Conservative Management Versus Full Thickness Skin Grafting in Treating Finger Tip Injuries without Bone Exposure

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ABSTRACT

Traumatic amputation of the tip of the finger is a common injury both in domestic and industrial settings and is the most common injury seen in upper extremity. Since the treatment of finger tip injury is still controversial, several options for the management of this type of injury are available. These options include surgical and conservative management. The main aim of these options is coverage and retaining sensation of the finger tip. If the fingertip wound cannot be repaired primarily and no bone is exposed, conservative treatment or skin grafting is usually considered. Sixty six fingers in 58 patients are included in this study. Thirty four finger tips were allocated to group 1 (conservative management) and 32 to group 2 (full thickness skin grafting). Two point discrimination test was conducted after 12 months for the treated finger and the same contralateral digit. The incidence of infection, joint stiffness, cold intolerance and hypersensitivity was also noted. Cosmetic outcome and time to complete healing were also noted. The result of the present study concluded that despite longer time required for healing the sensory recovery and cosmetic outcome using conservative management is much better than that achieved with full thickness skin graft and there is no statistical difference in the incidence of cold intolerance or hypersensitivity between the two methods of treatment after 12 months.

Key words: Fingertip injuries- sensation- conservative management- skin graft.

INTRODUCTION

Traumatic amputation of the tip of the finger is a common injury both in domestic and industrial settings (1). Finger tip amputation is the most common type of amputation injury in the upper extremity (2). The finger tip is defined as the portion of the finger distal to the plane of the major dorsal and volar skin creases at the distal interphalangeal joint (3).

The treatment of finger tip amputations is controversial and so, many treatment options are available. These treatment options are either conservative management or surgical treatment. The main aim of these treatment options is to keep functional impairment to a minimum and maintain acceptable cosmetic outcome. Of course regaining sensation at the finger tip is the most important aspect of maintaining function in finger tip injury.

This study was conducted to compare conservative management versus full thickness skin grafting in finger tip injuries without bone exposure.

PATIENTS & METHODS

Sixty six finger tip injuries in 58 patients (8 patients had 2 finger tips injured) were included in the study. Smokers, patients with peripheral neuropathy and diabetics were excluded from the study. Patients with bone exposure or other associate hand injury were also excluded. On admission, adequate history taking, thorough physical examination and X-rays were taken to exclude associated hand injury. 34 finger tips were allocated to group 1 (conservative management) and 32 to group 2 (full thickness skin grafting). Two point discrimination test was conducted 12 months post injury for both the treated finger and the same finger in the opposite hand. The incidence of infection, joint stiffness, cold intolerance, hypersensitivity and time to complete healing were also noted. The cosmetic outcome was evaluated as either good or poor outcome by the treating doctor, another doctor and the patient himself. Data was expressed as mean ± standard deviation (SD) or number (%). Comparison between the numerical data of two groups was performed using unpaired t test while Chi square test was used to compare categorical
data. SPSS computer program (version 14 windows) was used for data analysis. P values ≤ 0.05 was considered significant.

Conservative management (group 1):
Adequate wound debridement is done under regional ring block anesthesia, following that the wound is dressed with Vaseline impregnated gauze with fusidic acid. The finger is covered with the cut finger end of a sterile surgical glove for 48 hours. The patients are followed up in the out patient clinic and dressing is changed every 48 hours in the 1st week and twice weekly after that until healing occurs. Patients start wide range of early motion exercise from first day post injury.

Full thickness skin grafting (group 2):
Under regional ring anesthesia, adequate wound debridement is done. A full thickness graft is obtained from the groin under local anesthesia. The graft is fixed in place using absorbable vicryl 4-0 sutures and a tie over is applied. The tie over is removed after 6 days. Dressing change is done every 48 hours for 4 days; this is followed by motion exercises.

RESULTS

66 finger tip injuries in 58 patients (8 patients had 2 finger tips injured) were included in the study. 40 patients were injuries due to industrial accidents and 18 injuries domestic accidents. 44 patients were males (75.9 %) and 14 were females (24.1 %), male to female ratio were 3.14: 1. The mean age of the patients at the initial presentations was 36.1± 8.75 years (range 19-55 years) (table 1). Smokers, diabetics, patients with peripheral neuropathy, finger tip injuries with exposed bones and associated hand injuries were excluded from the study. 34 injured finger tips were treated using conservative management (group 1) and 32 were treated using full thickness skin graft (group 2). Three grafts were lost in group 2 so they were excluded from the study leaving only 29 cases for evaluation in this group.

Table 1: Patients data.

<table>
<thead>
<tr>
<th>Patients’ Data</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ No of patients:</td>
<td>58 (100 %)</td>
</tr>
<tr>
<td>♦ Etiology:</td>
<td></td>
</tr>
<tr>
<td>▪ Industrial accident</td>
<td>40(69%)</td>
</tr>
<tr>
<td>▪ Domestic accident</td>
<td>18 (31%)</td>
</tr>
<tr>
<td>♦ Age (years):</td>
<td></td>
</tr>
<tr>
<td>▪ Mean ± SD</td>
<td>36.1± 8.75</td>
</tr>
<tr>
<td>▪ Range</td>
<td>19-55</td>
</tr>
<tr>
<td>♦ Sex:</td>
<td></td>
</tr>
<tr>
<td>▪ Male</td>
<td>44 (75.9 %)</td>
</tr>
<tr>
<td>▪ Female</td>
<td>14 (24.1%)</td>
</tr>
</tbody>
</table>

Conservative treatment (group 1) :
34 finger tip injury were treated using this method. After adequate debridement, the mean surface area of the defect was 1.6 cm2 (range 0.5-2.2 cm2). The mean number of dressing changes was9.8 (range 6-14) and the mean time to healing was 29 days (range 21 to 45 days). No infection in any finger occurred during the period of treatment.

Two-point discrimination was measured 12 months post injury for both the treated and the same contralateral digit (same finger in the opposite hand). There was a mean increase in the two-point discrimination distance from 2.15±0.29 mm in the contralateral normal digit to 3.03±0.63mm in the affected digit (table 2). Cold intolerance was detected in 9 fingers (26.5%) after 3 months and only in 2 fingers (5.9%) after 12 months. Hypersensitivity was noticed in 12 fingers (35.3%) after 3 months. After 12 months no hypersensitivity was noticed in any finger (table 3). No joint stiffness was observed in any finger. Good cosmetic outcome was reported in 26 fingers (76.47 %). The result is shown in figure 1.

Full thickness skin grafting (group2):
32 fingers were treated using this method. After adequate debride
The area of the defect was 1.5 cm² (range 0.6-2.1 cm²). Three grafts were lost from this group and hence excluded from the study. The mean time to complete healing was 10 days (range 6 to 12 days).

The sensory recovery was evaluated in the same way as group 1. Two-point discrimination tests were done at 12 months post-operatively for both the treated and the same contralateral digit. There was a mean increase in the two-point discrimination distance from 2.26 ± 0.34 mm in the contralateral normal digit to 7.88 ± 0.78 mm in the affected digit (table 2). Cold intolerance was observed in 8 fingers (27.6%) after 3 months and in 2 fingers (6.9%) after 12 months. Hypersensitivity was not noticed in any of the fingers after 3 or 12 months (table 3). Joint stiffness did not occur in any of the fingers. Good cosmetic outcome was reported in 8 fingers (27.59%). The result is shown in figure 1.

**Table 2:** Mean two point discrimination in the two studied groups.

<table>
<thead>
<tr>
<th></th>
<th>Conservative management (n=34)</th>
<th>Full thickness skin graft (n=29)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contralateral same finger</td>
<td>2.15 ± 0.29</td>
<td>2.26 ± 0.34</td>
<td>NS</td>
</tr>
<tr>
<td>Treated finger</td>
<td>3.03 ± 0.63</td>
<td>7.88 ± 0.78</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Data were expressed as mean ± SD.
NS = not significant; p< 0.05 = significant.

**Table 3:** Complications [n (%)] in the two studied groups.

<table>
<thead>
<tr>
<th>Complications</th>
<th>3 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conservative</td>
<td>Full thickness</td>
</tr>
<tr>
<td>Cold intolerance</td>
<td>9/34 (26.5%)</td>
<td>8/29 (27.6%)</td>
</tr>
<tr>
<td>Hypersensitivity</td>
<td>12/34 (35.3%)</td>
<td>0 (0%)*</td>
</tr>
</tbody>
</table>

*p< 0.05 relative to conservative management.

Fig. 1: Fingertip injury after conservative management (a) and fingertip injury after full thickness graft (b)
DISCUSSION

Since the treatment of finger tip injury is still controversial, several options for the management of this type of injury are available. These options include surgical and conservative management. Surgical treatment for finger tip injury includes a plethora of options that have been developed over years. Among these options are V-Y flaps with its modifications\(^{4-10}\), homodigital island flap\(^{10,11}\), heterodigital island flap\(^{12}\) and full thickness skin grafting which, in absence of exposed bones, is frequently used for defect coverage due to relative ease of the procedure. Treatment of fingertip injuries must be individualized to the patient’s age, sex, configuration and composition of defect, digit injured, hand dominance, pre-existing medical conditions, occupation, hobbies, and mechanism of injury.\(^{14}\) The fingertip wound should be assessed for tissue loss. If there is minimal tissue loss the wound can be debrided and closed primarily. If the fingertip wound cannot be repaired primarily and no bone is exposed, open treatment or skin grafting should be considered.

The main aim in management of hand injuries is reduction of functional impairment and maintaining good cosmetic outcome. Of course, in case of finger tip injury, this functional impairment would be sensory loss. Sensory recovery with conventional flaps leads to unsatisfactory results in a majority of patients: an average of 6-mm to 8-mm two point discrimination is reported by most authors.\(^{15-18}\) Neurosensory flaps obtain good results regarding sensory recovery; however they require special surgical experience.

Conservative management aims at wound healing by secondary intention which is caused by contraction and epithelization of the scar tissue and surrounding dermis that effectively reduce the subsequent size of the wound.\(^{19-25}\) Conservative treatment plays a significant role in the management of finger tip injuries, as was documented by Farrell\(^{23}\) and later by Allen\(^{24}\) and S.P. Chow\(^{25}\). Buckley et al. 1999\(^{26}\) studied the conservative management of finger tip injuries. They reported excellent results with a mean two point discrimination test 4.11mm twelve months post operatively. A prospective study of seven treatment methods used on 200 fingertip injuries showed that simple dressings gave excellent results if the lengthy time to healing was taken into account.\(^{27}\) Mennen and Wise\(^{28}\) in a series of 200 finger tip injuries found a healing time ranging from 20 to 30 days and good functional recovery (two point discrimination test after 3 months after healing averaged 2.5 mm indicating near normal sensitivity recovery. The same conclusion was reached by Lee et al.\(^{28}\).

Although some authors believe that the size of the wound is important and place size limitations on wounds that can be treated conservatively\(^{29}\), several studies showed that the size, location and involved structures are not critically significant factors in the conservative management of finger tip injuries.\(^{30,28}\) and some other authors even go further to the use of conservative treatment in fingertip injuries with small amount of exposed bone that can be cut below the level of surrounding tissue.\(^{30,31}\).

Finger tip injuries left to heal by secondary intention do so by the process of granulation, wound contraction and epithelialization. Granulation tissue seems actually to replace lost tissue volume while contraction pulls normally innervated skin over the defect resulting in near normal sensation and reducing the ultimate size of the scar and the newly formed epithelium is relatively normal.\(^{32}\) On the contrary, the reinervation of human glabrous skin autografts was investigated by Haro et al in biopsy specimens obtained four weeks to 15 months after transplantation. The grafted skin was taken from the volar aspect of the wrist and transplanted to the fingers. Immunohistochemical studies concluded that reinervation of human skin autografts is far from normal, and that sensory corpuscles were not able to regenerate in grafted human glabrous skin, at least during the times studied.\(^{33}\)

The results of our study confirm the opinion of previous authors. In the group treated conservatively, there was a mean increase in two point discrimination from 2.15 ± 0.29 mm in the contralateral normal digit to 3.03 ± 0.63mm in the treated digit. However in group 2 (group treated with full thickness skin grafting) there was a mean increase in two point discrimination from 2.26 ± 0.34 mm in the contralateral normal digit to 7.88 ± 0.78 mm in the treated digit. Although there was no statistically
significant difference in the mean two point discrimination of the contralateral same uninjured digit (control) between the two groups, the difference in the mean two point discrimination test between the treated fingers in both groups is statistically significant (table 2). This shows that conservative treatment is superior to full thickness skin grafting regarding sensory recovery.

Complications associated with conservative management are usually minor and improve with time\(^{32,35}\). Drawbacks of conservative management include cold intolerance and hypersensitivity. Goitz et al\(^{(19)}\) noticed that cold intolerance occurs in 1/3 of conservatively treated patients, however this cold intolerance often decreases with time. Cold intolerance is a consequence of the injury itself\(^{32}\) and higher incidence of cold intolerance is noted with other methods of closure\(^{36-39}\). Hypersensitivity can also occur but is usually transient. Patients with remaining hypersensitivity usually benefit from desensitization programs\(^{40}\). Joint stiffness is also reported with conservative management\(^{41}\); however this can be easily prevented by early range of motion exercise\(^{32}\).

In our study, after 3 months, cold intolerance was noticed in 9 fingers in the conservatively treated group (26.5%) and in 8 fingers in the second group (27.6%). After 12 months cold intolerance was noticed in 2 fingers (5.9%) in the conservatively treated group and in 2 fingers (6.9%) in the second group. The results were statistically insignificant both at 3 and 12 months. Hypersensitivity (perceiving previously non painful stimuli as painful stimuli) developed in 12 fingers in the conservatively treated group (35.3%) after 3 months. No patient complained of a hypersensitive finger after 12 months. The difference between the two groups was not statistically significant after 12 months.

Conclusion

Conservative treatment using repeated dressings is an effective, simple and good option for treatment of fingertip injuries without bone exposure. Despite longer healing time, the sensory recovery and cosmetic outcome using this technique is much better than that achieved with full thickness skin graft. There is no statistical difference in the incidence of cold intolerance or hypersensitivity between the two methods of treatment.

REFERENCES


