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Functional outcome of different treatment methods in fingertip injuries: A prospective study

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Abstract

Background: Various treatment modalities are used from the past to treat fingertip injuries. The common methods used are suturing, skin grafting, flap coverage of the wound by different techniques. This study reports the outcome of different treatment methods used in management of fingertip injuries.

Material and Methods: In a prospective study from 15 August 2006 to 31st March 2008 we included 103 patients out of which 10 patient lost in follow-up. Average age of distribution is 39.6 yrs. Patients are divided in to four treatment groups and were followed for 6 months. Assesment of results were done on basis of tip tenderness, Colour of tip with surrounding tissue, stiffness in DIP joint, sensation, aesthetic look.

Results: In our series we found that a total of seventy four patients had good and excellent relief of tip tenderness after 6 month of having the definitive surgery done, a total of sixty nine patients had good and excellent result as far as tip sensation is concerned, of sixty nine patients had good and excellent result as far as tip sensation is concerned, of sixty seven patients had good and excellent result as far as cosmesis is concern after 6 month post operatively.

Conclusion: Conservative management was more successful in paediatric age group than in adult age group. Maximum relief in tip tenderness, Sensation found in homodigital /local flap group. Best result of cosmesis was in grafting group and worst in distant flap group. Thenar flap was useful in middle and index finger.

Keywords: Finger tip, aesthetic, homodigital flap, tip tenderness

Introduction

Finger tip injuries are one of the most common hand injuries seen in the emergency room. Improper care, or an error in initial emergency room treatment, can lead to disastrous long term complication

The goal of treating fingertip injuries are

1. Obtain a healed wound
2. Restore function
3. Avoid complications leading to stiff joint
4. Avoid residual painful fingertip
5. Obtain an aesthetic appearance.^{1,2,3}

In the fingertip injuries treatments are

1. Dressing
2. Primary closure -Primary wound closure is particularly suitable for amputated fingertips in case of small avulsion wounds with prominent edges.
3. Split-thickness skin graft -It is the simplest and most expedient way of repairing the amputated fingertip. Split-thickness skin graft will take over small exposed cancellous bone remnants up to 0.5 cm in diameter by the process of bridging. A disadvantage of split-thickness skin graft for a large defects is that the graft has poor durability and lack of cutaneous padding-components whose lack causes difficulty in performing manual labour [4, 5, 6].
4. Full thickness skin graft – The full thickness skin graft has many advantages, but it leaves a permanent scar too.

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5. Local flaps - Recently local flaps have become increasingly popular in the management of fingertip injuries. They are particularly valuable for covering large areas of exposed bone and for padding of fingertips. Some flaps are given below.
 - (a) The cross finger flap
 - (b) The Kleinert volar flap
 - (c) The Kutler^[7, 8] lateral adva
 - (d) The Moberg sliding flap^[9].
 - (e) Thenar flap^[10].
6. Distant flaps - These comprise of flaps from the groin, abdomen and delto-pectoral region as well as cross-arm flaps.
7. Replantation of Finger Tips – Often the patient, relative or friend brings the amputated part for replantation. In adults this is not recommended because of high rate of failure.

Material and Methods

This study was conducted in department of orthopaedics, Tata Main Hospital, Jamshedpur. This study was conducted on indoor as well as outdoor patient with finger tip injury, partial or complete amputation. The duration of study was 1 year and 7 months, from 15 August 2006 to 31st March 2008. It was a prospective study. The following things were considered while selecting a case for this study:

1. Fresh injury (< 5 days)
2. All fingertip injury
3. Injured part should be distal to DIP.
4. No age bar /no sex differentiation

After getting the patient fit for surgery .The patient was posted for surgery and treatment method was decided on the basis of distal vascularity, amount and pattern of skin loss. We divided all these modalities into the following treatment groups.

1. Primary closure/conservative
2. Skin grafting
3. Local flap/homo-digital flap
4. Distant flap.

Follow UP

- Immediate post-op
- 3 weeks
- 3 months
- 6 months

Functional Assessment

On the following guidelines we have assessed the functional outcome of each treatment methods used in this study^[1].

1. Tip tenderness
2. Colour of tip with surrounding tissue
3. Stiffness in DIP
4. Sensation
5. Aesthetic look

1. TIP Tenderness

0=none

1=light pressure non tender, firm pressure is mildly tender but does not interfere at all with activities

2=light pressure non tender, firm pressure is painful but minimal handicap with activities

3=light pressure nontender, firm pressure is painful and causes slight handicap with activities

4=light pressure is tender and objectionable, but only slightly avoided

5=light pressure is painful and avoided, but activities minimally affected

6=light pressure is painful and avoided, activities slightly affected

7=light pressure is painful and avoided, activities significantly affected

8=occasional pain at rest, modifies use of hand to avoid many activities

9=frequent pain at rest, modifies use of hand to avoid most activities

10=worst possible pain; no use of finger possible; simply touching tip to cloth is so painful that patient makes sure it does not happen

2. TIP Colour

1. Same
2. Discoloured

3. Stiffness

1. None
2. Mild
3. Moderate
4. Severe

4. Sensation

A. Cold sensitivity

0=none,

1=mild sensitivity, does not interfere with ADL or work;

2=moderate sensitivity, slightly interferes with ADL or work but does not prevent activities

3=severed sensitivity, interferes with ADL or work

B. Two point discrimination

i. 2 mm

ii. 3 mm

iii. 4 mm

iv. 5 mm

5. Aesthetic Look (cosmesis)

1. Looks great
2. Minimally noticeable
3. Noticeable but OK
4. Noticeable, poor
5. Ugly
6. Needs revision

Overall function of injured finger

- 1. POOR
- 2. FAIR
- 3. GOOD

Statistical tools employed

- In this study,the data generated were statistically examined to obtain a representative meaningful analysis. All such analytical methods used are describe below:

- 1. Mean
- 2. Standard deviation
- 3. Variance
- 4. Chi-square test
- 5. Probability (p- value)

Result and Discussion

The present study was conducted on 103 patient,of which 10 patients were lost during follow-up .therefore all the result based on available 93 patients.

Table 1: Shows the sex distribution

	Male	Female	Total
Patients	80	13	93

Table 2: Shows the age distribution

Age (yrs)	5-30	31-50	51- 60	Mean age
Patients no.	15	60	18	39.907

Age distribution

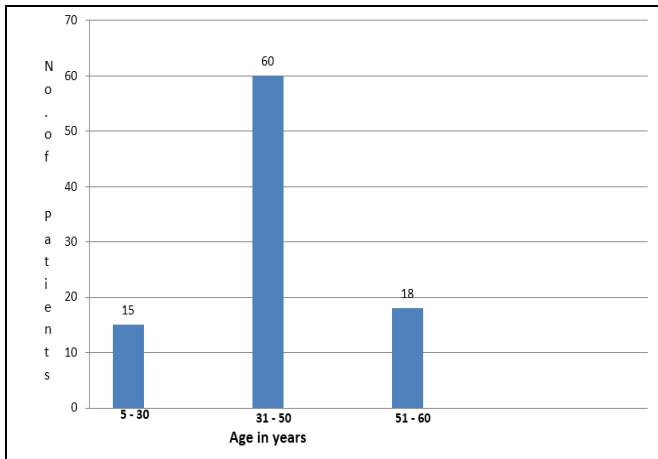


Fig 1

There were fifteen patients in the age group of 5 - 30 years, sixty patients in the age group of 31 – 50 years and eighteen patients in the age group of 51 – 60 years. The mean age was 39.907 years

Table 3: Number of patient & male/female patients in each group .after excluding the patients lost to follow up. The final number in each technique has been shown.

	Total	Male/female	Lost	Final total
Tech.1	35	30/5	4	31
Tech.2	30	25/5	4	26
Tech.3	30	27/3	2	28
Tech.4	08	8/0	0	08
Total	103		10	93

In technique 1 there were thirty five patients out of which thirty were male and five were female. Four patients were lost to follow up. So, finally, this study was conducted on the remaining thirty one patients.

In technique 2 there were thirty patients out of which twenty five were male and five were female. Four patients were lost to follow up so finally this study was conducted on the remaining twenty six patients.

In technique 3 there were thirty patients out of which twenty seven were male and three were female. Two patients were lost to follow up so finally this study was conducted on the remaining twenty eight patients.

In technique 4 there were eight patients all of which were males. No patients were lost to follow up so this study was conducted on the eight patients.

The allotment of technique was based on amount and pattern of injury and on individual finger. So we divided all cases into four groups .there was no differentiation on the basis of sex.

Tech.1-Primary closure group

Tech.2-Skin grafting group

Tech.3-Local flap group

Tech.4-Distant flap group

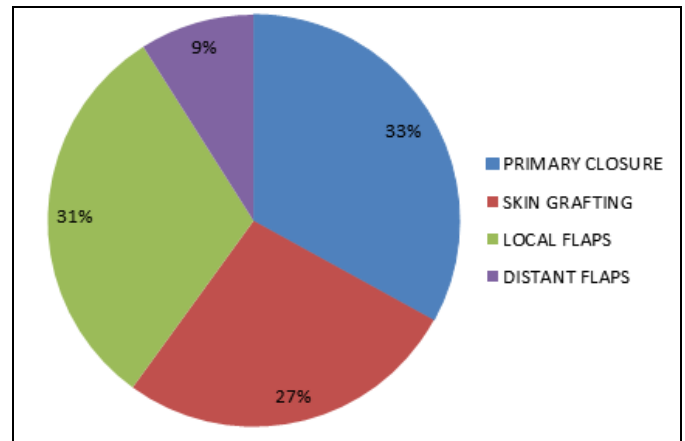


Fig 2

The pie chart above shows the distribution of patients to various treatment groups based on the injury assessment ie mode, amount and pattern of injury.

Post-operative infection

Table 4: shows the post op infection associated with the various techniques

Technique	Total patient	Post op infection
1	31	4
2	26	2
3	28	3
4	8	1

In technique 1, infection occurred in 4 out of 31 patients, in technique 2, 2 out of 26 patient had infection, in technique 3, 3 out of 28 patient had infection and in technique 4, 1 out of 8 patient had infection.

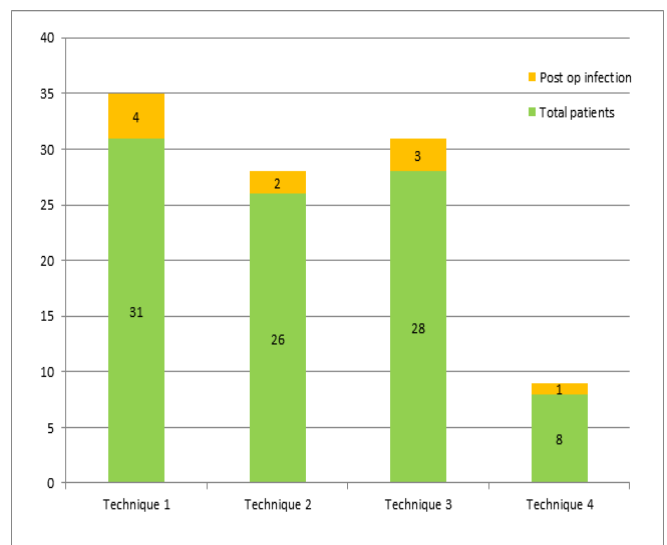


Fig 3: Graphical representation of post operative infection in the study group associated with the various techniques

Table 5: This shows our all excellent/good results regarding assessment criterias at 6 months are summarized in the following table.

Technique	Tip Tenderness	Tip Sensation	Stiffness	Tip Colour	Cosmesis (Aesthetic Look)	Overall Function
1	21(68%)	21(68%)	28(90%)	26(84%)	21(68%)	75.6%
2	22(85%)	20(77%)	24(92%)	20(77%)	20(77%)	81.6%
3	26(93%)	22(79%)	22(79%)	22(79%)	21(75%)	81%
4	5(63%)	6(75%)	5(63%)	5(63%)	5(63%)	65.4%
P-Value	4.8845	8.3495	2.4817	5.4805	10.0910	
Significance	Significant	Insignificant	Significant	Significant	Insignificant	

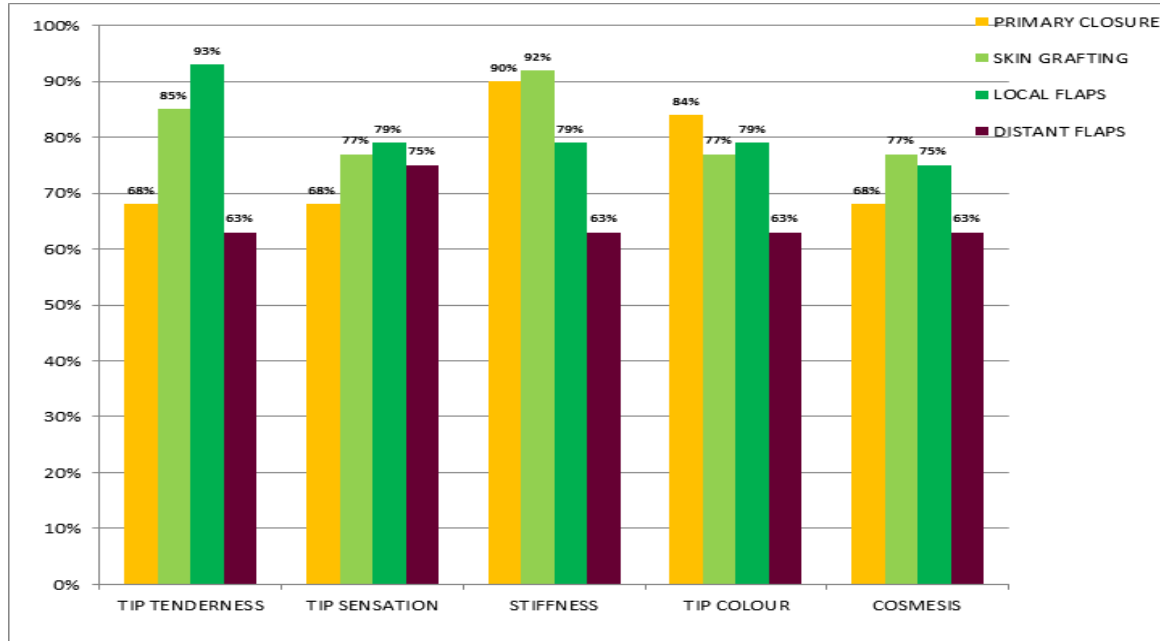


Fig 4

In this study a total of 103 patients were included out of which 10 were lost to follow up so all results are based on the remaining 93 patients. As discussed earlier all patients were divided into four groups i.e. conservative /primary closure group, skin grafting group, local /homodigital flap group and distant flap group. Number of patients lost to follow up was 4, 4 and 2 for group 1, group 2 and group3 respectively.

In group 1 mean age of patients was 37.22 yrs; in group 2 it was 42.2 yrs; in group 3 mean was 41.2 yrs; in group 4 it was 39 yrs. With this data it is very clear that there was a wide range of age in all the above mentioned groups, particularly in group 1 i.e. primary closure and conservative group.

The conservative approach was opted for as a standard management protocol in all children as a group.

TIP Tenderness

In our study we found that a total of seventy four patients had good and excellent relief of tip tenderness after 6 month of having the definitive surgery done .Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was eighty five, ninety three and sixty three respectively. These results were tested for statistical significance by evaluating the P value. The P value is 4.885 Which is lower than the tabulated value so this is significant.

In our study maximum relief in tenderness was in group 3 i.e. local / homodigital flap group. Similar results were seen in a study conducted by, Atasoy¹² and Kutler ⁷ who did lateral advancement and V-Y plasty respectively.

TIP Sensation

In our study we found that a total of sixty nine patients had good and excellent result as far as tip sensation is concerned, 6 month post operatively from the date of definitive surgery. Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy nine and seventy five respectively. These results were tested for statistical significance by evaluating the P value. The P value is 8.3495. Which is higher than the tabulated value means this is insignificant.

In our study the maximum relief in in tip sensation was found in local /homodigital flap this study produces similar result as study of Floyd Bralliar ^[13, 14, 15, 16, 17] and ROBERT HORNER.

Stiffness of DIP

In our study we found that a total of seventy nine patients had good and excellent result as far as stiffness is concerned. After 6 month post operatively. Ninety percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was ninety two, seventy nine and sixty three respectively. These results were tested for statistical significance by evaluating the P value. The P value is 2.4817 Which is significant.

TIP Colour

In our study, we found that a total of seventy three patients had good and excellent result as far as colour of tip is concerned after 6 month post operatively. Eighty four percent

of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy nine and sixty three respectively. These results were tested for statistical significance by evaluating the P value. The P value is 5.4809, which is significant. So it was appreciated that poorest result was in group 4 and good in group, which was supported by study of Martinc, Gonzalez [19].

Cosmesis (Aesthetic Look)

In our study we found that a total of sixty seven patients had good and excellent result as far as cosmesis is concern after 6 month post operatively. Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy five and sixty three respectively. These results were tested for statistical significance by evaluating the P value. The P value is 10.0910. Which is insignificant. So it was appreciated that the poorest result was in group 4 and best in group 2 which is supported by the study of Lin CH [20].

Infection

In our study there were 10 post operative infections, There were 4, 2, 3 and 1 patient, in group 1, group 2, group 3 and group 4 respectively. All the infections were controlled by intravenous antibiotic

Graft Rejection In group 2, i.e. skin grafting group, there was 1 graft rejection in partial thickness and 1 in full thickness graft group .Repeat procedure done with good and excellent results respectively.



Fig 5: Pre operative



Fig 6: Flap placed and secured



Fig 7: 3 months post-operative

Conclusion

In this study a total of 103 patients were included out of which 10 were lost to follow up so all results are based on the remaining 93 patients. As discussed earlier all patients were divided into four groups i.e. conservative /primary closure group, skin grafting group, local / homodigital flap group and distant flap group. Number of patients lost to follow up was 4, 4 and 2 for group 1, group 2 and group3 respectively.

Regarding tip tenderness we found that a total of seventy four patients had good and excellent relief of tip tenderness after 6 month of having the definitive surgery done .Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was eighty five, ninety three and sixty three respectively.

For tip sensation we found that a total of sixty nine patients had good and excellent result as far as tip sensation is concerned, 6 month post operatively from the date of definitive surgery. Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy nine and seventy five respectively.

In DIP joint found that a total of seventy nine patients had good and excellent result as far as stiffness is concerned. After 6 month post operatively. Ninety percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was ninety two, seventy nine and sixty three respectively.

Regarding tip colour, we found that a total of seventy three patients had good and excellent result, after 6 month post operatively. Eighty four percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy nine and sixty three respectively.

In our study we found that a total of sixty seven patients had good and excellent result as far as cosmesis is concern after 6 month post operatively. Sixty eight percent of patients of the first group experienced relief of tip tenderness after definitive surgery. For groups two, three and four the percentage of patients experiencing relief of tip tenderness was seventy seven, seventy five and sixty three respectively

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