Surgical correction of syndactyly; comparison between skin grafting and repeated dressing

Thesis Submitted for Partial Fulfillment of M.Sc.Degree In

Orthopaedic Surgery

By

Ayman Mohammed Mounir Hasan

M.B., B.Ch

Under Supervision of

Prof. Dr. Hisham Abdel Ghani

Professor of Orthopaedic Surgery

Faculty of Medicine

Cairo University

Ass.Prof.Dr. Mostafa Mahmoud

Ass.Prof of Orthopaedic Surgery

Faculty of Medicine

Cairo University

Faculty of Medicine

Cairo University

2014

Content

Content	Page
Review of literature	**1**
Patients and methods	**23**
Results	**35**
Discussion	**42**
Case presentation	**45**
Summary	**63**
References	**65**
Arabic summary	**70**

List of Tables

No.	Table	Page
1	Grading of the aesthetic outcome of separated fingertips	33
2	Parent's satisfaction	36
3	Operative time	37
4	The healing time	37
5	The size of raw area	37
6	Occurrence of complications	38
7	The Nail fold condition	39
8	Master table	40,41

List of Figures

No.	Figure	Page
1	(a) Six-week-old embryo (39 days, stage 16): the hand plate of the upper limb was clearly visible; (b) 6-week-old embryo (44 days, stage 18): the elbow region becomes visible and the digit rays start separating; (c) 8-week-old embryo (52 days, stage 22): from outside the upper limb seems to be complete.(10)	3
2	(a) Schematic drawing of the upper limb bud and the AER(blue) in the fifth week (stage 13); (b) schematic of the upper limb and the ZPA (red) in the sixth week (stage 17); (c) schematic of the hand plate and the interdigital necrotic zones in the seventh week (stage 19).	3
3	syndactyly type I	5
4	syndactyly type II	5
5	syndactyly type III	6
6	syndactyly type IV	6
7	syndactyly type V	7
8	syndactyly type VI	7
9	syndactyly type VII	8
10	syndactyly type VIII	8
11	syndactyly type IX	9
12	(a)incomplete simple syndactyly ,(b)complete simple syndactyly, (c)complex syndactyly (d)complex complicated syndactyly.	10
13	Figure 13.Planning-dorsal flap is then divided into two to obtain two separate flaps(flap a& flap b).	13
14	Planning-palmar aspect (flap c)	13
15	Semi-diagrammatic completed repair and the exposed areas are covered by skin graft	13
16	(A) Preoperative complete syndactyly. The expander and reservoir dome were inserted through a small incision along the dorsal wrist crease. (B) Expansion completed. (C) Before composite grafting. Syndactyly separated, with two Z-plasties on each finger, and the commissure formed with a rectangular flap. (D) Appearance I year and 6 months after separation of syndactyly	14

17	specialized external fixator used in cases of syndactyly	15
18	Trilobed flap elevated, leaving the dorsal veins on the digits	16
19	End on view of web space with the trilobed flap and the zig-zag incisions. Note that skin grafts have not been used	16
20	(A) Dorsal aspect of left hand, (B) Palmar aspect of the left hand and (C) Close up of the operated web after 10 years follow up	16
21 and 22	Marking of the incision palmary and dorsally	17
23	The dorsal flap was advanced distally	17
24 and 25	one-month postoperative palmar and dorsal views respectively	17
26	(A) Preoperative markings – dorsal view. (B) Preoperative markings palmar view. (C) Separation of digits – dorsal view. (D) Separation of digits – palmar view. (E) Appearance after closure of wounds.	18,19
27	Postoperative result (1 year). (A) Dorsal view with fingers adducted. (B) Palmar view. (C) Dorsal view showing web space	19
28	Schematic of the flap design, dorsal and palmar views	20
29	shows design of pentagonal flap and zigzag incisions from dorsal(a) and palmar views(b); dissection of pentagonal flap(c) ; web view after closure (d) ; web view after long term follow up(e)	20,21
30	A proximally based rectangular flap from the dorsum of the syndactyly is used to reconstruct the commissure	25
31	A zigzag flap in the palmar aspect of the hand	27
32	shows Buck-Gramko flaps to cover nail fold	27
33	Lateral spreading of the digits places the intervening tissue under tension and facilitates digital separation	28
34	The bifurcation between the common and proper neurovascular structures requires identification	28
35	the raw area from the dorsal aspect of the hand	30
36	the raw area from the dorsal aspect of the hand; the arrow pointed towards lateral nail flap	30

37	the arrows point toward Buck-Gramko flaps	30
38	the raw area from the palmar aspect of the hand	31
39	the raw area seen in between fingers	31
40	Adhesive steripad were placed in the web spaces	32
41	Fingertip aesthetic outcomes	33
42	Graphical representation of parent's satisfaction in non graft group	36
43	Graphical representation of parent's satisfaction in graft group	36
44	Graphical representation of the nail fold condition in non graft group	39
45	Graphical representation of the nail fold condition in graft group	40
46	volar aspect of the left hand	46
47	dorsal aspect of the left hand	46
48	X-ray of left hand	46
49	dorsal aspect of the hand after two weeks from the operation	47
50	palmar aspect of the 1st web after two weeks from the operation	47
51	palmar view of separated 4th web space	47
52	palmar aspect of 1st web after one month	48
53	dorsal aspect of 4th web after one month	48
54	show normal appearance of the hand after complete healing	49
55	dorsal aspect of the left hand	50
56	volar aspect of the left hand	51
57	x-ray of the left hand	51
58	the raw area intra-operatively after separation	51
59	show the left hand after healing	52
60	showing dorsal aspect of the affected hand	54
61	showing palmar aspect of the affected hand	54
62	showing preoperative marking	54
63	the affected hand after separation	55
64	showing healing of the hand after removal of dressing 2 weeks after operation	56
65	shows complete healing of the hand after 4 weeks	56
66	shows the hand after 6 weeks from the operation	57

67	shows angulation of distal phalanx of middle finger after 3 months	57
68	shows complete healing with notching of lateral nail fold of the middle finger	58
69	shows dorsal view of the affected hand	59
70	shows palmar view of the affected hand	60
71	AP x-ray of the affected hand showing no bony synostosis between 4th and 5th finger	60
72	shows palmar view of affected hand after reconstruction of the commissure	61
73	shows dorsal view of the affected hand after reconstruction of the commissure. The arrows pointed to the FTS graft	61
74	dorsal view of the affected hand after complete healing	62
75	palmar view of the affected hand after complete healing	62

List of Abbreviations

FTG : full thickness skin graft

AERMF : apical ectodermal ridge maintainance facor

DIP : distal interphalangeal

PIP : proximal interphalangeal

Abstract

Aim:

The purpose of this prospective study is to assess the results of separation of syndactyly without grafting and comparing it to classic separation using skin grafting.

Background:

Syndactyly is the fusion of adjacent digits. It is the most common of all congenital hand deformities. Surgical release of this soft tissue is recommended .The release leaves a raw area can be managed either by full thickness skin graft or just repeated dressing.

Methods:

Twenty webs in sixteen hands in sixteen patient presented with simple syndactyly were included in this study. A dorsal flap was preformed for reconstruction of the commissure. The remaining raw area was managed by grafting in 10 patients and by repeated sterile dressing in remaining 10 cases.

Results:

In non graft group the mean time of surgical procedure was 64.09 minutes, the mean healing time was 6.45 weeks, web creep occurred in two cases, angulation occurred in one case, skin maceration occur in 2 cases, nail fold condition were excellent in 9 cases and parents satisfaction was 90%.

In graft group the mean time of surgical procedure was 85.56 minutes, the mean healing time was 7.44 weeks, web creep occurred in one case, angulation occurred in one case, skin maceration occur in 3 cases, nail fold condition were excellent in all fingers and parents satisfaction was 70%.

Conclusion:

This study proves that using repeated dressing in separation of simple syndactyly is a valuable alternative to skin grafting yielding comparable and in some aspects superior results to traditional grafting technique. Moreover it avoids the donor site morbidity and shortens the operative time.

Key wards:

Syndactyly- Repair- Graft- Non graft- Pediatric.

ACKNOWLEDGMENT

This work would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study.

First and foremost, my utmost gratitude to ***Prof. Dr. Hisham Abdel Ghani & Ass.Prof. Dr. Mostafa Mahmoud***, for giving me the advantage of working under their supervision. They saved no effort to guide me in every aspect. Without their advice, valuable suggestions and criticism this study would not have been completed.

I would like to express my great appreciation to all staff members of the Abo El Reesh Hospital, Orthopaedic department, Faculty of medicine, Cairo University, for their support and encouragement, and also my colleagues for their support and advice.

Above all, I thank ***Allah***, for answering my prayers and for giving me the strength and will to go on.

Ayman M. Mounir

Review of literature

Introduction

Syndactyly is a condition well documented both in textbooks and current literature mainly due to it being the most common congenital hand defect. Coming from the Greek syn (meaning together) and dactyly (meaning digits). It describes an embryological failure of finger separation.[1,2,3,4]

Epidemiology:-

Isolated syndactyly is a common congenital anomaly of the hand with an incidence of approximately 1 in 2000. It occurs bilaterally in 50% of cases. Between 10% and 40% of patients have a positive family history that was inherited as an autosomal dominant trait. Variable expressivity and incomplete penetrance account for the male preponderance (2 : 1) and the variable phenotype within a family pedigree. Syndactyly was also seen with other deformities such as polydactyly, clinodactyly, brachydactyly, symphalangism, and synostosis as part of a broader anomaly of the child's hand, either as a sporadic or in a syndromic association. In isolated syndactyly, the long/ring finger web space was most commonly affected (57%), followed by the ring/small finger web space (27%). Thumb/index finger and index/long finger web syndactylies were the least common. In

syndromic cases, the thumb/index finger and index/long finger web spaces were relatively more frequently affected.[5]

Embryology and Development

The hand develops as a paddle like prominence at the end of the upper limb bud between days 33 and 36.[6] The individual digital rays gain definition as distinct mesenchymal condensations between days 41 and 43 of development. The cells between these digital condensations elaborate a substance known as apical ectodermal ridge maintainance facor (AERMF).[7,8] At a preprogrammed moment, the production of this substance is halted.

Without AERMF, the apical ectodermal ridge begins to break apart. Its distruption signals the liberation of lysosomal enzymes from within lysozymes in the cells between the digital condensations. The liberated enzymes dissolve the interdigital cells and resorption gives definition to the web space. If this process fail to occur, or occur inappropriately late, syndactyly will result. [7] (figures 1 &2)

In contrast, syndactyly occurring as a result of early amnion rupture sequence is believed to be (an intrauterine) secondary syndactyly of initially independent digits.[9]

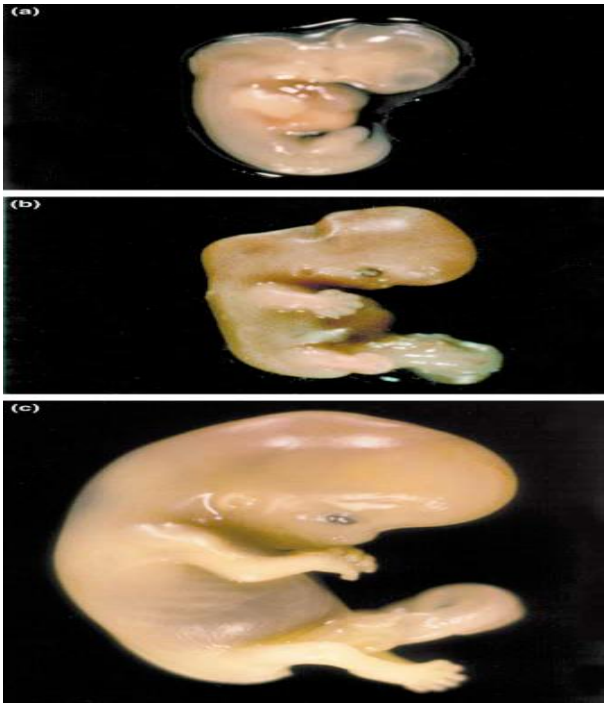

Fig. 1. (a) Six-week-old embryo (39 days, stage 16): the hand plate of the upper limb was clearly visible; (b) 6-week-old embryo (44 days, stage 18): the elbow region becomes visible and the digit rays start separating; (c) 8-week-old embryo (52 days, stage 22): from outside the upper limb seems to be complete.[10]

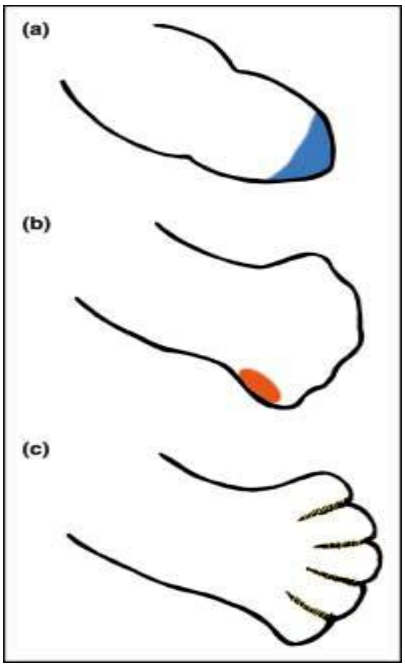

Fig. 2. (a) Schematic drawing of the upper limb bud and the AER(blue) in the fifth week (stage 13); (b) schematic of the upper limb and the ZPA (red) in the sixth week (stage 17); (c) schematic of the hand plate and the interdigital necrotic zones in the seventh week (stage 19).[10]

Classification of syndactyly

Syndactyly can be classified in several ways. The classical classification has been a simple anatomical categorization depending upon the digits within the web, number of digits involved, and also, the extent of webbing(Davis-German classification). [13]

There were also Descriptive and embryological approaches of classification. These approaches rely on the grouping of similar patterns of limb deficiencies due to embryological failures. They consider, for instance, whether the insult involves soft/skeletal tissue or only the dermo-myofascial structure.(Temtamy-McKusick classification).[14]

Temtamy-McKusick, and Davis-German were well-appreciated used systems for classification.

TEMTAMY-McKUSICK CIASSIFICATION:-

The current classification scheme of syndactyly was an adaptation and extension of Temtamy-McKusick system by incorporating into it the clinical, genetic, and molecular developments into the following [14]:

Syndactyly Type I:

Also known as zygodactyly, SD1 was characterised by involvement of the 3rd and 4th finger web space. It was the more common non-syndromic presentation of syndactyly and has also been described with involvement of other digits and the underlying bones [15]. (figure 3)