Hypothenar skin grafts for fingertip reconstruction

Full-thickness skin grafts from the hypothenar area were used to reconstruct 25 digits in a group of 20 patients. The results were evaluated objectively and subjectively at an average of 9.5 months after operation for sensibility, durability, and appearance. Eighty-six percent of the patients had two-point discrimination of 10 mm or less, with one half of them having two-point discrimination of less than 6 mm. All patients had good protective coverage and no ulcer formation. All patients could differentiate between coarse and smooth texture, although only one third had texture discrimination equal to that of normal digits. None of the patients complained of hypersensitivity. The donor site was cosmetically acceptable in all cases. The use of hypothenar full-thickness grafts provides an acceptable method for fingertip reconstruction, particularly in instances of palmar and lateral pulp loss in which there is insufficient tissue available for local advancement.

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Fingertip amputations are common injuries in home and industrial accidents. The aim of treatment should be to provide early closure of the wound, rapid healing, and stable skin coverage with good sensibility, function, and appearance.

This report describes the technique of using a full-thickness skin graft from the hypothenar area as a convenient and reliable method for fingertip reconstruction. This technique is evaluated by objective measurements of light touch, two-point discrimination, texture discrimination, and the Moberg pick-up test for dexterity, as well as by subjective evaluation of hypersensitivity and appearance.

Technique

After wrist or axillary block anesthesia has been induced, any projecting bone is rongeured to a level slightly shorter than that of the surrounding soft tissue. An appropriate area of skin is elliptically outlined over the hypothenar area (Figs. 1 and 2). In an adult the hypothenar area can provide, if needed, skin that measures 2 cm in width by 6 cm or more in length. The skin is taken as a full-thickness skin graft, leaving behind as much fat and subcutaneous tissue as possible. The graft is completely defatted by draping the inverted graft over the surgeon's index finger, with use of the convexity of a pair of slightly curved scissors. The graft is tailored to match the area of skin loss and sutured in place with silk sutures (Fig. 3). These sutures are left long and are tied over a bolus dressing. The finger is further protected by a sterile dressing and a padded aluminum splint. If the injury is confined to the distal phalangeal level, the proximal interphalangeal joint...
The full-thickness skin graft has been obtained. The donor site is closed without the need for undermining.

**Patient data**

<table>
<thead>
<tr>
<th>Sensation quality</th>
<th>Two-point discrimination</th>
<th>Digits</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>6 mm or less</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Fair</td>
<td>Between 7 and 10 mm</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Protective</td>
<td>One point perceived</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
<td>100</td>
</tr>
</tbody>
</table>

The donor site is closed, without undermining of skin edges, with 3-0 nylon interrupted sutures. The bolus dressing is removed after 10 days and the donor area sutures are removed at 3 weeks.

**Material and methods**

Twenty patients with 25 fingertip injuries who were treated by full-thickness hypothenar skin grafts were evaluated at an average follow-up period of 9.5 months. The average age of the patients was 42.4 years (range 12 to 62 years). The injuries involved four thumbs, eight index fingers, seven long fingers, and six ring fingers. All but three patients injured their fingers at their jobs. Fifteen patients had some element of crush as the mechanism of injury. At follow-up evaluation the average area of skin graft was 12 by 16 mm. Injuries were made regarding age, mechanism, and relationship of the injury to the job. The patients were asked about hypersensitivity of the fingertips and the donor area to touch and cold. They were also asked to grade the hypersensitivity as mild, moderate, or severe. The appearance of the fingertip and grafted skin was assessed on a scale of 0 to 5, with 5 being the score if grafted skin matched exactly with surrounding skin and the patient was very satisfied with the appearance. The score was 0 when the graft looked markedly different and the patient was greatly displeased with the appearance. Scores of 4 to 5 were rated as good, 3 as acceptable, and less than 3 as poor. Skin coverage was also evaluated for durability and for development of any ulcer caused by pressure from either use or bone prominence underneath the graft. The following objective measurements were made: (1) light touch, (2) two-point discrimination, (3) texture discrimination, and (4) the Moberg pick-up test for dexterity.

Light touch was tested by touching the finger with a wisp of cotton while the patient's eyes were closed. The number of responses to five stimulations was recorded and compared with responses of normal fingers of the other hand. If the difference between the normal counterpart and the injured finger was more than two responses, the finger was recorded as having poor light touch sensibility.

Calipers applied in the longitudinal axis of the digit were used in the two-point discrimination test. The dis-
No attempt was made to compare other methods of skin grafting because several years ago we became satisfied with the results of this technique that it became the preferred method in our adult patients.

The Moberg pick-up test for dexterity, which uses the number of small objects as a functional test, was used to compare the dexterity of the injured hand with that of the normal hand. The patient was asked to use the thumb and the injured finger. The time taken to complete the test with the injured hand was compared with the time taken for similar use of the normal hand. Finally, the time lost from work was recorded.

Results

All patients had well-padded, stable coverage over the tips of the injured fingers, and there was no incidence of ulcer formation caused by pressure from the fingers or prominence of bone underneath.

In assessment of appearance, 23 digits received a score of 4 or 5 (good) and three digits received a score of 3 (acceptable). None of the digits were scored as having a poor appearance (Figs. 4 and 5). The scar on the donor site on the ulnar border of the hand was always cosmetically acceptable (Fig. 6).

When tested for light touch, three patients stated that the stimuli were normal, and all but one patient could feel the same number of light touch stimuli as with the normal fingers of the uninjured hand. In four digits the healed area was too small to assess two-point discrimination properly. Two-point discrimination of less than 6 mm was present in 18 of the remaining 21 digits (86%) (Table I). Nine of these digits (43%) were found to have normal sensibility, with two-point discrimination of less than 6 mm. In three fingers the two-point discrimination was judged to be only protective in quality.

Texture discrimination evaluation revealed that all digits had the ability to differentiate between very coarse and smooth surfaces. In eight digits (32%) texture discrimination was identical to that of comparable digits of the uninjured hand. Only two digits with hypothenar grafts had poor texture discrimination.

As measured by the Moberg pick-up test, there was no loss of dexterity in the majority of cases. There were only two instances of a 5-second or greater difference between the normal and injured hands in the time taken to accomplish the test.

None of the patients with a follow-up of more than 1 year complained of hypersensitivity to touch, although nine patients followed less than 1 year complained of mild (and one of moderate) hypersensitivity to touch. Eleven patients had hypersensitivity to cold; it was mild in seven patients and moderate in four. Three patients had cold hypersensitivity severe enough to interfere
with their work in cold environments. Two patients complained of mild hypersensitivity over the donor area, although one of them had mild discomfort only when playing racquetball. The average time lost from work was 39 days, an acceptable time period in that 17 patients (56%) were injured on the job in occupations that required full, strong use of their hands.

Discussion

The aim of fingertip reconstruction is to provide stable, painless, well-padded skin coverage with adequate sensory function and acceptable appearance. Skin of the palm or sole differs from hair-bearing skin of the rest of the body in several ways. For instance, palmar skin has a thick epidermis with a particularly thick layer of keratin on its outer surface. Pigment cells containing melanin are few in number, and the sebaceous glands are absent. In addition, connective tissue is more compact and therefore less elastic. These characteristics allow greater resistance to pressure, friction, and trauma. Replacement of this specialized skin ideally would be by skin of nearly identical characteristics, and grafts from the hypothenar area provide skin with these qualities and appearance. Moreover, as Napier pointed out, the quality of return of sensibility in the grafted area depends partly on the nature of the grafted skin. The pattern of nerve plexus just below the basal layer of the epidermis is largely responsible for the extent and quality of its reinnervation. In our group of patients, 86% achieved two-point discrimination of normal to fair, an excellent result believed to be due, at least in part, to the quality of the skin grafted.

Full-thickness skin from the plantar area has been used in the past. PALM or SOLE skin from the area radial to the thenar crease was reported recently, but it does have the potential disadvantage of scarring in the center of the palm. HYPOTHENAR skin grafts of split-thickness skin have been reported and may be widely used, although a report of hypothenar full-thickness skin grafts has largely been ignored. The authors of the last reference quoted used hypothenar skin mainly to correct unsatisfactory results of pigmentation and hypertrophic scars of grafts taken from other donor sites.

The skin from the ulnar border of the hand provides a readily available donor site within the same operative field for small skin defects in the hand. Although this objective can be achieved by use of other methods, each also has specific disadvantages. The thenar flap has been pointed out, it is unlikely to be successful. While the V-Y flap remains an excellent alternative in certain situations, the hypothenar full-thickness skin graft is more versatile and generally useful, particularly in injuries in which local skin is not suitable for covering skin defects and in other conditions such as division of syndactyly and the release of flexion contractures of the fingers.

Full-thickness skin grafts from the hypothenar area provide an excellent method for fingertip reconstruction, with good cosmetic and functional results.

REFERENCES


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