ANKYLOSING SPONDYLITIS : VALUES OF MR IMAGING

Suphaneewan JAOVISIDHA MD[1], Pimjai SIRIWONGPAIRAT MD[1], Chathchai POOKARNJANAMORAKOT MD[2], Patchrin PEKANAN MD[1].

ABSTRACT

Two cases with ankylosing spondylitis (AS) whose MR imaging proved very helpful were reported. The first case presented with hip pain, and MR imaging was requested to clarify abnormal scintigraphic findings at femoral head-neck regions. MR imaging disclosed extensive synovitis corresponding to the known AS as well as bone marrow edema of femoral heads and necks which was an early sign of avascular necrosis (AVN). Core decompression was performed with dramatic relief of symptom . The second case had a long-standing AS, and subsequently developed colorectal carcinoma which was treated by A-P resection. He presented with back pain, abnormal spine radiographs and abnormal bone scintigram. MR imaging revealed spondylitic process and helped exclude metastasis.

INTRODUCTION

Ankylosing spondylitis (AS) is a systemic rheumatologic disorder of adults that results in disease-specific inflammation and eventual ossification at the site of ligamentous insertion . The onset of AS generally occurs between the ages of 15 and 35 years (average 26-27 years) in both men and women, although an earlier onset has been noted in some female patients.[1] Magnetic resonance (MR) imaging, due to its superior soft tissue contrast, provides important information regarding disease activity and helps differentiating AS from other disease process. We reported two cases of AS patients whose MR imaging was proved very helpful.

CASE 1

A 49-year-old single female patient, known case of AS for 10 years and receiving steroid intermittently,came to the hospital because of bilateral hip pain. She also had neck pain in the morning, but to a lesser degree. She had past history of right knee pain and straw color fluid was obtained from this joint. She had had ankle and heel pain as well. Her peripheral joints were symptom-free at the time of this presentation.

Physical examination revealed limited range of motion of back and neck. She had severe hip pain bilaterally, particularly while changing position. Her chest, abdomen, and other organs were unremarkable on physical examination.

Cervical spine radiographs revealed mild degree of degenerative change. Syndesmophyte formation was observed at the level of C2-3 and C5-6, whereas calcified or ossified posterior longitudinal ligament was seen from the level of C2 to C6 (Fig.1). Lumbar spine radiographs revealed squaring of anterior vertebral bodies,

[1] Department of Radiology, Ramathibodi hospital, Rama 6 street, Bangkok 10400, Thailand.
[2] Department of Orthopedic Surgery, Ramathibodi hospital, BKK.

hypertrophied facets at the level of L4-5 and L5-S1, syndesmophytosis, and diskal calcification. Sacroiliac joints showed bilateral, symmetrical involvement. The ligamentous portions of the SI joints were obliterated, representing ankylosis. The synovial portions of the SI joints were narrowed at their upper portions, whereas their lower portions showed erosion and sclerosis of subchondral bone (Fig.2). A radiograph of both hips revealed mild, diffuse narrowing of hip joint spaces. Extrinsic erosion was observed at lateral aspect of femoral heads-necks, involving more on the left side. Erosion and sclerosis of subchondral bone on both sides of pubic symphysis were noted with adjacent eburnation (Fig.3).

Complete blood counts were as followings: Hb 12 gm%, Hct 38%, WBC 7,940, and platelet 368,000. HLA-B27 was positive. Rheumatoid factor was negative. ESR was 92 mm. Antinuclear antigen (ANA) was homogenously positive, with titer of 1:40. The clinical impression at that time was underlying AS with arthritis.

Bone scintigraphy was subsequently performed, and revealed abnormally increased uptake at both femoral head-neck regions (Fig.4). No definite increased uptake at spinal column is noted. Magnetic resonance (MR) imaging was requested to clarify the pathology on bone scintigram.

T1-weighted coronal MR image revealed small foci of decreased signal intensity (SI) in femoral head-neck regions corresponding to scintigraphic findings, and low SI of adjacent bone marrow (Fig.5). These foci were proved to be subchondral bone cysts on sagittal gradient recalled echo (GRE) images (Fig.6). The fast multiplanar inversion recovery (FMPIR) sequence revealed diffuse bone marrow edema involving femoral heads and necks bilaterally, as well as small joint effusion (Fig.7). T1-weighted axial MR image exhibited hypertrophied synovium eroding femoral heads and necks as well as acetabuli (Fig.8). These findings explained the extrinsic erosion of femoral necks seen on plain radiograph and scintigram (Fig.3 and 4). Abnormal decreased marrow SI was also noted at pubic bones. T1-weighted fat-suppression enhanced axial images showed that the thickened synovium, the subchondral cysts, and the edematous marrow at femoral heads and necks exhibited inhomogenous enhancement, as did the pubic bone marrow (Fig.9). MR imaging findings were interpreted as 1) extensive synovitis, corresponding to the known AS, and 2) bone marrow edema of femoral heads and necks, could be an early sign of AVN or transient marrow edema.

As correlated with clinical findings, the diagnosis of an early AVN was favored, and core decompression was performed to the right hip because of more severe pain. The patient had dramatic symptom relief, and 3-months appointment was made for the treatment of the left hip.

AVN = Avascular Necrosis

CASE 2

A 60-year-old male patient has had AS for 30 years and received inadequate medical treatment . He has undergone A-P resection for the treatment of colorectal carcinoma, ten years ago. He developed back pain at lower thoracic level for 7 days. Lateral radiograph of thoracic spine revealed diskal calcification and diffuse syndesmophytosis. Nearly complete obliteration of T7-8 disk space was seen. Diskovertebral destruction at T10-11 level with compression fracture of T10 and T11 vertebral bodies were also observed (Fig.10). Bone scintigraphy showed abnormally increased uptake at lower thoracic level. MR imaging was requested to exclude metastatic process.

MR imaging revealed squaring of thoracic vertebral bodies with diffuse syndesmophytosis, and diffuse anterior longitudinal ligament ossification. The fractured T10 and T11 bodies maintained signal of normal hyperintense fatty marrow on T1- weighted MR image, and of hypointense on T2-weighted image (Fig.11). Posterior protrusion of T11 body caused small indentation on anterior thecal sac without spinal cord compression. The T7-8 intervertebral disk showed decreased height with internal bright spot T1WI (corresponding to central type of signal change of intervertebral disk in AS patients described by Tyrrell et al),[2] and was hypointense on T2WI. The T7 and T8 bodies maintained normal fatty marrow intensity. The MR imaging findings was interpreted as diskovertebral erosion at T7-8 and spondylitic fracture at T10 and T11. Possibility of metastatic deposits was excluded.

Fig. 1: Lateral cervical spine radiograph reveals posterior longitudinal ligament ossification from the level of C2 to C6 (white arrowheads). Syndesmophytes are noted at C2-3 and C5-6.

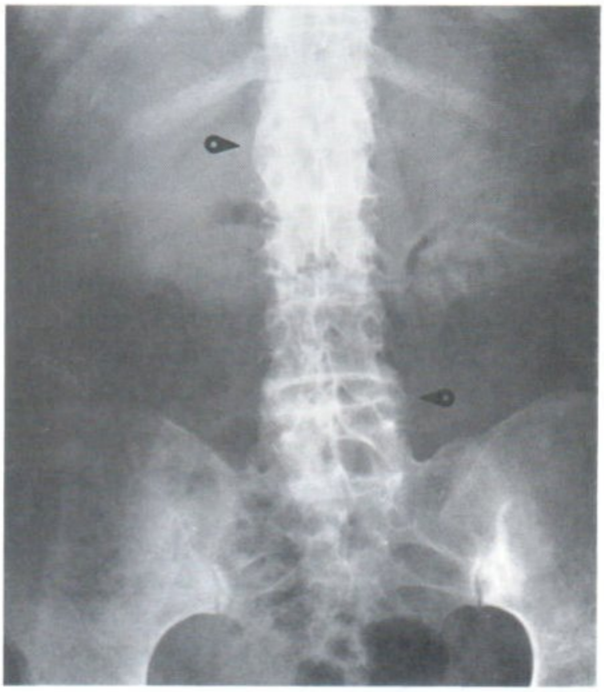

Fig. 2 : AP lumbar spine radiograph shows syndesmophytosis (round arrowheads) and hypertrophied facets. At sacroiliac joints, obliteration of the ligamentous portions is observed whereas the synovial portions show erosion and sclerosis of subchondral bones.

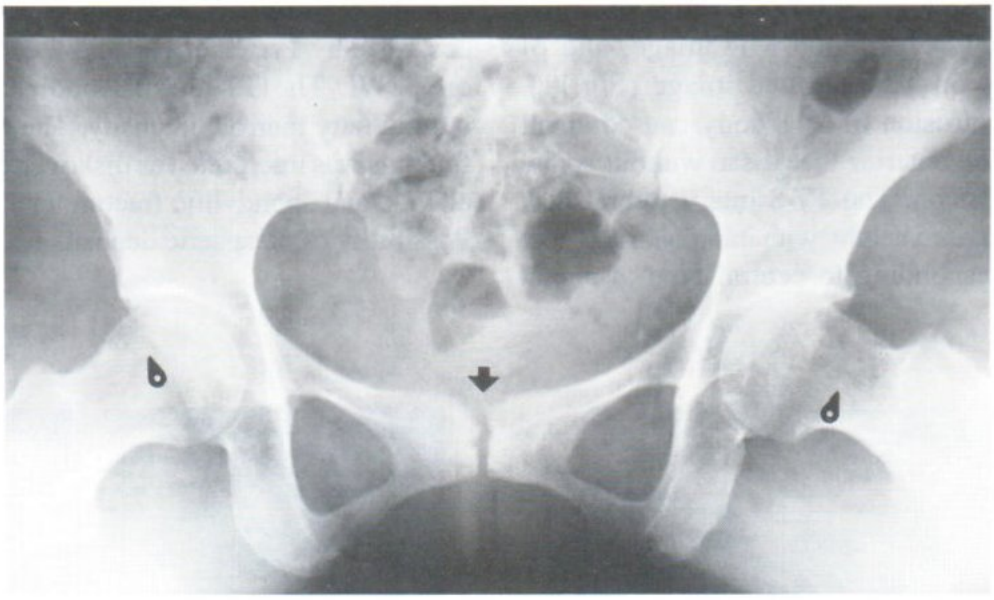

Fig. 3 : AP radiograph of both hips (frog leg view) demonstrates extrinsic erosion at femoral head-neck regions (round arrowheads). The pubic symphysis exhibits bone erosion and sclerosis of subchondral bone (arrow).

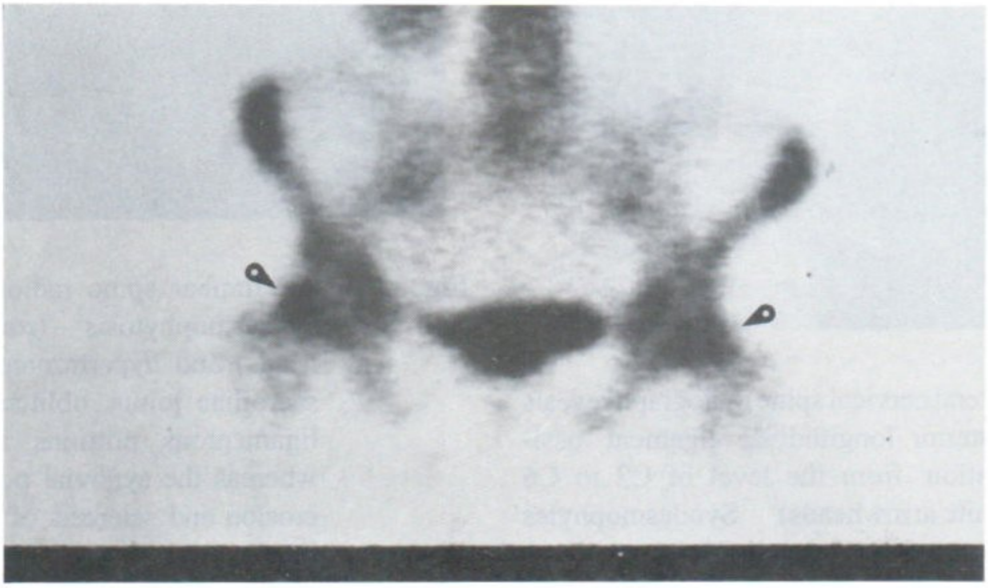

Fig. 4 : Bone scintigram reveals foci of increased radiotracer uptake at femoral head-neck regions (round arrowheads).

Fig. 5 : T1-weighted coronal MR image reveals that the areas of increased radionuclide uptake in bone scintigram are foci of low SI (round arrowheads)

Fig. 6 A. Fig. 6 B.

Fig. 6 : Gradient recalled echo sagittal MR images demonstrate that the foci of low SI in Fig. 5 are subchondral cysts on both right (Fig. 6A) and left (Fig. 6B) femoral heads.

Fig. 7 : FMPIR-sequence coronal MR image demonstrates diffuse bone marrow edema involving femoral heads and necks bilaterally (arrows). Small joint effusion is observed nearby.

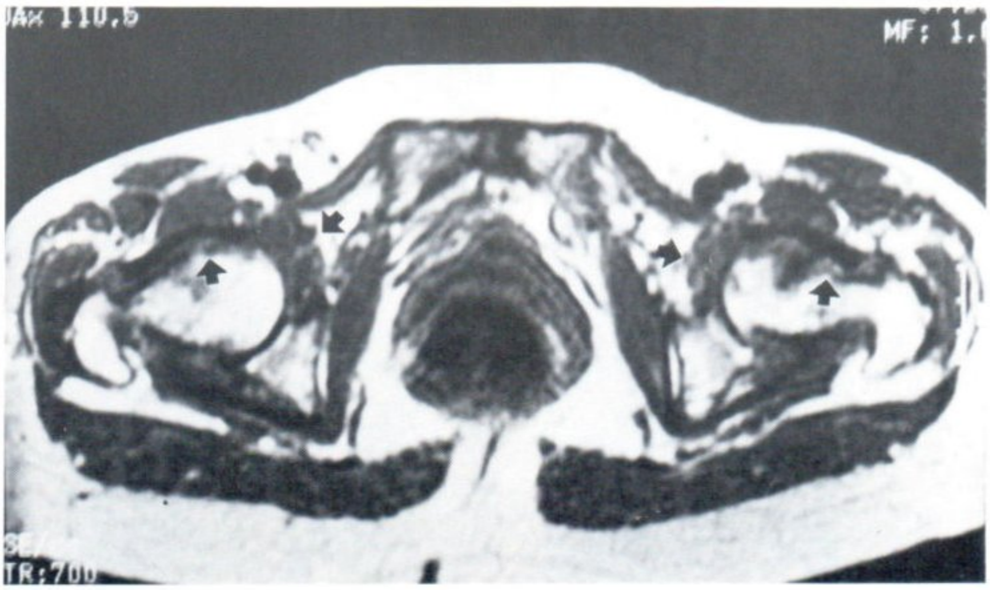

Fig. 8: T1-weighted axial MR image reveals low-SI hypertrophied synovium eroding and extending into subchondral bone both of femoral heads / necks and of acetabuli (arrows).

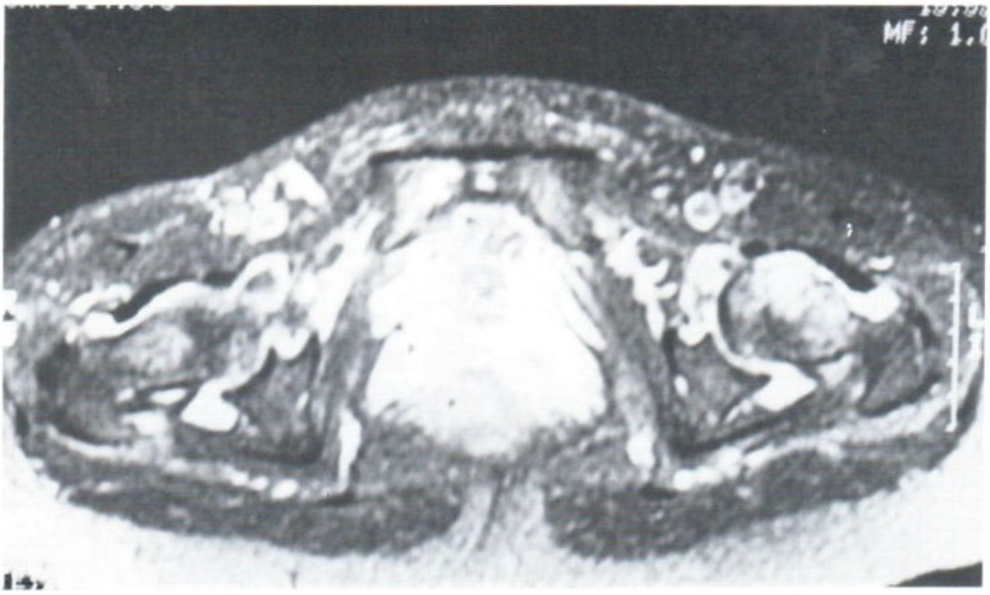

Fig. 9: T1-weighted fat-suppression enhanced axial MR image reveals that the proliferated synovium and the edematous marrow show inhomogeneous enhancement

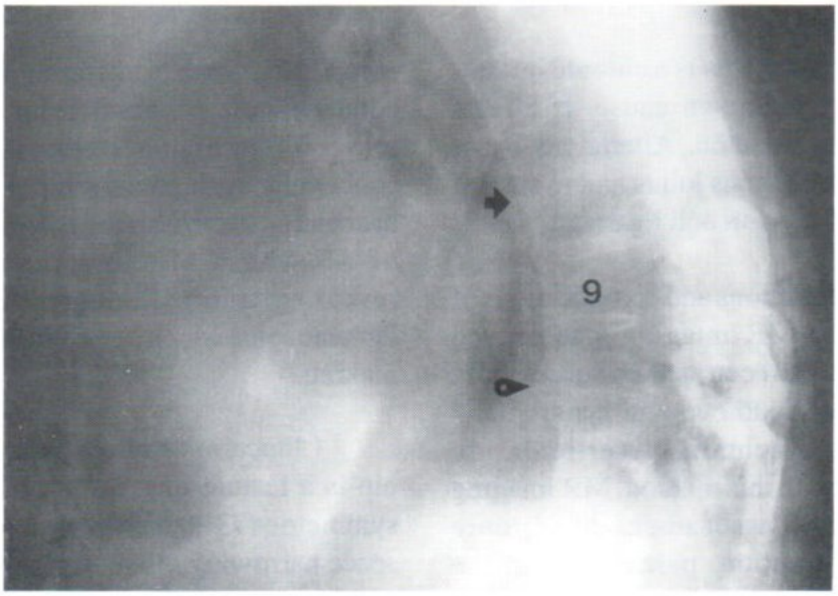

Fig. 10: Lateral thoracic spine radiograph reveals nearly complete obliteration of T7-8 disk space (arrow), with diskovertebral destruction at the level of T10-11 (round arrowheads). (Number 9 indicates level of T9)

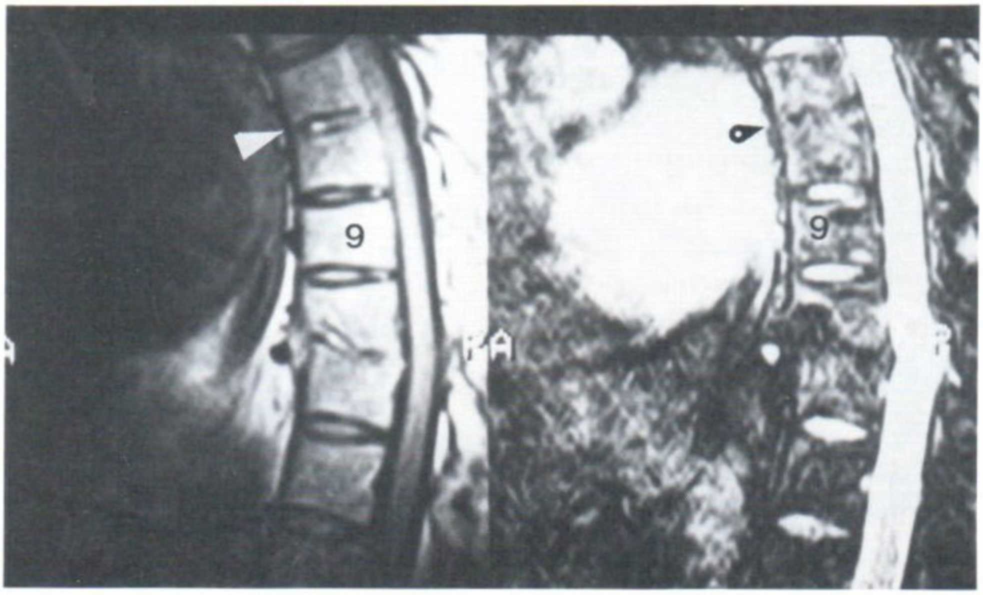

Fig. 11: T1-weighted (left) and T2-GRE (right) sagittal MR images demonstrate that the fractured T10 and T11 bodies still have normal signal of fatty marrow. The T7-8 disk shows a spot of increased SI on T1WI (white arrowhead) and decreased SI on T2GRE (round, black arrowhead).

DISCUSSION

Ankylosing spondylitis is a chronic inflammatory disorder of unknown cause. It affects principally the axial skeleton. Alterations occur in synovial and cartilaginous joints and in sites of bony attachment of tendon and ligament.[1]

Certain manifestations and complications of AS exist for which MR imaging was proved useful. MR imaging has been applied successfully in the evaluation of cauda equina syndrome.[3-6] Dorsally situated arachnoid diverticula are visualized directly with this method. MR imaging may be used in the assessment of chronic diskovertebral destruction, particularly in the differentiation of improper fracture healing, infection, and other related disorders.[1] In case 2 of this study, MR imaging is useful because of the high frequency of associated neurological symptom in AS patients. MR imaging can differentiate the various causes of cord compression and identify cord contusion.[7,8] Roles of MR imaging was to make an early diagnosis of sacroiliitis,[9] and to differentiate inflammatory edema (acute process) from fibrosis or bone sclerosis (more chronic process).[1,10] MR imaging concerning evaluation of hip pain in AS patients has seldom been described. We reported two cases of AS whose MR imaging was of value in revealing true pathologic change in hip and thoracic spine which helped in therapeutic decision making.

Clinical and radiological involvement of the hip is a feature of AS.[11] A bilateral (93%) and symmetric (73%) distribution of concentric joint space narrowing (50%) and osteophytosis (58%) are characteristic. Axial migration of the femoral head with respect to the acetabulum is a frequent feature of hip involvement in AS. It is classically related to superficial erosion of cartilage by inflammatory tissue or pannus,[12] but subchon-dral extension of inflamed synovium has also been observed.[13] Since the nutrition of mature articular cartilage is derived from the synovial surface, subchondral infiltration does not necessarily destroy the overlying cartilage or produce cartilaginous proliferation.[1] Subchondral cysts are observed, and generally are multiple and of variable size. In case 1, MR imaging demonstrates the extensively proliferated synovium extending into subchondral and marrow compartments of acetabuli, with extrinsic erosion to the femoral head-necks anteriorly. These MR findings may explain the increased uptake on bone scintigram. Such findings could be demonstrated only by MR imaging. In addition, detection of marrow edema involving femoral heads and necks in this case was an important information because it can be an early sign of AVN.[14,15] Focal MR abnormalities subsequent to the presentation of diffuse bone marrow edema has been reported as early as 6 to 8 weeks from the time of detection.[14] Core decompression is most commonly used as the conservative or prophylactic procedure, to alleviate the elevated intraosseous pressure, and permit neovascularization.

Increased accumulation of radionuclide in the spine and at entheses can be observed in patients with AS, especially in the presence of active disease.[16-18] At any location, an abnormal scintigraphic examination is not specific, and accurate diagnosis necessitates its correlation with clinical and radiological investigation.[1] As in case 2; question arose concerning the nature of abnormalities detected by plain radiograph and bone scintigram. Malignancy induced fractures of vertebral bodies may be differentiated by MR imaging from those of benign processes.[19,20] Ninety percent of vertebral fracture caused by non-traumatic malignancy had complete tumoral replacement of the marrow, whereas 77% of benign fractures had complete preservation of normal bone marrow signal.[19] In case 2, MR imaging revealed complete preservation of normal bone marrow signal, and spondylitic process was diagnosed. Clinical improvement was obtained after medical treatment. MR imaging was proved very helpful in excluding metastasis and in suggesting appropriate treatment.

In conclusion; certain manifestations and complications of AS exist for which MR imaging was proved useful, in demonstrating disease activity, revealing early signs of critical complications, and in therapeutic decision making.

REFERENCES :

1. Resnick D, Niwayama G. Ankylosing spondylitis. In: Resnick D, ed. Diagnosis of bone and joint disorders. 3rd ed. Philadelphia, Pa: WB Saunders, 1995;1008-1074.
2. Tyrrell PNM, Davies AM, Evans N, Jubb RW. Signal changes in the intervertebral discs on MRI of the thoracolumbar spine in ankylosing spondylitis. Clin Radiol 1995; 50:377-383.
3. Ruiz A. Dural ectasia in a patient with cauda equina syndrome (CES) of AS. In: Quencer RM, ed. MRI of the spine. New York: Raven Press, 1991;61.
4. Grosman H, Gray R, St Louis EL. CT of long-standing ankylosing spondylitis with cauda equina syndrome. AJNR 1983;4:-1077-1080.
5. Abello R, Rovira M, Sanz MP, et al. MRI and CT of ankylosing spondylitis with vertebral scalloping. Neuroradiology 1988; 30:272-275.
6. Rubenstein DJ, Alvarez O, Ghelman B, Marchisello P. Cauda equina syndrome complicating ankylosing spondylitis: MR features. J Comput Assist Tomogr 1989; 13:511-513.
7. Karasick D, Schweitzer ME, Abidi NA, Cotler JM. Fractures of the vertebrae with spinal cord injuries in patients with ankylosing spondylitis: imaging findings. AJR 1995; 165:1205-1208.
8. Flanders AE, Tartaglino LM, Friedman DP, Aquilone LF. Magnetic resonance imaging in acute spinal injury. Semin Roentgenol 1992; 27:271-298.

9. Murphey MD, Wetzel LH, Bramble JM, Levine E, Simpson KM, Lindsley HB. Sacroiliitis: MR imaging findings. Radiology 1991;180:239-244.
10. Ahlstrom H, Feltelius N, Nyman R, Hallgren R. Magnetic resonance imaging in sacroiliac joint inflammation. Arthritis Rheum 1990;33:1763-1769.
11. Dwosh IL, Resnick D, Becker MA. Hip involvement in ankylosing spondylitis. Arthritis Rheum 1976;19:683-692.
12. Cruickshank B. Pathology of ankylosing spondylitis. Clin Orthop 1971; 74:43-58.
13. Pasion EG, Goodfellow JW. Pre-ankylosing spondylitis: histopathological report. Ann Rheum Dis 1975; 34:92-97.
14. Stoller DW, Matoney WJ. The hip. In: Stoller DW, ed. Magnetic resonance imaging in orthopaedics and sports medicine. Philadelphia, Pa: JB Lippincott, 1993;57-78.
15. Beltran J. Infections and avascular necrosis. In: Stark DD, Bradley WG, eds. Magnetic resonance imaging. 2nd ed. Missouri: Mosby Year Book 1992;2345-2354.
16. Weissberg DL, Resnick D, Taylor A, Becker M, Alazraki N. Rheumatoid arthritis and its variants: analysis of scintigraphic, radiographic, and clinical examinations. AJR 1978;131:665-673.
17. Esdaile J, Hawkins D, Rosenthall L. Radionuclide joint imaging in the seronegative spondyloarthropathy. Clin Orthop 1979;143:46-52.
18. Baumgarten DA, Taylor A. Enthesopathy associated with seronegative spondyloarthropathy: 99mTc-methylene diphosphonate scintigraphic findings. AJR 1993; 160:1249-1250.
19. Yuh WTC, Zachar CK, Barloon TJ, Sato Y, Sickels WJ, Hawes DR. Vertebral compression fractures: distinction between benign and malignant causes with MR imaging. Radiology 1989; 172:215-218.
20. Baker LL, Goodman SB, Perkash I, Lane B, Enzmann DR. Benign versus pathologic compression fractures of vertebral bodies: assessment with conventional spin-echo, chemical-shift, and STIR MR imaging. Radiology 1990; 174:495-502.