Diffuse intervertebral disk calcification in a patient with rheumatoid arthritis

Michihiro Nakamura[#], Satoshi Shiokawa[*], Yoshitaka Miyazaki[*], Hiroto Kita[*], Keigo Setoguchi[†], Kimito Kawahata[†], Yoshikata Misaki[†], Kazuhiko Yamamoto[†], and Junji Nishimura[*]

[#]*Department of Anatomy and Cell Biology, The University of Tokushima School of Medicine, Tokushima, Japan ;* [*]*Department of Clinical Immunology, Medical Institute of Bioregulation, Kyushu University, Oita, Japan ; and* [†]*Department of Allergy and Rheumatology, Postgraduate School of Medicine, University of Tokyo, Tokyo, Japan*

Abstract: A patient with seronegative rheumatoid arthritis (RA) who presented with intervertebral disk calcification (IDC) of several thoracic and lumbar intervertebral disks is herein described. There was no evidence of any other coexisting diseases such as ochronosis and hemochromatosis, but a remarkable degree of polyclonal hypergammaglobulinemia was observed as a notable finding. Although the appearance of IDC on T1-weighted images on magnetic resonance is controversal, no increased signal intensity was observed in our patient. To the best of our knowledge, this is the first report of IDC in RA.
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Key words **:** *rheumatoid arthritis, intervertebral disk calcification, magnetic resonance imaging, hypergammaglobulinemia*

INTRODUCTION

Intervertebral disk calcification (IDC) is not an infrequent radiographic finding (1). Diffuse calcification of many lumbar and thoracic intervertebral disks has been suggestive of ochronosis. It may also occur in other disease states such as hemochromatosis, chondrocalcinosis, hyperparathyroidism, poliomyelitis, acromegaly, amyloidosis and a fused spine. IDC is also an occasional finding in ankylosing spondylitis and juvenile rheumatoid arthritis in which fusion of the spine occurs (2, 3). However, IDC has not been previously report in rheumatoid arthritis (RA). In this paper, we reported IDC in a patient with RA. The magnetic resonance imaging (MRI) findings of IDC are also described.

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Address correspondence and reprint requests to Michihiro Nakamura, M.D., Department of Anatomy and Cell Biology, The University of Tokushima School of Medicine, Kuramoto-cho, Tokushima 770-8503, Japan and Fax : +81-88-633-9426.

CASE REPORT

A 34-year-old woman with an 11-year history of destructive RA (Steinbrocker Stage IV, Lansbury index 62%) was admitted to our hospital in May 1996. She had been treated as an outpatient at our hospital since 1991 for polyarthritis involving the wrists, hands, hips, knees, ankles and feet. She underwent a synovectomy of her right ankle in 1985, a right knee synovectomy and a right hip replacement in 1993, and a synovectomy of her left ankle in 1994. Previous medications consisted of prednisolone, D-penicillamine, bucillamine, and non-steroidal anti-inflammatory drugs.

A physical examination revealed soft tissue swelling and tenderness in the right elbow, right wrist, finger joints, both knees and both ankles. Deformities of both thumbs and an ulnar deviation of the left wrist were observed. She had not complained of either pain or stiffness of the spine, and deformity and loss of motion in the spine was not observed. In her clinical course, no episode of skin rash, spike fever, pericarditis or iritis was observed. The laboratory findings revealed microcytic hypochromic anemia

(Hb, 6.6g/dl ; RBC, $351\times10^4/mm^3$; Ht, 23.8%) and thrombocytosis ($37.4\times10^4/mm^3$). Biochemical tests showed an elevated total protein level of 10.0 g/dl, and a marked degree of hypergammaglobulinemia (IgG, 7465 mg/dl ; IgM, 1552 mg/dl). The Westergren erythrocyte sedimentation rate was 135 mm/hour. C-reactive protein was elevated (9.58mg/dl). Rheumatoid factor, anti-nuclear factor, anti-nuclear ribonucleoprotein antibody, anti-centromere antibody, anti-Smith antibody and SS-A/Ro antibody were undetectable. A urine specimen was tested for the presence of homogentisic acid, but no positive findings were observed. There was no evidence of any parathyroid abnormalities, renal disease, or calcification of the pheripheral joints. Immunoelectrophoresis showed no monoclonal protein or Bence-Jones protein in the serum or urine. The endoscopic and biopsy findings of the upper digestive tract revealed no evidence of amyloidosis. On a recent X-ray, joint destruction of the carpal bones, narrowing of the metacarpophalangeal joints, periarticular osteoporosis of both wrists, and hallux valgus on the right foot were all observed. In addition, diffuse calcification of the thoracic and lumbar intervertebral disks (Th6-L3) was noted (Figure 1). No calcification was observed in other ligaments or joints of the spine. Magnetic resonance imaging of the thoracic and lumbar vertebrae demonstrated osteopenia, narrowing of intervertebral spaces, and IDC of low signal intensity on T1-weighted images (TR400 ; TE16 ; EC ; 1/1 16 kHz) (Figure 2). There were platyspondyly and some irregularities of the end-plate but not fused spine.

DISCUSSION

Diffuse IDC was observed in our patient with seronegative RA. There was no evidence of complications due to hemochromatosis, chondrocalcinosis, hyperparathyroidism, poliomyelitis, acromegaly, amyloidosis, fused spine or progressive pseudorheumatoid dysplasia, which may have accompanied IDC. In juvenile RA and ankylosing spondylitis, in which fusion of the spine occurs, IDC has been occasionally found in the fused spine (2, 3). However, IDC has not been reported in RA.

The mechanism of IDC is not clear. As for hemochromatosis, it was suggested that an indi-

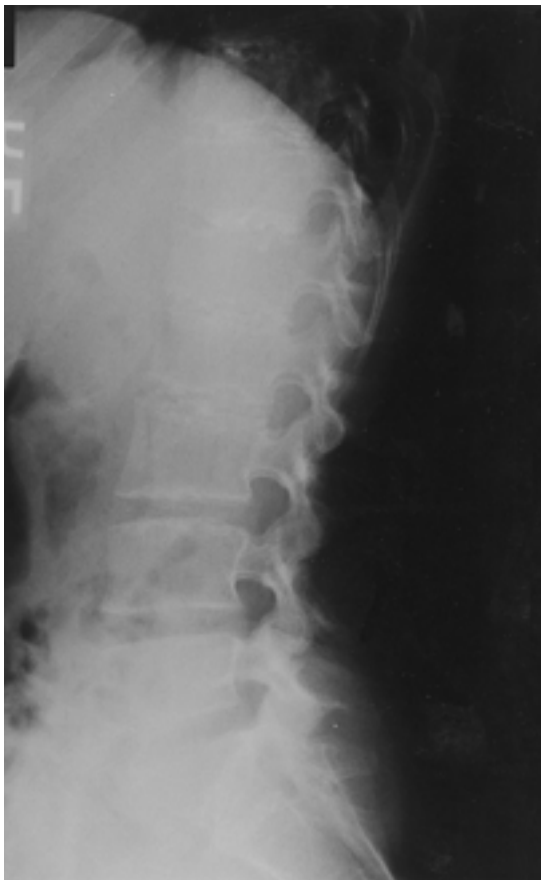

Fig. 1. Lateral radiographic view of the thoracolumbar spine demonstrates diffuse intervertebral disk calcifications and osteopenia.

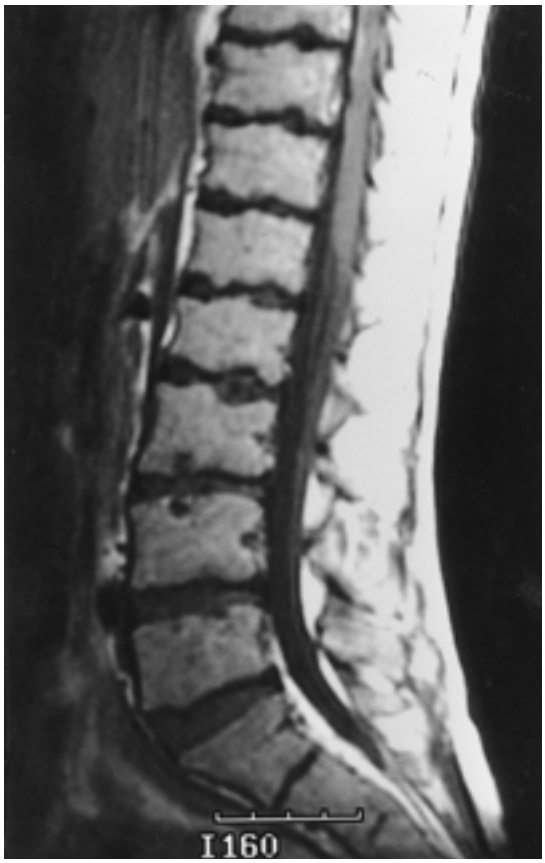

Fig. 2. Sagittal T1-weighted image of the thoracolumbar spine shows narrowing, but no increased signal intensity in multiple disks.

rect effect such as pyrophosphatase inhibition by iron might contribute to calcium pyrophosphate deposition (1). On the other hand, the mechanism of IDC in the fused spine may be due to a lack of mechanical stress, which is an important factor in the modeling of joints and bones (1). A remarkable degree of hypergammaglobulinemia was observed in our patient. The association of hypergammaglobulinemia and tissue calcification has rarely been reported. Tentolouris *et al*. (4) reported three patients of the same family with a linear calcification of the ascending aorta and a severe calcific mixed aortic disease associated with immunological abnormalities including hypergammaglobulinemia. However, no association with immunological abnormalities and IDC has yet been reported.

The MRI findings in our patient were compatible with the traditional belief that calcification appears as areas of low signal intensity or signal void on T1-weighted images. However, recent studies have shown that a high signal intensity can be seen in association with IDC. Major *et al*. reported that five patients with IDC showed high signal intensity on lumbar disk calcification on T1-weighted MRI images (5). Tyrrell *et al*. reported that an increased signal intensity of IDC on T1-weighted images was found in 17 of 36 patients with ankylosing spondylitis and that an increased signal intensity correlated with disk calcification on the radiographs in 78% of cases (6). It is now believed that the appearance of calcified tissue on MRI therefore depends on the actual structure and degree of calcification (7). We thus need to be careful when using T1-weighted MRI images to detect the presence of calcification in disks. However, further studies are necessary to distinguish better the structure and degree of calcification in the tissue from the appearence of calcification in MRI images.

REFERENCES

1. Weinberger A, Myers AR : Intervertebral disc calcification in adults : a review. Semin Arthritis Rheum 8 : 69-75, 1978
2. Martel W, Holt JF, Cassidy JT : Roentgenologic manifestations of juvenile rheumatoid arthritis. Am J Roentgenol Radium Ther Nucl Med 88 : 400-423, 1962
3. Dussault RG, Kaye JJ : Intervertebral disk calcification associated with spine fusion. Radiology 125 : 57-61, 1977
4. Tentolouris C, Kontozoglou T, Toutouzas P : Familial calcification of aorta and calcific aortic valve disease associated with immunologic abnormalities. Am Heart J 126 : 904-909, 1993
5. Major NM, Helms CA, Genant HK : Calcification demonstrated as high signal intensity on T1-weighted MR images of the disks of the lumbar spine. Radiology 189 : 494-496, 1993
6. Tyrrell PN, Davies AM, Evans N, Jubb RW : Signal changes in the intervertebral discs on MRI of the thoracolumbar spine in ankylosing spondylitis. Clin Radiol 50 : 377-383, 1995
7. Henkelman R, Watts J, Kucharczyk W : High signal intensity in MR images of calcified brain tissue. Radiology 179 : 199-206, 1991