

·

1

· · 1,2 · 1,2 · 1,2 · 1,2 · 1,2

:

: 가 31 43  
19 ,

12 T1 I ; , II ;  
, III ;  
, IV ; 가

: 19 28 I (n=4,  
14%), II (n=17, 61%), III (n=1, 4%), IV (n=6, 21%) . 12  
15 I (n=1, 7%), II (n=2, 13%), III  
(n=10, 67%), IV (n=2, 13%)  
:

2

가 가 (1-4). 가 , 가  
(2, 5, 6, 8).

(5).

, , , .  
,  
(5, 6).

(1, 5, 7).

가

95 1 99 2

43

19, 12

12, 6

4, 1, 1

1.5-T (Magne - tom Visions, Siemens, Erlangen, Germany)

(Repetition Time) 500 - 600 msec, (Echo Time) 12 - 15 msec T1

4000 - 4600 msec, 112 - 120 msec

T2

Gd - DTPA (Magnevist, Shering, Berlin, Germany, 0.1 mmol/Kg)

4 mm, 0.4 mm, 180×512, 150×300 mm 135×180 mm

(vertebral level, )

T1

I ; , II ; , III ; , IV ;

가 (Fig. 1).

(Comparison of proportions)

가

**Table 1.** Involved vertebral levels in infectious spondylitis

	Tuberculous Spondylitis	Pyogenic Spondylitis
Cervical	0	1
Thoracic	11	2
Lumbar	15	8
Sacral	1	0
Cervicothoracic	1	0
Thoracolumbar	0	2
Lumbosacral	0	2
Total	28	15

**Table 2.** Patterns of disc enhancement in tuberculous and pyogenic spondylitis (%)

	Tuberculous Spondylitis (n=28)	Pyogenic Spondylitis (n=15)
Type I	4(14)	1(7)
Type II	17(61)	2(13)
Type III	1(4)	10(67)
Type IV	6(21)	2(13)
Total	28	15

31, 43, 19

28, 12, 15

가 11, 가 1, 가 15, 가 1

가 8, 가 2, 가 2, 가 2, 가 1

(Table 1).

Gd - DTPA

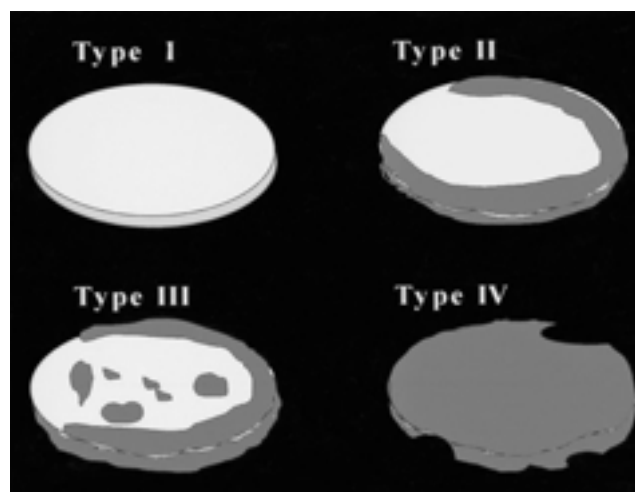
I 4 (14%), II 17 (61%), III 1 (4%), IV 6 (21%)

I 1 (7%), II 2 (13%), III 10 (67%), IV 2 (13%) (Table 2).

II (P<0.01) (Fig. 2, 3), III (P<0.01) (Fig. 4, 5).

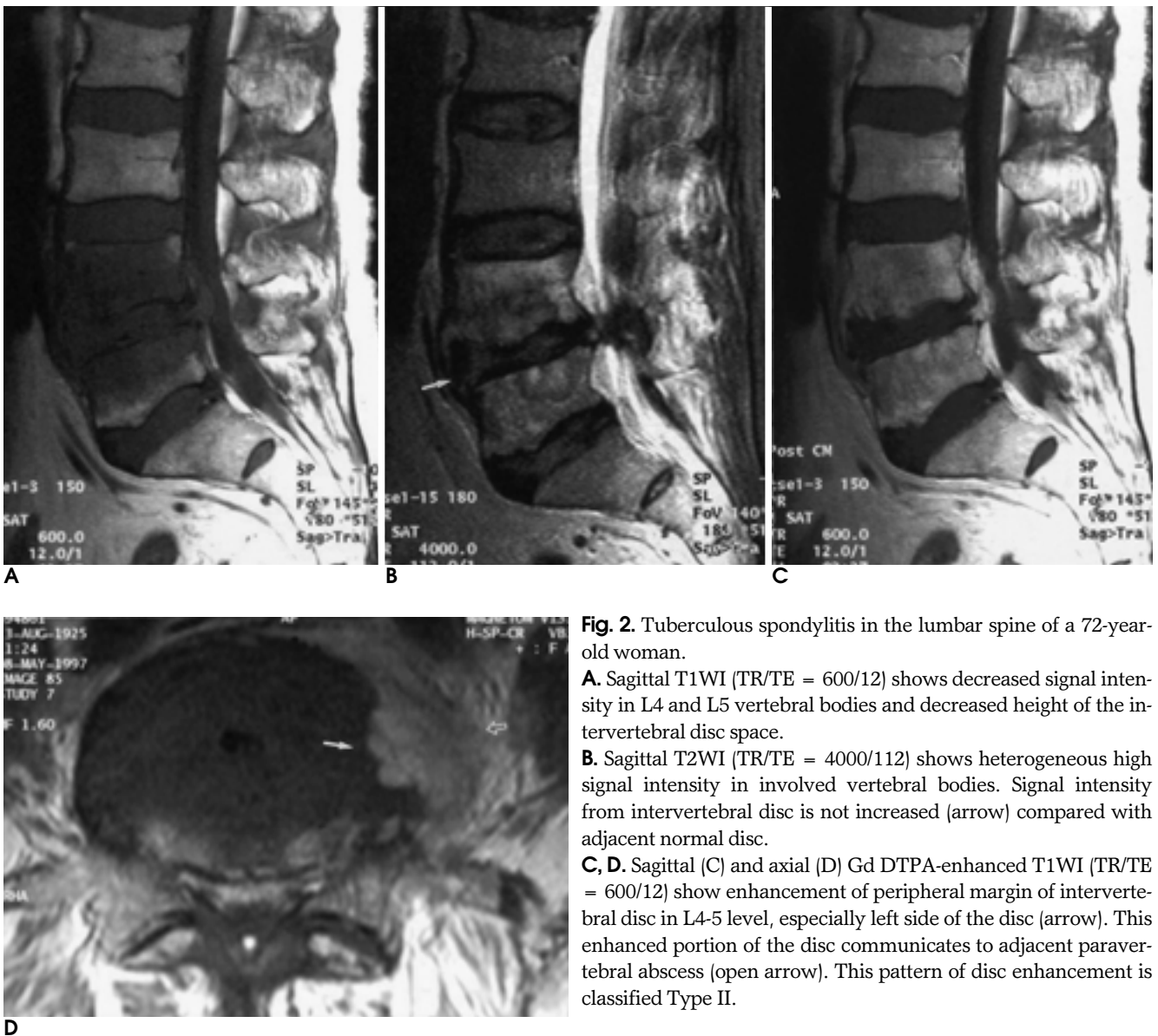
가 (6, 9, 10).

가 가 (6, 10).



**Fig. 1.** Classification of patterns of disc enhancement. Type I, non-enhancement; Type II, enhancement of peripheral margin of the disc; Type III, enhancement of peripheral margin and central area adjacent cortical vertebral endplate; Type IV, general enhancement and/or destruction of the disc.

가 가 (2 - 4),  
 가 가 (gibbus deformity)  
 가 가 (2, 6, 10),  
 가 가 (6, 8, 9, 11, 13).  
 가 가 (2, 6, 11).  
 가 가 (5).  
 가 가  
 가 가



**Fig. 2.** Tuberculous spondylitis in the lumbar spine of a 72-year-old woman.

**A.** Sagittal T1WI (TR/TE = 600/12) shows decreased signal intensity in L4 and L5 vertebral bodies and decreased height of the intervertebral disc space.

**B.** Sagittal T2WI (TR/TE = 4000/112) shows heterogeneous high signal intensity in involved vertebral bodies. Signal intensity from intervertebral disc is not increased (arrow) compared with adjacent normal disc.

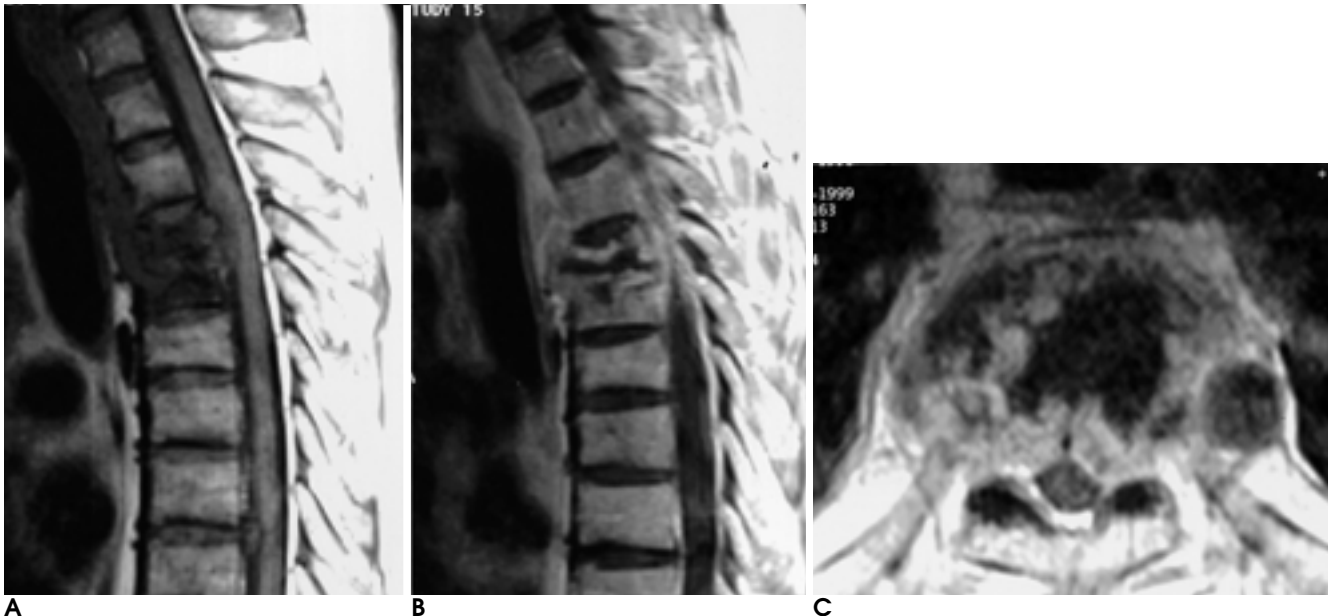
**C, D.** Sagittal (C) and axial (D) Gd DTPA-enhanced T1WI (TR/TE = 600/12) show enhancement of peripheral margin of intervertebral disc in L4-5 level, especially left side of the disc (arrow). This enhanced portion of the disc communicates to adjacent paravertebral abscess (open arrow). This pattern of disc enhancement is classified Type II.

가

가 (5, 6).

(5),

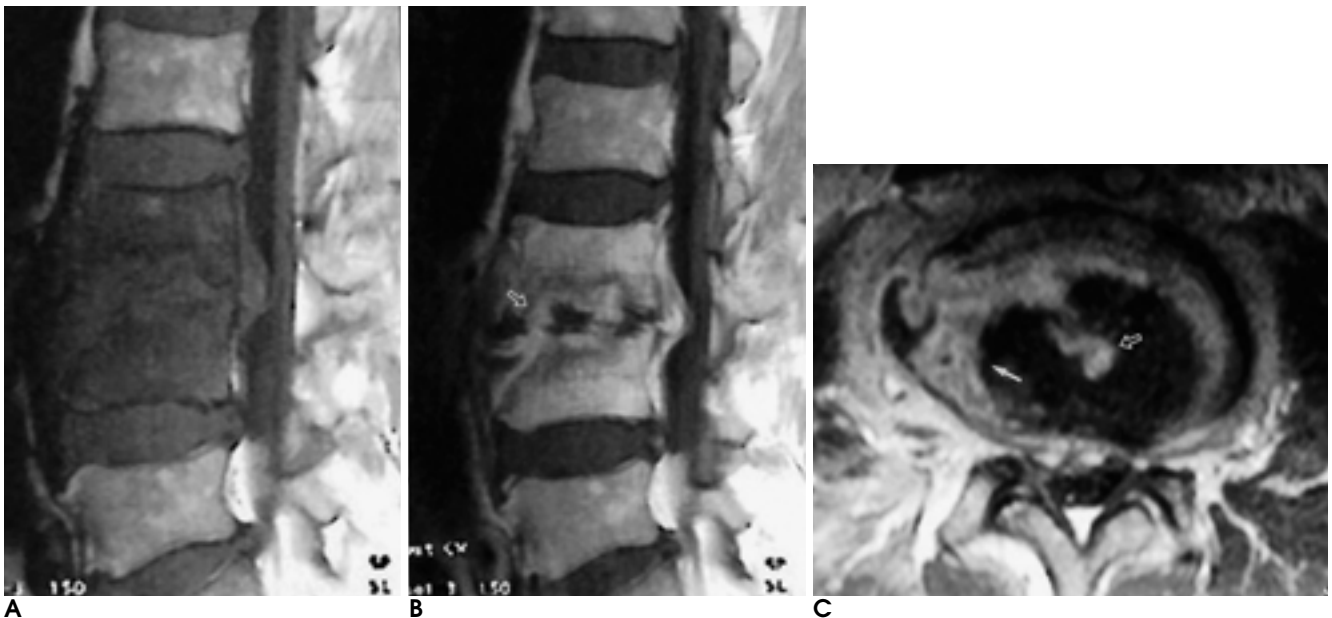
가



**Fig. 3.** Tuberculous spondylitis in the thoracic spine of a 49-year-old man.

**A.** Sagittal T1WI (TR/TE = 500/15) shows decreased signal intensity in T3 and T4 vertebral bodies and loss of the intervertebral disc space.

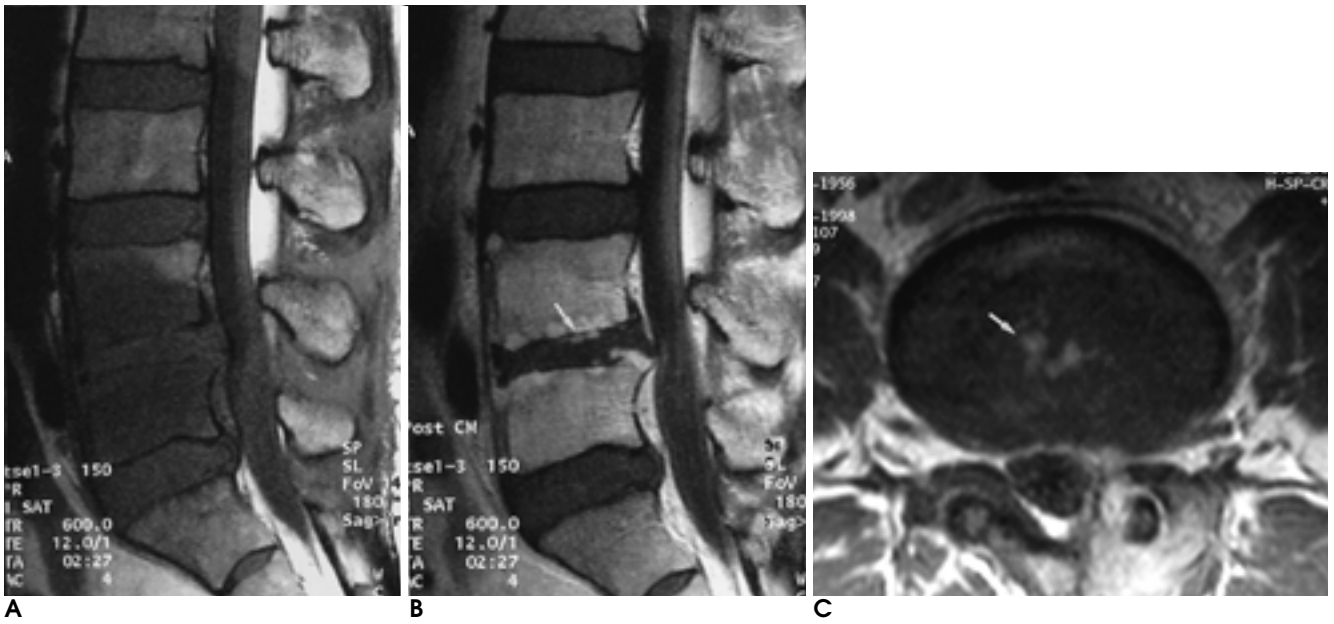
**B, C.** Sagittal (B) and axial (C) Gd DTPA-enhanced T1WI (TR/TE = 500/15) show decreased height of intervertebral disc space and enhancement of peripheral area of the intervertebral disc in T3-4 level. Enhancement of central area is not observed.



**Fig. 4.** Pyogenic spondylitis in the lumbar spine of a 52-year-old man.

**A.** Sagittal T1WI (TR/TE = 642/12) shows decreased signal intensity in L3 and L4 vertebral bodies and decreased height of the intervertebral disc space. A portion of vertebral endplate is irregular and destroyed.

**B, C.** Sagittal (B) and axial (C) Gd DTPA-enhanced T1WI (TR/TE = 642/12) show disc enhancement at the peripheral margin (arrow) and central area (open arrow) adjacent to cortical endplate. Enhancement of paravertebral soft tissue is also demonstrated. This pattern of disc enhancement is classified Type III.



**Fig. 5.** Pyogenic spondylitis in the lumbar spine of a 41-year-old woman.

**A.** Sagittal T1WI (TR/TE = 600/12) shows decreased signal intensity in L4 and L5 vertebral bodies. Intervertebral disc space is preserved.

**B, C.** Sagittal (B) and axial (C) Gd DTPA-enhanced T1WI (TR/TE = 600/12) show focal enhancement of the disc at the central area adjacent to cortical endplate (arrow). This pattern of disc enhancement is classified Type III.

(3, 11).

가

, III

가 가

Gd - DTPA

가 , T2

II 61%

가

, III 1 (4%)

Gd - DTPA

III 67%

가 (13 - 15). Post (13)  
DTPA

Gd -

57가

: 1)

가

; 2)

가

; 3)

가

; 4)

; 5)

가

가

I

, IV

가

. II

가

(3, 11)

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## Differentiation between Tuberculous and Pyogenic Spondylitis on Gd-enhanced MR Imaging: Focus on the Patterns of Disc Enhancement<sup>1</sup>

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**Purpose:** The purpose of this study was to analyze the patterns of intervertebral disc enhancement seen in tuberculous and pyogenic spondylitis, and to evaluate their utility in differentiating between the two groups.

**Materials and Methods:** Magnetic resonance images obtained in 31 consecutive infectious spondylitis patients (43 discs) in whom intervention occurred due to infected vertebral bodies, were retrospectively analysed. Nineteen of the patients had tuberculosis and 12 were infected by pyogenic organisms. After analysis, the patterns of disc enhancement revealed by contrast-enhanced T1-weighted axial and sagittal MR imaging were classified as of four types: Type I, non-enhancing; Type II, enhancement of the peripheral margin of the disc; Type III, enhancement of the peripheral margin and central area adjacent to the cortical vertebral endplate; Type IV, general enhancement and/or destruction of the disc.

**Results:** There were 19 cases of tuberculous spondylitis involving 28 intervertebral discs, and the enhancement patterns observed were as follows: Type I: n = 4, 14%, Type II: n = 17, 61%, Type III: n = 1, 4%, Type IV: n = 6, 21%. Twelve cases of pyogenic spondylitis involved 15 intervertebral discs; the enhancement patterns observed in these cases were as follows: Type I: n = 1, 7%, Type II: n = 2, 13%, Type III: n = 10, 67%, Type IV: n = 2, 13%.

**Conclusion:** Careful analysis of the patterns of disc enhancement occurring in infectious spondylitis can be useful for differentiating between the tuberculous and pyogenic varieties of this condition.

**Index words :** Spine, infection

Spine, MR

Magnetic resonance (MR), contrast enhancement

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