Thumb Replantation Using the Superficial Palmar Branch of the Radial Artery

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Abstract

Keywords

- thumb amputation
- superficial palmar branch of radial artery

The thumb is the most important part of the hand. If thumb is amputated, all efforts should be made to replant it to preserve hand functions. Good functional outcome can be obtained with successful thumb replantation than with other reconstructive surgery. We present a case of thumb amputation of a 44-year-old male with severe damage to the soft tissues and bony structures of the radial part of the hand. We performed the replantation anastomosing the superficial palmar branch of the radial artery as donor artery as the proximal part of thumb digital arteries were severely damaged due to crush injury and got favorable result.

Introduction

The thumb is the most important part of the hand. Its unique position is responsible for good pinch, grasp, and fine movements of hand. If thumb is amputated, all efforts should be made to replant it to preserve hand functions. During replantation, digital arteries are usually chosen for anastomosis. However, occasionally replantation becomes difficult due to severe damage to the digital artery. In amputated thumb with radial part of hand, artery with good caliber is needed to feed the distal stump. We replanted an amputated thumb with radial part of hand using the superficial palmar branch of the radial artery (SPBRA) as feeding vessel in a 44-year-old male and got favorable functional outcome. Though this technique is not well documented in the literatures, we found that some authors used free thenar flap based on the SPBRA. This study suggest that anastomosis of the SPBRA to digital artery may provide a solution in thumb with radial part of thumb amputation where proximal parts of digital arteries are severely damaged.

Case Report

A 44-year-old male presented to our department with an amputated thumb with radial part of the hand (►Fig. 1). His

injury was occurred by an electrical saw. The index finger circulation was intact. The margins of both the parts were crushed and severely damaged. Under general anesthesia and tourniquet control, we explored the wound. After thorough debridement, bone was fixed using K-wires. Repair of flexor pollicis longus and extensor pollicis longus was performed. The digital nerves were also repaired. Then we attempted to do anastomosis of the digital arteries. But digital arteries of both radial and ulnar sides of the proximal stump were found severely damaged and irreparable. Hence, we checked the proximal stump for any expandable intact artery. We found that the main radial artery was not damaged. Therefore, we attempted to identify the SPBRA on the thenar area of the amputated thumb, and it was found intact with its venae comitantes (►Figs. 2 and 3). At this stage, tourniquet was released and clamps were applied at the planned site of division of palmar arch, and confirmation of vascularity particularly to the index finger was confirmed. As it did not hamper the vascularity of the index finger, we proceeded to anastomose the SPBRA to thumb digital artery: two concomitant veins and one additional dorsal vein to the thumb veins, end to end, without applying any vein graft.

We followed the standard postoperative protocol for replantation. K-wires were removed after 4 weeks.

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Fig. 1 A 44-year-old male with complete amputation of the left thumb caused by an electric saw.

Fig. 3 At surgery, the superficial palmar branch of the radial artery is seen (star: the distal end; rectangle: the proximal end of the artery).

After 4 months of replantation, the patient was followed up for functional outcome. There was 15-degree extension lag at interphalangeal (IP) and metacarpophalangeal (MCP) joints, and range of movement was measured 15 to 45 degrees at IP and 15 to 40 degrees at MCP joint (→**Fig. 4**).

Discussion

Digital artery is usually used in thumb replantation, which arises from the princeps pollicis artery (PPA).¹ The PPA artery arises from the deep palmar arch. It may also arise from the radial artery just as it turns medially toward the deep part of the hand. It descends between the first dorsal interosseous

muscle and the oblique head of the adductor pollicis, along the medial side of the first metacarpal bone to the base of the proximal phalanx, where it lies beneath the tendon of the flexor pollicis longus and divides into two branches.¹

The SPBRA arises from the radial artery, just where it is about to wind around the dorsal side of the wrist. The SPBRA passes through or occasionally over the thenar muscles, which it supplies, and sometimes anastomoses with the terminal portion of the ulnar artery, completing the superficial palmar arch.¹

Omokawa et al² reported that the SPBRA was found in all hands. The average diameter of the branch measured at its bifurcation site was 1.4 mm (0.8–3 mm), and the constant area nourished by the SPBRA was approximately 4×3 cm

Fig. 2 Schematic view of the superficial palmar arch of the hand in the patient (rectangle: the superficial palmar branch of the radial artery; triangle: digital arteries).

Fig. 4 Four months after replantation the patient's thumb shows complete viability.

located over the proximal parts of the abductor pollicis brevis and opponens pollicis muscles.

Zhao et al³ reported that the SPBRA was constantly existed, it usually arises from the main trunk of the radial artery. The origin diameter was 1 to 3 mm and the distal diameter at the styloid process of radius was 1 to 2.90 mm.

The SPBRA flap is usually used during reconstruction of the fingers.^{4–8} Garg et al⁴ reported about a free thenar flap, which is a fasciocutaneous sensate flap, supplied by a constant branch of the superficial radial artery and its variable nerve supply. It has a distinct advantage of low donor site morbidity, and better cosmesis and texture. Kamei et al⁵ treated two patients with a volar defect of the index finger using a free thenar flap based on the SPBRA. Therefore, the SPBRA is an expendable artery with less donor site morbidity.

In our case, as the digital arteries of both radial and ulnar sides were severely damaged, an expendable, good caliber vessel was needed to feed the amputated part. Hence, we used the SPBRA for arterial anastomosis.

We suggest that the SPBRA can be an alternative donor artery in the replantation of the amputated thumb with radial

part of the hand when digital arteries are severely damaged and good caliber vessel is needed for the survival of the part. But before transferring it as a donor artery, we need to check the completion of palmar arch as there is a possibility that if the arch is not complete and we transfer the SPBRA, we may land up in compromising the vascularity of viable fingers, particularly of the index finger. In such cases, we have to choose other donor artery and do anastomosis with the help of a venous graft.

There are other arteries of choice, including PPA, digital artery of index finger, and dorsal carpal branch of radial artery. But as the SPBRA is an expendable artery with less donor site morbidity, we choose the SPBRA as the donor artery.

Conflict of Interest

None.

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