

Recognition of Arachnoiditis on MRI

Information document for radiologists and MRI departments. Purpose

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The purpose of this document is to raise awareness of the recognition of arachnoiditis on MRI images of the spine. Arachnoiditis is a rare, often underdiagnosed condition involving inflammation and adhesion of the arachnoid structures surrounding the spinal cord or the cauda equina. Early and accurate recognition on imaging is crucial for further diagnosis, treatment, and prognosis.

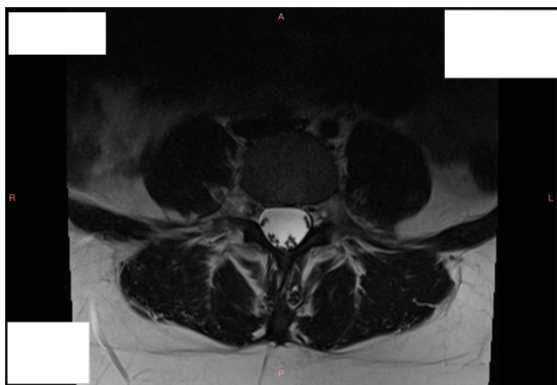
Relevance of MRI

MRI is the gold standard for imaging arachnoiditis. T2-weighted images, particularly axial and sagittal images, demonstrate anatomical changes in the nerve roots, the arachnoid space, and the cerebrospinal fluid (CSF).

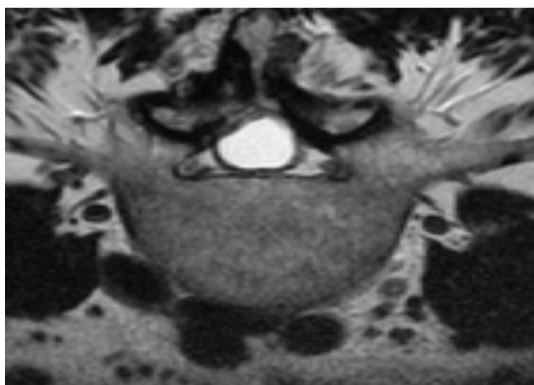
Although the abnormalities can be subtle, some specific patterns often provide clear clues.

Characteristic MRI findings in arachnoiditis

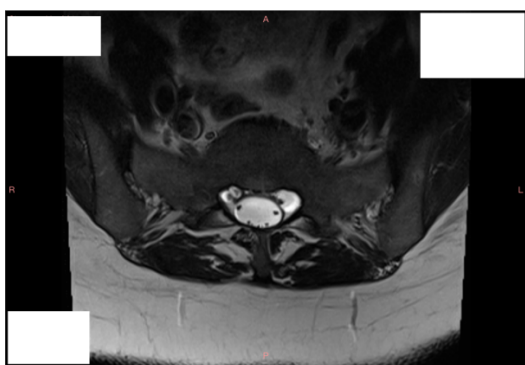
1. **Nerve Root Clumping** (Fig. 1)
 - The nerve roots are abnormally densely packed in the dorsal or lateral portion of the dural sac.
 - This can lead to a loss of the normal "floating" appearance of the nerve roots in the CSF.
 - Sometimes an asymmetric distribution or a "bundle" of compressed nerve roots is visible.
2. **Empty Thecal Sac Sign** (Fig. 2)
 - The nerve roots are adhered to the edge of the dural sac, making the central portion of the thecal space appear empty.
 - This pattern often occurs in advanced or chronic forms of arachnoiditis.
3. **Arachnoid cyst formation or septations** (Fig. 3)
 - Cystic spaces or compartmentalization within the subarachnoid space due to adhesions.
 - May lead to abnormal CSF pressure distribution and possibly to cord compression or tethering.
4. **Abnormal CSF flow** (Fig. 4)
 - Disturbed or absent CSF flow may be visible in areas with adhesions, especially on cine MRI.
 - This can cause secondary pressure increases or impaired drainage, which correlates with pain and loss of function.
5. **Signal changes in the spinal cord or cauda equina**
 - Sometimes visible as hypertensive signs on T2, consistent with inflammation, edema, or secondary damage from compression.



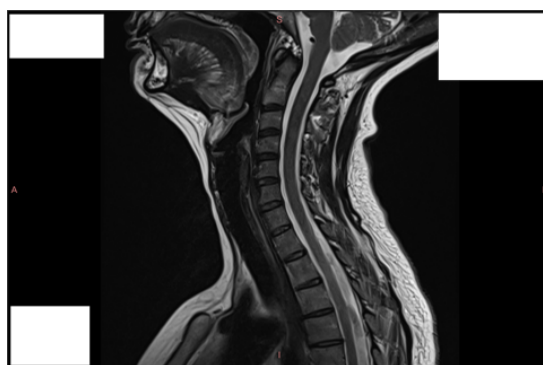
Afb. 1: Verkleiving van zenuwwortels



Afb. 2: Empty Sac



Afb. 3: Tarlov Cyste



Afb. 4: Abnormale CSF-flow

Differential diagnostic considerations

Arachnoiditis may mimic other pathologies on imaging, such as epidural fibrosis, postoperative changes, arachnoid cysts of congenital origin, or chronic infections. Combining clinical context (surgery, puncture, trauma, infection, or intrathecal medication) with imaging is essential for accurate interpretation.

Additional recommendations

- **Preferably use T2-weighted sequences in both sagittal and axial planes**, with thin sections (3–4 mm).
- **Consider contrast administration** if active inflammation is suspected or when differentiation between a cyst and an adhesion is necessary.
- **Document CSF flow abnormalities** whenever possible, especially on repeat imaging.
- **Report explicitly** if arachnoiditis or adhesions are suspected, to enable targeted clinical follow-up.

Conclusion

Arachnoiditis remains a rare and frequently missed diagnosis. By being alert to the characteristic MRI patterns—nerve root adhesion, empty thecal sac, cyst formation, and abnormal CSF flow—the condition can be recognized earlier.

An accurate description in the radiological report is essential for correct clinical interpretation and further treatment.

Colophon & Scientific Evidence

The content was developed in consultation with international experts and is based on clinical protocols used in specialized centers in the United States and Europe.

Scientific References: The criteria used for the classification of adhesive arachnoiditis in this document are based on the following core literature:

- **Delamarter, R. B., et al. (1990).** Diagnosis of lumbar arachnoiditis by magnetic resonance imaging. *Spine*, 15(4), 304-310. (Basis for the classification of nerve root adhesions: the central group, the peripheral group ('empty sac'), and the soft tissue mass.)
- **Ross, J. S., et al. (1987).** MR imaging of lumbar arachnoiditis. *AJR. American Journal of Roentgenology*, 149(5), 1025-1032. (Definition of early MRI features and the differential diagnosis of spinal adhesions.)
- **Anderson, T. L., et al. (2017).** Imaging Appearance of Advanced Chronic Adhesive Arachnoiditis. *AJR. American Journal of Roentgenology*. (Updating modern imaging techniques for complex spinal adhesions.)
- **He, S., et al. (2019).** Diagnostic Value of MR Imaging in Spinal Arachnoiditis. *Clinical Neuroradiology*.