Specific Markers of Knee Morphology Are Associated with Osteochondritis Dissecans of the Medial Femoral Condyle in Pediatric and Adolescent Patients: A Matched Case-Control Study

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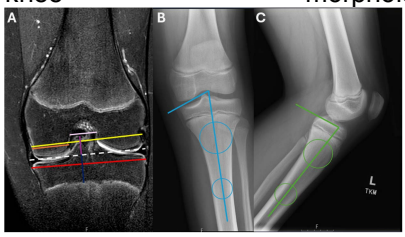
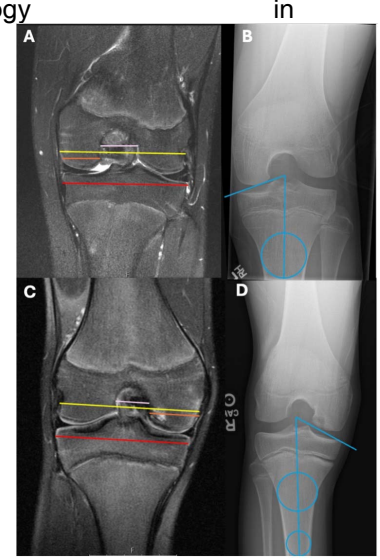
INTRODUCTION: Etiologies of knee osteochondritis dissecans (OCD) remain to be further elucidated. Past literature has suggested that specific knee morphologies may be associated with OCD of the medial femoral condyle (MFC), however parameters have not been thoroughly externally validated.

METHODS: Patients under 21 years of age diagnosed with MFC OCD between 2016-2024 were age and sex-matched to control patients 1:1 who had advanced knee imaging for reasons unrelated to MFC OCD . Radiographic measurements were made by two independent observers and included MFC width (MFCW), tibial plateau width (TPW), femoral notch width (FNW), femoral bicondylar width (FCW), distance from top of tibial spine to bimeniscal axis (A), distance from top of tibial spine to proximal tibial physis (B), medial tibial slope (MTS) and posterior tibial slope (PTS). Medial condyle index (MCI = MFCW/TPW), Notch Width Index (NWI = FNW/FCW), and S ratio (S = A/B) were calculated. Measurements were compared between the two groups via regression modeling.

RESULTS: 86 MFC OCD patients [32 females (37.2%)] were matched to 86 control patients (n=172 total). Mean age was 13.8 ± 2.8 years. MCI (0.371 ± 0.029 vs. 0.338 ± 0.023, p<0.001) was significantly larger in the OCD group, while NWI was significantly smaller (0.232 ± 0.032 vs 0.263 ± 0.031, p<0.001). No significant differences were found in A, B, S Ratio, MTS, or PTS. Multivariable logistic regression identified MCI (p<0.001), NWI (p=0.011), and MTS (p<0.001) as significant predictors of MFC OCD. Patients with an MCI > 0.354, NWI < 0.240, and an MTS > 18.9 degrees had a 18.6-, 4.7-, and 9.4-fold higher likelihood of having OCD, respectively.

DISCUSSION AND CONCLUSION: Significantly wider medial femoral condyles, narrower femoral notches, and larger medial tibial slope angles highlight the presence of abnormal osseous morphology in pediatric and adolescent MFC OCD compared to age- and sex-matched controls. These radiographic measurements were able to distinguish MFC OCD patients from controls with a high degree of likelihood. Continued research is needed to better understand the role of knee morphology in OCD pathophysiology





	OCD	Control	OR (95% CI)	OR p-value
Medial Femoral Condyle Width (MFCW)	27.74 ± 3.35 mm	25.15 ± 2.71 mm	**1.327 (1.181 to 1.490)**	**<0.001**
Tibial Plateau Width (TPW)	74.80 ± 7.06 mm	74.46 ± 7.02 mm	0.996 (0.954 to 1.039)	0.844
Medial Condyle Index (MCI = MFCW/TPW)	0.371 ± 0.029	0.338 ± 0.023	**1.744 (1.456 to 2.088)***	**<0.001**
Femoral Notch Width (FNW)	17.38 ± 3.03 mm	19.41 ± 2.63 mm	**0.758 (0.671 to 0.857)**	**<0.001**
Femoral bicondylar width (FCW)	74.93 ± 7.55 mm	73.89 ± 6.89 mm	1.008 (0.966 to 1.051)	0.721
Notch Width Index (NWI = FNW/FCW)	0.232 ± 0.032	0.263 ± 0.031	**0.726 (0.644 to 0.819)***	**<0.001**
Distance from top of tibial spine to bimeniscal axis (Distance A)	7.84 ± 1.61 mm	7.67 ± 1.52 mm	1.044 (0.857 to 1.272)	0.666
Distance from top of tibial spine to proximal tibial physis (Distance B)	22.77 ± 2.72 mm	22.48 ± 2.71 mm	1.012 (0.905 to 1.131)	0.840
S-Ratio (S = A/B)	0.343 ± 0.050	0.341 ± 0.054	1.006 (0.949 to 1.066)	0.844
Medial Tibial Slope (MTS)	17.2 ± 2.4 degrees	16.5 ± 2.4 degrees	1.129 (0.987 to 1.292)	0.077