Imaging features of discospondylitis in cats

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Abstract

Objectives This study describes the imaging features of feline discospondylitis on magnetic resonance imaging (MRI), comparing them to computed tomography (CT) and radiographic findings where available.

Methods Medical records of cats diagnosed with discospondylitis, presented to three referring institutions. Magnetic resonance imaging, CT and radiographic features were assessed by two of the authors independently.

Results Fourteen sites of discospondylitis were retrospectively identified in thirteen cats. The L7-S1 intervertebral disc space (IVDS) was affected in 7/14 (50%) of cases.

Characteristic MRI features included a hyperintense nucleus pulposus signal on T2W (10/14, 71%) and STIR (11/13, 85%) with contrast-enhancement in all (11/11), involvement of adjacent vertebral endplates (11/14, 79%), hyperintense neighbouring soft tissue on T2W (11/14, 79%) and STIR (10/13, 77%) with contrast enhancement in all (11/11) and presence of spondylosis deformans (10/14, 71%). Other features included narrowed or collapsed IVDS (8/14, 57%), contrast enhancement of vertebral bodies (5/11, 46%), epidural space involvement (5/14, 36%), compression of the spinal cord or nerve roots (5/14, 36%), paraspinal abscessation (3/14, 21%) and meningeal signal intensity abnormalities with contrast-enhancement (5/6, 83%). These latter findings may indicate secondary focal meningitis.

Radiographs were available covering five sites (in 4 cats) and CT covering three sites (in 2 cats). Most common radiological features were collapse or narrowing of the affected IVDS (80%) and endplate erosion (60%). No changes suggestive for discospondylitis were identifiable on radiography or CT in two sites (1 cat) despite being identifiable on MRI. Repeated radiography in one case did not reveal complete radiological resolution following nine months of treatment.

Conclusions and relevance The results of this study indicate consistent MRI features of feline discospondylitis that should be considered in the diagnosis of feline discospondylitis.

Introduction

Discospondylitis describes the infection of an intervertebral disc (discitis) and its adjacent cartilaginous vertebral end plates (spondylitis).[1-5] This condition is well recognised and reported in dogs, with descriptions of its associated clinical signs, typical signalment and imaging characteristics.[3,4,6] However, literature describing discospondylitis in cats is sparse with six individual case reports, and two cats being mentioned in a series of feline patients with spinal cord disease.[7-13] Discospondylitis appears to be a rare condition in cats, more commonly identified in male cats mainly at the level of the lumbar spine.[7-12] Prognosis appears guarded as four out of six reported cases died (1 case) or were euthanased (3 cases) following diagnosis. Reported imaging investigations included vertebral radiographs in every case with additional computed tomography (CT) or magnetic resonance imaging (MRI) in single cases.[7,12]

Discospondylitis in dogs can be challenging to diagnose as signs are variable and sometimes vague. Commonly described clinical signs include spinal hyperaesthesia, lethargy, reluctance to move, pyrexia, anorexia and weight loss.[1,2,5] Neurological dysfunction can develop, usually secondary to abnormal osseous proliferation, empyema, focal meningitis/myelitis, subluxation or pathologic fractures.[4,5]

Considering the variable and challenging clinical presentation, imaging is critical in establishing a diagnosis of discospondylitis.[5] A diagnosis of discospondylitis relies on a combination of compatible clinical signs, exclusion of other painful and debilitating conditions, culture and sensitivity results, and cytology on any available biopsy material. However, the clinical conundrum is that to attain a final diagnosis based on histopathology and culture, imaging features need to be identified, in order to recognise the need for further procedures. Moreover, blood or urine culture and sensitivity results have been reported to be negative in about 40-75% of cases of discospondylitis in dogs, with percutaneous disc aspiration yielding positive culture in 75% of dogs.[2,3,14,15] A definitive diagnosis of discospondylitis in dogs, is therefore based on characteristic imaging findings in conjunction with compatible clinical signs, ideally in the presence of a positive culture result.[2,5,16]

MRI is considered the investigation method of choice in the diagnosis of discospondylitis in both people and dogs. It is considered more sensitive and specific than other imaging techniques, particularly in the early stages of the condition, being able to identify cases not evident on conventional radiographs.[4-6,17] There is limited literature reporting diagnostic imaging findings of discospondylitis in cats, particularly with reference to cross-sectional imaging.

The aim of this retrospective study is to describe the MRI features of discospondylitis in a population of clinically affected cats. Radiography and CT features are discussed and compared with MRI when available, in order to give stronger guidance for the imaging diagnosis of feline discospondylitis.

Material and Methods

Animals

Medical records of cats diagnosed with both presumptive and confirmed discospondylitis at three referring institutions between February 2009 and April 2019 were reviewed.

Cases were included when presented with (1) clinical signs and history compatible with discospondylitis, and (2) MRI features suggestive of infection in one or more intervertebral discs, alone or in conjunction with its adjacent endplates. Compatible clinical signs included a persistent presence of spinal hyperaesthesia in all cases, lameness, abnormalities on neurological examination and pyrexia. Since no extensive literature is available for MRI features of feline discospondylitis, an MRI diagnosis was based on previously reported imaging characteristics of discospondylitis in a single feline case report and in two case series of affected dogs.[4,6,12] An MRI diagnosis of discospondylitis was considered when conformation or signal intensity of an intervertebral disc space differed, when compared to their adjacent counterparts. The finding of adjacent vertebral endplates, with an abnormal conformation or signal intensity also supported the presence of a discospondylitis. All cases presenting an ongoing suspected or proven neoplastic process and history of trauma were excluded.

Imaging

Cross-sectional imaging was performed under general anaesthesia. All cats underwent CT using a multislice CT machine (Aquilion RXL; Toshiba Medical Systems Corporation, Tokyo, Japan) and MRI using a low field 0.25 Tesla (T) permanent magnet (Esaote VetMR Grande, Genova, Italy), a low field 0.4 T (Aperto MRI, Hitachi, Tokyo, Japan), or a high field 1.5 T (Signa HDe, General Electric, London, UK). MRI studies included a minimum of T2-weighted (T2W) sagittal and transverse images in all cases, a pre and post-contrast T1-weighted (T1W) and/or short tau inversion recovery (STIR) dorsal, transverse or sagittal images in the remaining cases. Radiographic and CT studies were retrieved and assessed when available.

MRI features

MRI features were assessed, with selection of these features being based on reports on canine discospondylitis and a single feline report.[4,6,12] The intervertebral disc space, nucleus pulposus, adjacent endplates, vertebral bodies, overlying epidural space, overlying meninges, paraspinal soft tissues and distal colon were all assessed. The MRI features assessed are described in Table 1. The epidural space was assessed for presence of suspected empyema or suspected inflammation of the epidural fat.[4,18] Overlying meninges were only assessed when high-field images were available, as it was considered that low-field images did not offer enough resolution to perform this in detail. The presence of a suspected paraspinal soft tissue abscessation was determined when a focal, well-demarcated region, presenting a contrast enhancing rim-pattern with an iso-hypointense center in T2W sequences was detected in direct contact with the affected intervertebral disc space.[19] Colonic distention was considered subjectively normal or enlarged. Megacolon was considered if the ratio of maximum colonic diameter compared to the length of L5 was of more than 1.48.[20] When evidence of discospondylitis was found on MRI then available radiographic and CT studies of the affected sites were evaluated.

Radiographic features

For each case, vertebral radiographs were evaluated if at least a lateral and a ventro-dorsal projection were available. Assessed features included evidence of endplate erosion, endplate sclerosis, vertebral body osteolysis, intervertebral disc space morphology (normal, narrowed or collapsed), osseous proliferation adjacent to the intervertebral disc space, spondylosis and soft-tissue opacity alterations as well as any signs of vertebral fracture, subluxation or shortening.[4,5,7-10,12] Presence of the vacuum phenomenon was evaluated and the vertebral region surveyed was noted.[21]

Computed tomographic features

Vertebral CT images were evaluated and assessed features included evidence of endplate erosion, vertebral body osteolysis and its pattern (focal or multifocal punctate osteolysis), intervertebral disc space morphology (normal, narrowed or collapsed), osseous proliferation adjacent to the intervertebral disc space, endplate sclerosis, spondylosis, soft-tissue attenuation alterations, and signs of vertebral fracture, subluxation or shortening.[7,14,22] Presence of the vacuum phenomena was evaluated and the vertebral region surveyed was noted.

Image assessment and imaging modality comparison

All radiographs, CT and MRI scans were assessed by two of the authors (SG and ML) independently. When an initial agreement was not attained, features were subsequently revaluated and a consensus was reached.

Descriptive comparison of the three modalities was performed, detailing cases where more than one modality was performed. In order to assess the capability of both radiography and CT in detecting feline discospondylitis when compared with MRI, it was considered that at least two radiological or CT features had to be identified in order for a discospondylitis to be suspected based on these imaging modalities alone, e.g. a narrowed/collapsed intervertebral disc space as well as eroded endplates.

Follow-up

All follow-up repeated imaging studies in all modalities were retrieved if available and described in detail. Resolution of radiological signs was considered if the lytic focus had smoothed and disappeared, sclerotic margins had vanished and bridging of the affected vertebrae was detected on follow-up radiographs.[3]

Results

Signalment

13 cats were identified with a clinical diagnosis of discospondylitis. Breed distribution included Domestic Short Hair (n=10), Maine Coon (2) and Siamese (1) with five females and eight males with a mean age of 107.54 months (median 115, 12 – 168 months).

Fourteen foci of discospondylitis were identified in the 13 cats, with a single case presenting with two affected sites. Discospondylitis was identified at L7-S1 in 7/14 (50%), with T12-T13, T13-L1, L1-L2, L2-L3, L3-L4, L5-L6 and L6-L7 being represented once. In the case with two affected sites these were L1-L2 and L5-L6.

Magnetic resonance imaging findings

High-field MRI was available for 6 cases and low-field MRI in the remaining 7 cases encompassing 8 sites of discospondylitis. Within the fourteen imaged sites, one case had no T1W sequences, in another case STIR sequences were not obtained, and in three cases undergoing low-field MRI a contrast-study was not performed. The signal intensity and contrast-enhancement features on MRI are detailed in Table 2. Intervertebral disc space morphology was assessed as normal 6/14 (43%), narrowed 6/14 (43%) or collapsed 2/14 (14%). There was no evidence of a concomitant disc herniation. Adjacent vertebral endplates were considered normal in 3/14 (21%), eroded in 7/14 (50%) and destroyed in 4/14 (29%). Vertebral body involvement was found in 6/14 cases and this was only found to affect a maximum of a third of the vertebral body. Evidence of vertebral body shape deformity was found in three cases and vertebral body subluxation was identified in one case. The epidural space was considered to be involved in five sites with a suspicion of either an empyema or a local inflammation of the epidural fat with a focal contrast enhancement in 3/5 sites. Compression of the spinal cord was present in 5/14 sites (36%), subjectively classified as mild in 4 cases and severe in the remaining case. Concomitant nerve root compression was observed in three cases. A region compatible with a suspected abscess in the paraspinal tissues was found in three cases (21%). Ventral spondylosis deformans was found in 10/14 cases, and the colon was considered subjectively enlarged in 10/13 cats with two presenting imaging features compatible with megacolon. Examples of the MRI appearance of feline discospondylitis are depicted on Figure 1.

Radiographic findings

Radiographs were available in four cases covering five discospondylitis sites. All radiographs were performed concurrent with initial MRI studies, except in one case covering two sites which was performed two weeks previous. The lumbar region was included in all cases with the whole vertebral column being radiographed in one case. Other cases surveyed the full thoracic spine to the tail (1), the thoracolumbar junction to the tail (1) and from C3 to the tail (1). Evidence of endplate erosion alongside vertebral body osteolysis was found in 3/5 sites (60%), intervertebral disc space was abnormal in 4/5 sites being narrowed in two and collapsed in the remaining two. A single occurrence was found of the following findings: endplate sclerosis, spondylosis, soft-tissue opacity, vertebral body shortening and vertebral body subluxation. No osseous proliferation adjacent to the intervertebral disc space, vertebral body fractures or vacuum phenomena were identified. Based on these features, clear evidence of discospondylitis was only found in 3/5 sites (60%). Examples of the radiographic appearance of feline discospondylitis are depicted on Figure 2.

Computed tomography findings

Computed tomography was performed in two cases covering three discospondylitis sites. In one case the whole vertebral column was imaged whilst the other included the area of interest encompassing T7 to the tail. Evidence of endplate erosion was present in one case (33%) and intervertebral disc space morphology was considered normal in one site and collapsed in the other two sites (66%). A single occurrence was found of the following findings: endplate sclerosis, spondylosis deformans and vacuum phenomena within the affected intervertebral disc. No evidence of soft-tissue attenuation, osseous proliferation, vertebral body osteolysis, shortening, fractures or subluxations were identified. Based on these features, clear evidence of discospondylitis was only found in 1/3 sites (33%) (Table 3). Examples of CT appearance of feline discospondylitis are depicted on Figure 3.

Comparison of imaging modalities

When comparing radiographic and MRI findings in five available sites (Table 3), two sites were not clearly apparent radiographically, since although one of the disc spaces was collapsed, no evidence of endplate erosion or other associated features were identifiable in either of them. This occurred in the case in which two discospondylitis foci were identified on MRI, which was the only case where the three imaging modalities were performed. Radiographs in this case were performed two weeks previous to MRI study.

In these sites, the nucleus pulposus was T2W isointense, STIR hyperintense, with diffuse contrast-enhancement and paraspinal tissues were involved being hyperintense on both T2W and STIR sequences. Also CT, performed at the time of MRI diagnosis, did not suggest discospondylitis due to the lack of endplate or vertebral body changes. Radiographs provided indication of three discospondylitis sites out of five, by revealing a combination, amongst other features, of signs of endplate erosion as well as narrowing or collapse of the affected intervertebral disc space. None of these later cases had a CT performed.

The second case in which a CT was performed, there was clear evidence of endplate erosion, a collapsed intervertebral disc space, endplate sclerosis, evidence of subluxation and ventral spondylosis deformans (Figure 3b). This was further confirmed on MRI in which a T2W hyperintense nucleus pulposus with rim-contrast enhancement was identified, with a third of the vertebral body affected.

Follow-up

Repeated imaging studies were only available for one case, in which radiography was repeated 6 and 9 months following diagnosis and a treatment protocol with antibiotics (Figure 4). Radiological resolution was not present: there was radiographic evidence of disappearance and smoothing around a lytic focus, partial replacement by bridging of the involved vertebrae however sclerotic margins were still detectable on both follow-up radiographs.

Discussion

This report describes the MRI features of discospondylitis in a population of cats, including its comparison with radiography and CT when available. This study revealed a series of imaging features which could aid in the detection of discospondylitis in cats.

Feline discospondylitis had been previously reported in six individual case reports and two cats being described in a series of feline patients with spinal cord disease.[7-13] Previously reported affected disc spaces in these cats were L7-S1 (3), L3-L4 (2), L4-L5 (2) and L2-L3 (1), with two cats presenting multiple affected discs. This study confirms the suspicion that L7-S1 seems to be an intervertebral disc particularly susceptible to discospondylitis in cats, making up 50% of our reported population and making up almost half of the totality of reported cases. The L7-S1 intervertebral disc space is also described as the most commonly affected site in dogs.[2-4] We also report the first two instances of feline thoracic discospondylitis (T12-T13 and T13-L1).

MRI features of discospondylitis in dogs have been described previously and have been found to be generally consistent, although individual variability has been reported.[4-6] In the sole feline discospondylitis report with MRI findings, the intervertebral disc was T2W hyperintense and T1W isointense, and the vertebral endplates were T2W and T1W hypointense.[12] Marked contrast-enhancement of the L7 and S1 endplates and surrounding soft tissues was evident. A subjectively distended distal colon was also reported .[12]

Magnetic resonance features of discospondylitis in cats appeared to be fairly consistent within the population described in this study, although individual variability was apparent. Intervertebral disc space morphology was altered in 57% of cases. Nucleus pulposus signal was found to be mainly hyperintense on both T2W and STIR sequences with signal void occasionally seen on T2W images. T1-weighted sequences were typically isointense, contrast uptake was noticeable in every case where this was available. Affected vertebral endplates were irregularly eroded or completely destroyed. Vertebral bodies were mostly unaffected, with the majority failing to enhance following intravenous contrast injection. The neighbouring soft tissues were often abnormal, with T2W and STIR hyperintensity and contrast enhancement present in every case where this was available. These MRI findings were mostly compatible with the MRI features described for dogs.[4-6] In contrast, epidural space involvement and compression of the spinal cord or nerve roots was found in 36% of cases (5/14), which differs from dogs where both were found more commonly.[4,6] Overlying meningeal signal intensity abnormalities were common with contrast-enhancement present in all five cases, indicating that discospondylitis in cats relates to a secondary focal meningitis. Other findings were the presence of areas compatible with paraspinal abscessation in 21% of cases, and a high prevalence of ventral spondylosis deformans (71%).

Radiographic features previously described in feline patients included vertebral endplate lysis and /or sclerosis, a narrowed or collapsed intervertebral disc space, spondylosis deformans, irregular bone proliferation ventrally to the affected disc, an increase in ventral soft-tissue opacity, and subluxation at the level of the L7-S1 joint. All of these features, except for bone proliferation, were found in our population of cats. Vertebral body shortening is a new feature associated with discospondylitis in our subset of patients. The most common radiographic feature was collapse or narrowing of the affected intervertebral disc space (80%), with endplate erosion seen in 60% of radiographs. Radiographic evidence of intervertebral disc space narrowing has been reported in cats suffering from other conditions such as intervertebral disc disease and acute non-compressive nucleus pulposus extrusion.[23-25] However, when evidence of intervertebral disc space narrowing is identified in a cat with spinal hyperaesthesia, particularly in the presence of endplate erosion, discospondylitis should be included in the list of differential diagnoses. Interestingly in one of the cases previously reported, discospondylitis was identified post-mortem, and had not been identified on either survey radiographs or myelography.[11] In our population there were two affected sites in which radiography and CT failed to reveal characteristics relating to discospondylitis when changes were present on MRI. In dogs, there is a reported delay in development of radiographic signs with additional cross-sectional imaging often necessary to make a diagnosis.[5] The presence of discospondylitis with minimal or no changes on radiographs and CT, would support the same assertion in feline patients. However, further cases might be required to confirm this in view of the small number of cases having had all imaging modalities.

Computed tomography findings of discospondylitis in both cats and dogs include the same features as plain radiography with the addition of being able to identify areas of punctate osteolysis within the endplates with or without osteolysis of the adjacent bone.[7,14,22] In one previously reported cat, contrast CT identified a rim contrast-enhancement mass compatible with an abscess next to the affected disc.[7] Computed tomography has clear advantages over plain radiography offering a more detailed depiction of bone with the potential of identifying osseous lesions earlier in the course of disease.[5] However, in one of our cases there was a time-lapse of two weeks between radiography and both CT and MRI. In this case there was no evidence of changes on radiography besides a reduced intervertebral disc space. An argument could be made that radiological features had not yet developed, however a CT performed at the same time as MRI also failed to detect radiological features supportive of discospondylitis (Figure 3,

a_1 and a_2). In our population of cats, CT findings were compatible with previous reports, with a reduced intervertebral disc space being the most repeatable finding. Interestingly the vacuum phenomenon was identified within one of the affected intervertebral discs. This is a radiographic feature most commonly associated with intervertebral disc extrusion.[26] This is the first reported occurrence of this sign in a feline discospondylitis patient, although it has previously been reported in canine discospondylitis.[21] Although radiography lacked sensitivity for the detection of discospondylitis, CT also failed to identify discospondylitis detected on MRI in two out of the three imaged sites. Further studies utilising CT in feline discospondylitis would be required to further assess its potential diagnostic value.

The presence of infectious processes of the vertebral column in cats, such as empyema, have previously been reported in cats in the absence of a concurrent discospondylitis.[27-30] Feline discospondylitis, however, has been reported concomitantly to paravertebral abscesses and meningomyelitis.[7,9,11] Within our population, the subset of patients presenting contrast-enhancing regions within the epidural space, meninges or paraspinal soft tissues could have presented with abscessation or even meningomyelitis. When such regions were identified in the epidural space, these were considered to either be a sign of an empyema or inflammation of the epidural fat. The presence of these concomitant and adjacent infectious loci could be explained by the close proximity of these structures allowing direct spread of an infectious agent.

Imaging evidence of a subjectively enlarged colon was found in the majority of cases, with megacolon found in 15%. Although some faecal retention is to be expected in cases presenting with spinal pain, the clinical significance of this later finding is unknown.

Further clarification would require further studies describing clinical presentation and treatment of feline discospondylitis and other spinal cord disorders.

Follow-up imaging was only available in one case with repeated radiographs six and nine months following diagnosis. In dogs, evidence of radiological resolution of discospondylitis was only achieved following treatment for a period of 53.7 ± 45.4 weeks.[3] In our case there was evidence of a partial resolution of the radiological signs at nine months. Further studies will be required to demonstrate if radiological resolution in the feline population is similar to that reported in dogs. Follow-up cross-sectional imaging, particularly MRI, may have the potential to predict clinical resolution, treatment length and relapse in both feline and canine discospondylitis.

A number of limitations exist in the current study. Data were collected retrospectively, and therefore imaging acquisition protocols and equipment were not standardised. Diagnosis of discospondylitis relied on clinical features and MRI evidence of a suspected infectious process affecting the intervertebral disc spaces and/or the vertebral endplates. Therefore MRI was utilised as an inclusion criteria and it could therefore not be compared in terms of sensitivity and specificity with the other imaging modalities. There may have been cases in which MRI did not reveal any changes where a diagnosis of discospondylitis could have been missed. However, imaging is critical in making a diagnosis of discospondylitis and even if no abnormalities are found at an initial MRI, these should develop as the condition progresses.[5] A full vertebral column study was not performed in most cases, leaving the potential for other affected intervertebral discs being overlooked. This can be explained by costs associated with advanced imaging and investigation based on an area of interest identifiable either through a clear neurolocalisation or an indication of a neurolocalisation based on spinal hyperaesthesia. We would recommend that when a focus of discospondylitis is detected, imaging of the entire vertebral column is performed in search of other possible foci of infection. Only a small number of radiographs and CT studies were available in relation with MRI studies, which limited the comparison within modalities. Follow-up study was only available in one case and further information could have been gathered with an increased number of cases.

Conclusions

This is the largest reported population of cats diagnosed with discospondylitis. A set of MRI features are described, indicating a series of consistent findings that might be helpful in the diagnosis of discospondylitis in cats. Although only a few cases had all imaging modalities performed, the findings in this study support the notion that MRI should be considered the investigation method of choice in the diagnosis of discospondylitis in feline patients, as is presently considered in both dogs and humans. Where only radiography is available, evidence of intervertebral disc space narrowing in conjunction with adjacent endplate irregularities should be considered a strong indication for the presence of discospondylitis, and further advanced imaging should be performed.

Conflict of interest

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Ethical approval

This work involved the use of client-owned animals only, and followed established internationally recognised high standards ('best practice') of individual veterinary clinical patient care. Ethical Approval from a committee was not therefore needed.

Informed consent

Written informed consent was obtained from the owner or legal guardian of all animals described in this work for the procedures undertaken.

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Tables

Table 1. MRI features assessed

Region of interest	**MRI features based on Carrera *et al.* 2010 and Harris *et al.* 2013**
Intervertebral disc space (IVDS)	Number and location of affected intervertebral discs.
	Morphology (normal, narrowed or collapsed in comparison with contiguous IVDS).
	Presence of intervertebral disc herniation.
	Presence of ventral spondylosis deformans.
Intervertebral disc nucleus pulposus	Intensity on T2W, T1W and STIR compared to adjacent discs.
	Contrast-enhancement pattern (focal, diffuse, rim-enhancement or absent)
Adjacent endplates	Intact / eroded (hypointense signal alongside normal signal intensity of the adjacent marrow) / destroyed (both cortical and adjacent marrow signal disruption)
Vertebral body	Intensity on T2W, T1W and STIR compared with normal vertebral bone marrow.
	Extent of abnormalities (one-third, two-thirds, complete).
	Contrast-enhancement pattern (as described above).
	Morphology (presence of deformity or subluxation).
Epidural space	Presence of suspected empyema / epidural fat inflammation.
	Contrast-enhancement pattern (as described above).
	Spinal cord compression (mild, moderate, severe).
	Nerve root compression.
Meninges	Intensity on T2W, T1W and STIR.
	Contrast-enhancement pattern (as described above).
Paraspinal tissues	Intensity on T2W, T1W and STIR.
	Contrast-enhancement pattern (as described above).
	Suspected abscess presence.
Colonic distention	Normal, enlarged or megacolon.

Table 2. Overview of the MRI signal intensity features of feline discospondylitis found in this study. The most frequent finding in each category is highlighted

	T2-weighted	T1-weighted	STIR	T1-weighted post-contrast pattern or presence
Intervertebral disc nucleus pulposus	**Hyperintense** 10/14 (71%) Isointense 1/14 (7%) Hypointense 2/14 (14%) Not identifiable 1/14 (7%)	Hyperintense 0/13 (0%) **Isointense** 9/13 (69%) Hypointense 3/13 (23%) Not identifiable 1/13 (8%)	**Hyperintense** 11/13 (85%) Isointense 1/13 (8%) Hypointense 0/13 (8%) Not identifiable 1/13 (8%)	Absent 0/11 (0%) Focal 2/11 (18%) **Diffuse** 6/11 (55%) Rim-like 3/11 (27%)
Vertebral body	Hyperintense 0/14 (0%) **Isointense** 11/14 (79%) Hypointense 3/14 (21%)	Hyperintense 0/13 (0%) **Isointense** 9/13 (69%) Hypointense 4/13 (31%)	Hyperintense 3/13 (23%) **Isointense** 10/13 (77%) Hypointense 0/13 (0%)	**Absent** 6/11 (55%) Focal 5/11 (46%) Diffuse 0/11 (0%) Rim-like 0/11 (0%)
Paraspinal tissues	**Hyperintense** 11/14 (79%) Isointense 3/14 (21%) Hypointense 0/14 (0%)	Hyperintense 0/13 (0%) **Isointense** 13/13 (100%) Hypointense 0/13 (0%)	**Hyperintense** 10/13 (77%) Isointense 3/13 (23%) Hypointense 0/13 (0%)	Absent 1/11 (9 %) Focal 3/11 (27%) **Diffuse** 7/11 (64%) Rim-like 0/11 (0%)
Meninges (only evaluated in high-field imaging)	**Hyperintense** 5/6 (83%) Isointense 1/6 (17%) Hypointense 0/6 (0%)	Hyperintense 0/6 (0%) **Isointense** 5/6 (83%) Hypointense 1/6 (17%)	**Hyperintense** 4/5 (80%) Isointense 1/5 (20%) Hypointense 0/5 (0%)	**Present** 5/6 (83%)
Epidural space	Found involved in 5/14 (36%) cases			Absent 0/5 (0%) **Focal** 3/5 (60%) Diffuse 2/5 (40%) Rim-like 0/5 (0%)

Table 3. Comparison of different imaging modalities in the available cases

	Lesion location	MRI demonstrable	CT demonstrable	Radiographically demonstrable	Repeat radiography
Cat 1	L7-S1	√		√	
Cat 2	L1-L2	√	x	x	
Cat 2	L5-L6	√	x	x	
Cat 3	L2-L3	√		√	
Cat 4	L7-S1	√		√	√
Cat 5	L7-S1	√	√		

Figures

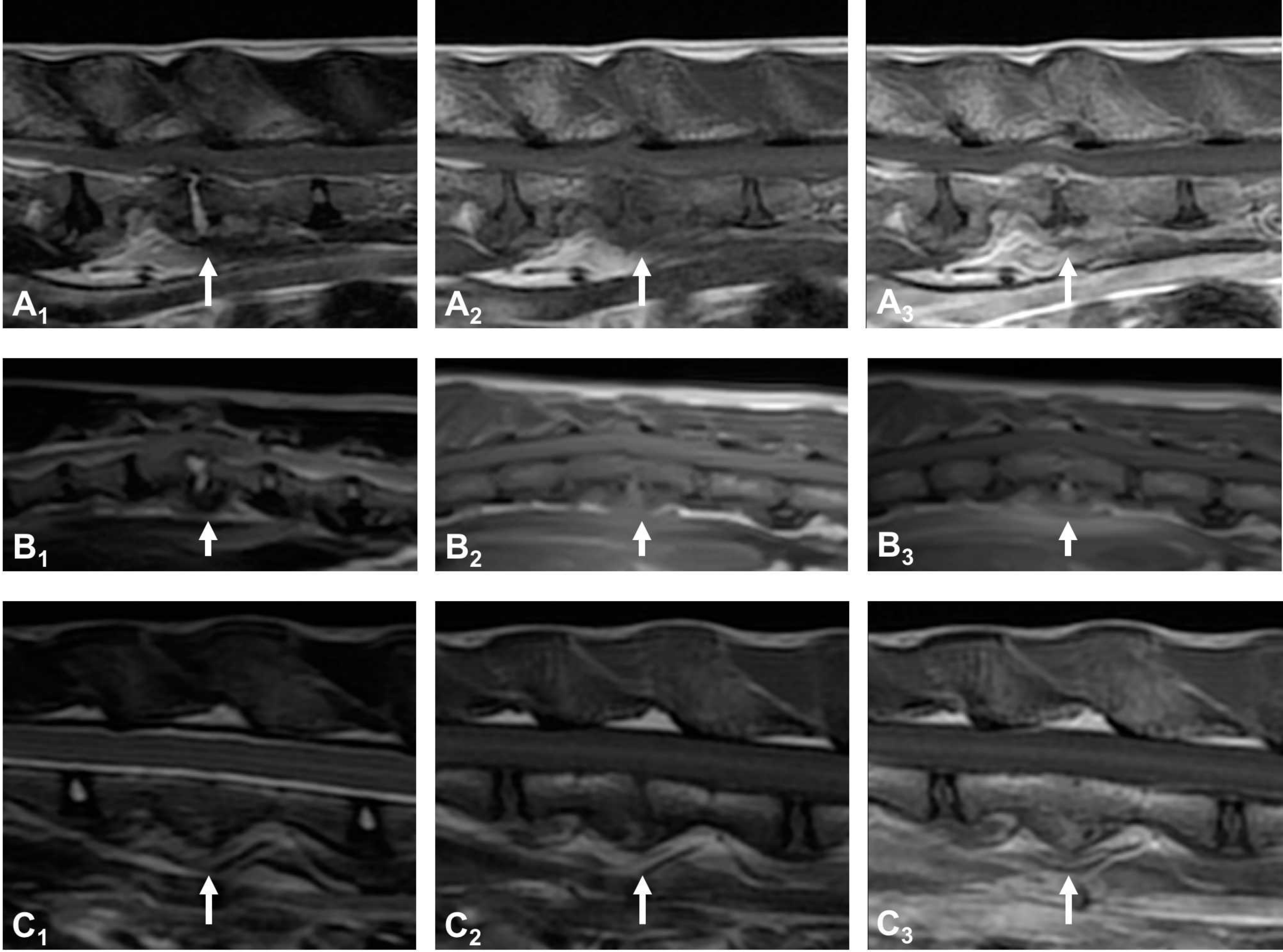
Figure 1. Three examples of feline discospondylitis on sagittal plane MRI: (a) discospondylitis present at L3-L4 (arrow) acquired on high-field MRI: A_1 T2-weighted, A_2 T1-weighted pre-contrast, A_3 T1-weighted post-contrast; (b) discospondylitis present

at T12-T13 (arrow) acquired on low-field MRI: B_1 T2-weighted, B_2 T1-weighted pre-contrast, B_3 T1-weighted post-contrast; (c) discospondylitis present at L2-L3 (arrow) acquired on high-field MRI: C_1 T2-weighted, C_2 T1-weighted pre-contrast, C_3 T1-weighted post-contrast

Figure 2. Two examples of feline discospondylitis identifiable on radiography. (a) L2-L3 discospondylitis (arrow): A_1 lateral projection, A_2 ventro-dorsal projection. There is loss of normal endplate morphology, left lateral bone proliferation (arrow) and intervertebral disc space narrowing –endplate erosion with evidence of a reduced foramen at this level confirms a narrower space in comparison with adjacent spaces. (b) L7-S1 discospondylitis (arrow): B_1 lateral projection, B_2 ventro-dorsal projection. There is endplate destruction and sclerosis, evidence of subluxation, osteolytic lesion at the S1 vertebral body and collapse of the intervertebral disc space at this level. A subjectively enlarged distal colon is also identifiable (*)

Figure 3. Two examples of feline discospondylitis identifiable on computed tomography. (a) L5-L6 discospondylitis (arrow): A_1 sagittal plane, A_2 dorsal plane. Narrowing of the intervertebral disc space is identifiable without endplate erosion. (b) L7-S1 discospondylitis (arrow): B_1 sagittal plane, B_2 dorsal plane. There is endplate sclerosis, collapse of the intervertebral disc space and evidence of spondylosis deformans ventral to the affected disc. A subjectively enlarged distal colon is also identifiable (*)

Figure 4. L7-S1 feline discospondylitis identifiable on repeated radiography following treatment with antibiotics: a1 (initial), a2 (6 months later), a3 (9 months later). Full radiological resolution was not present despite clinical resolution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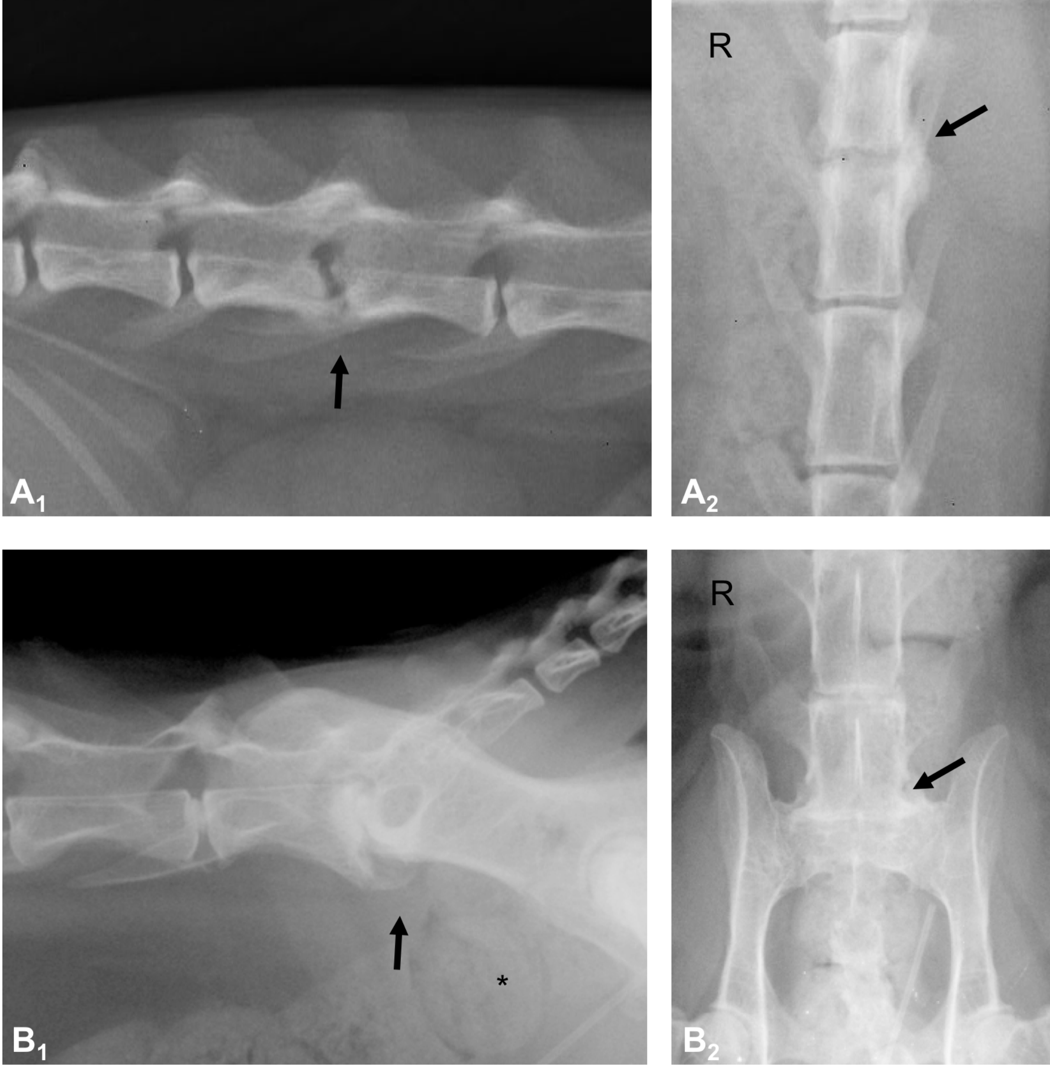

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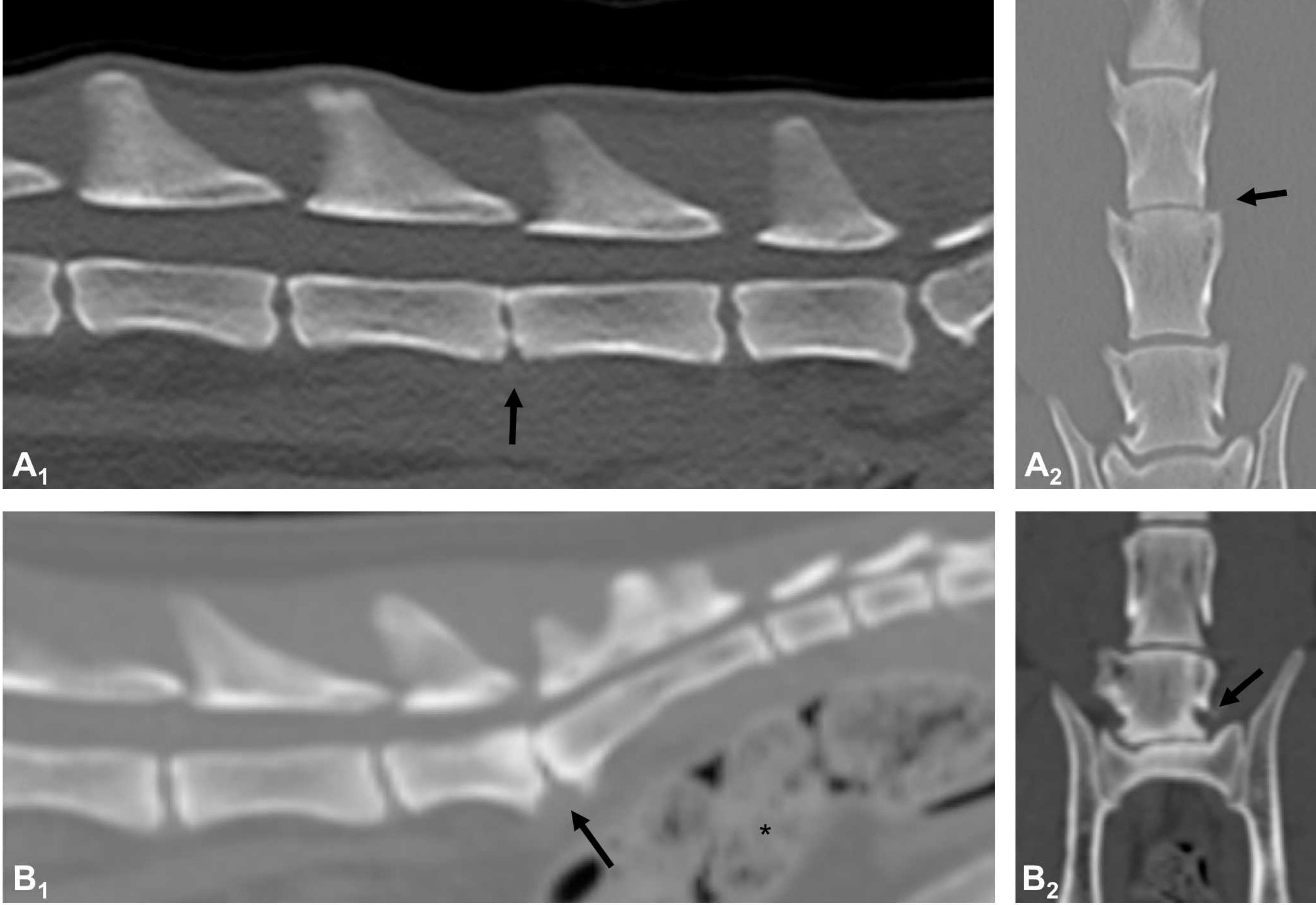

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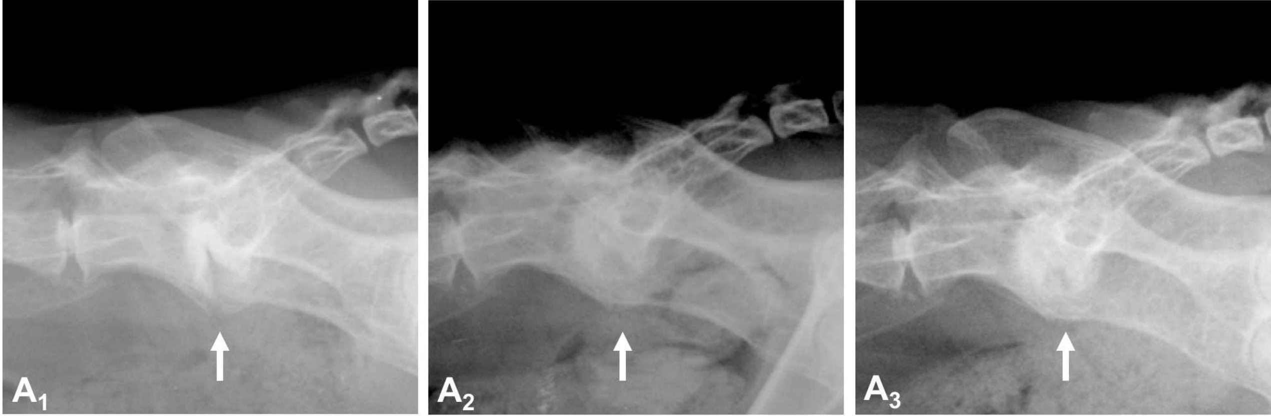
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