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Discovertebral lesion in ankylosing spondylitis: differential diagnosis with discitis by magnetic resonance imaging

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Abstract Ankylosing spondylitis (AS) is occasionally accompanied by erosive changes in the vertebral endplate at one or more restricted levels (Andersson lesions). The radiographic findings of this lesion are similar to those of bacterial discitis, and a differential diagnosis between them is often difficult. These diseases must be diagnosed correctly because they require different treatments. In order to evaluate the prevalence of Andersson lesions in the Japanese population, we examined 31 cases of AS which were treated in our department, and Andersson lesions were found in three (9.7%) of them. All these three cases developed Andersson lesions in the earlier phase of the AS, and differentiating the lesions from bacterial discitis was difficult. The details of these three cases are reviewed, and the importance of differentiating between Andersson lesions and bacterial discitis is discussed. Plain radiographs showed no clear difference between these conditions, but magnetic resonance imaging (MRI) was found to be more efficient.

Key words Ankylosing spondylitis (AS) · Discitis · Discovertebral lesion · Magnetic resonance imaging (MRI)

Introduction

Ankylosing spondylitis (AS) is an inflammatory disease which may have both genetic and environmental factors in its pathogenesis. Spinal column and sacroiliac joints (S-I joints) are mainly affected, but major peripheral joints are also often involved. AS is usually characterized by obvious radiographic evidence in the spinal column and S-I joints, but some cases show minimal change on plain radiographs. In such cases a diagnosis of AS is difficult, and it is possible that the patient will be treated for unknown fever, or undergo time-consuming tests to detect the focus of a persistent inflammatory reaction. Occasionally, AS is accompanied by an erosive focal change in the vertebral end plate (Andersson lesion),[1] and this lesion is difficult to differentiate from typical findings of bacterial discitis with plain radiographs only, especially in the early phase of AS. We examined 31 cases of AS who were treated at our department, and discovertebral lesions were observed in three of these cases. Here we give details of these three cases. In all three, Andersson lesions were thought to be possible, but all were diagnosed retrospectively after their clinical course. These cases are unusual because the diagnosis of AS was not made in the earlier phase of the disease. In this report, we emphasize the importance of considering the presence of AS when we encounter a case of back pain and disc space narrowing, especially in female patients.

Materials and methods (case description)

Diagnoses of AS were made based on the New York 1966 criteria, and a total of 31 cases were treated in our department. Twenty-seven patients were male and four were female. Their age at radiographic evaluation was between 16 and 64 years; average age 39.1 years for males and 38 years for females. These cases were examined, and the radiographic images, mainly of the vertebral column and S-I joint, were used for this study. All patients had a history of back pain, and stiffness with motion of the vertebral column was also observed for all patients. All 31 cases showed S-I joint change, and 28 of 31 cases showed grade III or grade IV changes on at least one side of the S-I joints. Three cases showed grade II changes on both sides of the S-I joints and

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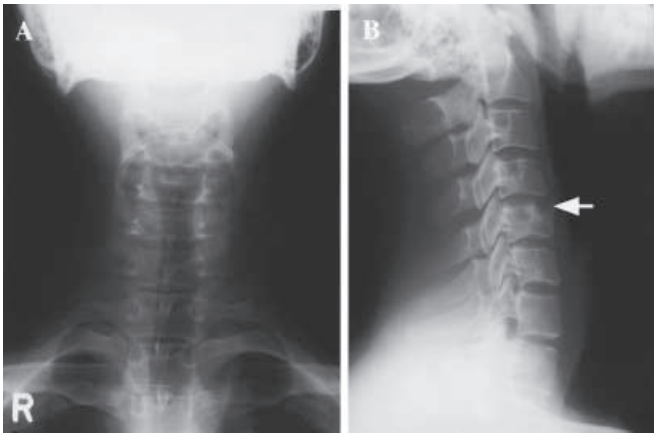

Fig. 1. Case 1. Erosive change on the upper end plate of C5 (*arrow*) can be seen on the lateral radiograph (**B**), and this lesion was surgically treated with anterior spinal fusion at an other hospital

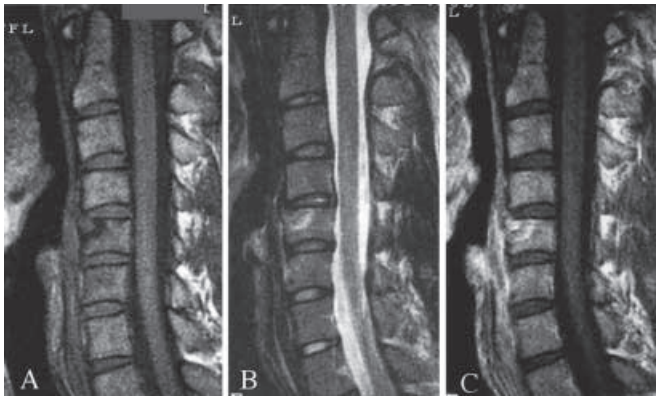

Fig. 2. Case 1. Affected lesion on vertebra C5 is accompanied by peripheral edematous change. The center of the lesion shows isointensity on T1WI (**A**), and low intensity on T2WI (**B**). The peripheral reactive zone shows T1 low intensity and T2 high intensity with obvious enhancement (**C**), and this was considered to be edematous change

no remarkable change in the spinal column, but these three cases had bilateral grade II S-I joint lesions and a history of back pain and obvious stiffness with motion in all directions, and therefore were included in the study. Radiographic examination of the lumbar vertebral column showed bamboo spine in 16 cases, facet joint erosion without changes in the vertebral body in 4 cases, squaring in 3 cases, and no clear change in 5 cases. Andersson lesions were observed in three of the 31 cases, and details of these three cases are given below.

Case 1

A 25-year-old man visited our department complaining of stiffness and pain in his back and persistent low-grade fever. The patient had suffered from low back pain for 6 years before his initial visit to our facility, and neck pain had also occurred for 2 years before the initial visit. A plain radiograph of the cervical spine at his initial visit showed minimal abnormalities except for the postoperative finding of anterior spinal fusion at the C4/5 level. Radiographs taken preoperatively showed a focal osteolytic lesion at the upper anterior part of vertebra C5 (Fig. 1). Magnetic resonance imaging (MRI) showed a localized change in intensity corresponding to the lesion shown on the radiographs (Fig. 2). The lumbar spine showed squaring, and the sacroiliac joint showed grade 3 erosive changes on both sides (Fig. 3). His erythrocyte sedimentation rate (ESR) was 39/59 mm (1 h/2 h), and his C-reactive protein (CRP) was 1.6 mg/dl. Anterior spinal fusion for the neck pain was performed at another hospital to treat the discovertebral lesion at C4/5 after a diagnosis of discitis. After the operation, the neck pain decreased, but widespread back pain and fever were persistent. When he visited our clinic, a moderate limitation of the mobility of the whole spine was observed. A bacterial culture performed at the time of the operation was negative.

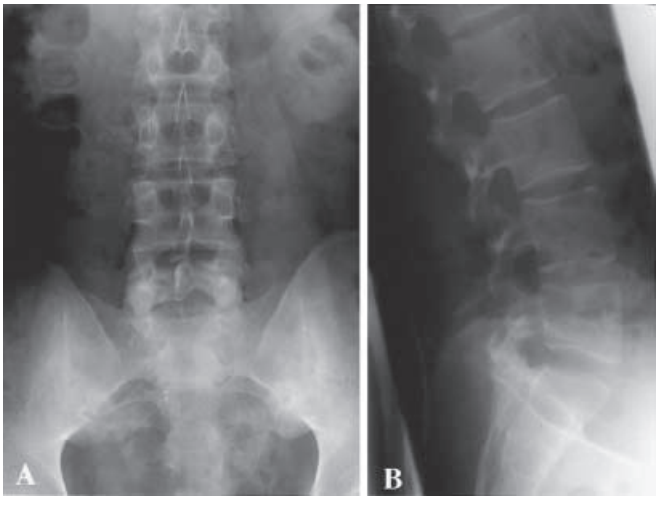

Fig. 3. Case 1. **A** Bilateral S-I joints show grade III arthritic change. **B** The lumbar vertebral body shows squaring. No erosive change in the facet joint is seen

Case 2

A 36-year-old woman began to complain of right hip pain when she was 11 years old, and of low back pain when she was 15 years old. AS was initially diagnosed at our department when she was 23 years old. After that, we lost touch with her. When she visited our department later, she had a moderately severe low back pain and could not sit even for 10 min. Her left hip gave severe pain with motion and the range of motion was severely limited. Her ESR was 19/50 mm (1 h/2 h) and her CRP was negative. A rheumatoid arthritis hemagglutination (RAHA) titer was 160 and HLA-B27 antigen was positive.

Radiographs showed typical AS findings, including a grade III erosive change of the bilateral sacroiliac joint, and the left hip joint was also involved. A discovertebral lesion

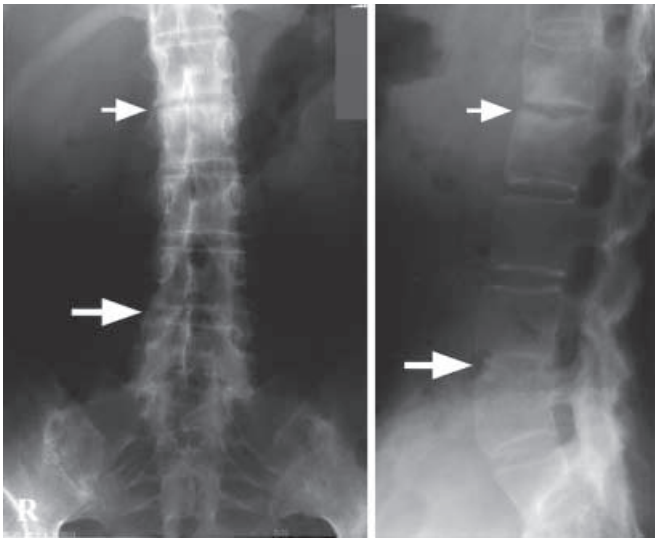

Fig. 4. Case 2. Radiographs of the lumbar spine showing typical AS changes, include bilateral grade III S-I joint erosion. A sclerotic change in the vertebral end plate can be seen at L1/2 (*small arrows*). Calcification of the intervertebral disc can be seen at L4/5 (*large arrows*)

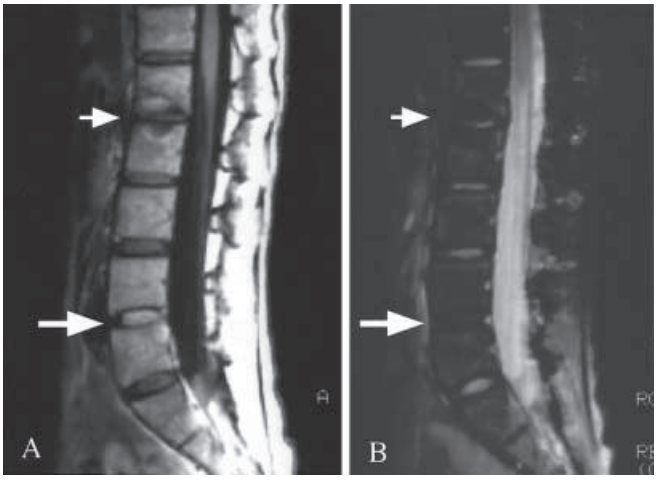

Fig. 5. Case 2. MRI showing erosive changes and peripheral reactive changes on L1/2 (*small arrows*). The L4/5 disc shows high intensity on T1WI (**A**) suggesting calcification of the disc, whereas T2WI (**B**) shows only low intensity, implying degeneration (*large arrows*)

at level L1/2 was observed on the radiograph (Fig. 4). MRI showed an intensity change at level L1/2 corresponding to the radiographic findings (Fig. 5). In this case, radiographic evidence of AS was not apparent at the beginning of the disease, a proper diagnosis was not carried out, and this patient had been treated conservatively, including lumbar traction. The presence of AS had clearly been overlooked, perhaps because the patient was a young woman.

Case 3

A 32-year-old woman had complained of left buttock pain since she was 22 years old. She visited our hospital at the age

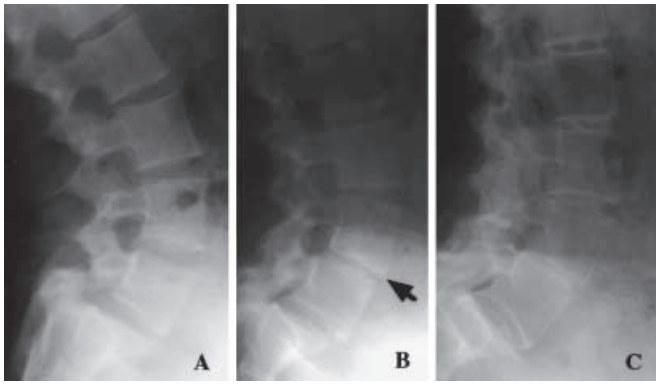

Fig. 6. Case 3. **A** Spondylolysis of L5 pars was the only pathologic finding on a lumbar spine radiograph on the patient's initial visit when she was 22 years old. **B** Five years later (27 years old), the L4/5 intervertebral space had narrowed (*arrow*) and a different diagnosis from discitis was necessary. **C** The final radiograph (31 years old) showing spontaneous fusion of L5 spondylolysis and ankylosis of the facet joint at multiple levels. Ankylosis of the spinal column is almost complete at this stage

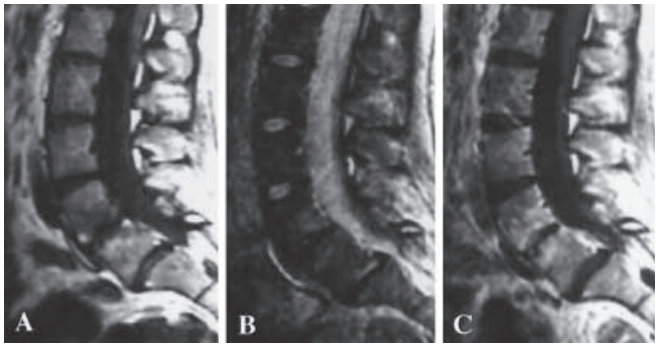

Fig. 7. Case 3. The vertebral end plate surrounding the L4/5 disc shows low intensity on T1WI (**A**), and high intensity on T2WI (**B**), with a slight signal enhancement (**C**). Note that no fluid collection can be seen within the disc space

of 23, and routine examinations of the lumbar spine, including computed tomography (CT) and peridurography, were performed, but only L5 spondylolysis was found (Fig. 6) and she was treated conservatively. On a radiograph taken when she was 27 years old, a narrowing of the L4/5 disc space was seen. Laboratory examinations showed elevated CRP and ESR and a continuing, low-grade fever, and discitis was suspected. Antibiotics were used, but with no effect. A disc biopsy was performed, but the bacterial culture of the specimen was negative. The low back pain then gradually decreased and she did not attend the hospital for several years. She visited our hospital again in 1995 when she was 31 years old complaining of left hip pain. At the time of the visit, L4/5 showed ankylosis and there was intervertebral calcification in other disc spaces. Interestingly, spontaneous fusion of the L5 isthmic lysis was also observed on the radiograph. MRI showed T1 low intensity and T2 high intensity at the end plate adjacent to the L4/5 intervertebral disc, with a slight enhancement of the lesion. No fluid collection within the disc was observed (Fig. 7).

This patient was diagnosed with AS in 1995 when she was 32 years old, and left THA was performed for the treatment of severe left coxalgia. During her course, her CRP was 1.5–2.5 mg/dl, her ESR was 40–80 mm 1 h, and HLA-B27 antigen was positive.

Discussion

Ankylosing spondylitis, psoriatic arthritis, Reiter's disease, so-called enteropathic arthritis coexisting with ulcerative colitis, Crohn disease, and other inflammatory bowel and skin diseases often overlap with each other, thus forming a group of diseases which is designated seronegative spondyloarthropathy (SNSA). AS is one of this group, which mainly shows as ankylosis of the spine and erosive changes in the large peripheral joints. The disease usually starts from the S-I joint, and finally leads to total ankylosis of the spine. The etiology of AS is controversial, but it is widely accepted that cross-immunoreactivity between human cells and some microorganisms may contribute to the onset of the disease.[2] Diagnosis is usually not difficult in advanced cases, but there are some cases in which radiographs show minimal abnormalities, and such cases are occasionally misdiagnosed. Generally, vertebral lesions in AS initially occur from erosive change in the S-I joints and vertebral facet joints, and finally lead to ankylosis between each vertebral body accompanied by the formation of a bony bridge, the so-called bamboo spine. Some cases of AS are accompanied by disc-space narrowing at a localized level and erosive changes to adjacent vertebral end plates, and this type of lesion is often difficult to differentiate from bacterial discitis. These lesions were initially described by Andersson in 1937 as spondylodiscitis (Andersson lesions). Typical Andersson lesions show the following radiological features: disc-space narrowing, bone destruction, surrounding sclerosis, and local kyphosis. Bone destruction occurs as erosive changes at the vertebral end plate adjacent to the disc. These changes often lack osteoblastic changes such as sclerosis and osteophyte formation, and in this way can be differentiated from typical spondylotic changes which are often accompanied by sclerotic change, peripheral osteophyte formation, and lack of erosive change. However, these lesions and bacterial discitis show similar patterns on radiographs and they are difficult to differentiate with radiographs alone. In the literature,[3–5] the incidence is given as around 8% to 16%, and it most commonly occurs as thoracolumbar lesions. In our study, the incidence of Andersson lesions was 9.7% (3 of 31), and this is similar to previous reports. The main symptoms of discovertebral lesions are pain and stiffness of the spinal column, although some are asymptomatic.[6] Histological descriptions may vary,[7] but generally the lesion is composed of necrotic bone and granulation tissue compatible with pseudoarthrosis.[8,9] Some reports support the theory that these lesion are traumatic in origin,[5,8,10] and some support an atraumatic origin.[11,12] When these lesions occur in the earlier phase of the disease, they are similar in appearance to those of bacterial discitis, as mentioned above, and they are very difficult to differentiate using only radiographs.[13] This is a problem because these two conditions require very different treatments. Most previous reports have shown lesions in advanced AS cases so that the changes in the vertebral column are obvious, and the Anderson lesions are shown on the radiographs as erosive changes between ankylosed segments. Thus differentiating between these and discitis was relatively easy. The cases we report here are unusual in that they all developed these lesions in the relatively earlier phase of AS; in other words, they developed an erosive change in the vertebral end plates without severe AS changes in other parts of the vertebral body. Thus all three cases were suspected to have bacterial discitis at some point in their illness. MRI is of great value in discriminating between these two diseases. In bacterial discitis, MRI shows that the disc often indicates the progression of the disease as it becomes a focus of fluid collection. However, in AS, the signal intensity of the disc is generally preserved or shows only disc degeneration, and therefore intensity changes shown by MRI will probably be limited to within the vertebral body and the vertebral end plate, and not appear in the disc. Active granulation tissue in the end plate will be enhanced, and this may explain the presence of high-intensity spots within the vertebral end plate in both gadolinium-enhanced and T2-weighted images. In addition, perivertebral effusion and intradiscal effusion are seldom seen in the dicovertebral lesions in AS. This may well be explained by the fact that in Andersson lesions, the center may be composed of active granulation tissue within the vertebral end plate. The high signal intensities on T2-weighted images observed in AS cases usually correspond to granulation tissue itself, and peripheral T2 high-intensity areas reflect an infiltration of inflammatory tissue and cells, not fluid collection. The lack of intradiscal or perivertebral fluid collection may be the most important diagnostic evidence.

AS usually predominantly affects males, but when a female is affected, the radiographic findings tend to be less obvious than in males in many cases. In females, the stiffness of the spine also tends to be less severe than in males, whereas peripheral joint pain is often worse than in males. Laboratory data also tend to show fewer abnormalities in females than in males. For these reasons, especially in the early phase of the disease, the presence of AS may be overlooked in some female cases.

Two of the three cases presented here were female, and the age of onset was relatively low in all cases (estimated at about 20 in case 1, 11–15 years in case 2, and 22–23 years in case 3). Although there are reports of the early appearance of spondylodiscitis in younger-onset cases,[14,15] it is often difficult to confirm the presence of AS at a period when spinal lesions are at a minimum. Thus, bacterial discitis is a more likely diagnosed than AS if only radiographic images are available when a patient complains of back pain and persistent fever. It is necessary to take great care in the diagnosis of such cases. MRI gives good information in such cases. CT also has a complementary role in demonstrating bone erosion, and it gives a clearer image of changes in the bone than MRI.[16] A bone scan is also useful for evaluating

bone lesions,[17,18] but MRI still has advantages over any other visual examination because it also gives information about soft tissues and nerve systems in a single plane. It is worth noting a report of a signal change on MRI in the very early stage of AS.[19] Another paper reports that MRI represents edematous change sensitively, and is useful to predict the progression of AS.[20] These reports confirm that MRI is useful in the early diagnosis and prediction of the course of discovertebral lesions in AS. In summary, we consider that MRI can be of great value in the differential diagnosis of Andersson lesions from bacterial discitis, as well as in its efficiency in the early diagnosis of AS.

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