Subtle huge intervertebral disc herniation

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The accuracy of computerized tomography (CT) in diagnosing herniated discs has been well established. Huge herniated discs, which paradoxically may be very subtle, have been mentioned but not stressed as potential causes of false-negative diagnosis. Five cases during a 5-year period encompassing approximately 2500 examinations have been encountered by the authors. In this experience, the most consistent finding is the subtle increased density of the disc compared with the dural sac. The diagnosis is aided by awareness that huge discs severely compressing the dural sac may be very subtle; the use of narrower windows for CT scanning, sagittal re-formation, and occasionally the use of myelography with or without repeat CT scanning may also assist.

KEY WORDS • herniated nucleus pulposus • intervertebral disc • diagnostic imaging

THE overall accuracy of computerized tomography (CT) in diagnosing herniated discs is most often quoted as 90% to 95%.²,³ Paradoxically, huge herniated discs may be extremely subtle, being mistaken for what appears to be a normal dural sac. The possibility of this entity has been briefly mentioned by several authors in the radiological literature, but further emphasis, with presentation of clinical experience, is warranted to ensure familiarity among radiologists and clinicians.

Clinical Material and Methods

During a five-year period, approximately 2500 patients with sciatica and/or low-back pain underwent CT of the lumbar spine at the University Hospital with a whole-body scanner.* Two-level scans (L4–S1) were routinely obtained, and three-level scans (L3–S1) were occasionally performed. The gantry was tilted in order to scan through the disc spaces as parallel as possible. Contiguous scans 4 mm thick were obtained except for overlapping 2-mm scans through the disc spaces and intervertebral foramina. All patients were scanned using standard dual window settings, with a window width of 500 Hounsfield units (HU) and level of 25 HU for soft tissue and a window width of 1500 HU and level of 250 HU for bone. During this period of time we encountered five cases of huge intervertebral discs masquerading as nearly normal dural sacs. There was surgical confirmation in all cases.

Results

In all five cases the initial impression was that of a relatively normal-appearing dural sac. The diagnosis was usually suspected because the “dural sac” appeared of slightly greater density than would be expected. The presence of a large herniated disc was confirmed by a variety of means, including utilization of narrower windows, sagittal re-formation, and myelography with or without repeat CT scanning.

Representative Case Report

This 38-year-old female nurse with a history of back and left-leg pain presented with a sudden exacerbation of her symptoms, including bowel and bladder problems and numbness in her perineum. As a result CT scanning was urgently performed, revealing a very large disc herniation at the L5–S1 level. The diagnosis was made by appreciating that the “dural sac” appeared to be increased in density (Fig. 1 left). Use of narrower window widths (thus providing greater contrast) revealed a very small attenuated dural sac along the posterolateral aspect of the bone canal, displaced by a large disc (Fig. 1 right). No obvious distortion of fat planes could be identified. At surgery, a very large sequestered disc was demonstrated.

* Somatom DR2 whole-body scanner manufactured by Siemens, Iselin, New Jersey.
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FIG. 1. Computerized tomography scans showing a large L5–S1 disc herniation. Left: Scan through a disc at a standard window setting. A large disc protrusion is demonstrated compressing the slightly less dense sac (arrowheads) posterolaterally. Right: Scan corresponding to that shown left but filmed at a narrower window setting. The contrast between the herniated disc and the compressed dural sac (arrowheads) is enhanced.

Discussion

Diagnosis of disc herniation by CT is dependent on the density difference between the normal thecal sac which is of lower attenuation and the herniated disc material which in most cases has a higher Hounsfield number. The diagnosis is aided by careful observation for any asymmetry in the surrounding epidural fat. The soft-tissue density of the disc material is seen extending posteriorly or posterolaterally into the spinal canal, displacing and/or compressing the lower density thecal sac and nerve roots. Mention has been made that disc material consistently displaces epidural fat, however; it is not unusual for the epidural sac at least centrally to normally oppose the annulus even at the L5–S1 level without any intervening epidural fat. Therefore, unless the disc material obliterates the fat more laterally, this may not be a reliable sign.

In our cases, because the protruding discs were considerably larger, the compressed dural sacs may be overlooked and the large discs mistaken for dural sacs. Firooznia, et al., briefly commented on huge disc herniations and warned that they may not be easily detectable as the fat planes may not be distorted and an obvious interface between the disc and the dural sac may not be present. No examples were provided, however. Teplick and Haskin also briefly mentioned huge herniated discs and presented several examples. Taylor commented that “if the herniated nucleus pulposus is very large, it may obliterate so much of the spinal canal that the interface between disc and dural sac may not be recognized causing the disc in the canal to be missed.”

The incidence of these huge herniated discs is not known. Fries, et al., mentioned that among 204 disc explorations three of 16 false-negative CT examinations were due to huge discs being missed. The current report does not present a thorough retrospective analysis of all examinations performed, but our experience would suggest that these are relatively uncommon.

In our experience the most consistent finding is that the density of the disc is greater than that of the normal dural sac. Even a severely compressed dural sac has an appearance of slightly decreased density. In this regard our experience differs from that of Livingston and Grayson, who postulated that in cases of spinal stenosis less fluid and relatively more neural tissue was present within the dural canal, resulting in its density approaching that of a herniated disc. Our results also contrast with those of Fries, et al., who described the huge discs as isodense. To appreciate this altered density, however, one must have a high index of suspicion for the possibility of this diagnosis and not rely merely on the presence of an abnormal configuration of the dural sac or loss of epidural fat. One can be easily fooled into thinking that the appearance is normal as the huge disc, being much larger than the dural sac, occupies almost the entire spinal canal. The density difference between the disc and residual dural sac may be enhanced by narrowing the window widths to increase contrast. This is similar to the use of narrow window widths while examining the liver for subtle metastasis. Sagittal reformations can be helpful because the lower density of the dural sac above and below the herniated disc is better appreciated. Occasionally, myelography with or without CT may be necessary.

There may be some criticism that our routine windows settings (500 HU at a level of 25 HU) do not provide adequate contrast; however, our experience with these settings has been favorable in most circumstances. Overall film contrast depends not only on the window settings but also on the scanner itself, the camera settings, and the film combination utilized.

In summary, these cases emphasize that huge herniated discs may produce only subtle abnormalities on
the CT scan. A high index of suspicion coupled with careful assessment of the density of the "sac" and utilization of narrower windows, sagittal re-formations and, if necessary, myelography or magnetic resonance imaging should result in the proper diagnosis being made. The diagnosis is especially important as most of these patients will be candidates for surgery, some with symptoms and signs severe enough that semi-urgent surgery may be necessary.

References