

Periosteal Angiosome of the Descending Geniculate Artery

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Synopsis

Background: The medial femoral condyle (MFC) vascularized corticoperiosteal flap has been well described for the treatment of avascular necrosis and nonunions with minimal bone donor morbidity. The practice of harvesting larger corticocancellous flaps based on the descending geniculate artery (DGA) raises the question of osseous perfusion of this source vessel. The purpose of this study was to delineate the proximal extent of periosteal blood supply of the medial column of the femur provided by the DGA system. (1-4)

Methods: In fresh cadaveric specimens, the DGA was isolated, measured in relation to the knee joint-line, and cannulated. Cutaneous and muscle branches were ligated prior to perfusion. The vascular system was irrigated with saline under manual pressure followed by radiopaque contrast. Using fluoroscopic subtraction angiography, the vascular network and proximal-most extent of periosteal perfusion was recorded.

Results: The DGA was isolated in eighteen cadaveric specimens branching from the superficial femoral artery $14.2\text{cm} \pm 2.4\text{cm}$ proximal to the joint line of the knee. Length of the vascular pedicle to attachment onto the periosteum was $7.7\text{cm} \pm 2.2\text{cm}$. All specimens demonstrated a filigree of periosteal vessels dominated by a transverse and a longitudinal branch at the level of the condyle. Proximal perfusion was consistently noted by a large longitudinal medial metaphyseal periosteal artery (MMPA). The MMPA demonstrated the proximal-most perfusion of the DGA at a level of $13.7\text{cm} \pm 1.3\text{cm}$ proximal to the joint line. Average femur length was $47.1\text{cm} \pm 3.1\text{cm}$. The DGA provided perfusion of $29.2\% \pm 2.3\%$ of the total length of the medial femur. (Figure 1-2)

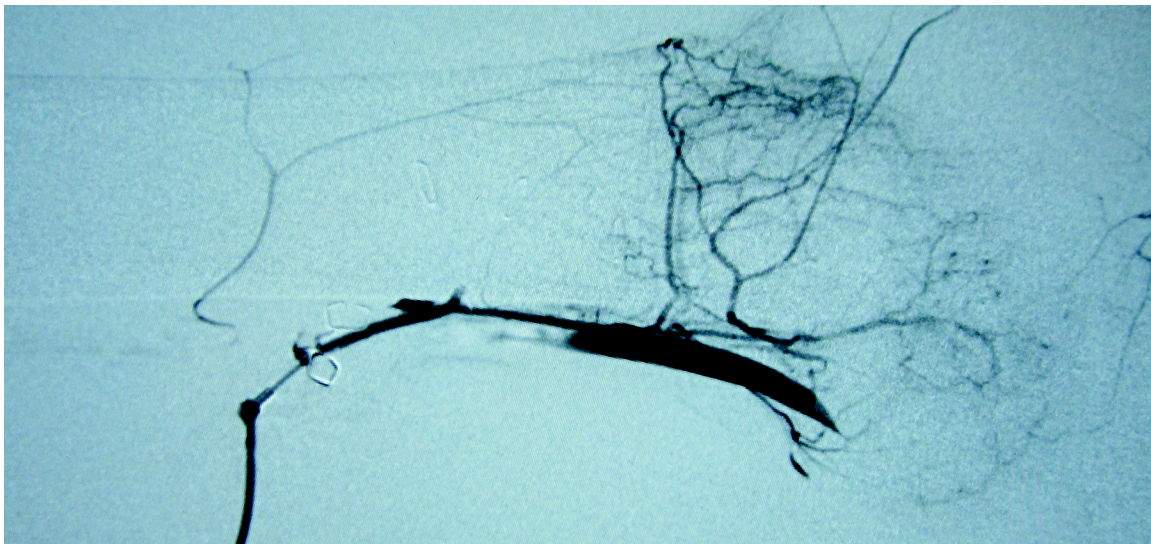


Figure 1. Descending geniculate artery (DGA) subtraction angiography demonstrating filigree of periosteal vessels over medial femoral condyle (MFC) and proximal perfusion via medial metaphyseal periosteal artery (MMPA).

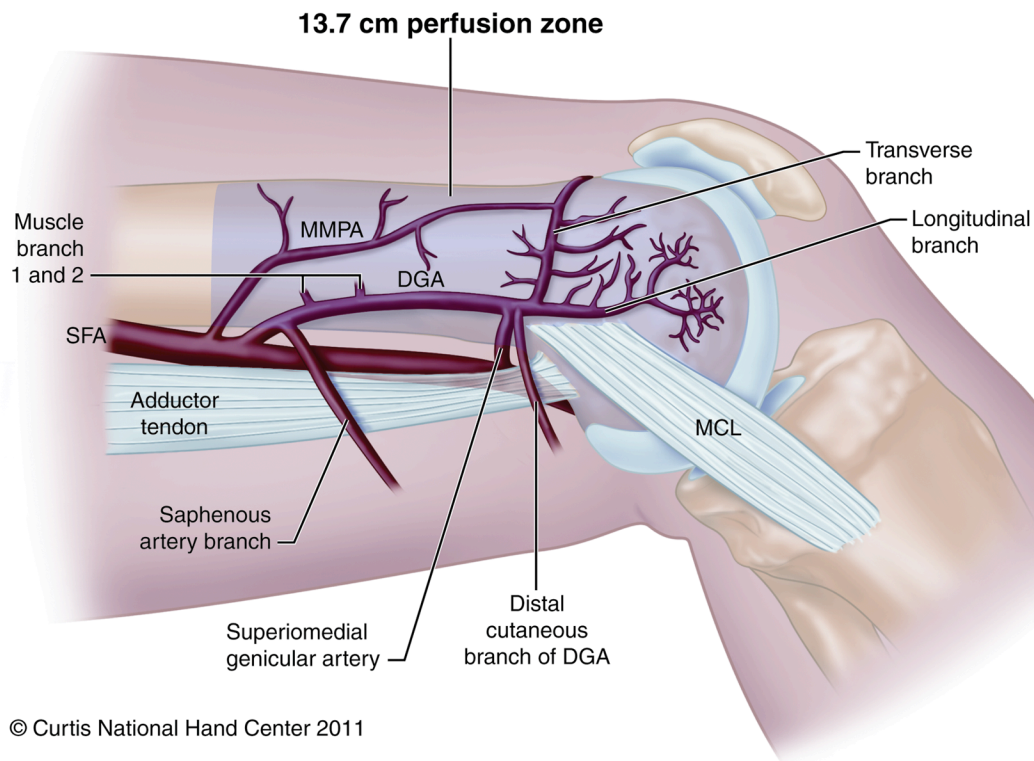


Figure 2. Depiction of the typical relationship of the descending geniculate artery (DGA) to its distal branches. The more proximal medial metaphyseal periosteal artery (MMPA) has connections with the transverse branch that enable the DGA to provide perfusion to the periosteum as proximal as 13.7 cm above the joint line (shaded area). SFA = superficial femoral artery; MCL = medial collateral ligament.

Conclusions: The DGA provides a large and reliable region of periosteal perfusion. Harvest of MFC osseous flaps extending up to 13.7 cm proximal to the joint line may be perfused from the DGA pedicle. The MFC donor site may thus be a reliable option for vascularized bone reconstruction of larger bone defects.

References:

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