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Case Report

Cadaveric Meniscus Arthroplasty for Post-Traumatic Arthritis: A Case Report

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We present a novel treatment for post-traumatic arthritis of the hand and fingers using joint resurfacing with cadaveric meniscus. A 20-year-old man presented to the clinic with chronic pain and stiffness after an intra-articular fifth metacarpal fracture. Meniscus allograft, which has been used successfully in treatments for thumb carpometacarpal and radiocarpal degenerative osteoarthritis, was used to reconstruct the joint surface with complete resolution of stiffness and pain.

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Post-traumatic arthritis is a well-described sequela of joint injuries that can cause long-term symptoms including pain, swelling, and stiffness.^{1,2} Although arthritis in older patients is well known to cause a decline in quality of life due to pain with work or leisure activities, these same symptoms can be devastating in young, active patients. The incidence of post-traumatic arthritis is estimated to be 12% in large joints, but the incidence in smaller joints is not well elucidated and is likely under-represented in the literature.³ Most reports focus on joint resurfacing and replacement for knees and other large joints, and surgical options for addressing arthritis of the hand and fingers have not undergone the same scrutiny and innovation. Traditional treatments for post-traumatic arthritis of the hand include joint replacement or fusion, both of which represent unsatisfactory solutions for young, active patients. In recent years, interest has developed around the use of meniscus allograft for joint resurfacing of the thumb carpometacarpal (CMC) joint as an alternative approach to maintaining joint architecture and motion while avoiding many of the complications inherent to prosthetic implants.^{4–7} We present a novel case of application of this technique for post-traumatic arthritis of the fifth CMC joint in a young patient.

Declaration of interests: D.K. is on the advisory board of MTF Biologics. The other authors declare no conflict of interest.

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This report describes a novel treatment for arthritic changes in a 20-year-old patient who suffered an intra-articular fifth metacarpal fracture with subsequent CMC arthritis and arthralgia correlating to joint degeneration and osteophytes on radiographs and magnetic resonance imaging (Fig. 1).

Case Report

The patient is a 20-year-old right-hand-dominant man who initially presented 3 months after striking the ulnar side of his right hand on a metal pole, resulting in a fifth metacarpal base fracture with intra-articular extension. He was initially managed non-operatively at an outside facility with immobilization for 6 weeks and went on to achieve bony healing with a good range of motion. However, he continued to experience pain, with increasing discomfort with range of motion. He was followed up for 12 months, during which he subsequently underwent hand therapy and two cortisone injections, which temporarily relieved his symptoms. He maintained an excellent range of motion, but his daily activities were significantly limited by refractory pain. Radiographs demonstrated evidence of arthritis changes and osteophytes at 15 months from injury.

The option of joint fusion was discussed with the patient, but he was averse to any procedure that would sacrifice motion. After a thorough discussion of the surgical options, he elected to undergo arthroplasty with a cadaveric meniscus autograft.

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Figure 1. Preoperative magnetic resonance imaging demonstrating arthritis of the right fifth digit CMC joint.

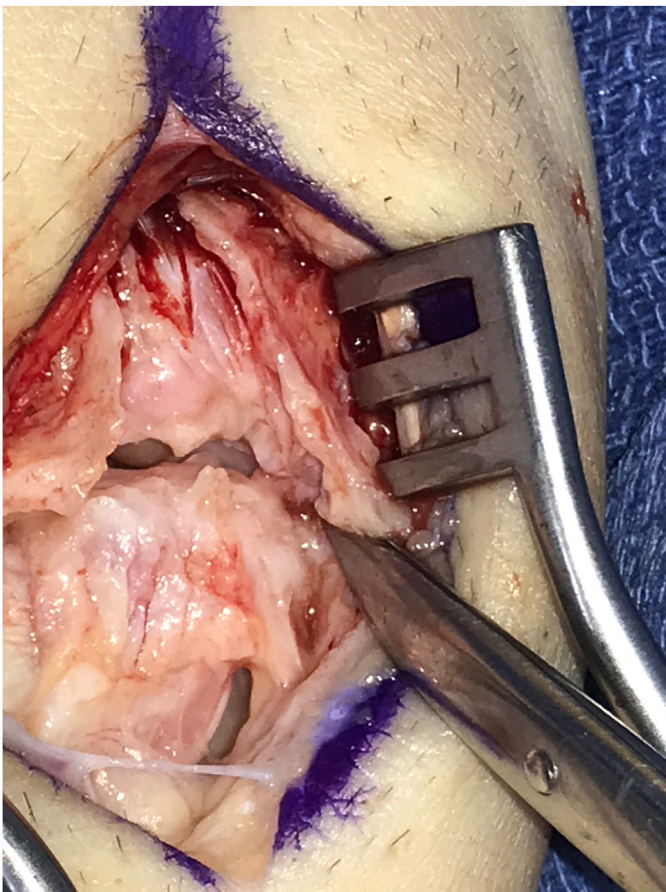


Figure 2. An intraoperative photograph demonstrating irregular surface of the joint corresponding to the patient's symptoms and radiographic findings.

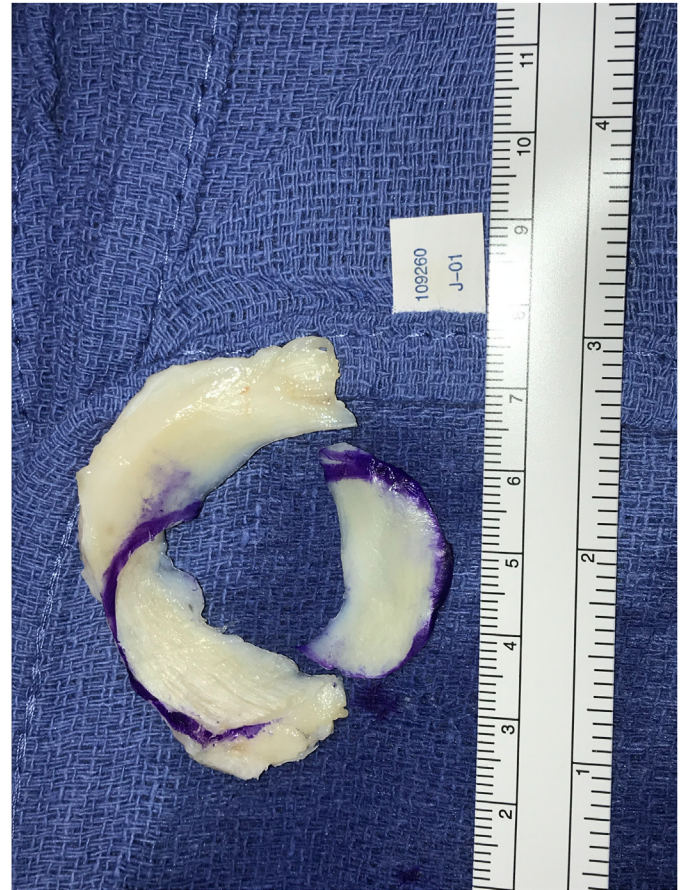


Figure 3. An intraoperative photograph with meniscus, marked for trimming to size.

Surgical technique

At the time of the procedure, a dorsal incision was made over the affected CMC joint, which was confirmed with fluoroscopy. The extensor mechanism was incised, and the joint was found to have grossly visible arthritic changes and synovitis (Fig. 2). The CMC joint was then decorticated with a burr to healthy bone. The meniscus allograft was cut to the size and shape of the joint space (Fig. 3). A 4.5 Kirschner wire was used to perforate the bone to allow for suture anchors to be placed. Fiberwire sutures were passed through these small holes and through the meniscus, securing the allograft (Fig. 4). The meniscus placement was confirmed on fluoroscopy, and fibrin glue was applied before closing the joint capsule and skin.

After surgery, the patient was immobilized in a plaster splint for 2 weeks before beginning passive range of motion and resuming hand therapy. His restrictions for the use of the hand were raised at 6 weeks, and he advanced his activity as tolerated. The patient demonstrated no postoperative complications. At his 3-month postoperative visit, the patient's pain had resolved, and he had a full range of motion in the operative hand. Postoperative radiographs are shown in Figure 5.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

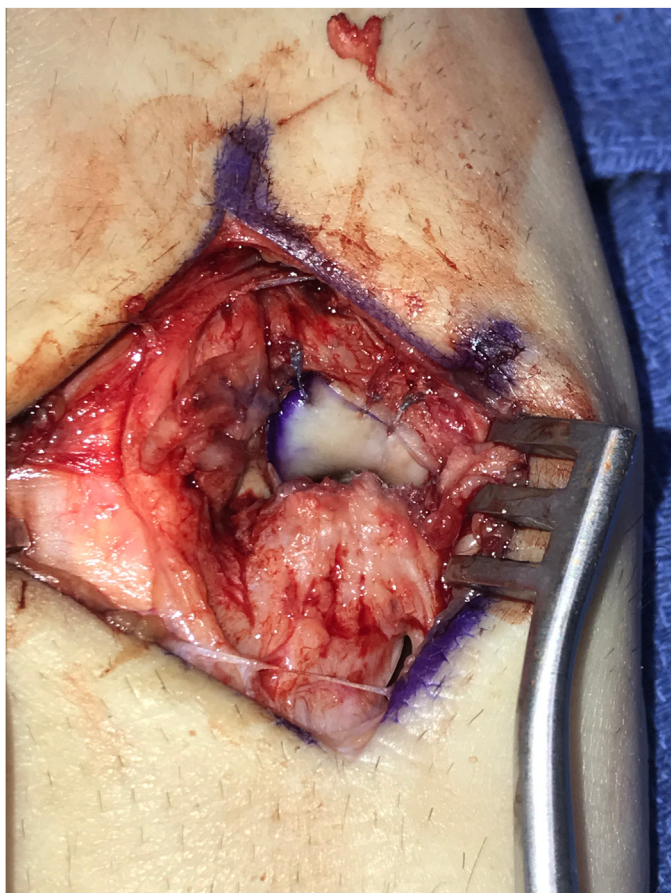


Figure 4. An intraoperative photograph demonstrating placement of the meniscus into the joint with suture anchors.

Discussion

Joint pain in the hand and wrist is painful and debilitating, and despite multiple arthroplasty techniques and implants available, none have demonstrated superiority. Because the most common cause of hand arthritis is osteoarthritis associated with aging, current treatment options are often better suited to elderly patients with lower functional demands. Post-traumatic arthritis in the young patient population represents a unique challenge. Cadaveric meniscus allograft has been recently explored as a novel technique for maintaining range of motion while avoiding many of the complications associated with traditional silicone or pyrocarbon implants. Several series have demonstrated successful use of cadaveric meniscus for basilar joint arthritis, but a limited amount of data exists to support extrapolating these treatments to other joints or less common etiologies. We demonstrate the successful use of cadaveric meniscus allograft for resurfacing post-traumatic arthritis of the fifth CMC joint in a young patient.

In this report, we describe the case of a young, active patient with post-traumatic arthritis who was successfully treated with joint resurfacing using a cadaveric meniscus allograft. The patient



Figure 5. Radiograph at 2 weeks after surgery.

had a complete resolution of pain after the procedure. Innovation in the field should be encouraged as novel materials and treatments may prove to be dependable solutions for challenging problems currently treated with traditional, but unsatisfactory, procedures.

References

1. Punzi L, Galozzi P, Luisetto R, et al. Post-traumatic arthritis: overview on pathogenic mechanisms and role of inflammation. *RMD Open*. 2016;2(2):e000279.
2. Lieberthal J, Sambamurthy N, Scanzello CR. Inflammation in joint injury and post-traumatic osteoarthritis. *Osteoarthritis Cartilage*. 2015;23(11):1825–1834.
3. Brown TD, Johnston RC, Saltzman CL, Marsh JL, Buckwalter JA. Posttraumatic osteoarthritis: a first estimate of incidence, prevalence, and burden of disease. *J Orthop Trauma*. 2006;20(10):739–744.
4. Shapiro PS, Diao E, Givens LM. Meniscal allograft arthroplasty for the treatment of trapeziometacarpal arthritis of the thumb. *Hand*. 2015;10(3):407–416.
5. Hoang D, Chen VW, Gould DJ, Cohen MJ, Kulber DA. Successful arthroplasty using cadaveric meniscus for osteochondral defects in the wrist and hand joints. *Plast Reconstr Surg Glob Open*. 2017;5(3):e1257.
6. McCullough MC, Minasian R, Tanabe K, Rodriguez S, Kulber D. Functional outcomes for meniscal allograft interposition arthroplasty of the hand. *Plast Reconstr Surg Glob Open*. 2021;9(4):e3520.
7. Yamamoto M, Chung KC. Joint fusion and arthroplasty in the hand. *Clin Plast Surg*. 2019;46(3):479–488.