

Thumb Metacarpal Reconstruction with a Medial Femoral Condyle Flap

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INTRODUCTION

The medial femoral condyle (MFC) free flap has previously been described as a corticoperiosteal flap used for cases of nonunion in the upper and lower limbs.¹⁻³ In the literature, the MFC flap has been used to reconstruct bony defects ranging from 1.2 up to 2.1 cm in length.⁴⁻⁶ Some of the advantages that have been described include the consistent vascular anatomy and minimal donor site morbidity.⁴ With this in mind, we decided to use the MFC flap in two cases of thumb reconstruction.

CASE 1

A 56-year-old man experienced a traumatic amputation of his right thumb at the MCP joint. At the patient's request, distraction osteogenesis was used to increase the length of the first metacarpal for osteoplastic reconstruction. Unfortunately, the distracted segment did not consolidate correctly after an interval of more than 3 months, possibly due to underlying peripheral vascular disease. At 3 months, the segmental bony defect measured at 3.5 cm on x-ray.

At surgery, the MFC flap was raised with a skin paddle. Fixation was achieved using low-profile titanium plates. A fringe of periosteum was harvested, and this was wrapped around the graft and the metacarpal remnants to promote bony union. Initially, the MFC flap was supplied by end-to-side anastomosis to the radial artery. Intraoperative indocyanine green (ICG) dye injections were used to assess vessel patency and flow.⁷ These showed an atheromatous plaque in the perforator supplying the skin island—so the skin paddle was discarded. The blood supply to the MFC flap also appeared to be sluggish.

Because of the precarious blood supply to the MFC flap, an adipofascial Foucher flap was used to provide additional soft-tissue cover over the titanium plates.

Unfortunately, this proved insufficient to cover the whole MFC flap and the metal plates. Therefore, a reverse flow radial forearm flap was raised. This was a decision made based on intraoperative necessity but was not originally planned. The blood supply to the MFC flap was revised from end to end to the pedicle of the radial forearm flap using the axial vessel of the forearm flap as the source of perfusion for the MFC bone flap as well. After this, further ICG injections showed that perfusion of the bone flap and the skin paddle of the radial forearm flap were good.

Postoperatively, the patient developed an infected seroma in his donor site needing drainage. The MFC flap went on to unite successfully by 3 months. Unfortunately, the shape of the bone was complicated. Therefore, the patient needed a further two osteotomy procedures to correct angulation of the final construct. He also underwent a first webspace release using full-thickness skin grafts. After six separate surgical procedures the patient now has a thumb which is functional, sensate, and pain-free.

CASE 2

A 59-year-old man presented with psoriatic arthritis mutilans resulting in loss of most of the proximal phalanx and distal metacarpal of his left thumb. The thumb was telescoped with poor function. The distal phalanx was relatively well preserved.

Previous attempts to bridge the bony defect using nonvascularized iliac crest bone grafts failed on two occasions because the bone grafts were quickly reabsorbed, probably due to his underlying psoriatic condition and/or his immunosuppression (steroids and adalimumab). Therefore, a decision was made to use a vascularized MFC flap instead. The soft tissues of the left thumb were distracted to create a thumb of adequate length before inserting the MFC flap into the bony defect.

During the soft-tissue distraction, the patient developed a severe pin-site infection at 1 month. He halted his distraction due to pain. By this stage, there was a bony defect of 3.5 cm between the first metacarpal and the remainder of the proximal phalanx. Given the experience with the previous MFC flap, no skin paddle was raised with

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the flap. Instead, an adipofascial Foucher flap was used to provide soft-tissue cover over the low-profile titanium plates used for fixation. A full-thickness skin graft was then applied to the Foucher flap. Perfusion was confirmed again with ICG injections, and this proved satisfactory.

Postoperatively, the distal part of the distal plate became exposed resulting in localized infection. Therefore, the plate was removed at 8 weeks. Because the bone had not united, longitudinal K-wires were inserted to stabilize the construct. However, the donor site healed uneventfully with no concerns. We did not routinely request postoperative x-rays as the donor site was very small.⁸

At 7 months postoperative, the MFC flap united. He subsequently achieved good opposition and range of movement of the thumb (Kapanji score 5). [See Video (online), which displays the preoperative, intraoperative, and postoperative journey of a patient undergoing an MFC free flap reconstruction to the thumb.]

DISCUSSION

Although we achieved a successful outcome in both cases, using the MFC flap was not a simple, complication-free solution. We used it because we felt that the length of the bony defects in both cases (3.5 cm) was too small to justify using a free fibula or deep circumflex iliac artery flap but too large to use a pedicled flap option such as a radial forearm osseocutaneous flap. Moreover, in case 2, we wanted to use the MFC flap because previous attempts to bridge the bony defect using nonvascularized bone failed. The unreliability of the skin paddle associated with this flap meant that we were forced to use an adipofascial Foucher flap to provide skin cover over the MFC flap in both cases and a radial forearm flap in case 1, further increasing the complexity of this solution for thumb reconstruction. The unreliability of the skin paddle of the MFC flap has been demonstrated by others, such as Scampa et al, and further limits the value of the MFC for thumb reconstruction.⁹ Finally, as the length of the bone harvested increases, so does the complexity of its shape. This made it necessary to carry out further corrective osteotomies to achieve a final (useful shape) for

the reconstructed thumb in case 1. We conclude that the MFC flap is a reasonable second or possibly third choice for reconstruction of the thumb in situations where other options have been exhausted or ruled out.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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