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Case Report

Case Report: Reverse Homodigital Dorsal Radial Flap for Distal Thumb Reconstruction

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Abstract

The retrograde flow flap carries multiples advantages including long vascular pedicle with wide arc of rotation. These flaps are thin, flexible , and have a durable nature. Furthermore donor site morbidity is reduced by limiting surgery to the same digit, it is a single stage procedure with a short recovery period allowing quick progression to rehabilitation. We present a 60 year-old gentleman had an electrical burn to his left hand with a deep injury to the radial side of distal phalanx of the thumb. The wound has been treated by the reverse homodigital dorsal radial flap that has been described by Moschella et al, patient had very good result, with good range of movement and function after a year postoperatively. Moschella flap is a very good choice to treat distal phalanx injury of the thumb.

Introduction

The concept and utility of a retrograde flow digital artery island flap using the anastomotic network between the two proper digital arteries was introduced by Weeks and Wray in 1973(1)(2). The retrograde flow flap carries multiples advantages including long vascular pedicle with wide arc of rotation. The flap size can be adjusted allowing , coverage of various sized defect. These flaps are thin, flexible, and have a durable nature. Furthermore donor site morbidity is reduced by limiting surgery to the same digit, it is a single stage procedure with a short recovery period allowing quick progression to rehabilitation. (2)

The thumb is very important structure in the function of the hand, a defect or loss of the function of the thumb reduces a lots the effectiveness and the use of the hand. Extensive loss of substances over the thumb with exposure of tendon and bone is a challenging problem. The skin graft has very limited role in the treatment because it would not work over the exposed tendon or bone and even if there is no exposure of these structures loss of sensation over the skin graft area makes this option at the end of the surgical option list. The surgical options including local, distal, retrograde or free flap.

Moschella et al (3), mentioned the constant presence of the dorsal radial digital artery and its constant connection with the palmar circuit permit the mobilization of a skin flap raised from the dorsal radial skin of the thumb. This flap allows coverage of a substantial loss of tissue at the tip of the thumb in a single procedure,

involving only one finger, with inconspicuous donor-site morbidity.

Observation

A 60 year-old gentleman presented to our service following electrical burn to his left hand with a deep injury to the radial side of distal phalanx of the thumb, and intermediate depth injury to the distal phalanx of his index finger and middle and distal phalanges of the middle finger (Fig.1).

Figure 1 : Preoperative

The wound of the index finger has been treated conservatively by dressing, while the middle finger has been treated by skin graft.

The wound of the thumb has been treated by the reverse homodigital dorsal radial flap that has been described by Moschella et al (3) (Fig.2)

Figure 2 : A week post operatively

Preoperatively Doppler identified the dorsal radial artery from radial border of thumb down to distal phalanx. A skin paddle was designed overlying the first metacarpal and a longitudinal incision on the radial side of the extensor mechanism to the thumb, stoping at the mid-point of proximal phalanx. The skin flaps were raised sub-dermally to avoid potential compromise of the pedicle, and to allow a cuff of soft tissue to better capture venous network to avoid congestion and provide better venous outflow. Following rotation of the flap to the defect the donor site was closed primarily. Dressing with vaseline gauze has been done. Postoperatively the patient has been discharged the same day. Hand therapy has been started two weeks postoperatively. At three months postoperatively review the patient had good functionality (Kapandji score 8), reaching 9 a year postoperatively. (Fig.3)

Figure 3A a year postoperatively

Figure 3B A year postoperatively

Discussion

As it needs to be quick and emergent as well as effective and succeeded functionally and aesthetically because of the importance of this vital structure in daily life for both sex, all age groups and various jobs not only the manual workers. Thumb reconstruction is a challenging task and treatment options include local, regional, distant, or free flaps to reconstruct the thumb.

The reverse homodigital dorsal radial flap of Moschella (3), is one of these options, it is a homodigital flap based on the dorsal radial artery which is arising from the radial artery at the level of snuffbox and it runs under the extensor policies brevis tendon. The artery communicates constantly with the palmar circuit at the level of middle third of proximal phalanx (3)(6). The major advantage is limitation of the site of surgery to one digit, limited donor-site morbidity and color match of the skin. This is eventually important in case of mutilating hand trauma which might involve the neighboring index finger, thus reducing the availability of the heterodigital donor site.

One of widely used flap now a day is mobilizing a flap from the dorsal surface of the index finger and pedicled on the first dorsal metacarpal artery and sensory branch of the radial nerve. These flaps give good functional results. The main disadvantages are involvement of two fingers, frequent hair growth on the dorsal skin of the index finger (which is less suitable for pulp reconstruction), and the morbidity associated with donor site reconstruction which is mostly skin graft which often leaves undesirable obvious scar. In addition to extensive digital or palmar dissection (3-5), which is not the case in Moschella flap.

Other option is the superficial palmar branch of radial artery flap (SUPBRA), which can be a free flap or pedicle flap. Iwuagwu et al (7) has described an antegrade SUPBRA flap, The flap was based on the entrance of the SUPBRA into palm at the distal wrist crease and tip of flap extending beyond distal palmar crease in palm. The flap was elevated and transposed over the defect with tip of flap reaching mid-distal phalanx of the thumb (7). The flap is a door option in palmar proximal injury of the thumb as the flap would not achieve the distal help of the distal phalanx with limiting value to reconstruct the sides and the dorsum of the thumb, however it has good tissue, texture and color match, reduced donor site morbidity, unrestricted mobility and uncomplicated wound care (7). The reverse SUPBRA flap can achieve more distal thumb defect in comparison with the antegrade flap however it would have some limitation to cover the dorsal side. Flap elevation began proximally with ligation of the SUPBRA just distal to the wrist crease. The flap once elevated was supplied

by reverse flow from the distal communications with the superficial palmar arch or anastomoses perforators in the first webspace. The flaps were rotated on these vessels at the base to reach the defect. Donor site can be closed primarily (8).

The cross- finger flap requires a staged approach and has some limitations, including a considerable period of immobilization, with the risk of subsequent joint stiffness.(3) Free flaps can be used, but this technique requires microsurgical experience, prolonged operation, and a high risk of total flap loss.

We didn't need to have a skin graft to cover the donor site , which is frequently the condition in most of the cases as by Moschella et al (3). We did a longitudinal incision on the radial side of the thumb, zigzag or lazy S incision are also a choice as by Marschella

Fortunately, we didn't experience complications, and the postoperative course was smooth and in correct steps. The hand therapy was important to improve the function and prevent any stiffness, particularly our patient was afraid moving his hand.

Conclusion

The reverse homodigital dorsal radial flap of the thumb that has been described by Moschella is a very useful and effective option in management of distal thumb injury, as it is single stage surgical procedure with ordinary instruments and no need to specific instruments or machines like the free flap with minimal morbidity of the donor site which is in the same digit and can be closed directly in most of the cases, and short recovery period.

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