Research on knee osteoarthritis (OA) has been slowed by the difficulty of quantifying early disease progression. T2 relaxation times from MRIs reflect cartilage health and tend to increase with osteoarthritis progression. Segmentation of cartilage in MRIs is a necessary first step for measuring T2 relaxation times, but current methods are labor-intensive. We present a convolutional neural network (CNN) model based on the U-Net architecture to fully automate femoral cartilage segmentation in MRIs.

**PROCEDURE**

Data: The OAI is a public study of knee OA in which MRIs were collected longitudinally. We used 286 sagittal plane multi-echo spin echo (MESE) MRI volumes from 143 OAI subjects assessed at baseline and four years later. Half of the subjects were randomly selected from among those in the OAI Incidence Cohort with BMI > 30 and the other half were age- and sex-matched controls with normal BMI in the Incidence Cohort. Each image was segmented with a semi-automated process and refined by an experienced musculoskeletal radiologist, referred to as Reader 1. Subjects were split into training (115 subjects, 230 image volumes), validation (14 subjects, 28 image volumes), and test (14 subjects, 28 image volumes) sets with no crossover of subjects across sets.

Models were trained and evaluated using one NVIDIA Tesla K80 GPU (Santa Clara, Calif).

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**CODE AND MODELS**

https://github.com/kathoma/AutomaticKneeMRISegmentation