Distal vastus medialis volume is the strongest predictor of patellar cartilage morphology in patients with knee osteoarthritis

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Abstract

The purpose of this study was to determine whether distal vastus medialis (VM) volume, as opposed to whole quadriceps muscle volume or isometric knee extensor strength, is a more predictive quantitative measure of patellar cartilage in patients with knee osteoarthritis (OA). Twenty-three (13 female) community dwelling participants with knee OA completed isometric maximal voluntary knee extensor contractions to determine maximal torque. MRI using 3D multi-echo spoiled gradient echo imaging sequences and a multi-point fat-water separation method were used to acquire images of the quadriceps and the patellofemoral (PF) joint. The determinants of normalized cartilage volume (volume/surface area of subchondral bone) were obtained from individual linear regression models. Normalized VM volume (volume/patient height; cm^3/m) predicted the largest proportion of variance ($r^2 = 0.41$, $p=0.001$) in patellar cartilage volume over normalized isometric torque (torque/body mass; $N \bullet m/kg$, $r^2 = 0.33$, $p=0.004$) and normalized whole muscle volume (volume/patient height; cm^3/m) ($r^2 = 0.26$, $p=0.02$). These results provide support for further investigation of the distal quadriceps in patients with knee OA, as distal VM volume is an important predictor of patellar cartilage morphology. Reduced distal VM volume could indicate focal weakness in this portion of the muscle that may not be evident with knee extensor strength or whole muscle volume measurement.