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ORIGINAL ARTICLE

Assessment of Aesthetic Outcomes Following Late Surgical Release of Syndactyly in Pediatric Patients

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ABSTRACT

Background: *Syndactyly is one of the most common congenital anomalies of the hand, characterized by the fusion of adjacent digits due to incomplete separation during embryonic development. Early surgical correction is generally recommended to achieve optimal functional and cosmetic outcomes. However, delayed presentation and late surgical intervention are still common in many developing countries. This study aimed to assess the aesthetic outcomes following late surgical release of syndactyly in pediatric patients.* ***Methods & Materials:*** *This hospital-based descriptive observational study was conducted in the Department of Orthopaedic Surgery at Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh, from November 2024 to October 2025. A total of 30 pediatric patients who underwent late surgical release of syndactyly were included using purposive sampling.* ***Results:*** *The majority of patients were aged 5–7 years (36.7%) and males constituted 56.7% of the study population. Most participants were from rural areas (63.3%). The right hand was most commonly affected (46.7%) and simple syndactyly was the predominant type (70.0%). The third web space was most frequently involved (40.0%). The dorsal rectangular flap with skin graft was the most commonly used surgical technique (60.0%). Most patients had no postoperative complications (70.0%). Regarding aesthetic outcomes, excellent results were observed in 40.0% of patients, good outcomes in 33.3%, fair outcomes in 20.0% and poor outcomes in 6.7%.* ***Conclusion:*** *Late surgical release of syndactyly in pediatric patients can achieve satisfactory aesthetic outcomes with a relatively low rate of postoperative complications when appropriate surgical techniques and postoperative care are applied.*

Keywords: *Syndactyly, Late surgical release, Pediatric patients, Aesthetic outcome, Congenital hand anomaly.*

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INTRODUCTION

Syndactyly is one of the most common congenital anomalies of the hand, characterized by the fusion of two or more adjacent digits due to failure of normal embryological separation during limb development [1]. It may involve only soft tissue (simple syndactyly) or include bony and nail fusion (complex or complicated syndactyly). The condition can occur as an isolated deformity or as part of various congenital syndromes. Syndactyly may affect one or both hands and most frequently involves the third web space between the middle and ring fingers [2]. Although the exact etiology remains unclear, genetic factors and disturbances in embryonic limb development are considered important contributing factors [3].

The primary goals of surgical management of syndactyly are to achieve functional separation of the digits, restore normal hand anatomy and obtain a satisfactory aesthetic appearance [4]. Early surgical intervention, usually recommended between 6 months and 2 years of age, is generally preferred to prevent functional limitations and abnormal growth of the fingers [5]. However, in many developing countries, delayed presentation and late surgical intervention are not uncommon. Factors such as lack of awareness, limited access to specialized surgical care, financial constraints and sociocultural beliefs often contribute to postponement of treatment. As a result, some children undergo surgical correction at a later age [6].

Late surgical release of syndactyly can still provide functional and cosmetic benefits, although outcomes may vary depending on the severity of the deformity, surgical technique, postoperative care and patient age at the time of operation [7]. Achieving an acceptable aesthetic outcome is an important objective of syndactyly surgery because the appearance of the hand significantly influences psychological well-being, social interaction and overall quality of life in children [8]. Proper web space formation, minimal scarring, good skin coverage and symmetrical finger alignment are key factors determining aesthetic success [9].

Various surgical techniques have been described for the correction of syndactyly, including dorsal rectangular flaps, Z-plasty techniques and the use of skin grafts to reconstruct the web space and provide adequate skin coverage [10]. Despite advancements in surgical techniques, complications such as web creep, hypertrophic scarring, infection and graft loss may occur and can affect the final cosmetic outcome. Therefore, evaluation of postoperative aesthetic results is essential to assess the effectiveness of surgical management [11].

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Therefore, the present study was conducted to assess the aesthetic outcomes following late surgical release of syndactyly in pediatric patients treated at Sylhet MAG Osmani Medical College Hospital in Sylhet, Bangladesh. The findings of this study may contribute to a better understanding of surgical results in delayed cases and support improved management strategies in similar healthcare settings.

METHODS & MATERIALS

This hospital-based descriptive observational study was conducted in the Department of Orthopaedic Surgery at Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh, from November 2024 to October 2025. A total of 30 pediatric patients who underwent late surgical release of syndactyly were included in the study. Patients were selected by purposive sampling. Children aged 2–13 years presenting with simple, complex, or complicated syndactyly and undergoing delayed surgical release during the study period were included. Late surgical release was defined as operative intervention performed beyond the commonly recommended early infancy period. Patients with previous hand surgery for syndactyly, associated severe congenital hand anomalies requiring staged reconstruction, syndromic cases with major systemic anomalies, or those lost to follow-up were excluded from the study.

Figure 1: Pre-operative

Detailed demographic data, clinical characteristics, type of syndactyly, web space involved (*Figure 1*), surgical technique used and postoperative complications were recorded in a structured data collection sheet.

Figure 2: Per-operative

All surgical procedures were performed under general anesthesia following standard operative principles, including appropriate flap design and skin grafting where necessary (*Figure 2*).

Figure 3: 3 months after operation

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Postoperative follow-up was conducted regularly and aesthetic outcome was assessed clinically at final follow-up using a standardized grading system (Excellent, Good, Fair, Poor) based on web space appearance, scar quality, symmetry and parental satisfaction (*Figure 3*).

Collected data were compiled and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were expressed as frequency, percentage, mean and standard deviation where appropriate.

RESULTS

Table I shows the demographic characteristics of the study population (n = 30). The majority of patients were aged 5–7 years (36.7%), followed by 2–4 years (26.7%). Male patients (56.7%) were slightly more common than females (43.3%). Most participants came from rural areas (63.3%), while 36.7% were from urban areas.

Table I: Demographic Characteristics of the Study Population (*n* = 30)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
2 – 4	8	26.7
5 – 7	11	36.7
8 – 10	7	23.3
11 – 13	4	13.3
Sex		
Male	17	56.7
Female	13	43.3
Residence		
Rural	19	63.3
Urban	11	36.7

Table II presents the clinical characteristics of syndactyly among the patients. The right hand was most commonly affected (46.7%), followed by the left hand (36.7%), while 16.6% had bilateral involvement. Simple syndactyly was the most frequent type (70.0%), followed by complex (23.3%). The 3rd web space was most commonly involved (40.0%), followed by the 2nd web space (30.0%).

Table II: Clinical Characteristics of Syndactyly in the Patients (*n* = 30)

Variable	Frequency (n)	Percentage (%)
Affected Hand		
Right	14	46.7
Left	11	36.7
Bilateral	5	16.6
Type of Syndactyly		
Simple	21	70.0
Complex	7	23.3
Complicated	2	6.7
Most Common Web Space Involved		
2nd Web Space	9	30.0
3rd Web Space	12	40.0
4th Web Space	7	23.3
Multiple Web Spaces	2	6.7

Table III shows the age at surgical release and surgical characteristics of the patients. Most children underwent surgery at 6–8 years of age (33.3%), followed by 9–11 years (30.0%). The dorsal rectangular flap with skin graft was the most commonly used technique (60.0%), while Z-plasty was used in 26.7% of cases. The majority of patients had no postoperative complications (70.0%), whereas web creep (13.3%), hypertrophic scar (10.0%) and infection (6.7%) were observed in a few cases.

Table III: Age at Surgery and Surgical Characteristics (*n* = 30)

Variable	Frequency (n)	Percentage (%)
Age at Surgical Release (years)		
3 – 5	6	20.0
6 – 8	10	33.3
9 – 11	9	30.0
≥12	5	16.7
Surgical Technique Used		
Dorsal rectangular flap with skin graft	18	60.0
Z-plasty technique	8	26.7
Local flap without graft	4	13.3
Postoperative Complications		
None	21	70.0
Web creep	4	13.3
Hypertrophic scar	3	10.0
Infection	2	6.7

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Table IV presents the aesthetic outcomes following late surgical release of syndactyly. Excellent aesthetic results were achieved in 40.0% of patients, while 33.3% had good outcomes. Fair outcomes were observed in 20.0% and only 6.7% of patients showed poor aesthetic results.

Table IV: Aesthetic Outcome After Late Surgical Release (*n* = 30)

Aesthetic Outcome	Frequency (n)	Percentage (%)
Excellent	12	40.0
Good	10	33.3
Fair	6	20.0
Poor	2	6.7

DISCUSSION

Syndactyly is one of the most frequently encountered congenital anomalies of the hand and is characterized by the fusion of adjacent digits due to incomplete separation during embryological development. Early surgical correction is generally recommended to optimize both functional and cosmetic outcomes; however, delayed presentation remains common in many developing countries. The present study assessed the aesthetic outcomes following late surgical release of syndactyly in pediatric patients treated at Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh.

In the current study, the majority of patients were aged 5–7 years (36.7%), followed by 2–4 years (26.7%), indicating that many children underwent surgery later than the recommended early infancy period. Similar findings have been reported by Gowrie S et al., who noted that delayed presentation of congenital hand anomalies is common in resource-limited settings due to lack of awareness and limited access to specialized surgical care [12]. Likewise, McCarter JH et al. described syndactyly as one of the most common pediatric hand anomalies, emphasizing that timely diagnosis and intervention are essential to prevent functional and cosmetic impairment [13].

Regarding gender distribution, male patients constituted 56.7%, slightly higher than females (43.3%). This pattern is comparable to the observations reported by Patel NK et al., who described a mild male predominance in congenital hand differences. In addition, the majority of patients in the present study were from rural areas (63.3%), which may reflect disparities in healthcare access and delayed referral patterns commonly observed in developing countries [14].

The clinical characteristics of the study population demonstrated that the right hand was most commonly affected (46.7%), while simple syndactyly accounted for 70.0% of cases. These findings are consistent with the systematic review by Gowrie S et al., which reported that simple syndactyly is the most prevalent form of the condition [12]. Furthermore, the third web space was most frequently involved (40.0%) in our study, a pattern also reported in the literature, including the case description by Szymkiewicz S, where syndactyly most commonly involved the middle and ring fingers [15].

In terms of surgical management, the dorsal rectangular flap with skin graft was the most frequently used technique (60.0%), followed by Z-plasty (26.7%). Similar surgical approaches have been described by Phan MD et al., who emphasized the effectiveness of flap and graft techniques in achieving satisfactory functional and cosmetic outcomes in older pediatric patients with syndactyly [16]. In addition, Banala M et al. reported favorable outcomes using various flap-based reconstruction techniques for congenital syndactyly, highlighting the importance of proper web space reconstruction [17].

Postoperative complications in this study were relatively low, with 70.0% of patients experiencing no complications. Minor complications included web creep (13.3%), hypertrophic scarring (10.0%) and infection (6.7%). These findings are comparable to those reported by Cordray H et al., who identified web creep and scar-related complications as common postoperative issues following syndactyly reconstruction [18]. Additionally, registry-based data analyzed by Bae DS et al. demonstrated that complications following congenital hand surgery are generally infrequent and manageable with appropriate surgical techniques and postoperative care [19].

The aesthetic outcomes observed in the present study were encouraging. Excellent results were achieved in 40.0% of patients, while 33.3% showed good outcomes, indicating that the majority of patients experienced satisfactory cosmetic improvement after late surgical release. Comparable results have been reported by Rajasubramanya P et al., who noted favorable scar appearance and patient-reported outcomes following syndactyly correction using flap techniques [20]. Similarly, Yang G et al. demonstrated that appropriate reconstructive techniques can produce satisfactory aesthetic outcomes even in complex or multifinger syndactyly cases [21].

LIMITATIONS

This study had several limitations. The sample size was relatively small and the study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to the broader population. In addition, the follow-up duration was relatively short and long-term outcomes such as late web creep or functional limitations could not be fully evaluated. The assessment of aesthetic outcomes was mainly based on clinical observation and parental satisfaction, which may introduce some degree of subjective bias.

CONCLUSION

The present study demonstrates that late surgical release of syndactyly in pediatric patients can achieve satisfactory aesthetic outcomes with a relatively low rate of postoperative complications. Most patients in this study showed excellent to good cosmetic results, indicating that delayed surgical correction can still provide meaningful improvement in hand appearance and function. Proper surgical technique, careful postoperative care and regular follow-up are essential to optimize outcomes in children presenting late with syndactyly.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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