The New Flap Based on the Longitudinal Fascial Branches of the Posterior Interosseous Artery

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Abstract

An island fasciocutaneous flap, based on the longitudinal fascial anastomotic vessels of septocutaneous branches of the posterior interosseous artery which lies along the forearm fascial septum between the extensor carpi ulnaris and the extensor digiti minimi is easier in harvesting and preserving the posterior interosseous artery.

Soft tissue reconstruction of the hand and wrist following serious hand injury represents a subtle balance between the profit of reconstructive procedure and donor site expense. The fasciocutaneous flap of the posterior interosseous artery which was described by Penteado et al (1986) and Costa and Soutar (1988) depends on the fascial plexus supplying the skin from the posterior interosseous vessels. The artery gives off septocutaneous branches which spread out on the deep fascia to form longitudinal fascial arcades(1). The distally based island fasciocutaneous flap supplied by longitudinal fascial anastomotic vessels is easier in harvesting and preserving the posterior interosseous artery.

Anatomy

The posterior interosseous artery originates from the common interosseous artery in 90 per cent and from the ulnar artery in 10 per cent. It passes between the chorda obliqua and the interosseous membrane and enters the posterior compartment of the forearm by passing between the supinator and abductor pollicis longus muscles which correspond approximately to the junction between the upper and middle thirds of the distance between the lateral epicondyle and the head of the ulna. Its course corresponds to a line drawn from the lateral humeral epicondyle to the head of the ulna and the line corresponds to the septum

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Fig. 1. Diagram shows pattern of longitudinal fascial anastomosis of septocutaneous branches of posterior interosseous artery.
PIA - Posterior interosseous artery
SC - Septocutaneous branches
LFA - Longitudinal fascial anastomosis of septocutaneous branches of posterior interosseous artery

between the extensor carpi ulnaris and the extensor digiti minimi muscles. The septum is in the frontal plane in the proximal half and in the sagittal plane in the distal half of the forearm. The artery is situated beneath the extensor digiti minimi in its proximal course and between the two muscles distally.

The posterior interosseous artery gives off septocutaneous branches which spread out on the deep fascia and all of these branches anastomose in the superficial layer of the deep fascia to form longitudinal anastomosis (Fig. 1). These longitudinal anastomotic vessels also have two venae comitantes.

The anastomoses between the posterior interosseous artery, the anterior interosseous artery and the dorsal carpal network were located in 98.6 per cent[2]. The longitudinal anastomotic vessels also have vascular connection to the posterior interosseous artery and the anastomoses so that the distally based island posterior interosseous flap appears to have a reliable vascular basis on these anastomoses.

Operative technique

The line drawn between the lateral epicondyle and the ulnar head, with the forearm in full pronation, is the outlined incision. At the level of the ulnar head, the incision is deepened to the deep fascia in which the septum between the extensor carpi ulnaris and the extensor digiti minimi is identified and preserved. The dissection proceeds from distal to proximal up to the distal border of the designed skin flap. The longitudinal anastomotic vessels are identified and some septocutaneous branches are preserved for reliable distal retrograde vascular supply. The other septocutaneous branches are divided proximally up to the skin flap then the longitudinal anastomotic vessels are temporarily clamped proximal to the flap to assess vascular supply by retrograde flow. If abundant perfusion of the skin flap is approved after tournique is off, completed dissection of the fascio-cutaneous unit is performed. The islanded tissue can then be rotated through 180 degrees to cover the defect in the hand and wrist.

Case I

A 21 year old man sustained a severe crush-degloving injury over the ulnar aspect of the right hand. The wound was debrided and the third metacarpal fracture was fixed with cross K-wire (Fig. 2). The fourth and fifth rays were amputated and covered with bony exposed area and some granulated tissue (Fig. 3). The fascio-cutaneous flap was raised and based on the longitudinal fascial anastomotic vessels (Fig. 4). The defect was successfully covered (Fig. 5) and donor defect was also covered with split thickness skin graft.

Case II

A 29 year old woman sustained an open fracture of the second and third metacarpal with dorsal soft tissue loss at the fracture sites. The retrograde distally based on longitudinal fascial anatomotic vessels was raised to cover the defect. The donor area was covered with split thickness skin graft and the flap healed uneventfully (Fig. 6).

Fig. 2. Plain radiograph of the injured hand.

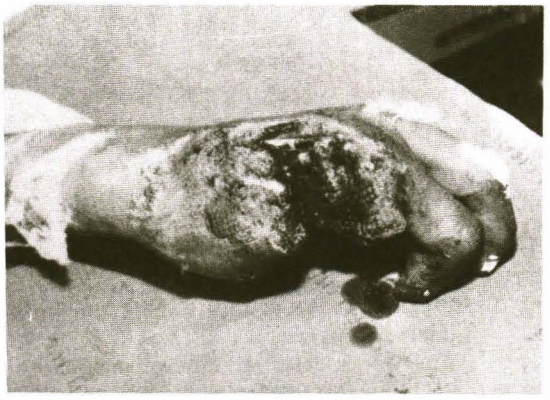

Fig. 3. There was a clean granulated wound with amputation of the fourth and fifth digit.

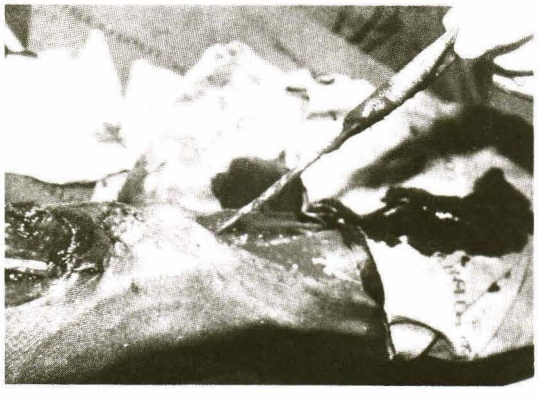

Fig. 4. The flap was based on longitudinal fascial anastomosis of posterior interosseous artery.

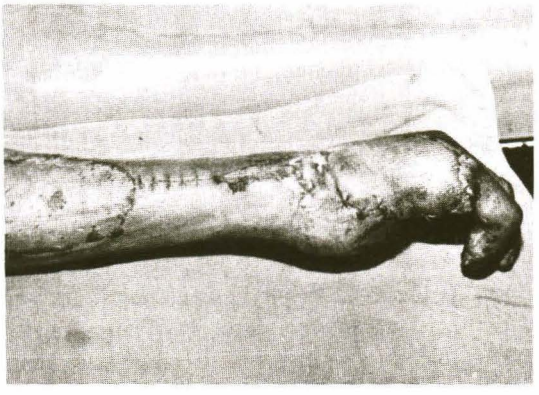

Fig. 5. The donor site defect was covered with split thickness skin graft and good flap coverage on ulnar aspect of the right hand.

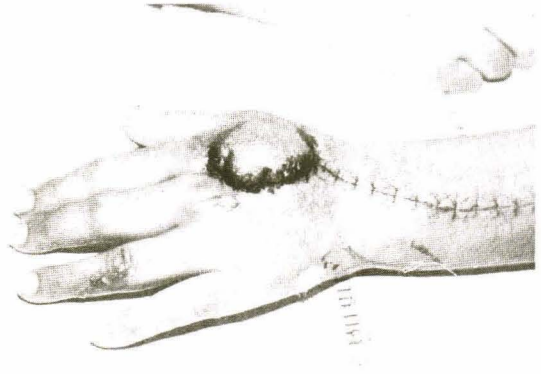

Fig. 6. The flap healed uneventfully. (Case II)

DISCUSSION

The anatomic basis of the fascio-cutaneous flap of the posterior interosseous artery was described by CV Penteado et al in 1986. The clinical applications of the posterior interoseous forearm flap in hand reconstruction were reported as distally based island fasciocutaneous flap[3] and a vascularised bone segment of the upper third of the ulna for thumb reconstruction[3]. Direct closure or skin graft at the donor area was successfully performed in clinical cases[1]. Another advantage is the nearly constant distal anastomosis between the anterior interosseous artery, dorsal carpal network and posterior interosseous artery[2]. The skin

which can be perfused by cutaneous branches of the posteior interosseous artery include almost the entire dorsal forearm skin, extending from the subcutaneous border of the ulna around to the radial dorsum of the forearm and from 4 cm below the interepicondylar line to the wrist[1]. Preserved major arterial supply to the hand is also a well known advantage compared to both radial and ulnar forearm flaps.

The disadvantage of the posterior interosseous artery flap is the small diameter of the artery which is 1.7 mm in diameter and a large number of cutaneous branches in its course. Another disadvantage is the deep branch of the radial nerve which is situated on the lateral side of the posterior interosseous artery[2]. Difficulty in delicate and steady dissection requires a length of time in dealing with the posterior interosseous artery flap.

The longitudinal fascial anastomosis is more superficial and not closely related to the deep branch of the radial nerve which is easier and faster in dissecting the flap. Untouched major arteries if microvascular transfer is required later or in case of one artery forearm, the flap based on longitudinal fascial anastomosis can offer a reliable blood supply to the skin of the posterior aspect of the forearm.

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การย้ายเนื้อเยื่อวิธีใหม่โดยอาศัยแขนงตามแนวยาวของหลอดเลือดโพสทีเรียอินเตอร์-ออสเซียส

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พังผืดซึ่งกันระหว่างกล้ามเนื้อเอ็กเทนเซอร์ คาปรี อาวนารีส และเอ็กเทนเซอร์ ดิจิไต มินิไม จะมีแขนงหลอดเลือดประสานตามแนวยาวกับแขนงหลอดเลือดตั้งฉากที่อยู่ในชั้นพังผืด ซึ่งให้เลือดมาเลี้ยงผิวหนังส่วนแขน แขนงหลอดเลือดทั้งสองกลุ่มต่อเนื่องมาจากหลอดเลือดโพสทีเรียอินเตอร์ออสเซียส วิธีใหม่ในการย้ายเนื้อเยื่อผิวหนังโดยอาศัยแขนงหลอดเลือดประสานตามแนวยาว สามารถทำได้ง่ายและไม่รบกวนหลอดเลือดโพสทีเรียอินเตอร์ ออสเซียส ซึ่งเป็นวิธีที่ใช้กันอยู่ทั่วไป

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