ORIGINAL ARTICLE

A comparative review of three techniques of syndactyly release

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Abstract

Objective: To compare the outcome of three techniques of congenital syndactyly release; to identify factors leading to difference in outcome, and to identify the incidence of neurovascular abnormalities in various types of syndactyly.

Methods: The chart review was conducted at The Indus Hospital, Karachi, and comprised data of all patients who had undergone syndactyly release between August 2008 and December 2014. Three techniques of release were included as described in literature by Bauer, Skoog and Niranjan. The data was collected through Health Management Information System. A detailed questionnaire was designed to address variables of interest.

Results: The age of the 29 patients with 50 webs in the study ranged from 2.2 to 17.1 years. The male to female ratio was 21:8. The complications encountered were web creep, skin flap necrosis, flexion deformity and contracture of joint. Single neurovascular bundle was found in 04(8%)webs and 45(90%) required skin graft for resurfacing of the digits.

Conclusion: Bauer technique was found to be to be superior for web formation and there was low incidence of web creep compared to Skoog technique. Inclusion of syndromic cases may lead to increased complication and dissatisfaction rate. Tight closure of flaps should be avoided and generous use of skin grafts is advocated for success.

Keywords: Syndactyly release, Graftless techniques for syndactyly, Syndactyly release techniques. (JPMA 65: S-28 (Suppl. 3); 2015)

Introduction

Descriptions and treatment of congenital syndactyly can be traced back to early 1800 in German litrature. It is one of the common anomalies of the hand with occurrence of around 2 to 3 per 10000 live births.[1] The prevalance is highest between ring and long finger, followed by ring and little. The least common is between the thumb and index finger.[1-4] The usual recommended time of release is 18 months of age or older except border digits or complicated syndacty.[1-4] A number of techniques have been described in literature with modifications over the years.[5-11] However, the principles of reconstruction remain the same and focus on adequate web reconstruction, adjacent web resurfacing and prevention of flexion contracture of the digits. Graftless techniques[12,13] and soft tissue distraction techniques,[14-16] however, need to be comparatively evaluated to prove their benefit over conventional methods and modifications. The complications of release include skin flap necrosis, loss of skin graft, flexion deformity, decrease in range of motion (ROM), web creep and digital necrosis.[1-17]

The current study was planned to review and compare three techniques described by Bauer et al,[5] Skoog[6] and Niranjan et al.[7] Comparison included the outcome of the three techniques. Identification of factors leading to difference in outcome and the incidence of neurovascular abnormalities in various types of syndactyly were also part of the study objective.

Materials and Methods

The chart review was done at The Indus Hospital, Karachi, and comprised all patients who had undergone syndactyly release between August 2008 and December 2014 by the Department of Orthopaedics and Traumatology and the Department of Plastic surgery. Three techniques of release were included[5-7] with a minimum follow-up of 3 months. The data was collected through Health Management Information System (HMIS). A detailed questionnaire was designed to address variables of interest.

The study excluded syndactyly that had resulted out of burn, infection or trauma.

Likewise, reconstructions of the first web with dorsal rotation flaps and so were those with less than three months of follow-up were excluded.

The study was approved by the institutional ethics review board and patient's identity was not revealed at any stage.

Results

Of the 29 patients, 21(72.4%) were males and 8(27.6%) were females with overall age ranging from 2.2 to 17.1

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Table: Comparitive demographic data and results.

	Bauer et al	Skoog	Niranjan et al
Age in years (Median/SD)	7.3 / 3.505	4.5 / 2.1863	4.1 / 1.55
*Proportion boys %	13/18 (72.2%)	6/10 (60%)	2/2 (100%)
*Proportion girls %	5/18 (27.7%)	4/10 (40%)	0/2 (0%)
Average follow up in months (SD)	19.48 (10.935)	12.3 (5.35)	19 (7.54)
No. of webs	31	16	3
Need for FTSG (Both digits)	26	14	1
Need for FTSG (Single digit)	4		
No need for FTSG	1	2	2
Superficial flap necrosis	1	0	0
Full thickness necrosis	2	0	0
Secondary procedure	2	0	0
Flexion contracture	1	0	0
Joint stiffness	1	0	0
Digital necrosis	0	0	0
Web creep	1	3	0
Dissatisfied (pts.)	1	2	0
Single neurovascular bundle	3 webs (16.6%)	1 web (6.2%)	0
Web number involved % 2 / 3 / 4	16.1 /51.6 /32.2	6.2 / 68.7 / 25	33.3 / 66.6 / 0
Cosmesis unacceptable (pts.)	1	2	0

FTSG: Full-thickness skin grafts

* The chart shows 30 patients as one patient has been operated by both Bauer et al and Skoog techniques, therefore included in both groups. The total number of webs is 50.

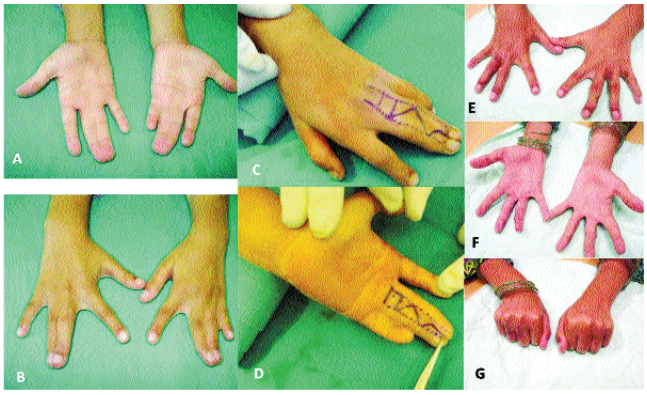

Figure-1: Syndactyly release by Bauer et al technique.
A & B: Preoperative complex syndactyly in a 10-years-old girl, between the middle and ring fingers both hands and simple incomplete syndactyly between left hand ring and little fingers. C and D: Peroperative marking of the flaps as described by Bauer et al. Dorsal web flap, volar flap for adjacent web resurfacing, zig zag mirror image flaps are seen. E, F, G: Result at one year from surgery. Full function, no complication and acceptable cosmesis.

Figure-2: Syndactyly release by Skoog technique.
A & B: A 6-years-old boy with complex syndactyly between the index and middle ring finger complex. Flexion and rotation deformity is seen. C & D: Volar and dorsal V flaps after transposition and suturing forming the web. Over one digit the transposed flaps were closed, other digit required full thickness skin graft over a small area. E,F,G: Result at two years from surgery. Full function, no complication and acceptable cosmesis.

years, with a mean of 17.3 months. There were 50 webs in the study. The type of syndactyly was simple incomplete in 16(32%) webs, simple complete in 13(26%), complex in 18(36%), and complicated including Apert's syndrome in 3(6%). The follow-up ranged from 3 to 36 months, with a mean of 17.3 months.

Besides, 31(62%) webs were released and resurfaced by Bauer et al. technique; 16(32%) by Skoog technique; and 3(6%) underwent Niranjan et al. procedure (Table). Superficial flap necrosis occurred in 1(3.2%) web operated by Bauer et al. technique where complete closure was performed without the need of graft. However, it healed by dressings without the need of secondary procedure.

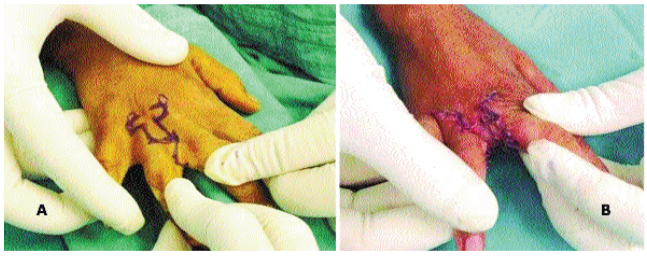

Figure-3: Syndactyly release by Niranjan et al technique.
A: Simple incompletely incomplete syndactyly in a six-years-old boy, flaps marked. B: Web formation and adjacent web resurfacing by the flaps. Skin graft was not required.

Full thickness volar skin flap necrosis occurred in 1(3.2%) web in the Bauer et al. group, requiring cross-finger flap. Although complete closure was not attempted and both digits were resurfaced with full-thickness skin grafts (FTSG), but complications occurred. The patient later developed web creep and flexion contracture of one digit, requiring aggressive rehabilitation. Another patient (3.2%) in the same group developed hematoma under the skin flaps and necrosis of one of the adjacent digit skin flaps, requiring dorsal metacarpal retrograde island flap. Web creeps also occurred in 3(18.7%) patients in the Skoog group. Two (66.6%) of these three patients were of Apert's syndrome. Patients with web creeps were not happy with cosmesis. All other patients were satisfied with the outcome and happy with cosmesis. All patients had good finger flexion and grip. There was slight limitation of extension of proximal interphalangeal (PIP) joint motion due to flexion contracture of 20 degrees in 1(3.5%) patient.

We found a single neurovascular bundle in 4(8%) webs, out of which 1(02%) were complex, 1(02%) complicated (Apert syndrome) and 1(02%) simple syndactyly.

Discussion

There has been a lot of debate in literature over the best method for the treatment of congenital syndactyly.[1-17] Very few studies have compared different techniques[18] although new modifications of web flap design to decrease the incidence of web creep have been addressed.[19] Kramer et al. have shown that the rate of complications increases with the complicated and syndromic cases like Poland's syndrome in their series.[18] In our series the highest rate of dissatisfaction due to web creep was found in patients with Apert's syndrome. Mallet et al.[10] have compared T and Omega dorsal flap techniques and found Omega flap to be better in terms of incidence of web creep (17% versus 5%). We did not find any comparative study of Bauer et al.,[5] Skoog[6] and Niranjan et al.[7] techniques which we have used in our patients. The original techniques described by Bauer et al. and Skoog provide satisfactory results on long follow-up as shown in our study. The web flap used in the Bauer technique matches the anatomy of a normal web without any scar in the web, and the volar flap resurfaces on adjacent web surface (Figure-1). In the Skoog technique (Figuer-2) there is a scar in the centre of the web and it may be difficult to match the dorsal and volar flaps during surgery, which may lead to a higher incidence of web creep as seen in our study. The technique by Niranjan et al. is a good technique to prevent skin graft on adjacent web surfaces (Figure-3) and similar other techniques and modifications of web flaps have been cited in literature.[9,10] We used a slight modification of Niranjan et al. flaps. In incomplete simple syndactyly it may lead to a graftless closure, but in complete syndactyly, there was need of graft on either digit. Our experience of this technique is very little to make firm recommendations.

There has been interest in the application of external fixators for the treatment of syndactyly. The results shown in literature do not include ROM as an indicator of success. Further, there is an increased incidence of nail bed abnormalities.[14-16]

Graftless techniques may be tried in syndactyly release[12,13] but making a recommendation for such a technique in all cases is not wise. The use of dorsal metacarpal V-Y flap as advancement flap[11,12] is an option, but in a case of multiple digit involvement, it may lead to many unsightly scars on the dorsum of the hand. Further, the dorsal metacarpal venous flaps are excellent tools to avoid complications, like skin flap necrosis, and helped us to salvage one web in our patients with excellent result. Therefore, it is better to keep a back-up option to handle any untoward complication. The hand is a tool for function, therefore recommendation of any technique over the other should follow this principle.

We found technique by Bauer et al. to be much superior in terms of web formation and adjacent web resurfacing. Modifications of the volar flap described by Moss AL et al.[19] can be considered for future cases, to decrease the incidence of web creep although only one web in the Bauer group in our series developed creep at two year follow-up.

We did not find any significant web creep as a result of a transverse incision in the web although a zig zag may be a better option, which we have started to use in our recent cases. Despite no nail fold abnormality in our series, we have also started to use V flaps to reconstruct adjacent nail folds in complex syndactyly.

Our results show that the skin is mostly inadequate to resurface the adjacent digits (90%). In angiographic

studies of congenital syndactyly, there is a high incidence of distal bifurcation of the common digital artery, as high as 30 out of 39 cases.[20,21] We did not perform any preoperative angiography in our cases and the incidence of neurovascular anomalies in our cases (10%), did not change the course of treatment. However, as a principle, we recommend that two adjacent webs should never be released simultaneously. The main limitation of our study is its retrospective nature.

Conclusions

The technique of Bauer et al. was found to be superior and versatile in our experience. Skoog technique though simpler may have problems with the web formation which is the most critical part of the procedure. Our experience of Niranjan et al technique is short. One should always check the vascularity of the flaps to prevent ischemia due to tight closure. Further prospective, randomised controlled trials in future on various techniques and modifications can further substantiate our results.

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