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Operative Techniques in

Sports Medicine

Patellofemoral Osteochondral Allograft Transplantation

Andreas H. Gomoll, MD, PhD,* Jack Farr, MD,†,‡ and Betina Hinckel, MD§

Patellofemoral (PF) cartilage defects are common. They may result from instability, incongruity between the patella and trochlea, repetitive overload (microtrauma), or direct impact (macrotrauma). If exhaustive conservative management fails to resolve symptoms of disabling anterior knee pain with activities of daily living, surgical treatment may be considered. There are 3 main indications for osteochondral allograft transplantation: cartilage defects that are associated with extensive abnormalities of the subchondral bone or frank bone loss that are expected to compromise surface procedures such as autologous chondrocyte implantation; cartilage defects that are associated with severe trochlear dysplasia; and PF osteoarthritis in young patients who are not candidates for arthroplasty. Osteochondral allograft transplantation is performed using 1 of the 2 following techniques, depending on the location and extent of cartilage damage being addressed. The dowel or press-fit technique utilizes a cylindrical reamer and coring reamer system to fashion a dowel and recipient site with a diameter ranging from 15-35 mm. The shell technique is an alternative, which addresses very large defects in which the chondral defect area is removed along with bone with a saw using the same plane(s) as for prosthetic resurfacing (total knee arthroplasty or PF arthroplasty). Careful assessment of PF kinematics and anatomy (or pathokinematics and pathoantatomy) are the key to optimizing success. In light of these factors, associated procedures (such as tibial tuberosity osteotomies, medial PF ligament reconstruction, or lateral retinacular lengthening) are very common in PF cartilage repair, especially with bipolar grafts. With attention to detail and technique, successful outcomes may be achieved in many patients.
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Background

Patellofemoral (PF) cartilage defects are common. The PF compartment and the medial femoral condyle are the most frequently affected locations in the knee joint. Cartilage defects in the PF joint are multifactorial.[1-13] They may be a result of instability, incongruity between the patella and trochlea, repetitive overload (microtrauma), or direct impact (macrotrauma).[1-13] Totally 90% of patellar dislocations result in some damage to the articular cartilage, ranging from simple fissures to large osteochondral fractures.[4,6,9,12] If exhaustive conservative management fails to resolve symptoms of disabling anterior knee pain with activities of daily living, surgical treatment may be considered.

Indications

There are 3 main indications: cartilage defects that are associated with extensive abnormalities of the subchondral bone that are expected to compromise surface procedures such as autologous chondrocyte implantation; cartilage defects that are associated with severe trochlear dysplasia; and PF osteoarthritis in young patients who are not candidates for arthroplasty

*Department of Orthopedic Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA.
†Cartilage Restoration Center of Indiana, OrthoIndy Hospital, Greenwood, IN.
‡Department of Orthopedic Surgery, Indiana University Medical Center, Indianapolis, IN.
§Institute of Orthopedics and Traumatology, Clinical Hospital of the Medical School of the University of São Paulo, São Paulo, Brazil.
Address reprint requests to Jack Farr, MD, 1260 Innovation Parkway, Greenwood, IN 46143. E-mail: jfarr@orthoindy.com, indyknee@hotmail.com

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Surgical Technique

Osteochondral allograft transplantation is performed by 1 of 2 techniques, depending on the location and extent of cartilage damage being addressed.[14] The dowel or press-fit technique utilizes a cylindrical reamer and coring reamer (circular saw) system to fashion a dowel and recipient site with a diameter ranging from 15-35 mm. The dowel is typically slightly oversized to allow press-fit, implant-free fixation in the recipient site. Generally, proprietary instrumentation for graft preparation is provided free of charge by the respective tissue bank. Smaller dowels are used predominantly for defects that do not cross the midline, that is, those located in their entirety on the medial or lateral aspect of the patella or trochlea and are thus somewhat independent of morphology (eg, Wiberg type of patella or trochlear groove angle). Central defects can be treated as well, but are technically more challenging to match perfectly owing to the complex geometry of the trochlea groove and median ridge (Fig. 1). DeBerardino (personal communication) has described using a "mega-OAT (osteochondral allograft transfer)" technique that resurfaces nearly the entire patella with 1 very large plug (Fig. 2). Taken a step further, the shell technique is an alternative to address the very large defects. In this technique, the chondral defect area is removed along with bone with a saw using the same plane as for patellar resurfacing (total knee arthroplasty or PF arthroplasty), leaving a uniform thickness of 12-15 mm. Host patellar bone thinner than 12 mm may increase the risk of fracture and thicker remaining host bone may significantly increase the final composite patellar thickness, which could increase PF contact forces. A size-matched graft is created using a similar cut using a free-hand technique (a commercial "lobster claw" patella clamp may be useful to stabilize the patellar graft in some cases). The graft is secured with antegrade or retrograde metal or resorbable screws (preferable to pins). Careful attention should be paid to the countersunk hardware to assure that it will not become proud in the future, thus having the potential to abrade the opposing joint surface. In addition to addressing any size and shape of cartilage defect, the shell technique can address also trochlear dysplasia, where chondrosis would preclude trochleoplasty. The dysplastic native trochlea is replaced with a normally shaped graft. If the patella is also involved with extensive chondrosis or if the native patella shape would lead to suboptimal contact area due to marked incongruency of the PF articulation, bipolar allograft resurfacing may be considered. In Figure 3, cartilage repair results are shown for the shell technique.

Associated procedures are very common in PF cartilage repair. Careful assessment of PF kinematics and anatomy (or pathokinematics and pathoanatomy) is the key to optimizing the success of these procedures. Femoral and tibial derotations, realignment of severe valgus deformity, lateral retinacular lengthening, quadriceps muscle derotation or selective lengthening of the quadriceps tendon, tibial tuberosity transfer, and medial patellofemoral ligament reconstruction should all be considered to optimize

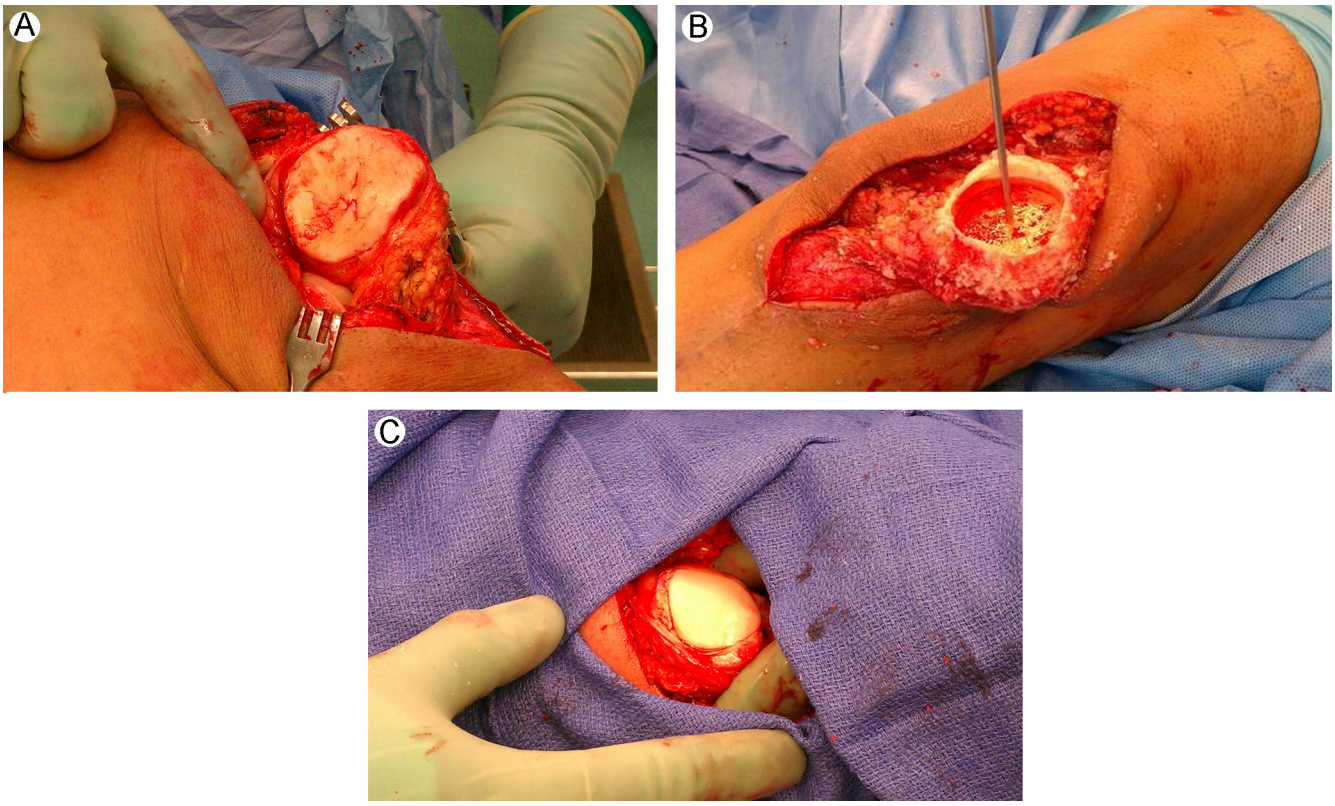

Figure 1 (A) Cartilage damage of the patella preoperatively. (B) Mega-OAT panpatellar socket created with guide pin and reamer. Base drilled to promote bony healing. (C) Cartilage repair with mega-OAT plug. (Photographs courtesy of Dr. Tom DeBeradino.)