

Diurnal Variation in Distal Femoral Cartilage Thickness

To the Editor:

We read with great interest the article “Cartilage Thickness of the Knee Joint in Juvenile Idiopathic Arthritis: Comparative Assessment by Ultrasonography and Magnetic Resonance Imaging,” by Pradsgaard, *et al*¹. The authors investigated the distal femoral cartilage thickness by using magnetic resonance imaging (MRI) and ultrasonography (US) in children with juvenile idiopathic arthritis. They showed the correlation between sonographic and MR measurements of cartilage thickness and reported that the cartilage thickness in medial femoral condyle was lower than that in lateral femoral condyle. Measurement of distal femoral cartilage thickness using different imaging methods including US is a relatively new topic and there are a growing number of publications investigating cartilage thickness in healthy populations and different disease groups such as systemic sclerosis and systemic lupus erythematosus^{2,3}. We comment here on diurnal variation of distal femoral cartilage thickness. So far, diurnal rhythm in cartilage thickness of femoral condyle has been highlighted in 4 MRI studies^{4,5,6,7} and 1 US study⁸.

First, Waterton, *et al* demonstrated that cartilage thickness decreased up to 0.6 mm in knee joint during the day owing to biomechanical forces, although cartilage volume did not change in asymptomatic patients⁴. Sitoci, *et al* investigated the deformation and the thickness of tibial cartilage in the knee joint during loading exercises and variation between morning and evening in healthy young volunteers. The authors showed that knee cartilage thickness decreases during the day and recovers overnight by up to 8% with resting⁵. In another study, Coleman, *et al* showed that cartilage thickness of the right knee joint decreased from AM to PM in all areas except the patellofemoral groove and lateral femoral condyle, after an average of 8057 steps during daily activities⁶. Finally, Widmyer, *et al* examined the effect of body mass index (BMI) on diurnal variation of cartilage thickness in the knee joint⁷. Cartilage thickness on femoral condyles decreased significantly from AM to PM. BMI did not have an influence on diurnal cartilage strain in the femoral cartilage, but did in the tibial cartilage⁷. We investigated the diurnal variation in the thickness of distal femoral cartilage by using US in healthy adults and showed diurnal variations reaching up to 10.6%⁸. The mean decrease in the cartilage thickness varies between 0.19 and 0.21 mm in the condyles and 0.11 to 0.13 in the intercondylar area. Interobserver intra-class correlation coefficients varied between 0.602 to 0.869 (for measurements of cartilage thickness in different regions and for time of the examinations).

All these studies suggested that cartilage thickness has diurnal variation and decreases from morning to evening in the same day. Pradsgaard and

colleagues explained that US and MRI examinations were performed in the same day; however, the exact time of the examination is also important for the measurements. Although the variations are small, diurnal rhythm may influence the results if the measurements were not performed synchronously.

ERKAN KILIC, MD; GAMZE KILIC, MD; SALIH OZGOCMEN, MD, Professor; Division of Rheumatology, Department of Physical Medicine and Rehabilitation, Erciyes University, Faculty of Medicine, Kayseri, Turkey. Address correspondence to Dr. E. Kilic, Erciyes Üniversitesi Tıp Fakültesi, Gevher Nesibe Hastanesi, Fiziksel Tıp ve Rehabilitasyon AD, Romatoloji BD, Kayseri, 38039, Turkey. E-mail: ekilic.md@hotmail.com

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