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Virtual Biopsy of the Joint Tissues using Near-Infrared, Reflectance Microscopy. A pilot study

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ABSTRACT

Standard noninvasive imaging techniques applied to joints provide gross morphological features, insufficient for assessing histological detail. On the other hand, biopsying is invasive, time consuming, and may involve unwanted processing artifacts. Near-infrared reflectance confocal microscopy is a technique that allows serial, high-resolution optical sectioning through intact tissues without employing exogenous fluorescent stains. The aim of this work was to evaluate the potential utility of near-infrared reflectance confocal microscopy for providing immediate histological information on meniscus, articular cartilage, epiphyseal plate, bone, muscle, and tendon. Images from near-infrared reflectance confocal microscopy were compared with mirror routine histology sections. Characteristic architectural features were readily visualized in the three dimensions of space. Additionally, the use of experimental contrast agents highlighted the localization of nuclei. Limitations include penetration depth and minor optical artifacts. In conclusion, near-infrared reflectance confocal microscopy is a useful technique for immediate, nondestructive, serial 'virtual' sectioning through intact tissues, being thus a potential adjunct to current imaging techniques in orthopedics.