

End-Plate Disruption as a Cause for Low Back Pain

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Severe axial loading of the spine may produce end-plate disruption rather than damage to the annulus fibrosus. This is primarily due to the load-bearing capabilities of the annulus as compared to the end-plate and vertebral body. It has been demonstrated that, as force is rapidly applied, the end-plate and vertebral body are deformed at a greater rate than the disc, thus producing disruption in the end-plate.¹ Patients with this type of injury may present with acute pain which does not radiate into either extremity past the knee to the foot. Typically, these patients have no "hard" neurological findings (motor loss, dermatomal sensory loss, deep tendon reflex attenuation, or root tension signs). Plain film radiographs are essentially normal, as are CT examinations and myelography. Occasionally, the patient's pain may be exacerbated by discography.² MRI examination of these patients may reveal the presence of focal marrow conversion adjacent to the end-plates of the involved segments. This may be the result of local stress to the end-plate region, ischemia, or an inflammatory process.^{3,4}

The region of the vertebral end-plate is innervated by divisions of the gray rami of the sympathetics and sinuvertebral nerve.⁵ These nerves travel with blood vessels and have been noted in all anatomical locations within the vertebral body except in the deeper zones of the annulus or in the nucleus pulposus.² It is hypothesized that axial loading sufficient to produce end-plate fracture would introduce disc material into the vertebral body. This introduction of disc material may result in the production of irritant chemical substances which would serve as the "chemical trigger" for irritation of the unmyelinated nerve endings which constitute the intramedullary nociceptive receptor system.

Disc material has been implicated as a causative agent for chemically induced low back pain in other studies due to the irritative nature of the nucleus pulposus when it comes in contact with structures other than the annulus fibrosus.^{6,7} Additionally, this may support the findings noted on MRI in the region of the end-plate. Thus, a patient may present with symptoms suggestive of a disc injury but present the clinician with no hard examination findings. In situations such as this, one must rely on the history provided by the patient in order to gain insight as to the injury mechanism.

During the exam, it may be helpful to place the patient in a position that would increase the axial load on the disc and end-plate in order to determine if there is the possibility of end-plate disruption. One such method useful in this determination is performed by having the patient attempt to maintain a half sit-up position while on the examination table. An exacerbation of the patient's pain while in this position may be suggestive of end-plate disruption.

References

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