CASE REPOSITORY

Medial Femoral Condyle Microvascular Bone Transfer as a Treatment for Capitate Avascular Necrosis: Surgical Technique and Case Report

Nikolas H. Kazmers, MD, MSE,* Joshua C. Rozell, MD,† Kevin M. Rumball, MD,‡ Scott H. Kozin, MD,§ Dan A. Zlotolow, MD,§ L. Scott Levin, MD†

Avascular necrosis (AVN) of the capitate is a rare clinical entity for which a variety of treatment options have been described, ranging from immobilization to microvascular bone transfer. Outcomes following medial femoral condyle corticocancellous free flap reconstruction have not been reported for this specific pathology. We present the case of a 16-year-old girl with posttraumatic capitate AVN who was treated with curettage and medial femoral condyle corticocancellous vascularized bone grafting. At 18 months after surgery, the patient remains pain-free and had resumed all activities including lifeguarding by 6 months after surgery. This microsurgical technique, described previously for AVN of the scaphoid and lunate, may be applied in a similar fashion for the capitate with promising clinical results. *(J Hand Surg Am. 2017;■(■):1.e1-e6. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic V.

Key words Avascular necrosis, capitate, medial femoral condyle/descending genicular artery flap, reconstruction.

Online Exclusive

AVASCULAR NECROSIS (AVN) OF THE capitate is an uncommon clinical entity that may be idiopathic or traumatic in etiology. Owing to its rarity and paucity of early radiographic changes, this diagnosis may be challenging to establish but should be included in the differential diagnosis for young and active patients presenting with wrist pain and loss of motion or strength. Although the natural history is unknown, outcomes have been described following a spectrum of treatments including immobilization, proximal capitate resection,[1] intercarpal arthrodesis,[2] prosthetic[3] or interpositional[4] arthroplasty, pedicled vascularized bone grafting,[5,6] and iliac crest microvascular bone transfer.[7] One publication described capitate proximal articular surface replacement with a medial femoral trochlear flap; however, no information was provided to describe the postoperative outcome or whether union was achieved.[8] The current case report highlights the technique and postoperative results following treatment of capitate AVN with curettage and corticocancellous vascularized medial femoral condyle (MFC) bone grafting with proximal articular preservation in a pediatric patient.

*From the *Department of Orthopaedics, University of Utah, Salt Lake City, UT; the †Department of Orthopaedic Surgery, University of Pennsylvania; the §Shriners Hospital for Children—Philadelphia, Philadelphia, PA; and the ‡Gundersen Health System, La Crosse, WI.*

Received for publication June 2, 2016; accepted in revised form April 13, 2017.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Nikolas H. Kazmers, MD, MSE, Department of Orthopaedics, University of Utah, 590 Wakara Way, Salt Lake City, UT 84108; e-mail: nkazmers@gmail.com.

0363-5023/17/■ ■-0001$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2017.04.006

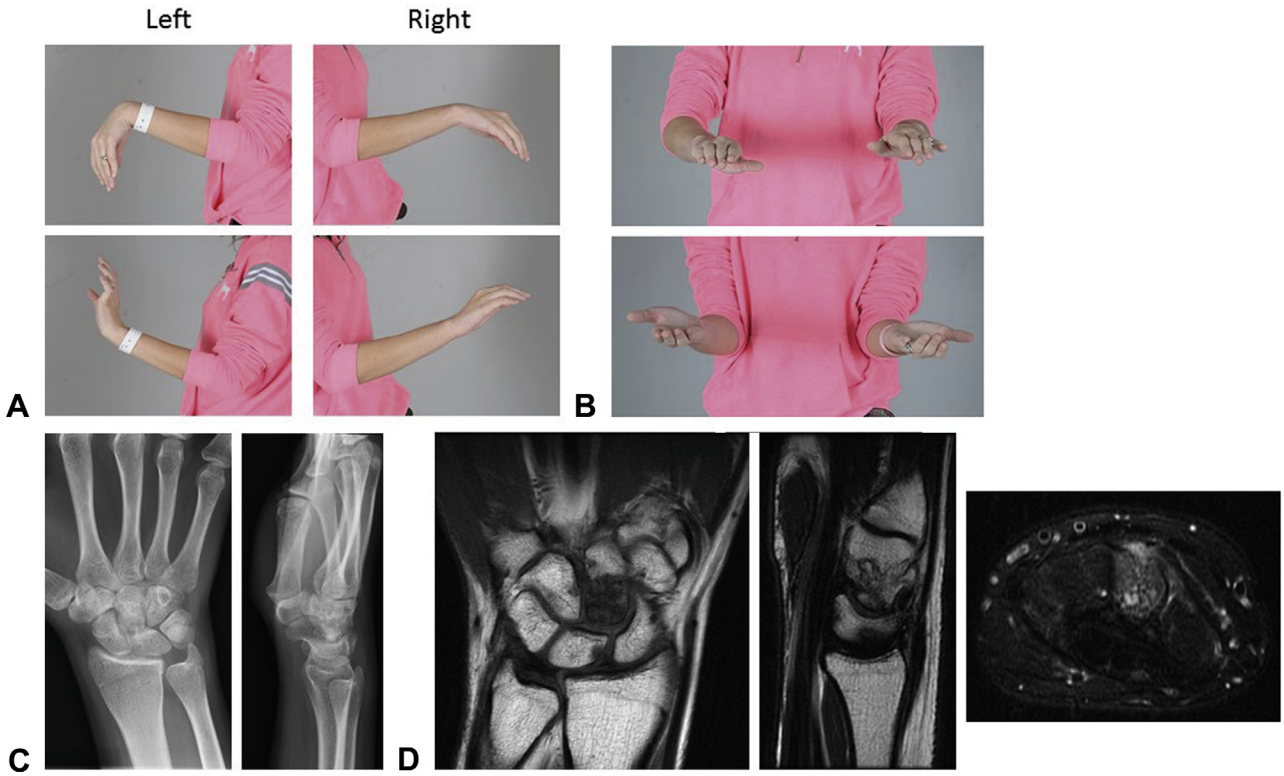

FIGURE 1: A–D Summary of patient's preoperative status.

CASE REPORT

Patient presentation

The patient was an active 16-year-old right-handed girl who sustained a hyperextension injury to her right wrist during high school cheerleading activities $2^1/_2$ years prior to presentation. With several negative radiographic series over this time frame, she was initially diagnosed with a wrist ligamentous sprain by her pediatrician and was managed with anti-inflammatory medication, activity modification, and bracing. Despite treatment, her pain progressed to impair activities of daily living. The physical examination revealed a deficit in wrist flexion and extension, each to 40° actively (Fig. 1A), with preservation of forearm rotation (Fig. 1B) and normal motion of the elbow and digits. Palpation revealed tenderness across the central midcarpus over the lunate and capitate. She was neurovascularly intact including a normal Allen test.

Wrist radiographs showed sclerosis throughout the capitate with cystic changes in the head, and a preserved capitolunate joint space despite irregularity of the capitate head subchondral bone (Fig. 1C). A magnetic resonance imaging (MRI) study of the wrist (Fig. 1D) corroborated the radiographic findings, with homogeneous low T1 signal intensity throughout the proximal two-thirds of the capitate and a serpiginous pattern, characteristic of AVN, most evident on the sagittal cuts. The T2-weighted axial images showed heterogeneous low-signal intense areas throughout the capitate, characteristic of AVN, and preserved capitate head cartilage.

Before surgery, treatment options were discussed with the patient considering the literature's shortcomings and lack of clarity regarding the natural history for this condition. Options discussed included continued orthosis treatment with activity modification, intercarpal arthrodesis, interposition or implant arthroplasty, capitate curettage and nonvascularized grafting, pedicled bone grafting, or grafting with a free vascularized bone flap. She declined further nonsurgical treatment, given the duration and severity of her symptoms. We decided against intercarpal arthrodesis or arthroplasty (resection, interposition, or implant) owing to her young age, combined with the preoperative imaging data suggesting that her capitate head articular cartilage remained intact. Treatment options designed to directly provide vascularity to the capitate were preferentially considered, given relatively unimpressive results following nonvascularized bone grafting.[9] Use of free vascularized bone grafts for capitate AVN is supported by limited reports demonstrating promising results following treatment of a high-level gymnast using the iliac