

Case Series

Long pedicle for radial forearm flaps as a reconstruction of hand surgery:

A case series

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ABSTRACT

Introduction: Long Pedicle for Radial forearm flap is a reconstructive option for skin and soft tissue that benefits from harvesting, rich tissue, and long pedicles. In this paper, we will explain the use of forearm radials in acute trauma cases and chronic cases with different skin sites on the dorsal and volar hands. However, there is a dearth of reports in our area about the use of this flap.

Methods: Reconstruction of two cases with hand defect problems had been successfully performed using radial forearm flap in January 2020 in Orthopaedic and Traumatology Department of Hasan Sadikin Hospital.

Results: Two radial forearm flaps were used to reconstruct hand defects in two different sites and different mechanism of injuries. One patient performed radial forearm flap as defect closure due to traumatic injury in the dorsal site, while the next patient with post-incision defect due to release contracture at volar aspect of the hand performed another radial forearm flap. On long-term evaluation, the flaps are found to be vital, thin and pliable.

Conclusion: Radial forearm flaps are effective in providing skin cover from soft tissue damage that is difficult for the functions of the hands of our patients. There are many potential advantages to this flapping technique. The design and height of the cover do not technically require micro-network transfer which is still under development.

Keywords: Hand Defect, Radial Forearm Flap

<https://doi.org/10.31282/joti.v3n3.65>

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INTRODUCTION

The hand remains one of the most difficult part to reconstruct. Because of the thin skin covering, tendons and vessels are easily exposed by minor injury.¹ Flap is one of the most commonly used to restore the covering and preserve the function.² The Long Pedicle for Radial Forearm Flap (RFF) has gained popularity since it was introduced in 1981 by Yang *et al.* in China. Due to its high success rate (90-100%), pliability, easiness to harvest, long and high-caliber vascular pedicle, this flap became a common flap of choice in head and neck reconstructive surgery such as tongue, nose, buccal mucosa, and ear.^{3,4} Besides head and neck reconstructive surgery, the Long Pedicle for RFF also used in hand reconstructive surgery such as of thumb, palmar and dorsal surface of the hand and ulnar articulation.⁵

Before harvesting the Long Pedicle for RFF, an Allen test is recommended to be performed to ensure sufficient blood supply to the ulnar artery after sacrificing the radial artery. Allen test was done by manually occluding both radial and ulnar arteries by finger and followed by releasing the blockage of ulnar arteries. Assessment can be done visually or by placing a pulse oximetry on the tip of the finger.⁶ Another non-invasive study has been used for the same intention such as the Doppler examination.^{1,5} Abnormalities in both Allen test and Doppler examination indicate insufficiency of collateral blood flow and are contraindication for the Long Pedicle for RFF.⁶

However, donor site aesthetics and functions including sensation, range of movement, and strength should be considered as well. The Long Pedicle for RFF may also cause complications. The most common donor site complications are partial graft loss, hematoma, and seroma.⁴ Failure of the Long Pedicle for RFF mostly caused by venous congestion. Factors that affect the result include surgeon experiences, the width of the pedicle, management of superficial veins in the pedicle, and stenosis of the subcutaneous tunnel.²

Case Presentation

Case 1

A 33-year-old male came with a wound and deformity of the right hand because of an injury 7 hours prior. He worked at a garment factory and he accidentally got his right hand inside a cotton grinder. His vital signs were

normal but there was profuse bleeding from his right hand. On examination, there was a significant deformity on the right hand and index finger. There was a wound with a size of 15x15x1cm at the dorsal aspect extending from extensor zone I to zone IV with an irregular edge. His 2nd extensor digitorum communis (EDC) and extensor indicis proprius (EIP) tendon were ruptured. A partial rupture was also found on his 3rd and 4th EDC tendon. The range of motion at MCP was limited due to pain with active and passive MCP flexion of 0-10° and 0-20°, respectively. Active and passive extension of MCP was 0°.

On plain radiography of the right hand, we found comminuted displacement of the neck of the right 2nd metacarpal and middle phalanx of the right index finger. The patient was diagnosed with open fracture Swanson Szabo type II of the right 2nd metacarpal and index finger with comminuted displacement. There was also a rupture of EDC and EIP tendon with large laceration and skin loss.



Figure 1. The patient came to the emergency room with multiple fractures and a large soft-tissue defect



Figure 2. Emergency debridement and fixation performed at the emergency operating theater, leaving a large defect around

The patient was given analgetic, antibiotic, and tetanus prophylaxis. The patient was then prepared for urgent surgery. The wound was debrided and the fractures were

managed with internal fixation screwing. The tendon was then repaired. The stump was then covered with an island flap measured according to the blood mark using a gauze, which gauze was then taken from the defect and placed on the radial forearm. A corrugated rubber drain was inserted. The donor site was covered with a split-thickness skin graft from the contralateral thigh. The total hospital stay was 5 days. On follow-up 1 year later, the flap was vital, thin, and pliable.



Figure 3. A radial forearm flap was performed to cover the wound defect



Figure 4. One year follow-up showed a good outcome, aesthetically and functionally

Case 2

A 23-year-old man, had a history of severe injury on his left forearm to wrist 2 years ago while doing a part-time job in the manufacturing industry. The patient was treated with primary suture and resulting in contracture deformity.

Physical examination showed contracture deformity at the left hand and left wrist joint. He then underwent contracture release surgery and the surgical wound was covered with a distally based radial forearm island flap measuring of 11.5cm by 7.0cm. A corrugated rubber drain was inserted. The flap donor site was covered with a split-thickness skin graft from the contralateral thigh. The drain was removed after 48 hours. The flap survived completely providing primary wound closure. The total hospital stay was about three weeks. When he was seen at the outpatient clinic a year later, the wound cover remained stable.



Figure 5. The preoperative clinical picture showed contracture around the hand and the wrist joint



Figure 6. Radial forearm flap performed after releasing the contracture

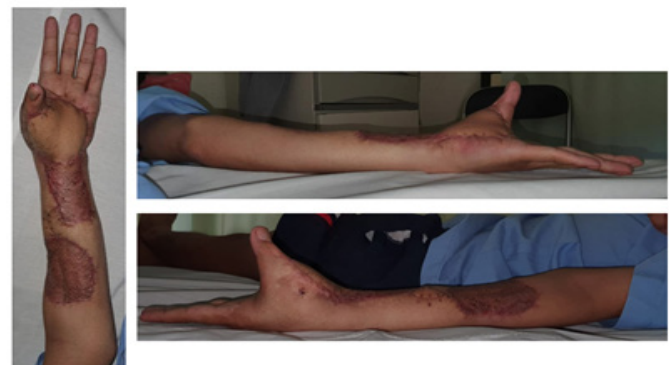


Figure 7. One year follow-up showed a good outcome, aesthetically and functionally.

DISCUSSION

Due to the thin skin covering of the hands, tendons and vessels are easily exposed by minor injury.¹ Flap is one of the most common methods used to restore the covering and preserve the function.² Long Pedicle for Radial Forearm Flap (RFF) has become popular since the first description in 1978.⁶ There are many types of Long Pedicle for RFF. A researcher in Poland classifies RFF as proximal and distal. Proximal Long Pedicle for RFF may be used in post-traumatic reconstruction of the palmar and dorsal surface of the hand while distal Long Pedicle for RFF may be used to reconstruct defect of ulnar articulation and as a free fasciocutaneous flap.⁵ Another common classification is cutaneous, fasciocutaneous, and osteocutaneous. Fasciocutaneous flaps are the most frequently performed type of flap⁴ due to its high success rate (90-100%), pliability, easiness to harvest, long and high-caliber vascular pedicle. This flap has become a common flap of choice in head and neck reconstructive surgery as well as hand reconstructive surgery, but less likely in genitourinary surgery.^{3,4}

Before harvesting The Long Pedicle for RFF, an Allen test must be performed to ensure sufficient blood supply to the ulnar artery after sacrificing the radial artery. A non-invasive method such as Doppler examination can also be utilized.^{1,5}

After the surgery, patients are followed up for at least 4 months to observe the progress of the flap and functions. Total Active Motion (TAM) score for finger and DASH score for arm, shoulder, and hand functions can be used to evaluate the functional status.² TAM score is calculated by adding total flexion measurement of metacarpophalangeal (MCP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) and then subtracting it with a total of extension deficit at these joints.⁷ Disabilities of Arm, Shoulder, and Hand (DASH) score is a simple questionnaire with thirty questions about daily activities and used to determine the severity of impairment in physical function.⁸

CONSLUSION

Radial forearm flaps are effective in providing skin cover from soft tissue damage that is difficult to restore in the hands of our patients. There are many potential advantages to this flapping technique. The design and height of the cover do not technically require micro-network trans-

fer which is still under development.

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