PERSISTENT NOTOCHORDAL CANAL: IMAGING FINDINGS AND LITERATURE REVIEW

Leonor G. Savarese; Mateus A. Hernandes; Marcelo N. Simão; Paulo M. Agnollitto; Marcello H. Nogueira-Barbosa

Musculoskeletal Radiology - Ribeirão Preto Medical School, University of São Paulo - Brazil

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Corresponding author: leonorgs@usp.br
We describe a case of a prominent persistent notochordal canal (PNC) involving the L1–L5 vertebrae, discovered as an incidental finding, documented by plain films, computed tomography (CT) and magnetic resonance imaging (MRI).
A 53-year-old woman was referred to our hospital for evaluation of low back pain and weight loss, to rule out neoplasia.

Plain films showed a change in the shape and height of the anterior aspects of the L1–L5 vertebrae.

CT and MRI revealed a vertically oriented canal contiguous with the intervertebral disks of L1-L5 transversing the anterior aspect of each affected vertebral body. Bone biopsy was negative for malignancy.

Other imaging tests (thoracic and abdominal CT) and laboratory showed no suspicious alterations to malignancy or infection.

Her back symptoms were stable at the 6 months follow-up examination.
The imaging findings in the lumbar spine are consistent with the diagnosis of persistent notochordal canal.
Lateral radiograph of the lumbar spine shows a change in the shape and height of the anterior aspects of the L1-L5 vertebrae, corresponding to the notochordal canal.
Axial (A) and sagittal (B) CT of the lumbar spine showed a vertically oriented canal, contiguous with the intervertebral disks, traversing the anterior aspect of the L1–L5 vertebrae (arrows).
Sagittal MR images showed a vertically oriented canal contiguous with the intervertebral disks traversing the anterior aspect of the L1–L5 vertebrae, with a well-defined low signal outlining the periphery of the canal, compatible with sclerosis. Post-contrast MR image shows enhancement of the canal, without enhancement of the rounded central components at the disk spaces that corresponds to the nuclei pulposi.
Axial MR images show the canal transversing the anterior aspect of the vertebral bodies (arrows). B, disk level, shows peripheral enhancement and a central portion that do not enhance, corresponding to the nucleus pulposus. C, vertebral body level, shows the canal with homogeneous enhancement.
The notochord is an embryonic longitudinal cord of cells which induces the formation of the neural plate and serves as a model on which the axial skeleton will develop.

Progressive chondrofication of the vertebral body displaces the notochord into the intervertebral space, where it forms the nucleus pulposus of the intervertebral disk. Thus, no residual notochordal tissue normally remains in the vertebral body.

The persistent notochordal canal was first described in 1891 by Musgrove as a “core of unossified tissue, resembling the appearance of an intervertebral disk”.
Drawing of persistent notochordal canal from original description by Musgrove.

Schematic showing normal development of the intervertebral disk (adapted from Peacock).

PNC is a rare developmental anomaly, typically restricted to 1 or 2 vertebral levels, with less than 30 cases reported in the literature.

The radiographic appearance is characteristic and usually does not require further investigation, however, in some cases plain films may fail to depict this appearance and CT or MRI is required for final diagnosis.

Cotten et al. have demonstrated by discography that this circumstance is continuous and can be an implant for infarction discitis.

Christopherson et al. reported the only noted case of persistent notochordal remnants over multiple segments from T12-L5.
On plain films, a change in the shape and height of the central part of the vertebral body may be present; hence the differential diagnosis includes butterfly malformation and post-traumatic vertebra collapse.

CT and MR show a well-defined vertical central canal surrounded by a rim of osteosclerosis without abnormality of the adjacent bone marrow, allowing the diagnosis to be made.

The canal exhibits identical signal characteristics to the adjacent intervertebral discs on T1- and T2-weighted images.
Christopherson et al highlighted interesting points of the MR features concerning the notochordal canal, also found in our case:

- The presence of a normal-appearing nucleus pulposus suggests that the alteration in development involved primarily the cells surrounding the intravertebral portion of the notochord but did not affect the formation of the nucleus pulposus.

- The homogeneous enhancement of the canal is not likely related to an infectious or neoplastic process, since it only involved the canal and did not involve the nucleus pulposus or vertebral bone marrow.
✓ The characteristic features of PNC should be known by radiologists to avoid misinterpretation.

✓ This case is unusual considering the extent of the canal and, to the best of our knowledge, is the sixth case reported presenting findings on MRI and the second case reported presenting the PNC involving multiple levels.


Jeffrey Benjamin Stambougha, James Coleb, Jeffrey L. Stamboughc, Megan E. Stamboughd and Elisha K. Clousee. Persistent notochordal remnants of the lumbar spine: a case study and literature review


Thank you for your attention!

leonorgs@usp.br