

Congenital Syndactyly Separation with Dorsal Rectangular Flap in Yemen

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Abstract

Background: congenital hand Syndactyly is prevalent with substantial aesthetic and functional implications, so the surgical separation of the fused fingers is essential in order to restore the hand function, enhance appearance and facilitate normal hand growth with less complications and procedures.

Patients and Methods: the study is a descriptive prospective study is carried on 31 webs of 18 cases underwent surgical repair of congenital syndactyly during the period from August 2021 to August 2023 of different ages and sexes performed in Al-Gumhori Teaching Authority Hospital, Elite Hospital and police hospital.

Results: the age of study population ranged between 2 - 25 years, and the majority of the patients belong to age the group above 13 years (66.7%), (N= 12) patients with median age of study 17.92 years; most of them are female with a common web involved between middle - ring fingers in (44.5%) (N=8) patients and frequently

presented with simple complete syndactyly in (55.6%) (N=10), complex 22% and complicated 16.6%. The reconstructive technique for repair is dorsal rectangular flap with zig-zag interdigitating flaps. No intraoperative complications and there are postoperative complications like skin infections two webs, flap maceration one webs, partial graft loss two webs.

Conclusion: the dorsal rectangular flap technique is preferred due to its simple design and easy modification during operation with smooth mobilization of the dorsal skin to achieve more natural web space with good results and can be applied in the majority of syndactyl types.

Keywords: Syndactyly, Congenital Hand Anomalies, Skin Graft, Web Reconstruction, Rectangular Flap.

Introduction

Congenital syndactyly is the joining of two or more adjacent fingers and is common congenital hand anomaly with an incidence of about 1 in 2000-3000 live births. The embryological causes are failure of the separation of developing fingers during organogenesis ⁽¹⁾, due to improper apoptosis between digits ⁽²⁾. Acquiring spontaneous genetic mutation factors associated with syndactyly, including maternal smoking, exposure to teratogenic agents, lower socioeconomic status, infections and diseases in the early pregnancy are postulated as possible causes ^(3,4). In Yemen, combinations of genetic predisposing and challenging environmental and socio-economic conditions exacerbated by ongoing conflict, factors such as poor maternal health care with malnutritional status, limited access to parental health care resources and exposure to teratogenic or pollutants, significantly increase the risk of congenital syndactyly as well as challenges to the effective management of this conditions. As a result, most born children with congenital syndactyly in Yemen do not receive the timely or adequate surgical treatment necessary for optimal functional and

psychosocial outcomes. So, delaying the time of surgical repair may alter the grip development, hand function and deformity in fingers of unequal length with refractory correction or unsatisfying correction in the latter presentation. ⁽⁵⁾

For all aforementioned reasons we decided to introduce and study the technique of congenital syndactyly separation with dorsal rectangular flap along with interdigitating (zig-zag) incisions and the remaining raw area resurfaced by full thickness skin graft, ⁽⁵⁾ and discuss the outcome with other author's studies. the study can add the knowledge on successful approaches of congenital syndactyly management, potentially leading to innovations in surgical techniques in the Yemeni context, and can help in developing best practice guidelines with guiding efforts to train plastic and reconstructive surgeons in Yemen to improving the surgical outcomes, it is important to identified clearly and definitely the range of deformity before reconstruction, where syndactyly complete or incomplete and simple or complex, as simple when only fusion of skin and soft tissue or as complex when associated with bone or cartilage union ^(5,6) and complicated when skeletal deformity associated with accessory digits, abnormal tendon, muscles or nerves, and mainly with syndrome, ^(7,5) as the technique is same for separation but in complex and complicated there are more complications and multi stages surgery or even reoperation with accepted or unsatisfactory outcome in compare to simple syndactyly .

Patients and Method

It is descriptive proscriptive study conducted in the unit of plastic and reconstructive surgery, Typical police hospital, Special force hospital, Elite hospital, Al gumhori teaching hospital, Sana'a city, Yemen, over period from august 2021 to august 2023. the study included patients of various ages and sexes who were undergoing congenital syndactyly separation with the exception of those with burns and severe complex syndactyly. Following the patients preoperative preparation , we performed

the procedure under general anesthesia, in a supine position, aseptic technique of the affected hand and side of lower abdomen, with preferred uses of loupe magnifying and tourniquet, start marking design of dorsal rectangular flap from the tips of the adjacent metacarpal heads to the beginning of the last third of proximal phalanx, The interdigital dorsal zigzag incision is continuous from the tips of rectangular flap to the midst crease of the proximal joint of the adjacent finger. Then it crosses to the midst of the middle phalanx, and back across the midst of the distal joint crease, the palmar zigzag marking incision is mirror to dorsal incision, end by straight incision between the adjacent proximal phalanx to the level proximal skin crease with transfers extension incision to allow inseting of the flap (Fig.1).



Figure (1) preoperative marking of third webs syndactyly.

the tourniquet is inflated and starts to elevate the dorsal interdigital flaps, changes to raise the volar flaps, then separate the fingers from distal to proximal, paying attention to identifying and preserving the neurovascular bundles during separation, our limitation of dissection is the digital artery bifurcation, and finally elevate the dorsal rectangular flap (Fig.2).



Figure (2) complete separation of the fingers

After bleeding controlled and irrigation of the wound the flaps are fixed in place with 4-0 vicryl suture and the remaining raw area resurface with FTSG from lower abdominal side over the ASIS, the donor site is closed primarily. (Fig.3).



Figure (3) inset the flaps and the raw area resurface with FTSG

Adequate postsurgical dressings are essential to satisfying surgical outcomes, both compression and immobilization are important along grafted area and between the separated fingers, for graft take and to avoid flap folding in the newly formed web space, covered with fucidin gauzes, supported with amounts of soft gauzes and lightly wrapped with padding. In a young patient, the dressing may need to be reinforced with plaster of Paris extend to the elbow and flexed with 90 degrees to reduce the digits' motility. The dressing well remains on for 1 to 3 weeks, the removal depending on the healing and after dressing removal, gentle washing, wound

care, light dressing and encourage normal hand use. the early and late outcome (fig.4).



Fig (4) A- early outcome and (B) final outcome

Statistical Analysis

The data was analyzed using SPSS version 26. Descriptive statistics were employed to summarize the patient demographics, intraoperative details, and postoperative outcomes. p-value less than 0.05 was considered statistically significant.

Results

The present study prospectively analyzed 31webs operated on 18 patients with congenital hand syndactyly who were treated in the Plastic Surgery department, the youngest patient was treated at 2 years and the oldest patient was 25 years, the majority of patients were above 13 years, with a median age of 17.92 years. twelve patients (66.67%) were female, while six patients (33,33%) are male the ratio of

females to males was 2:1. six patients (33%) presented with bilateral syndactyly and twelve patients (67%) presented unilaterally. eight (44.4%) patients presented with syndactyly on third web space, five (27.7%) presented with syndactyly on second, third and fourth web spaces, two (11.25%) presented with syndactyly on fourth web space, one (5.55%) presented with syndactyly on first, second and third web space, one (5.55%) presented with syndactyly on second web space and one patients (5.55%) presented with syndactyly on second and third web space. ten (55%) patients have simple complete syndactyly, four (22.24%) patients have complex syndactyly, one (5.55%) patients have simple incomplete syndactyly and three (16%) patients have complicated syndactyl.

Discussion

in the early 1800, syndactyly fingers were separated by knife in the nursery leading to a raw area on both inner digital sides, healed by secondary intension and eventually flexion contracture occurrence.⁽⁸⁾chronological review of several procedures for separation the syndactylous fingers; the first was done by Rudtorffer in (1808), in particular on web reconstruction by creating epithelialized tunnel at the base of the future web, Zeiler in (1810) used a pedicled flap in web reconstruction, Didot in(1849) developed two flaps to be wrapped around the defects along the length of the syndactylous fingers. Lennander (1891) used straight line and covered the remaining defects with split thickness skin grafts. in1943–1956, Cronin introduced the use of zig-zag-incisions for fingers separation. ⁽⁹⁾ Withey et al (2001) modified the cronin interdigitating zig-zag incision into long and oblique angled flaps. ⁽¹⁰⁾ Millesi (1970) demonstrated the effectiveness of the using of small skin bridges between grafts. Skin grafting for covering the raw area as apart of syndactyly correction in the last century. ⁽⁴⁾ (Coombs &Multimer 1994), (Withey et al 2001) described tissue expansion techniques to avoid skin graft for raw area, as graft less method in syndactyly repair,⁽¹¹⁾ the main aim for syndactyly separation is to

reconstruct the web space by local skin flap, as the long-term stability of the newly created web space is best obtained when it is reconstructed by using a flap, and most articles on syndactyly repair describe the normal skin in the web space as dorsal in origin, and that supported the dorsal flap technique for reconstructing the web space. ⁽¹²⁾ many flaps techniques have been described to achieve this goal, started by Cronin in 1956 using dorsal and palmar flaps ⁽⁹⁾, Foucher in 1990 used dorsal quadri lateral and two volar laterally based flaps, ⁽¹³⁾ Abolwafa in 2008 who used hourglass dorsal metacarpal island flaps, ⁽¹⁴⁾ and Petra M et al in 2020 who used hexagonal dorsal flap. ⁽¹⁵⁾

In our study the congenital syndactyly presented in all age groups, first, second and third decades of life's, the youngest patient at the time of operation is 2-years old and the oldest patient was 25 years, the average age is 17.5 years. the majority of patients belong to age group above 13 years. Tuma et al conducted 37 web space repairs on 30 patients, each with a median of 4.8 years, and a higher proportion of female than males, a finding that aligns with our research in female dominance. ⁽¹⁶⁾ Dong et al reported in their study that the youngest patient is of 5 months old and the oldest patients of 35 months of old with a mean age 16.7 months. ⁽¹⁷⁾ Jose et al reported that patients age at time of operation ranged from 6 months to 13 years old, with an average of 2.7 years. ⁽¹⁸⁾ therefore, the differences in the age distribution and mean age from other studies can be attributed to various factors such as the socioeconomic status of the patients, ignobility of the proper time for separation, the acceptance of deformities, and social perceptions of women, particularly given that the majority of cases in our study are female and presented late. out of 18 patients the majority of patient had simple complete syndactyly ten patients (55%), four patients (22%), and three patients (16.6%) having complex syndactyly. Tauma et al in their study, reported that (36%) presented with simple syndactyly (63.6%) present with complex syndactyly 16. dong et al in their study, all patients presented with simple syndactyly

⁽¹⁷⁾ Jose et al in their study they found that 54 patients had both simple incomplete and simple complete syndactyly, while 25 patients showed complicated syndactyly ⁽¹⁸⁾. In our research, we concur with Jose et al. that simple syndactyly is the most prevalent presentation, and we also concur with Tuma et al. and Jose et al. that the prevalence of complex and complicated syndactyl is rising, potentially due to improper or non-existent early treatment and delayed repair. Of the 18 patients treated in this study (33%) presented with bilateral syndactyly and (67%) presented with unilateral 6 right and 6 Left hand, and the most affected web spaces are the third web space (44,4%). in our results, the unilateral syndactyly is the most common and the most affected web between middle and ring finger, which may explain other causes of late presentation, due to minimal function and aesthetic implication. and our results are similar to those of Jose and Tuma et al in common web space syndactyly. all patients in our study are operated with dorsal rectangular flap, the outcomes in this technique is good results in 90.4% with low complications rate 9.6%, the most complications related to the skin graft were skin infections two webs, maceration of flap one webs, partial graft loss two webs, presented of complicated cases are simply corrected with dressing and local wound care. Tuma et al in their study reported skin graft loss in two web spaces 9.1%, recurrence in one web space 4.5% with overall good results in 19 web spaces (87%).¹⁶ Dong et al in their study reported that the average follows up period was ranged from sex months to five years, ⁽¹⁷⁾ and no complications, only one of the 35 webs developed web creep. Jose et al reported that the follow up period ranged from 6 months to 4 years with a mean follow up of 2 years, creep was noted in 12 web spaces 5%. ⁽¹⁸⁾ in our follow-up for 18 patients, ten patients are followed for three months, and five patients follow up for twelve months, Deunk et al evaluated 27 patients with an average follow-up of 21 years. ⁽¹⁹⁾ Keret et al in their study reported that inappropriate or unsecure post-surgical dressing with inadequate follow up is the major factor for poor result. ⁽²⁰⁾ given that the surgery for congenital syndactyly is effective process with few post-operative complications, but

it should be followed up by doctors and the patient and their relatives should provide wound care to ensure the hands recovery. the limitation of our study is the short period of follow-up due to loss of contact with patients or relatives, lack of attention and participation and not responding to follow-up or our invitation, other cause may include the cost for follow-up, as most patient from outside the Sanaa capital. Overall, most of the simple syndactyly types that are operated in this study yield reasonable good results, but complex types requiring multiple correction stages with accepted or unsatisfied results. According to Percival and Sykes state that the major preoperative factors that effect on operative outcome are the complexity of the syndactyly. ⁽²¹⁾

Conclusion

Due to its simplicity in flap design and ease of modification, the dorsal rectangular flap technique is the best choice for web space reconstruction, it is ideal for all types of syndactyly as the dorsal skin easily mobilizes to provide more natural web space slop. This technique also has a low complication rate, as its broad size decrease tip necrosis. generally, simple syndactyly yields a good functional outcome with less complications whereas complex and complicated syndactyly gives accepted or unsatisfied outcome related to the extent of deformity and wound complications. Careful planning and meticulous surgical techniques can minimize potential errors and allow satisfactory separation of syndactyly.

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