



: (pars inter-articularis)  
 :  
 5 216 . 1.0T MR (pedicle), (lamina)  
 . T1 grade 0( ), 1( ), 2( ), 3( )  
 4 T2 가 가 grade 0, 1, 2, 3 4  
 (endplate)  
 : 36 216 5 61 가 , 4  
 22 , 3 T1 T2 . 3 , grade 0  
 2, 4 grade 3 , 133 86 grade 1, 43 grade  
 grade 3 , 가 grade 1, 48 grade 2, 26  
 (50/74)가 가 (p<0.001).  
 11 (level) , 10  
 가 가 . 13 ,  
 11 가 가 가  
 (p<0.001).  
 : , ,  
 가 T1 T2 가 ,  
 가

25%

(2).

X

가

1

2000 11 28

2001 4 16

가

Chi-square test

가, 가 (3-5) , .

36 216 83 , 5 , 4 , 3 , 3 , 29 , 2

T2 T1 grade 0 grade 1, 43 grade 2, 4 grade 3 133 86

36 17 82 ( 37.2 ) grade 1, 48 grade 2, 26 grade 3 83 9

27:9 . 1.0T MR Magnetom Impact(Siemens, Erlangen, Germany) , (p<0.01).

T1 가 , , 가 가 5가 , 가 가 (42/47)가 가 , 가 가 (50/74)가 가 (p<0.001) (Table 1).

3 5 216 가 , 가 , 가 , 36 108

T1 grade 0( ), 1( ), 2( ), 3( (level) 11 , 1 3

가 ) 4 , , 2 , 10

3 5 가 가

T2 가 (p<0.001). grade 0, 1, 2, 3 4 3 4 55% (11/20) , 13 , Meyerding plate) , 4 5 1 (end - grade I (12/13) grade II .

**Table 1.** Sites and Incidence of Signal Intensity Change of Marrow at Levels Where Spondylolysis is Present or Absent

Group \ Site*	P	PI & P	PI & L	P & L	P & PI & L	Total
† Spondylolysis (+)	4	12	6	2	50	74
† Spondylolysis (-)	42	0	4	0	1	47

\*site where signal intensity increased on T1- and T2-weighted images

†The difference was significant between two groups(p<0.001).

P : pedicle

PI : pars interarticularis

L : lamina



**Fig. 1.** Contiguous sagittal T1-weighted images (A-C) from pedicle to lamina. Signal intensity of pars interarticularis, pedicle, and lamina (black arrow) of L5, where spondylolysis (arrow head) is present, is increased (grade 3). At L4 level where spondylolysis is absent, slightly increased signal intensity (grade 2) is noted at pedicle area. Note isosignal intensity of lamina of L4 (white arrow), comparing to L5.

11 가 가 (partial volume imaging), 가 ( $p < 0.001$ ). 가 (8). 가 (9-11). 5 가 (1). 5% 2-4 Ulmer (12) 가 10-15% (5). X 가 , “incomplete ring” (3-5, 13) T1 (14, 15)가 Ulmer (6) 40% 1 (T1), 2 (T1), 3 (T1) Modic 가 T2 T2 619



## MR Imaging of Lumbar Spondylolysis: Signal Intensity Change in the Pars Interarticularis and Adjacent Structures<sup>1</sup>

Suk Whan Jang, M.D., Ghi Jai Lee, M.D., Jae-Chan Shim, M.D., Ho Kyun Kim, M.D.

<sup>1</sup>Department of Diagnostic Radiology, College of Medicine, Inje University

**Purpose:** To assess changes in MR signal intensity in the pars interarticularis and adjacent structures in patients with lumbar spondylolysis.

**Materials and Methods:** The MR images of 36 patients with lumbar spondylolysis, confirmed by plain radiographs, were retrospectively analyzed. Using a 1.0T unit, we evaluated the signal intensity of a total of 216 parts interarticularis and adjacent structures from L3 to L5, as seen on sagittal images, and differences between areas with and without spondylolysis. The signal intensity of T1- and T2-weighted images was graded 0 (more hypointense than spinal body), 1 (as isointense as spinal body), 2 (more hyperintense than spinal body and more hypointense than epidural fat), or 3 (as isointense as epidural fat). Signal intensity change in endplates and degree of spondylolisthesis were analyzed, and the relationship between these factors was determined.

**Results:** Spondylolysis was noted at L5 in 61 cases, at L4 in 22, and of L3 in no case. In three cases spondylolysis was unilateral, and in the remainder it was bilateral. The degree of signal intensity was the same on T1- and T2-weighted images, and no case was grade 0. Eighty-six of 133 areas without spondylolysis were grade 1, 43 were grade 2, and four were grade 3. In 42 of 47 cases, signal intensity change was localized at pedicles. Among 83 areas with spondylolysis, on the other hand, nine were grade 1, 48 were grade 2, and 26 were grade 3. Signal intensity change was most commonly observed at the pars interarticularis, pedicle, and lamina (50/74) ( $p < 0.001$ ). Signal intensity change at the pars interarticularis and adjacent structures was accompanied in most cases by degenerative endplate change (10/11) and spondylolisthesis (11/13) ( $p < 0.001$ ).

**Conclusion:** In patients with spondylolysis, signal intensity was frequently higher at the pars interarticularis and adjacent structures, and is thought to have a close relationship with degenerative endplate change and spondylolisthesis. Increases in signal intensity at the pars interarticularis and adjacent structures can help diagnose spondylolysis in patients without spondylolisthesis.

**Index words :** Spine, MR  
Spondylolysis

Address reprint requests to : Ghi Jai Lee, M.D., Department of Diagnostic Radiology, Seoul Paik Hospital, College of Medicine, Inje University.  
2-85, Jur-dong, Chung-ku, Seoul 100-032, Korea.  
Tel. 82-2-2270-0134 Fax. 82-2-2266-6799