

Osteochondral Autograft Transplantation Surgery for Metacarpal Head Defects

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Post-traumatic osteonecrosis of the metacarpal head is a challenging problem, particularly in younger patients in whom arthroplasty may not be a durable option. Although several osteochondral reconstructive options have been proposed, some are associated with considerable donor site morbidity and/or require the use of internal fixation. We present an application of osteochondral autograft transplantation surgery as a treatment option for focal metacarpal head lesions. An osteochondral plug from the non-weight-bearing articular surface of the knee is transferred and press-fit to resurface a focal metacarpal head defect. The technical pearls and pitfalls are reviewed, and an illustrative case is presented. (*J Hand Surg Am.* 2016;41(3):457–463. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Osteochondral autograft, OATS, metacarpal head, avascular necrosis, Dieterich disease.

OSTEONECROSIS OF THE METACARPAL head is an uncommon and clinically vexing problem. Whether due to prior fracture, osteochondral injury, vasculitis, autoimmune disorder, or idiopathic etiology (ie, Dieterich disease), the articular incongruity and compromised subchondral bone may lead to pain, stiffness, and loss of digital and hand function. Proposed treatment options include simple debridement, osteochondral grafting, arthroplasty, and arthrodesis. We present an application of osteochondral autograft transplantation surgery (OATS) as a treatment option for focal metacarpal head lesions.

INDICATIONS

Patients with painful focal defects of the metacarpal head articular surface with relative preservation of the proximal phalanx articular surface are candidates for this procedure. Post-traumatic osteonecrosis of the

metacarpal head with disruption of the articular surface is an ideal indication, particularly in younger patients who are not good candidates for arthroplasty. This technique can also be used to restore articular surface congruity in patients with focal metacarpal head defects from other causes.

CONTRAINDICATIONS

Osteochondral autograft transplantation surgery relies on press-fit fixation to resurface focal lesions surrounded by preserved articular cartilage, and it is contraindicated in patients with destruction of the entire metacarpal head. This technique also only addresses the metacarpal side of the joint, and it is contraindicated in patients with marked arthritic articular changes of the proximal phalanx base. Preoperative 3-dimensional imaging, such as magnetic resonance imaging, can be a helpful tool to assess the extent of articular surface involvement.

SURGICAL ANATOMY

The metacarpal head is a cam-shaped structure that projects more volarly than the diaphysis. The central axis of the metacarpal shaft is, therefore, more in line with the dorsal half of the metacarpal head (Fig. 1). An understanding of this anatomy is critical during the OATS recipient plug harvest because the vector of the recipient site chisel must be aligned correctly to avoid

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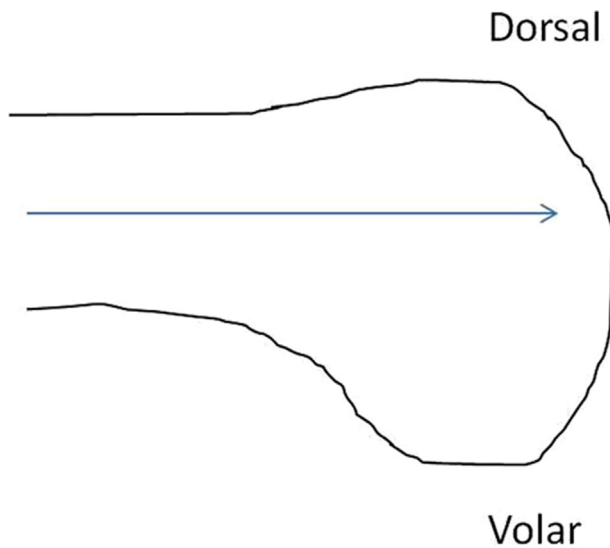


FIGURE 1: A sagittal view of a metacarpal. The metacarpal head projects more volarly than the metacarpal diaphysis. During the recipient plug harvest, it is critical to understand this anatomy and to advance the chisel in the proper trajectory to avoid cortical penetration in these small bones. (Image courtesy of the Children's Orthopaedic Surgery Foundation.)

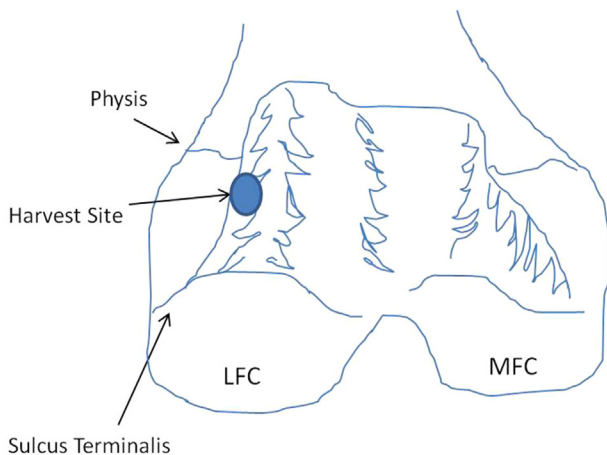


FIGURE 2: The coronal diagram of the knee demonstrating the donor osteochondral plug harvest site from the non-weight-bearing portion of the lateral femoral condyle (LFC), between the sulcus terminalis and the physis. MFC, medial femoral condyle. (Image courtesy of the Children's Orthopaedic Surgery Foundation.)

cortical penetration (see the [Surgical Technique](#) section below).

The donor plug can be harvested from either the medial or lateral femoral condyle. The difference in curvature of the condylar cartilaginous surface is minimal between the lateral and medial sides.¹ We prefer the lateral femoral condyle for ease of positioning and access during surgery. The donor plug is taken from the non-weight-bearing portion of the lateral femoral condyle, between the sulcus terminalis and the physis (Fig. 2).

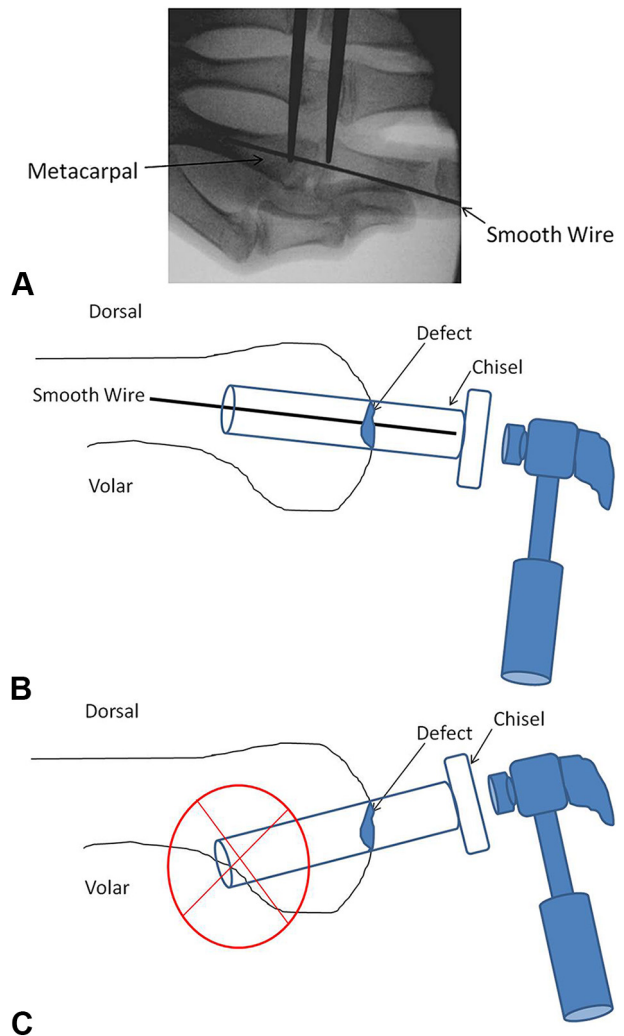


FIGURE 3: **A** The fluoroscopic anteroposterior image of the metacarpal demonstrating that a smooth wire has been advanced along the planned trajectory for the recipient plug harvest. The calipers are measuring the depth of wire advancement into the metacarpal diaphysis, which should be a minimum of 10 mm from the articular margin. Fluoroscopic radiographs are taken to ensure that there is low risk for cortical penetration with chisel advancement over the wire at a depth of approximately 10 mm on both anteroposterior and lateral views. **B** The diagram representing a sagittal projection of the metacarpal head with ample space for the chisel to harvest the recipient osteochondral plug along the trajectory outlined by the smooth wire. **C** The sagittal projection demonstrating that cortical penetration can occur if care is not taken to confirm a safe chisel trajectory. (Images courtesy of the Children's Orthopaedic Surgery Foundation.)

SURGICAL TECHNIQUE

The patient is positioned supine with the upper limb resting on a hand table and the ipsilateral knee extended. Tourniquets are placed on both the upper arm and the upper leg. A small bump under the ipsilateral hip improves exposure to the lateral aspect of the knee during the donor plug harvest. The surgeon

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