# Repairing Osteochondritis Dissecans (OCD) Lesions of the Knee

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## Introduction

Osteochondritis Dissecans (OCD) is a condition identified by injury to the subchondral bone of a joint; and is increasing prevalent among our active young population. Lesions are most commonly located in the posterior lateral aspect of the medial femoral condyle. When surgical intervention is indicated for OCD lesions with intact overlying articular cartilage, a retrograde approach, although more technically challenging, drills the subchondral bone from behind without damaging the articular cartilage and decreases the risk for degeneration and osteoarthritis. The purpose of this study is to determine a safe and reproducible bony entry point as defined by consistent anatomic landmarks, tunnel trajectory as defined by an angle referenced to the longitudinal axis of the femur, and safe distance and/or tunnel diameter able to course the medial femoral condyle and reach the OCD target without damaging the articular and physeal cartilage.

## Methods

A total of 17 MRI scans from skeletally immature patients with a mean age of 12.7 years (range, 9 to 15 years) were obtained and downloaded to an independent software (Mimics materialize) for analysis. Mimics allows for accurate mapping of different bone (epiphysis, physis, and metaphysis of distal femur, tibia, and femur) soft tissue (medial collateral ligament) and cartilage (distal femoral articular cartilage). These masks were used to build individual 3D models of the knee joint for each patient. An accurate virtual representation of OCD lesions were designed and placed in the lateral aspect of medial femoral condyle to serve as the target for computer generated drill tunnels. Tunnels were placed in an anterior or posterior window. This "window of safety" was defined as never contacting the MCL and being a least 10mm from the articular and physeal cartilage.

## Images

**Figure 1:** Sagittal PD weighted FSE of the knee.

**Figure 2:** Sagittal view of Mimics generated 3D model of the left knee. Shows posterior tunnel (red) and anterior tunnel (blue).

**Figure 3:** Coronal view of Mimics generated 3D model with transparency. Shows posterior (red) and anterior (blue) portals and simulated OCD lesion (black).

## Results

Anterior and posterior tunnels were interpolated within the 3D model to achieve the most acute angle referenced to the axis of the femur without directly damaging the MCL or causing injury due to thermal necrosis of the physeal and articular cartilage. All angles were directly measured on the 3D model in a X-Y plane. The insertion point was measured from the center of the tunnel to the medial epicondyle. Length of tunnel through epiphysis is from the insertion point to the subchondral bone. All data is reported as mean ± SD.

### Statistical Analysis of Anterior and Posterior Tunnels

| | Posterior Tunnel | Anterior Tunnel |
|---|---|---|
| Coronal View Angle of Tunnel to Longitudinal axis of femur | 43.9 ± 10º | 44.5 ± 10.4º |
| Coronal View Angle of Tunnel to Joint Line | 50.7 ± 9.3º | 49.7 ± 9.4º |
| Sagittal View Angle of Tunnel to Longitudinal axis of femur | 10.8 ± 7.0º | 46.4 ± 9.87º |
| Sagittal View Angle of Tunnel to Joint Line | 81.1 ± 8.8º | 43.7 ± 9.7º |
| Maximum Radius | 4.0 ± 0.8 mm | 5.1 ± 0.8 mm |
| Length of Tunnel | 33.5 ± 4.5 mm | 31.8 ± 3.7 mm |
| Distance of Tunnel Insertion to Medial Epicondyle | Posterior : 8.6 ± 2.6 mm<br>Superior: 5.1 ± 4.2 mm | Anterior: 12.1 ± 3.6 mm<br>Inferior: 2.4 ± 3.5 mm |


Fig. 1

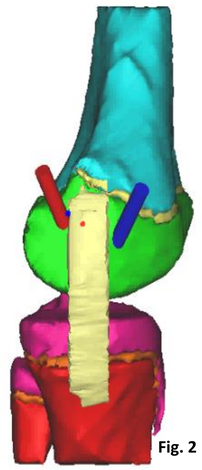
Fig. 2

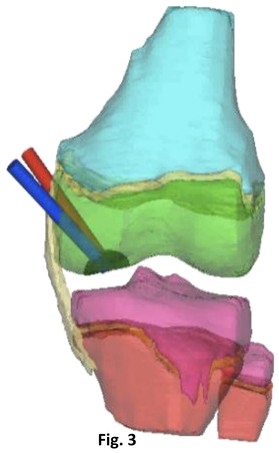
Fig. 3

## Conclusion

This anatomic study supports that drilling OCD lesions of the medial femoral condyle in an all extra-physeal all extra articular fashion can be safe and reproducible when using referenced angles and consistent external landmarks.

It should be noted that all images and corresponding 3D models are of the knee in full extension. Clinically, this surgery is performed with the knee in flexion, which would narrow the posterior window and potentially make an anterior portal more favorable.

## References

1. Boughanem J, et al. *Am J Sports* Med. 2011;39 (10):2212-2217
2. Detterline AJ, et al. *J Knee Surg*. 2008;21(2):106-115.
3. Adachi N, et al. *Arthroscopy*; 2009 Feb;25(2):145-52
4. Kawasaki K, et al. *Knee;* 2003 Sep;10(3): 257-63
5. Ojala R, et al. *Skeletal Radiol.* 2011; 40:765–770.
6. Cain EL, Clancy WG. *Clin Sports Med.* 2001;20(2):321-342.
7. Kocher MS, et al. *Am J Sports Med*; 2006 Jul;34(7):1181-91