

The Medial Metaphyseal Periosteal Artery (MMPA): An Alternate Pedicle for the Medial Femoral Trochlea Flap

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We report a case of medial femoral trochlea flap used for scaphoid proximal pole reconstruction, in which the transverse branch of the descending genicular artery was vestigial. The medial metaphyseal periosteal artery was clearly the dominant pedicle supplying the trochlear region. The flap was safely raised on the medial metaphyseal periosteal artery pedicle. The incidence of this uncommon presentation remains unknown and this anatomical variant is newly described. (*J Hand Surg Am.* 2021;46(11):1032.e1-e3. Copyright © 2021 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Anatomical variant, medial femoral trochlea flap, medial metaphyseal periosteal artery, scaphoid reconstruction.



THE USE OF VASCULARIZED osteochondral flaps is an established technique for the reconstruction of challenging articular defects of the carpals. Notably, the medial femoral trochlea (MFT) osteochondral flap has recently increased in popularity and serves as a workhorse flap in the treatment of scaphoid proximal pole nonunion and avascular necrosis of the lunate.

The descending genicular artery (DGA) is the dominant pedicle described for osseous or osteochondral flaps in the medial femoral condyle area. Many variations have been noted in the pattern of branching of its periosteal vessels. The DGA mainly divides into a longitudinal branch extending

distally to the joint line, supplying the medial femoral condyle bone flap, and a transverse branch coursing toward the proximal patellofemoral joint, supplying the MFT flap.¹

In this report, the authors describe a case of MFT flap used for scaphoid proximal pole reconstruction, with a previously undescribed anatomical variation to the dominant vascular pedicle.

CASE REPORT

The patient was a 19-year-old, right-handed man who sustained a left scaphoid proximal pole fracture after a fall. The patient did not seek treatment for the injury and went on to develop avascular necrosis and collapse of the scaphoid proximal pole. He presented to our facility with a painful nonunion and no radiographic signs of early osteoarthritis. He underwent a proximal pole reconstruction using an MFT osteochondral free flap. The elevation of the flap was carried out using the standard technique described by Higgins and Bürger.² During dissection of the pedicle, the transverse branch of the DGA was barely discernable and was not reaching the trochlea. A dominant periosteal artery was identified lying anteriorly on the femur; it was directly supplying the

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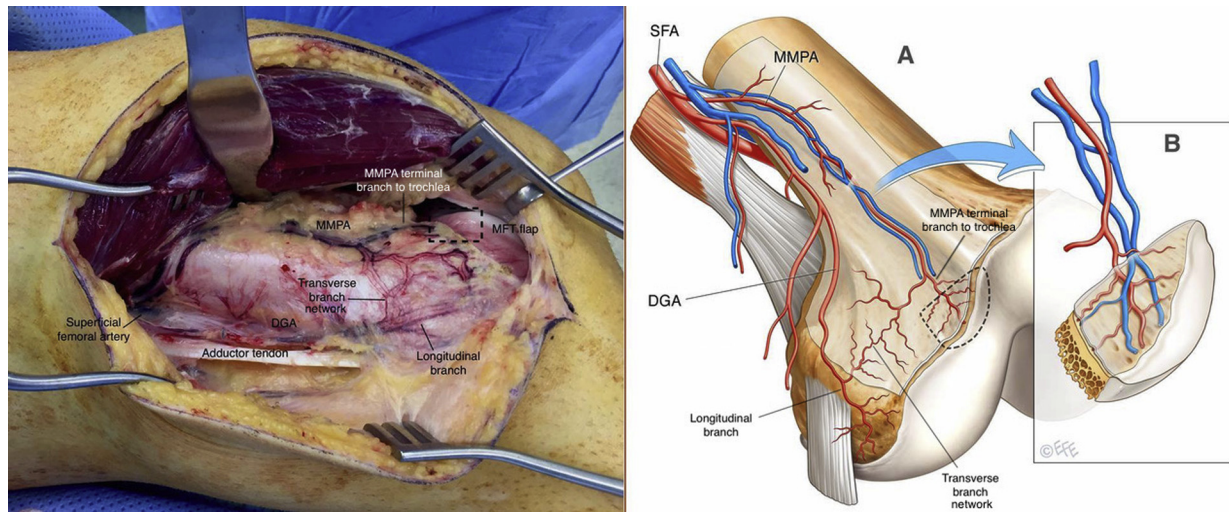


FIGURE 1: Clinical photograph (left) and illustration (right) demonstrating the anatomical variant of the MFT flap where the MMPA is the dominant pedicle to the trochlea with its terminal branches. The transverse branch of the DGA provides minor blood supply to the trochlea. A rich anastomotic periosteal network is observed between the MMPA terminal branches and the DGA transverse branch. **A** Blood supply of distal femur. **B** Elevated MFT flap. SFA, superficial femoral artery.

trochlear region where the chondral flap was to be harvested. The sterile tourniquet was released before vessel dissection to verify the dominant flow. The flap was then successfully elevated on this alternate artery, dissected in a retrograde fashion to its origin on the superficial femoral artery, while preserving a thin cuff of periosteum around the vessel. This artery, accompanied by 2 venae comitantes, was of adequate size for end-to-side anastomosis with the radial artery (Fig. 1). The osteochondral flap was inset to the proximal scaphoid with a cannulated compression screw. At 12 weeks, the reconstructed scaphoid was united on computed tomography scan (Fig. 2). The patient returned to normal work and activities without wrist or knee pain.

DISCUSSION

The anatomical work of Iorio et al¹ addressed the perfusion of corticocancellous bone flaps harvested from the medial femoral condyle region. The authors described the presence of a previously unnamed vascular pedicle providing additional perfusion to the metadiaphyseal area of the distal femur.^{1,3} This medial metaphyseal periosteal artery (MMPA) originates directly from the superficial femoral artery in the adductor hiatus, proximal to the origin of the DGA. It then courses medially in the periosteum of the medial femur and consistently forms an anastomotic periosteal network with the transverse branch of the DGA. Some variations in the pattern of branching of these vessels have been described.³



FIGURE 2: Postoperative computed tomography scan at 12 weeks illustrating scaphoid bony union.

In this case, the MMPA was clearly the dominant pedicle supplying the trochlear region and the chondral flap was successfully raised on this new vessel. When harvesting this flap, the authors typically use a sweeping curvilinear incision starting at the Hunter canal and extending distally and anteriorly to the midpoint between the medial border of the patella

and medial femoral condyle, as described by Higgins et al.² The incision usually measures 10 to 15 cm. When harvesting the MMPA artery as the flap main pedicle, it may be necessary to extend the proximal part of the incision to trace the MMPA vessels back to where they lift off the periosteum and join the superficial femoral artery. This facilitates microsurgery because the pedicle is not embedded in the periosteum at this level.

The incidence of this anatomical variant remains unknown. This uncommon presentation provides sufficient pedicle length in wrist reconstruction and allows preservation of the DGA at the donor site. To our knowledge, this is the first report of the

MMPA artery as an alternate pedicle to the MFT flap. It can safely be based on the MMPA when dominant.

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