



Fresh Femoral Head Osteochondral Allograft Transplantation for Treating Osteochondritis Dissecans of the Femoral Head

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Abstract: Treatment options for the management of osteochondritis dissecans (OCD) lesions of the femoral head are limited. Although arthroscopic surgery of the hip can treat a variety of intra- and extra-articular pathologies, an OCD lesion located at the superior and medial zone of the femoral head is often difficult to access and cannot be adequately treated arthroscopically. The use of fresh-stored osteochondral allograft allows surgeons to both avoid donor-site morbidity and treat lesions of a larger surface area. We present our technique for surgical treatment of a femoral head OCD lesion with open surgical dislocation of the hip through stepped trochanteric osteotomy and osteochondral transplantation of fresh-stored femoral head allograft.

Osteochondral lesions of the femoral head are uncommon, constituting approximately 2% of all cases of osteochondritis dissecans (OCD).¹ Separation of osteochondral lesions from subchondral bone causes pain, catching, and progressive cartilage damage that increases the risk of arthritis. In symptomatic patients, surgical intervention should be considered with the aim of restoring surface congruity and preserving joint kinematics.² In this context, fragment debridement is not the optimal option. Open or arthroscopic fragment fixation is constrained by the limited intrinsic healing capacity of hyaline articular cartilage, a critical pathogenesis factor in chronic cases.

Osteochondral transplantation is clearly indicated in cases of irreparable OCD.³ Techniques for osteochondral autograft transplantation have been described, but this approach has the inherent risk of donor-site morbidity.^{4,5} Arthroscopic osteochondral transplantation has several advantages, but OCD lesions located at the superior and/or medial surface of the femoral head are inaccessible.⁶ In such cases, open surgical dislocation must be performed. We present our technique of fresh femoral head osteochondral allograft transplantation for the treatment of OCD lesions located at the superior and medial zone of the femoral head through open surgical hip dislocation ([Video 1](#)).

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The authors report the following potential conflict of interest or source of funding: B.G.D. receives support from Arthrex. Research support to AHI/consulting/royalties. Breg, ATI. Research support to AHI. Pacira, Stryker. Research support to AHI/consulting. Orthomerica, DJO Global. Royalties. Amplitude, Medacta. Consulting. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received May 23, 2017; accepted October 7, 2017.

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2212-6287/17707

<https://doi.org/10.1016/j.eats.2017.10.001>

Surgical Technique

Patient Positioning and Approach

The patient is placed in the lateral position using a method of trunk stabilization and draped in a sterile fashion. The landmarks are identified, and a straight direct lateral 20-cm incision centered over the greater trochanter (Gibson approach) is performed. The iliotibial band is identified and split longitudinally parallel and in line with the skin incision. Care must be taken in identifying the plane between the gluteus maximus and tensor fascia lata ([Fig 1](#)). The gluteus maximus muscle is retracted posteriorly, and the tissue over the greater trochanter is incised longitudinally to expose the structures attached to the posterior aspect of the greater

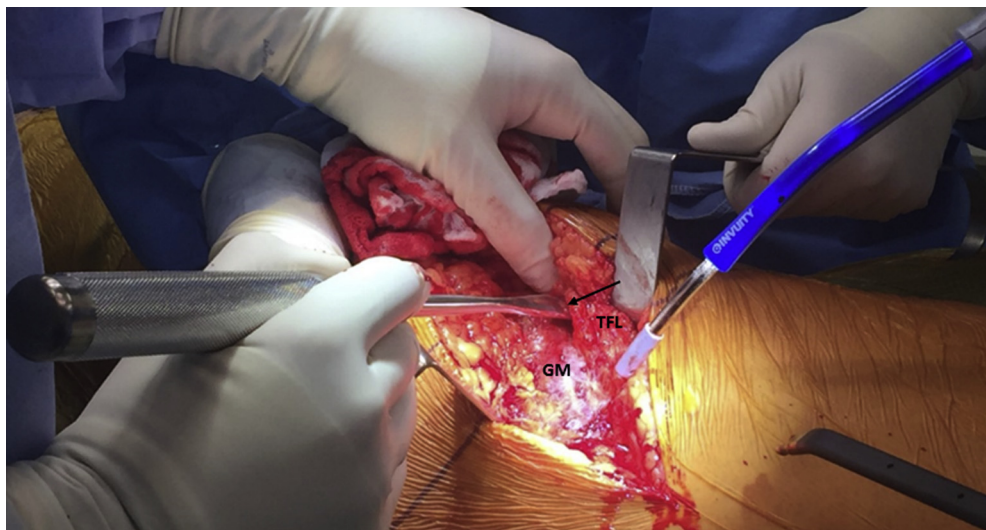


Fig 1. Left hip, viewed from posterior, with cephalic to right. The Gibson approach is performed with the incision centered at the greater trochanter. The plane between the gluteus maximus (GM) and tensor fascia lata (TFL) is developed to reach and identify the posterior structures—piriformis tendon and short external rotators—which remain intact during the whole procedure.

trochanter, leaving the piriformis tendon and the short external rotators intact. The posterior origin of the vastus lateralis muscle is released, and the muscle is lifted from the bone without detaching the tendinous origin from the tubercle (Fig 2). A stepped osteotomy of the greater trochanter is performed with an oscillating saw, reflecting the flip piece anteriorly along with its muscle attachments (Fig 3). Dissection of the interval between the posterior edge of the gluteus minimus and the piriformis tendon exposes the capsule up to the rim of the acetabulum, and capsulotomy and ligamentum teres release are performed. The hip is subluxated anteriorly through the arthrotomy by placing the leg in a sterile side bag, followed by flexion, external rotation, and adduction.

Arthroscopic-Assisted Examination and OCD Lesion Identification

Arthroscopic-assisted examination with a 70° arthroscope is performed to assess the labral and acetabular

cartilage condition. On the basis of magnetic resonance imaging findings and careful examination and palpation of the femoral head with an arthroscopic probe, the OCD lesion boundaries are identified.

OCD Lesion Preparation

All unstable cartilage is resected using a knife (Fig 4). The Arthrex Osteochondral Autograft Transfer System (OATS; Arthrex, Naples, FL) is then used. Cannulated Allograft OATS sizers are used to determine the diameter and number of plugs needed for coverage of the area of the lesion. For example, in a recent case, two 25-mm plugs were impacted in a “snowman” configuration. The appropriate sizer is placed over the fresh femoral head allograft to confirm that it is large enough for the defect site. The sizer is returned to the recipient site and placed over the defect, perpendicular to the femoral head surface. A drill-tip guide pin is drilled through the sizer into the femoral head (Fig 5).

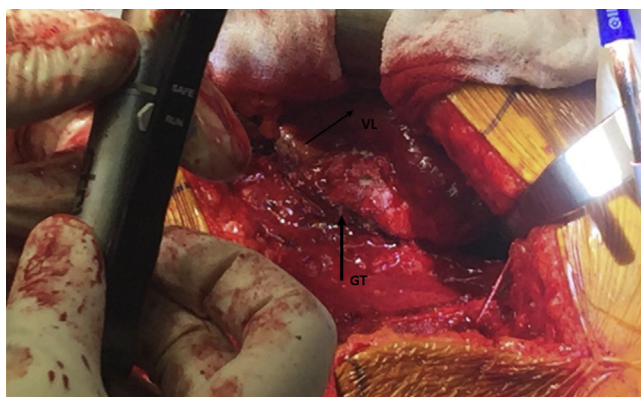


Fig 2. Left hip, posterior view, with cephalic to right. The posterior origin of the vastus lateralis muscle (VL) is elevated, and the muscle is lifted from the bone without detaching the tendinous origin from the tubercle. This will allow good exposure of the greater trochanter for osteotomy.

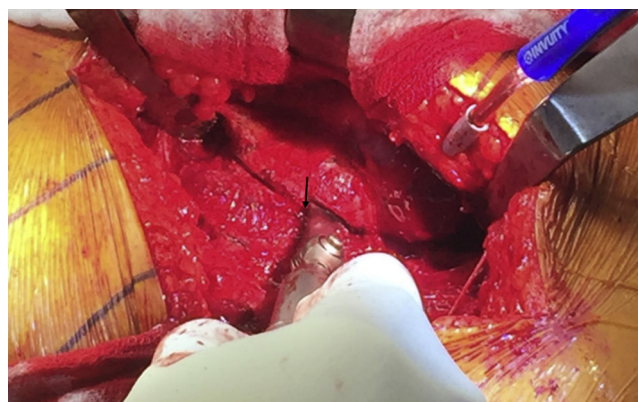


Fig 3. Left hip, posterior view, with cephalic to right. Stepped osteotomy (arrow) of the greater trochanter is performed with an oscillating saw. Increased stability after osteotomy reduction and fixation is achieved by using this technique.

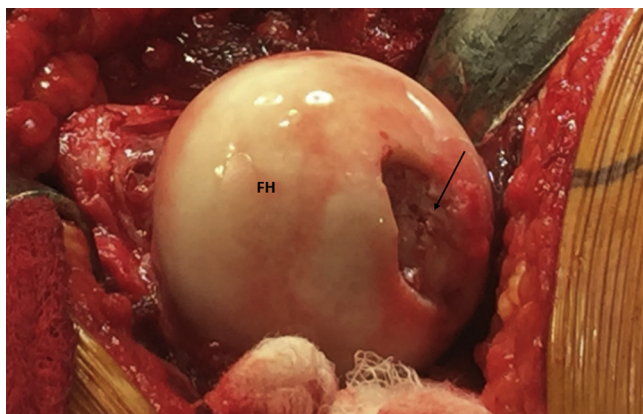


Fig 4. Left hip, viewed from posterior with 70° arthroscope, with cephalic to right. The femoral head (FH) defect view is shown after unstable cartilage removal from the osteochondritis dissecans lesion (arrow).

The sizer is removed. The calibrated Allograft OATS recipient counterbore is then secured to the drill and placed over the drill-tip guide pin. The counterbore is drilled into the defect and subchondral bone to a depth of 15 mm. Bleeding subchondral surfaces are confirmed. The appropriately sized Allograft OATS dilator is threaded onto the slap hammer and inserted into the recipient socket site to achieve a 0.5-mm socket dilation. Depth measurements of the created socket are taken from 4 quadrants (12, 3, 6, and 9 o'clock) and recorded for use when creating the allograft core.



Fig 5. Left hip, viewed from posterior, with cephalic to right. A drill-tip guide pin (P) is drilled through the sizer (S) into the femoral head (FH). In this case, because of the size of the osteochondritis dissecans lesion, 2 fresh femoral head osteochondral allografts were selected.

Femoral Head Allograft Preparation

The donor femoral head allograft is secured in the Arthrex Allograft OATS Workstation, and perpendicular alignment is confirmed with the OATS sizer. The Allograft OATS donor harvester with a collared guide pin is attached to the drill, passed into the proximal graft housing, and rested on the graft's surface. The harvester is subsequently drilled to a depth of 15 mm and then removed. The graft is advanced until flush with the surrounding cartilage. The same procedure is repeated with additional plugs as needed (Fig 6).

Hip Reduction and Closure

After femoral head reduction, the trochanteric flip is reduced and secured with two 3.5-mm fully threaded cortical screws with washers (Fig 7). Fluoroscopic confirmation is obtained, the capsule is repaired, and closure is performed in standard fashion (Table 1).

Postoperative Rehabilitation

The patient is placed in a brace (Donjoy X-Act ROM Hip Brace; DJO Global, Vista, CA) for 6 weeks to protect the hip and limit abduction and rotation. Gentle passive range-of-motion exercise is initiated during the first week, under the supervision of a physiotherapist. The patient remains limited to 20 lb of flat-foot partial weight bearing during the first 6 weeks. Active hip flexion is not allowed until week 6. Starting in week 6, weight bearing is gradually increased, and full weight bearing is allowed at 8 weeks after surgery.

Discussion

We present our open technique for fresh femoral head osteochondral allograft transplantation to treat OCD lesions located at the superior and medial aspect of the

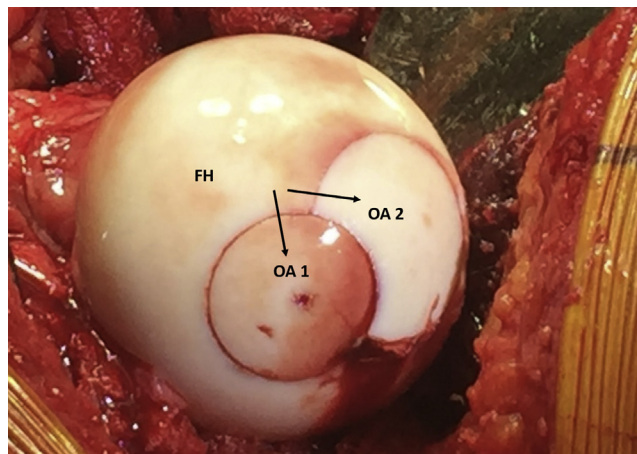


Fig 6. Left hip, viewed from posterior, with cephalic to right. Final result after transplantation of 2 femoral osteochondral allograft (OA) plugs in a snowman fashion with a perfect depth match with the surrounding cartilage.

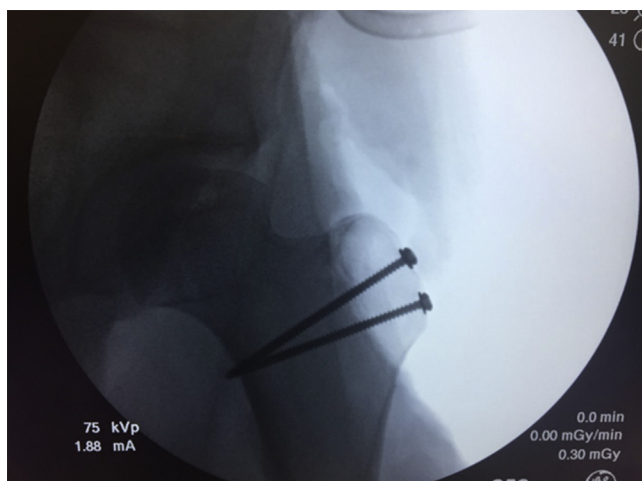


Fig 7. Fluoroscopic confirmation of adequate reduction and fixation of trochanteric osteotomy with two 3.5-mm fully threaded cortical screws with washers in left hip.

femoral head, where arthroscopic access is impossible with current techniques. OCD lesions of the femoral head are uncommon, and current treatment options are limited. Arthroscopic osteochondral transplantation had been described for OCD at the femoral head, but indications are limited to the anterosuperior and anterolateral aspects of the femoral head.⁵ There is not extensive literature on the treatment of OCD lesions in the hip, unlike in the knee. A case series of 10 patients with a mean follow-up period of 29.2 months reported on open surgical dislocation in the treatment of OCD of the femoral head with autograft.⁶ The authors concluded that osteochondral autograft transplantation may be an alternative option for OCD of the femoral head but that it is a technically demanding procedure requiring familiarity with surgical hip dislocation. Autogenous tissue is still considered the gold standard for reconstructive orthopaedic surgery. A 2-patient case series reported on femoral hip mosaicplasty with ipsilateral knee autograft for the treatment of traumatic osteochondral injury.⁷ At more than 1 year of follow-up for 1 patient and more

Table 1. Tips, Pearls, and Pitfalls

Tips and pearls

- Perform meticulous dissection during surgical dislocation approach
- Preserve integrity of abductor and vastus lateralis insertions on greater trochanter
- Size graft correctly to replace both diseased cartilage and pathologic subchondral bone
- Use snowman formation with multiple plugs for irregularly shaped defects

Pitfalls

- Disruption of vascular supply to femoral head during surgical dislocation
- Incorrect depth of OA plug (or plugs) relative to depth of recipient holes
- Plug or recipient preparation not perfectly perpendicular to chondral surface

OA, osteochondral allograft.

Table 2. Surgical Indications and Contraindications

Indications

- Grade III and IV OCD lesions according to ICRS classification
- Limited size, ideally <30 mm
- OCD lesions especially located at superior and medial area of femoral head

Contraindications

- Advanced osteoarthritis
- Active infection
- Bipolar chondral damage
- Advanced osteonecrosis with extensive head involvement

ICRS, International Cartilage Repair Society; OCD, osteochondritis dissecans.

than 5 years for the other, magnetic resonance imaging studies showed good autograft incorporation and maintenance of articular surface conformity in both patients. The authors concluded that treatment of osteochondral defects on the femoral head surface using surgical dislocation combined with an OATS procedure is a promising approach.

Donor-site morbidity is always a concern with autografts, and the articular cartilage of allografts is particularly vulnerable to the deep-freezing process. However, McDermott et al.⁸ and Lochter et al.⁹ have popularized the use of osteochondral allografts. They found that fresh cartilage allograft maintained nearly 100% cartilage cell viability, but there are some logistic limitations. Although chondrocyte viability is maintained for up to 45 days after procurement, studies have suggested a substantial decrease in viability after 28 days of storage. In a case report of open hip dislocation and femoral head fresh allograft with 12-month follow-up, the patient had a final Harris Hip Score of 94 and a full range of painless motion with no additional complaints of pain, suggesting that osteoarticular fresh allograft implantation may be appropriate for the treatment of osteochondral defects of the femoral head.³

The indications for the described technique are grade III and IV OCD lesions according to the International Cartilage Repair Society classification, located at the superior and medial area of the femoral head (Table 2). Fresh-stored osteochondral allograft transplantation through an open dislocation approach is a feasible alternative for such lesions. Lack of donor-site morbidity may allow for faster rehabilitation and earlier return to function (Table 3).

Table 3. Advantages and Disadvantages

Advantages

- No limitation by OCD location
- Direct visualization
- No donor-site morbidity

Disadvantages

- Steep learning curve
- Meticulous technique
- Open approach and trochanteric osteotomy
- Hip dislocation

OCD, osteochondritis dissecans.

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