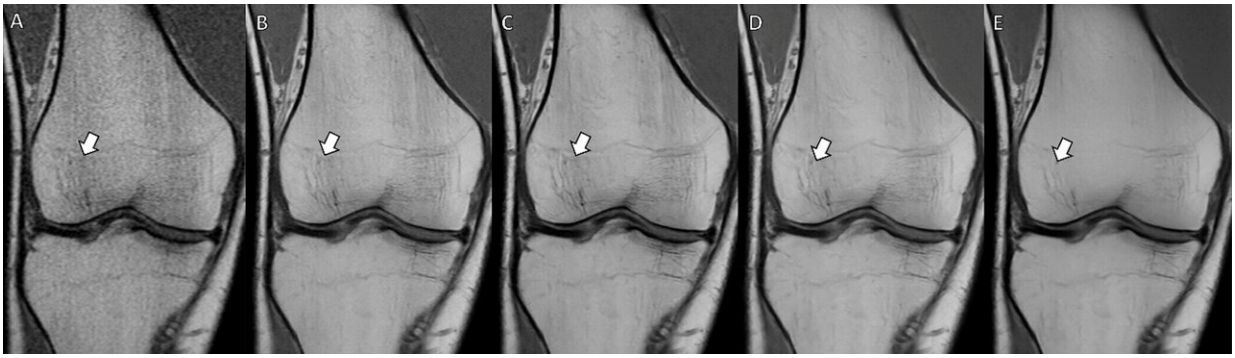
Can artificial intelligence improve musculoskeletal imaging?

January 3 2024



MRI scans of the right knee in a 42-year-old male patient acquired using a modern 0.55-T low-field-strength whole-body MRI system. (A–E) Coronal T1-weighted two-dimensional turbo spin-echo images of the knee without intravenous contrast material with (A) conventional image reconstruction and (B–E) deep learning (DL) superresolution image reconstruction applying increasing levels of denoising (B, lowest; E, highest). Compared with (A) conventional image reconstruction, (B–E) DL superresolution image reconstruction improved image quality with improved signal-to-noise ratio, contrast, and sharpness, resulting in better fine bone detail visibility (arrows). Increasing denoising levels (B, lowest; E, highest) elevated signal-to-noise ratio but decreased the detail of bone texture (arrows). Credit: *Radiology* (2024). DOI: 10.1148/radiol.230764

While musculoskeletal imaging volumes are increasing, there is a relative shortage of subspecialized musculoskeletal radiologists to

interpret the studies. Is AI the solution?

"With the ongoing trend of increased imaging rates and decreased acquisition times, a variety of AI tools can support musculoskeletal radiologists by providing more optimized and efficient workflows," says corresponding author Ali Guermazi, MD, Ph.D., chief of radiology at VA Boston Healthcare System and professor of radiology and medicine at Boston University Chobanian & Avedisian School of Medicine.

In a new article in the journal *Radiology*, BU researchers provide an overview of AI applications for musculoskeletal radiology, including basic principles, image acquisition and interpretation, and prediction of future outcomes. Their article also discusses AI implementation challenges, the non-interpretive uses of AI, and how it may transform the daily professional lives of musculoskeletal radiologists.

According to the researchers, AI shows great potential for more complex tasks such as disease prognostication and prediction of clinical outcomes over time, which may increase the value of imaging and allow the field to take a big step forward toward precision medicine.

However, many challenges must be overcome for AI to make its way to clinical practice. These include the requirement for large, good-quality data sets, which is more problematic for uncommon conditions such as musculoskeletal tumors, among others. They point out that multi-institutional collaboration will be essential to creating such data sets, but this introduces issues of its own, such as differences in imaging protocols.

"For AI to be the solution, the wide implementation of AI-supported data acquisition methods in clinical practice requires establishing trusted and reliable results. This implementation will require close collaboration between core AI researchers and clinical radiologists," says Guermazi.

Upon successful clinical implementation, a wide variety of AI-based tools can improve the musculoskeletal radiologist's workflow. Additional AI applications also may be helpful for business, education and research purposes if successfully integrated into the daily practice of musculoskeletal radiology.

Guermazi reassures that AI will not replace radiologists, but rather radiologists in the future will all use AI.

More information: Ali Guermazi et al, How AI May Transform Musculoskeletal Imaging, *Radiology* (2024). DOI: 10.1148/radiol.230764

Provided by Boston University School of Medicine