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TEST YOURSELF: ANSWER

Arachnoiditis ossificans

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Arachnoiditis ossificans (AO) is an uncommon clinical condition that remains poorly understood. The commonly accepted theory is that it is due to osseous metaplasia of the arachnoid membrane secondary to chronic meningeal inflammation (arachnoiditis) [1–4]. Initiating factors such as trauma, surgery, meningitis, CNS infections (including tuberculosis and syphilis), or myelography have been postulated [3, 5].

AO refers to an extensive leptomeningeal ossification in symptomatic patients and it should be differentiated from small dural calcified plaques that may be found at CT or during surgical procedures and that are usually of no clinical relevance [1, 3, 5].

The natural history of the disease includes backache and radicular pain that precede indolent progressive lower extremity weakness especially when AO involves the thoracic spine; it usually manifests either as a progressive myelopathy with paraparesis and a combination of motor-sensitive symptoms [1, 3] or as a radiculopathy associated with sphincteric dysfunction [4, 5]. The altered cerebrospinal fluid dynamics secondary to the obstruction in subarachnoid flow may predispose to further pathologic alterations, such as the formation of an arachnoid cyst and/or syringomyelia [1, 3]. When AO involves the lumbar spine, neurological deficit may be less severe and cases of asymptomatic AO have also been described [3].

Literature on the subject is scarce and limited to case reports or small case series. Intrathecal calcifications/ossifications can be subtle on standard radiography (Fig. 1). Non-enhanced CT is the best imaging diagnostic tool to identify, characterize, quantify, and localize ossified arachnoid plaques, and two classifications have been proposed based on the ossification pattern [2, 4]. MRI is frequently used to assess low back pain with motor deficits. However, its diagnostic performance to detect calcifications is suboptimal [5]. Nonetheless, when the tissue becomes ossified, it may contain fatty bone marrow that could be depicted on MRI as high signal intensity on T1-weighted images (Fig. 2a) [1, 3, 5]. Fast spin echo Dixon images have recently gained interest in spine imaging because of the high sensitivity and specificity to fat, seen on the "fat only" Dixon images (Fig. 2b) [6–8]. In our case, this sequence was particularly helpful to suggest the diagnosis by detecting signal specific to fat within the arachnoid ossification (Fig. 2) [6, 7].

There is no consensus on the treatment of AO. The role of surgery is somewhat controversial due to the increased risk of developing ossifications at new sites [3–5]. However, when neurological symptoms are invalidating,

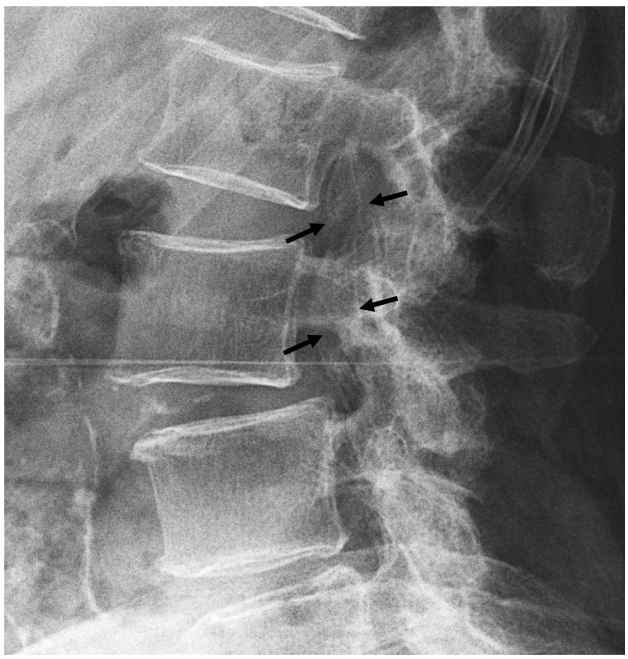

Fig. 1 Lateral radiograph of the lumbar spine shows faint fusiform linear ossifications (arrows) projecting over the spinal canal

The case presentation can be found at https://doi.org/10.1007/s00256-023-04464-8

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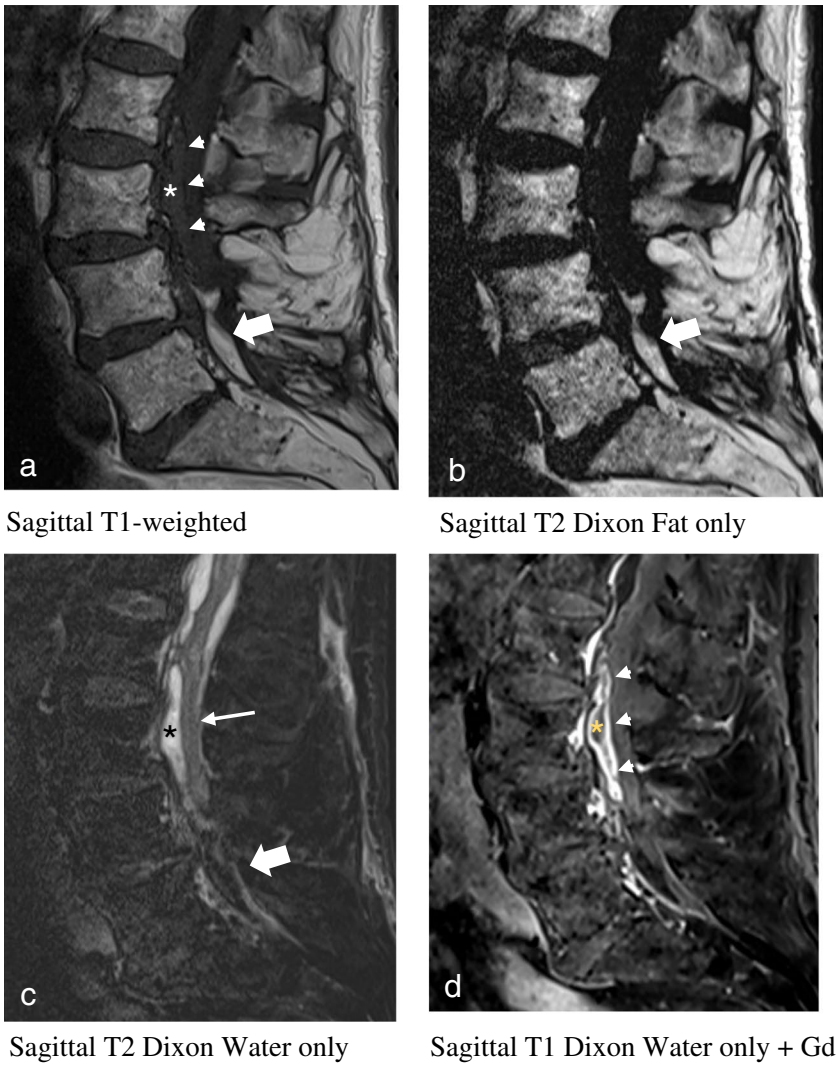

Fig. 2 (**a**) T1 , T2 Dixon (**b**) fat only and (**c**) water, and (**d**) T1 Dixon water only after intravenous contrast injection, show a heterogeneous formation with fat component at L4–L5 level (thick arrow in a-c) and another component at L3–L4 level showing high signal intensity and thin internal septa on water sensitive image (asterisk in c), higher signal intensity on T1-weighted images compared to CSF (asterisk in a), thin hypointense peripheral rim (arrowheads in a) and peripheral enhancement after intravenous contrast injection (arrowheads in d) corresponding to granulation tissue

laminectomy, and if necessary, facetectomy, may provide adequate decompression of the neural elements [2, 5]. Preoperative CT scan is useful to provide complete cartography of the plaques [5].

Arachnoiditis ossificans is a rare, often overlooked condition in patients who present with back pain [2, 5, 7]. If underdiagnosed, it may result in devastating neurological deficits [3, 5]. Although CT is considered the best modality

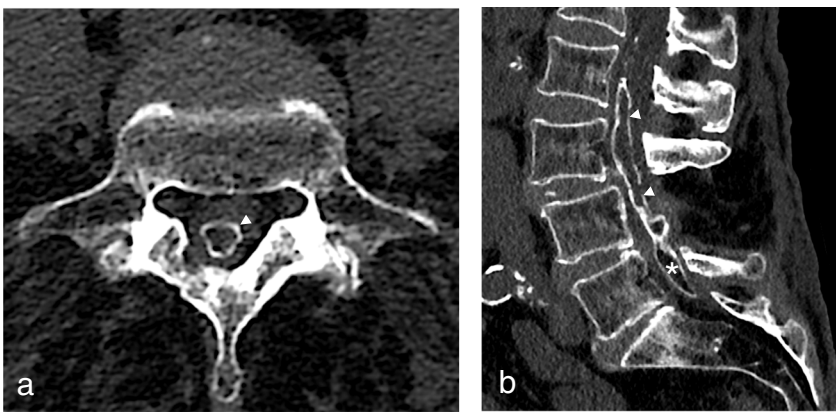

Fig. 3 (**a**) Transverse unenhanced CT image at L5 level and (**b**) sagittal CT reformat, show peripheral rim calcification (arrowheads) and bone marrow fat density at lower aspect, where the ossification process is more mature (asterisk in b). Note laminectomy and L4 spinous process resection

for diagnosis, it is not usually performed as a first-line method to investigate low back pain [9]. On MRI, the diagnosis may be challenging [3, 5]. This case report emphasizes the role of the radiologist who can suspect AO based on MRI findings and recommend further evaluation with CT to confirm the diagnosis (Fig. 3). Furthermore, the added value of including Dixon sequences in the standard low back pain MRI protocol has been described [6–8].

Declarations

Conflict of interest The authors declare no competing interests.

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