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Title:THz time-domain spectroscopic imaging of human articular cartilage
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Abstract:Articular cartilage forms a thin layer and has a specialized molecular composition and structural organization along its depth, which consists of superficial, transitional, deep, and calcified zones. Terahertz (THz) pulse imaging is an emerging technique that was developed as a result of recent advances in THz technology. THz pulse imaging is a coherent and non-ionizing method that can provide structural and functional information of biological tissues. Human articular cartilage tissues were obtained from a 62-year-old female patient after artificial joint replacement surgery. These tissues contained both normal and abnormal tissues, and both fresh and dehydrated tissues were measured. The abnormal tissues chosen for measurement showed severe cartilage degeneration. The progression of osteoarthritis mainly depends on biochemical changes that involve changes in water and proteoglycan content and the destruction of collagen fibers in the cartilage. The difference in spectral intensity thus suggests that changes in the water and biomolecular contents may occur in the abnormal cartilage.
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