Acta orthop. scand. *49*, 255–259, 1978

V-Y PLASTY AS TREATMENT OF FINGER TIP AMPUTATIONS

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V-Y plasty was performed in 28 patients who suffered from a transverse amputation of the finger tip. Bilateral V-Y plasty was carried out in 16 cases and single volar V-Y plasty in 12 cases. The average follow-up period was 32 months. Six patients had postoperative complications, requiring reoperation in four patients. The follow-up results were satisfactory. The results showed that V-Y plasty is indicated in transverse amputations through the distal one-third to one-half of the nailbed, but only in patients to whom the length of the finger is of importance.

Key words: amputation; finger-tip; V-Y plasty

Accepted 24.i.78

Amputation of the finger tip is a minor injury, but it is important because of an often disproportionately long period of convalescence. Moreover, there is usually a high frequency of late sequelae such as a feeling of coldness, diminished or absent sensation, tenderness, deformed nail and joint stiffness.

In traumatic finger tip amputations the demands of a satisfactory treatment are:

1. The sensibility must be as normal as possible.
2. The stump must be non-tender.
3. The nail must not be an inconvenience.
4. The length of the finger should be maintained if possible.
5. The movements of the joints must be free.
6. The cosmetic result should be satisfactory.

If the bone is exposed by a transverse amputation of the finger tip, all these demands can best be met by a V-Y plasty, either bilateral or single volar. Late results of V-Y plasties have hardly ever been elucidated and therefore we think that our results might be of interest.

METHOD

Digital nerve block anaesthesia is used and a small Penrose drain is applied at the base of the finger as a tourniquet. All devitalized tissue is excised and the bone is smoothed.

Bilateral V-Y plasty (Kutler 1947): Two triangular flaps are developed by cutting only through the skin (Figure 1A).

The length of each side should be 6 to 8 mm. A skin hook is used to apply a gentle distal traction and by separating the fibrous band between the skin and bone with the tip of a small scissor (without damaging the neurovascular supply) the two flaps can be mobilized to cover the tip of the finger. The flaps are sutured together and to the remaining nail or nailbed (Figure 1B). Prior to closing the volar portion of the skin it is often necessary to remove some excess pulp.

Volar V-Y plasty (Atasoy et al. 1970): A triangular flap with a distal base is developed (Figure 2A). The width of the base should be the same as the amputated edge of the nail or nailbed, and the length should be a little longer than the width. The flap is mobilized as mentioned above, and sutured to the nail or nailbed (Figure 2B). Finally the volar gap is closed (Figure 2C).

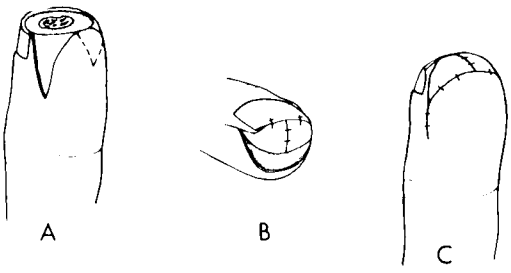

Figure 1. The operative procedure in a bilateral V-Y plasty (see text for details).

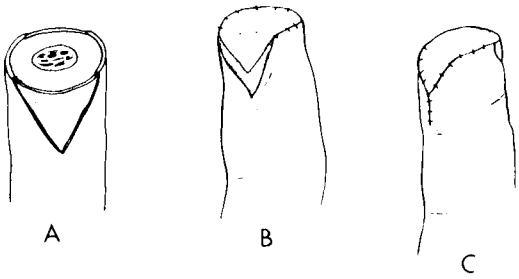

Figure 2. The operative procedure in a volar V-Y plasty (see text for details).

A petrolatum mesh and sterile gauze are applied to cover the stump. The finger is immobilized in a plaster of Paris cast and the hand is kept in a sling for a week.

PATIENTS

From January 1972 to December 1976, 28 patients were treated with a V-Y plasty after having sustained a transverse finger tip amputation with the bone exposed. There were 24 men, one woman and three children. The average age was 34 years, ranging from 2 years to 63 years. The amputations were in 16 cases caused by a sharp cutting instrument (planing machines, cutting machines, knives) and in 12 cases by a blunt injury (doors, chains, seesaws, circular saws). All except the children were treated as out-patients in digital nerve block anaesthesia. The operations were carried out by surgical house officers without special experience in hand surgery. The choice between the two types of V-Y plasty has rested on the discretion of the surgeon. Bilateral V-Y plasty was performed in 16 cases and volar V-Y plasty in 12 cases. All the patients had injured only a single finger. V-Y plasty was performed most often on the index (13 cases) and middle (9 cases) finger.

At the follow-up one patient had died and two patients refused to participate. One patient later had an exarticulation at the distal interphalangeal joint due to hypersensitivity of the stump and therefore has been excluded from the late results. The evaluation has been made from case records and a personal follow-up examination. The average follow-up period was 32 months, ranging from 6 months to 57 months. The time interval until healing and the postoperative complications were based on the case records. At the follow-up the patients were asked about the period of time off work and their subjective late sequelae. Tenderness was evaluated by palpation of the stump and by tapping the stump firmly on a table. Light touch was tested using cotton-wool.

RESULTS

Postoperative complications were seen in six patients. Five of these had infection, in four cases due to a total or partial flap necrosis. In one of these a small re-amputation was performed. After healing was established another patient was re-operated due to a very localized tenderness between the two flaps and the nail, and one patient had as mentioned an exarticulation in the distal interphalangeal joint due to hypersensitivity of the stump.

The time interval until healing occurred and the period of time off work are listed in Table 1. There was no difference between the two groups regarding age and occupation.

None of the stumps were tender to pressure, but firm tapping of the stump against a table showed tenderness in 58 per cent (Table 2). Light touch was present in all patients, but 71 per cent indicated that the feel of cotton-wool was slightly abnormal compared with this sensation on other fingers (Table 3). In seven patients (32 per cent) the nail was curved, and a straight normal nail was only seen in amputations through the distal third of the nailbed. All patients had free movements of the joints.

DISCUSSION

When an evaluation of the late results of finger tip injuries is to be made, one would like to base the conclusions on objective

findings. However, no objective measurements or tests are available for testing the small dermal areas in a V-Y plasty.

Using the two-point discrimination test abnormal values are often set at around 6 mm, but this is the same size as one side of the small triangular flaps in a bilateral V-Y plasty. Therefore, a two-point discrimination test would be meaningless in as much as it is often difficult to determine the borders of the flaps.

The ninhydrin test demonstrates the sudomotor function. The tactile gnosis varies directly with the sudomotor function except in skin grafts, which regain sudomotor function after a year or so (Moberg 1958). For this reason the ninhydrin test cannot be used for an objective evaluation of the late results.

As advocated by Moberg (1958) the picking-up test should be a fairly good test when applied to the thumb and the index finger and maybe the middle finger. At the follow-up examination this test was performed by all the patients (both with eyes open and blindfolded). The results have not

Table 1. Duration of treatment in 25 patients.

Type of V-Y plasty	Average period until healing	Average period off work
Bilateral	21 days (10–60)	61 days (14–180)
Volar	21 days (9–40)	29 days (14–47)
Total	21 days (9–60)	51 days (14–180)

Children and students omitted (no manual work).

Table 2. Subjective late sequelae at follow-up of 24 patients treated with V-Y plasty.

Type of V-Y plasty	Coldness	Tenderness on percussion	Difficulty in grasping small objects	Paraesthesia	Total
Bilateral	8 57 %	10 71 %	6 43 %	0 —	14
Volar	4 40 %	4 40 %	5 50 %	1 10 %	10
Total	12 50 %	14 58 %	11 46 %	1 4 %	24

Table 3. Objective late sequelae at follow-up of 24 patients treated with V-Y plasty.

Type of V-Y plasty	Light touch missing	Slight hypaesthesia or dysaesthesia	Unable to differentiate pin-prick and blunt	Curving of the nail	Total
Bilateral	0 —	10 71 %	0 —	4 31 %	14
Volar	0 —	7 70 %	0 —	3 33 %	10
	0 —	17 71 %	0 —	7 32 %	24

been listed in Table 3 as the patients often did not use the flap itself but an area immediately adjoining the flap.

For these reasons one is left with a mainly subjective basis upon which the evaluation of the late results has to rest.

In finger tip amputations the methods of repair include: (1) conservative treatment, (2) free skin grafting, (3) re-amputation, (4) local flaps and (5) pedicle flaps.

Conservative treatment should be the method of choice in finger tip amputations without exposed bone. Bojsen-Møller et al. (1961) found that conservative treatment gave a sensibility closer to normal and a better cosmetic result than free grafts. This was confirmed by Holm & Zachariae (1974), who furthermore found a higher frequency of skin trouble and abnormal mobility in those receiving free grafts compared to the conservatively treated group. In both series the period off work was a little longer in patients receiving free grafts than in those treated conservatively.

Free skin grafting should accordingly only have a minor place in the treatment of finger tip amputations. Rohleder (1960) compared the late results of split-skin grafts to full-thickness grafts. He found no difference regarding sensibility and tenderness; but the donor site on the forearm was very conspicuous in 50 per cent of cases after full-thickness grafting and only in 11 per cent after split-skin grafting.

Re-amputation with removal of sufficient bone to permit soft tissue and skin closure of the stump is probably the most frequently performed operation in finger tip amputations. It should be used when an oblique stump has a ventral or lateral flap to be swung around the stump to the opposite side (Kleinert 1959). The resulting finger tip should thus have good padding and good sensibility. However, the stump is often annoyingly tender. After re-amputation with primary closure Bojsen-Møller et al. (1961), Sturman & Duran (1963) and Holm & Zachariae (1974) found subjective tenderness of the stump in 36 per cent, 51 per cent and 42 per cent, respectively. Diminished sensation of touch was found in 17 to 24 per cent of the cases.

Local flaps: A bilateral V-Y plasty can be used in a transverse amputation of the finger tip and a volar V-Y plasty both in a transverse and an oblique dorsal amputation of the finger tip. V-Y plasties have been described by Kutler (1947), Fisher (1967), Atasoy et al. (1970), Freiberg & Manktelow (1972) and Weston & Wallace (1976); however, the results of a late follow-up have only been reported by Freiberg & Manktelow, who examined 10 patients in a series of 30 bilateral V-Y plasties. They found light touch to be present in all 10 patients and that 63 per cent (5/8) used the injured finger in precise tasks.

Atasoy et al. (1970) reported superficial flap necrosis in 4 per cent (2/56) of volar V-Y plasties, and Freiberg & Manktelow (1972) found postoperative complications such as flap necrosis and/or infection in 18 per cent (4/22) of bilateral V-Y plasties. In the present series there was no difference regarding postoperative complications and late results between the two types of V-Y plasties except that the average time off work was 8.7 weeks after a bilateral V-Y plasty compared with 4.1 weeks after a volar V-Y plasty (Table 1). The period of convalescence has not been registered in series of V-Y plasties reported earlier. Barclay (1956) found that the average period off work was 9 weeks following a free graft and 11.5 weeks following re-amputation. The same intervals were found by Brody et al. (1960) to be 5.1 weeks and 6.4 weeks, respectively.

The outcome of the nail is determined by the level of the amputation. A straight and normal nail can only be expected if the amputation is through the distal third of the nailbed.

Pedicle flaps, i.e., thenar flaps and cross finger flaps are only indicated in very oblique volar amputations of the finger tip with exposed bone. A free graft will either not heal or give a poor result and a re-amputation will

mean too much of the finger length will have to be sacrificed. However, pedicle flaps require a surgical expertise which only rarely will be available.

Neither thenar flaps nor cross finger flaps are followed by an acceptable degree of sensibility just as there often remains permanent residual joint stiffness (Brody et al. 1960, Miller 1974). Moreover the donor area often heals unsatisfactorily as reported by Miller (1974) who found that the donor site in the palm was either keloid and puckered or rough and prominent in 63 per cent of cases.

The result of the present study shows that a V-Y plasty is indicated in transverse amputations through the distal one-third to one-half of the nailbed when preserving the maximum length of the finger is important to the patient. However, the post-operative complications show that it is not an operation to be undertaken by beginners.

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