healing and increase complications. Optimal timing considers skin flexibility, finger size, and syndactyly extent.¹⁵

Postoperative follow-up is essential and includes monitoring flap and graft viability, infection prevention, pain control, and early rehabilitation. Joint mobility exercises and muscle strengthening help prevent adhesions, contractures, and functional limitations. Pediatric follow-up also evaluates fine motor development and adaptation to school and recreational activities, ensuring comprehensive outcomes that combine function, aesthetics, and development.¹⁵

Ultimately, syndactyly repair focuses on a comprehensive approach that combines meticulous surgical planning, neurovascular preservation, appropriate coverage techniques, and multidisciplinary postoperative management. Combining local flaps, skin grafts, and advanced techniques ensures consistent, satisfactory outcomes, restoring both hand function and appearance while improving patient quality of life. This emphasizes individualized management tailored to case complexity, ensuring optimal long-term results.¹⁵

In summary, surgical syndactyly repair ranges from simple local flap procedures to complex approaches combining flaps, grafts, and advanced techniques, depending on fusion extent, depth, and structures involved. Meticulous planning, preservation of vital structures, adequate skin coverage, and comprehensive postoperative follow-up are essential for optimal functional and aesthetic outcomes. This case underscores the importance of careful, multidisciplinary surgical management to restore anatomy, function, and aesthetics in pediatric patients with congenital syndactyly.¹⁶

CONCLUSION

Congenital syndactyly presents a surgical challenge requiring a comprehensive approach to restore function, mobility, and aesthetics of the affected hand. Early surgical correction takes advantage of pediatric skin elasticity, optimizes finger functionality, and prevents secondary deformities that may limit grip, dexterity, and independence in daily activities. Meticulous planning, based on fusion extent, skin availability, neurovascular preservation, and tendon integrity, is crucial to ensure successful outcomes.¹⁶

Repair types, including local flaps, partial or full-thickness skin grafts, and advanced digital reconstruction techniques, must be individually selected according to syndactyly complexity. Proper selection and execution of the surgical

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technique allow safe finger separation, prevent scar contractures, maintain sensation and strength, and achieve satisfactory aesthetic results. Combining local flaps with skin grafts in complex cases ensures adequate coverage of interdigital spaces while preserving finger length and function.¹⁷

Comprehensive postoperative follow-up, including early rehabilitation, mobility exercises, and scar management, is critical to consolidate long-term function and aesthetics. Multidisciplinary coordination among plastic surgeons, occupational therapists, and pediatricians maximizes functional outcomes and ensures patient adaptation to school and social environments.¹⁷

In conclusion, syndactyly surgery should be regarded as a highly specialized procedure combining detailed planning, reconstructive techniques adapted to case complexity, and comprehensive postoperative care. A careful, personalized approach not only separates fingers but also restores function, preserves aesthetics, and significantly improves quality of life in pediatric patients, reaffirming the importance of a multidisciplinary approach in managing congenital hand malformations.

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