

Inner annulus fibrosus in non-degenerated intervertebral disc shows bright signal on T2 weighted MR image

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The intervertebral disc is a fibrocartilaginous joint that supports spinal forces while facilitating compound movements. To meet these demands, the disc has a complex structural organization that imparts unique physical properties. The nucleus pulposus matrix is composed mainly of high molecular-weight glycosaminoglycans (GAGs) with fixed negative charges that induce osmotic swelling (1). The annulus fibrosus limits the swelling of the nucleus pulposus and the motions between adjacent vertebrae. The composition of the annulus fibrosus varies depending on its location within the disc. The inner aspect of the annulus fibrosus adjacent to the nucleus pulposus is rich in proteoglycans and contains lamellae composed predominately of type II collagen. These macromolecules, proteoglycans, and type II collagen decrease with increasing distance from the nucleus pulposus and the amount of type I collagen increases. Due to the differences in the extracellular matrix composition, the annulus fibrosus is divided into an inner annulus fibrosus and outer (peripheral) annulus fibrosus. The swelling pressure of the nucleus pulposus countered by the tension in collagen fibers of the annulus fibrosus gives the disc its biomechanical properties.

Recently a number of research papers described region-of-interest (ROI) based segmentation of intervertebral disc

into nucleus pulposus and annulus fibrosus on magnetic resonance (MR) images, and took the assumption that the bright signal area in the disc on T2 weighted MR image as nucleus pulposus. This is not correct. Actually the nucleus pulposus and inner annulus fibrosus are difficult to distinguish from each other macroscopically. In non-degenerated intervertebral disc, the nucleus pulposus and inner annulus fibrosus both show high signal intensity with no distinct boundary between them (2), while peripheral annulus fibrosus shows low signal intensity.

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