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## Anterior Decompression and Fusion with Instrumentation in Osteoporotic Vertebral Fracture

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### – Abstract –

**Study Design:** A Retrospective study

**Objective:** To evaluate the results after an anterior decompression and fusion, with anterior instrumentation, using a Z-plate in osteoporotic vertebral fractures.

**Summary of Literature review:** Despite conservative treatment, continuous severe pain, progressive neurological impairments and deformity may need surgical treatment in osteoporotic vertebral fractures accompanied with neurological deficit.

**Materials and Methods:** Fourteen patients that had undergone anterior decompression and an autogenous iliac bone graft, with anterior internal fixation, between 1997 and 2001, under the diagnosis of an osteoporotic vertebral fracture, were reviewed. The chief complaints, severity of pain measured, using the Denis pain scale, fracture patterns, fracture level, changes of kyphotic angle (revised with sagittal index) and complications were analyzed.

**Results:** Symptoms subsided completely in 5 patients, one case showed no definite improvement and 8 showed improved symptoms. The fracture levels included: 1 and 2 cases at the 11th and 12th thoracic spine, and 8, 1 and 2 in the 1st, 2nd and 3rd lumbar spine, respectively. 10 patients showed wedge type fractures, three a compression type and one a biconcave type. The average kyphotic deformity decreased 49.0% (50.9% when revised with sagittal index) after surgery, but the average loss of correction angle was 28.8% (26.0% when revised with sagittal index), compared with the immediate postoperative correction angle.

**The complications included:** screw loosening and adjacent vertebral fractures in 3 and 4 patients, respectively. Two patients had the combined problem of screw loosening and an adjacent vertebral fracture.

**Conclusion:** In anterior decompression and fusion, with instrumentation, for osteoporotic vertebral fracture treatment, the complications were primarily related, directly or indirectly, to the underlying osteoporosis. Complete neurological recovery occurred 9 of the 11 patients, but residual pain was common.

**Key Words:** Thoracolumbar, Osteoporosis, Vertebral fracture, Kyphotic angle, Anterior fusion

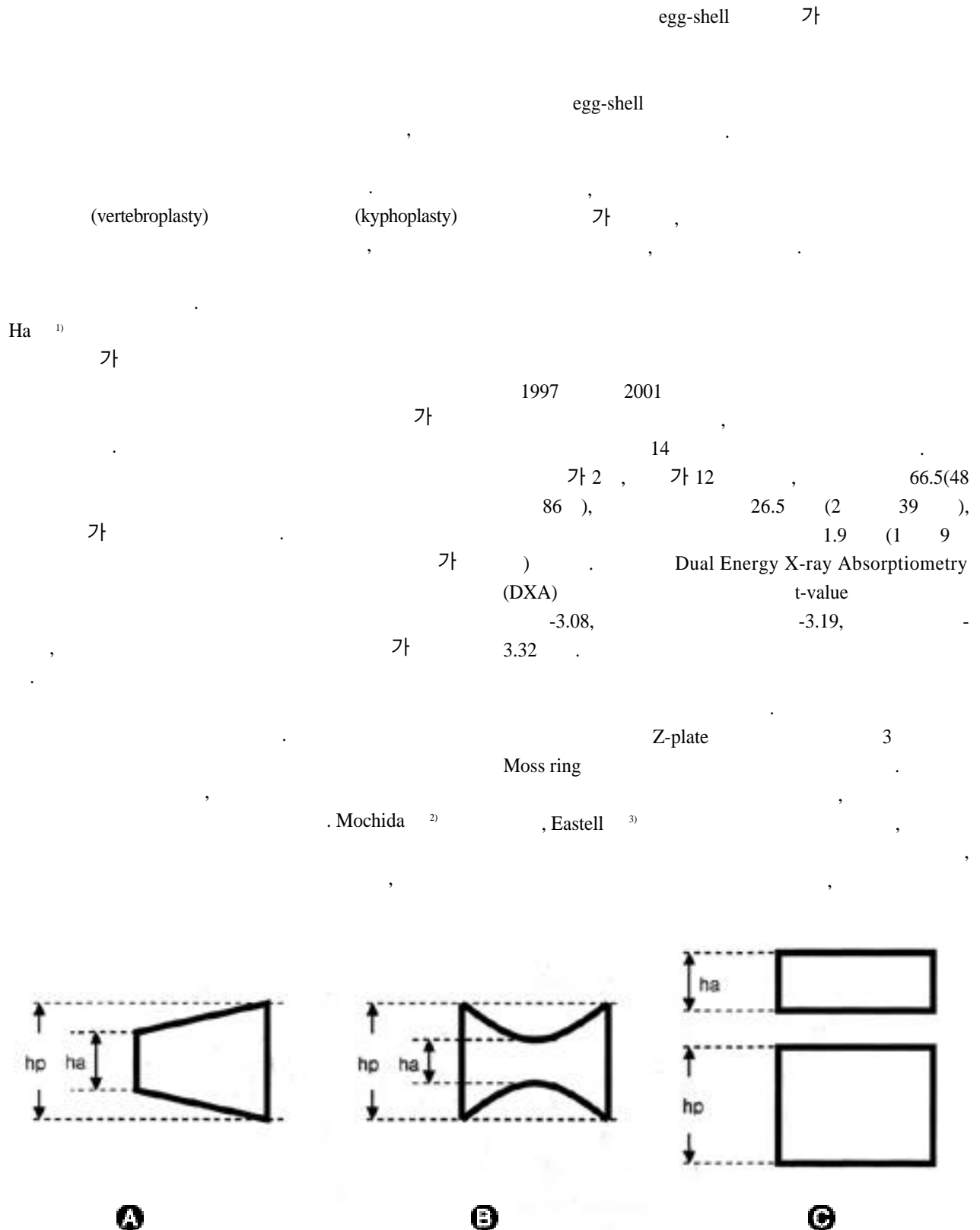
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**Fig. 1.** Classification of osteoporotic vertebral fractures by type (A) Wedge deformity, (B) Biconcavity deformity, (C) Compression deformity

**Table 1.** Summary of 14 Cases

Case No	Delay in op	Location	Fx type	Pain		Neurologic Deficit		Kyphotic deformity (degrees)		Preop BMD (t-value)		Postop BMD (t-value)	
				Preop	Last F/U	Preop	Last F/U	Preop	Postop	Spine AP	Spine Lat	Femur AP	Femur Lat
1	9 mo	L1	W2	P5	P4	R/P	no	30	8	-2.9	-3.37	-3.7	-4.1
2	3 mo	D12	C1	P4	P2	D1	D2	12	6	-3.3	-3.5	-3	-3.2
3	3 days	L1	W2	P4	P1	R/P	no	33	20	-2.8	-3.6	-3	-3.8
4	2 weeks	L3	BC2	P5	P4	R/P	no	12	3	-3.5	-3.7	-3.3	-3.5
5	5 mo	L3	W2	P5	P4	R/P	no	37	15	-3	-3.2	-3	-1.7
6	1 weeks	D12	W2	P4	P3	no	no	30	20	-3.4	-3.4	-3.3	-2.7
7	2 mo	L1	C1	P4	P3	R/P	no	11	5	-3.3	-3.1	-3.1	-3.3
8	1 weeks	L1	W2	P4	P1	R/P	no	25	14	-3.4	-3.4	-2.9	-3.2
9	1 mo	L1	W2	P4	P1	C	D1	45	43	-3.4	-3.5	-3	-3.1
10	2 mo	L2	W2	P4	P1	R/P	no	39	21	-3.3	-3.1	-3.2	-3.3
11	20 days	D11	W2	P4	P3	no	no	28	12	-3.2	-3.4	-2.9	-3
12	1 day	L1	W2	P4	P3	R/P	no	32	20	-3.2	-3.4	-2.6	-3.5
13	1 day	L1	W1	P4	P1	R/P	no	10	5	-3	-2.8	-3.2	-2.4
14	3 mo	L1	W1	P4	P4	R/P	no	18	5	-3	-2.7	-2.9	-3.6
Mean								25.9	14.1	-3.19	-3.32	-3.08	-3.17

(Table 1).

grade I

3.

1.

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Denis pain scale<sup>4)</sup>

. 6

P1 P5

(CT)

2

modified Frankel grade<sup>5)</sup> (Table 2)

4.

2.

(Fig. 1)

Sagittal index

Farcy<sup>6)</sup>

Eastell

hp

, ha

5.

(Fig. 1A),

hp

, ha

dual energy X-ray absorptiometry (DXA)

(Fig. 1B).

hp

alendronate sodium (Fosamax )

ha

(Fig. 1C).

ha가 hp 40%

grade II,

1

**Table 2.** Modified Frankel Grade

Grade	Motor Function	Function of bladder & bowel
A	0	paralysis
B	0-1	paralysis
C	2	paralysis or dysfunction
D1	3	paralysis to normal
D1	4-5	paralysis
D2	4-5	dysfunction
D3	4-5	normal
E	5	normal

Chi-square test

Student t-test

1.

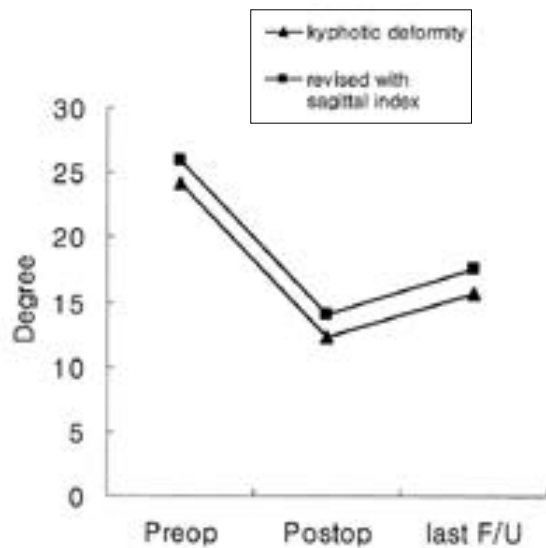
(Table 3)

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**Table 3.** Assessment of the clinical symptom according to five-grade Denis pain scale. (Denis Pain Scale)

Scal	Symptoms
P1	no pain
P2	slight pain with no need for medication.
P3	moderate pain with a need for occasional medication
P4	moderate to severe pain with a need for frequent medication and occasional absence from work or a major change in activities of daily living
P5	constant or severe incapacitating pain and a chronic need for medication

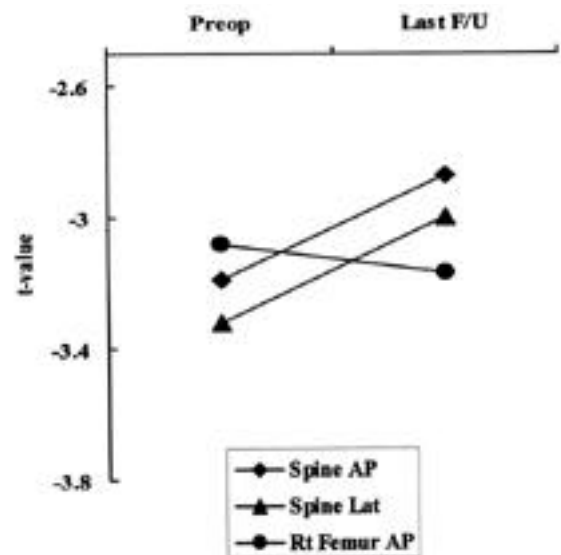
(P1), 1 P2, 4 P3, 4 P4  
 1 2 7 1  
 1 2  
 2 modified Frankel grade  
 D1, C D2 D1



**Fig. 2.** Change of average degrees of kyphotic deformity (revised with sagittal index)

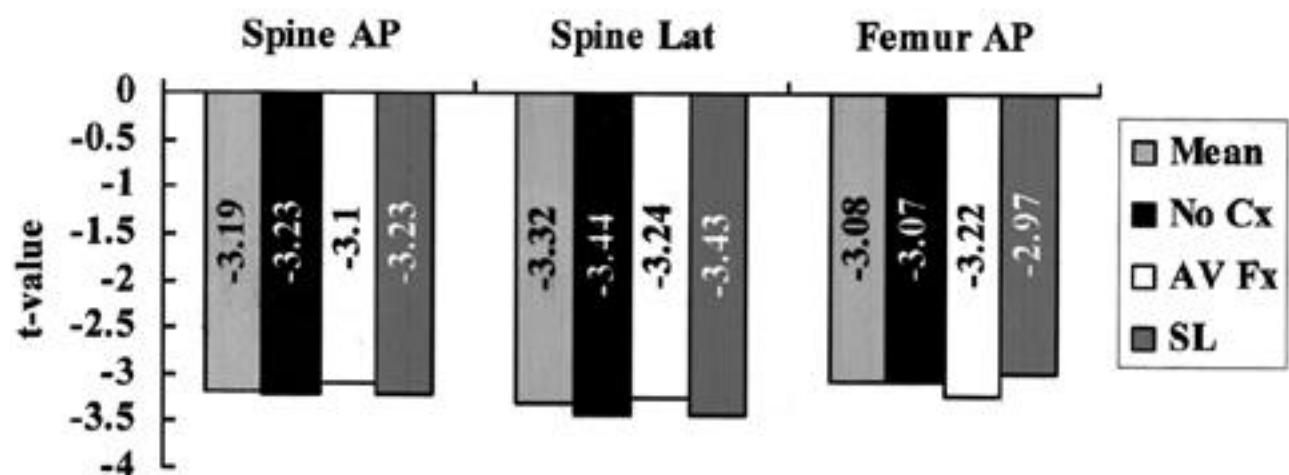
	Preop	Postop	Last F/U
Kyphotic deformity	24.1 °	12.3 °	15.7 °
Revised with Sagittal index	25.9 °	14.1	17.5 °

11 가 1 , 12 2 ,  
 1 8 , 2 1 , 3 2 ,



**Fig. 3.** Change of average t-value ( BMD )

	Preop	Postop
Spine AP	-3.19	-2.87
Spine Lat	-3.32	-3.00
Rt Femur AP	-3.08	-3.17



**Fig. 4.** Comparison of t-value of osteoporosis complication and non-complication case: there is no statistical significance (  $p > 0.05$  ) (Mean: average t-value of whole cases No Cx: average t-value of cases without complications AV Fx: average t-value of cases which show adjacent vertebral fracture SL: average t-value of cases which show screw loosening)

9 ), 11 (grade I 2 , grade II  
2 grade I .  
12 2 , 1 1 가  
1 grade II .

5.

3.

t-value  
-3.08, -3.19, -  
3.32 , t-  
value -3.17, -2.87, -3.00 (Fig. 3),  
(p > 0.05).

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. 6

4

(3 6 )

t-value

4.

(Fig. 2)

(p > 0.05)(Fig. 4).

24.1 (± 11.7 )  
12.3 (± 11.7 ) 49.0%  
15.7 (± 11.6 )  
28.8% 가 . sagittal index  
25.9 (± 11.5 )  
14.1 (± 10.6 ) 50.9%  
17.5 (± 10.9 )

6.

3  
2 , 1  
(Fig. 5).  
1 2 , 2 2  
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2 , 3 , 10  
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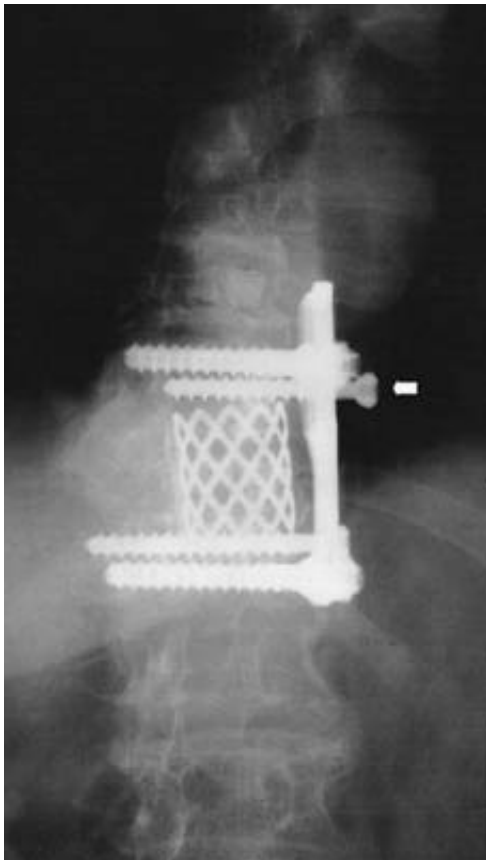
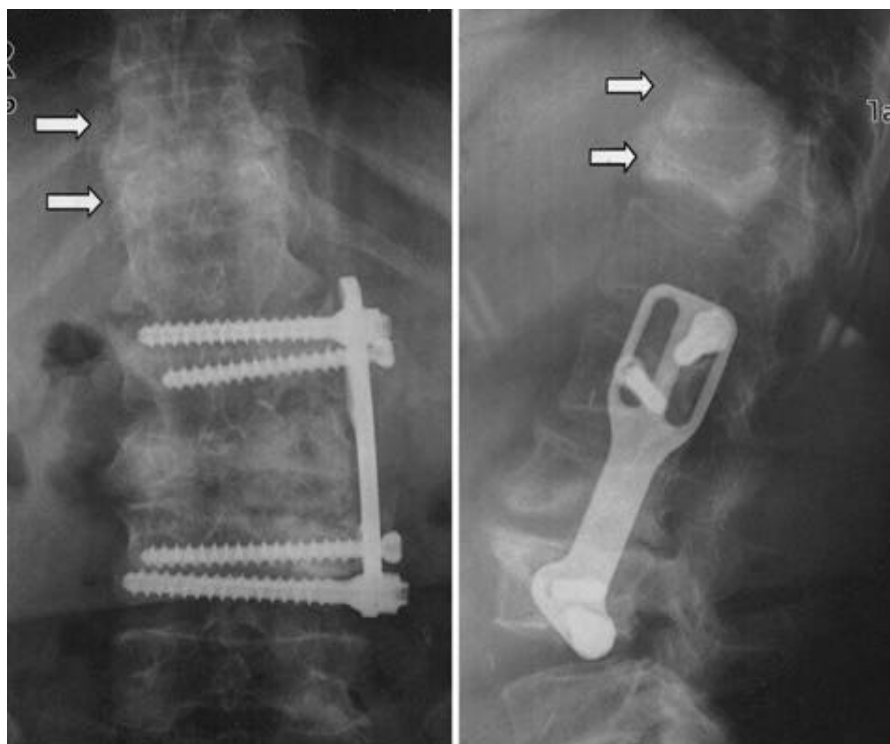


Fig. 5. showing screw loosening ( white arrow )

Lee 7) 497

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**Fig. 6.** showing both screw loosening and fracture at adjacent vertebrae

(reconstruction)

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1)

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(vertebral body replacement)

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2). Soshi 8)

. Mochida 2)

50.6%

11

spacer

12.18%

가

Z-plate

3

Moss Ring

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Kaneda <sup>9)</sup> Kaneda

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- Eastell <sup>3)</sup> 3가 .
- 11 .
- 2 1 , 1 가 (fulcrum)
- Kirkpatrick <sup>10)</sup> 1 3 14 3
- Kaneda 50% 16 , 50% .
- Hoan <sup>11)</sup> 1 50% (p > 0.05). 15 %
- 가
- Hoan <sup>11)</sup> 4 1 2 , 1 1 7
- 가 <sup>12)</sup> 75.4% 12.1% , 6.7% 13.3% . Kaneda <sup>9)</sup> 52.0% 4.5% 10% , 18% Hoan <sup>11)</sup> , 58.0% 49.7% , 20% 40% . Ha <sup>1)</sup> 18% , 94% , 28.6% , 0%
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 pain scale , , ,  
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 10 , 3 , 1 . 24.1 (sagittal index  
 25.9 ) 12.3 ( 14.1 ) 49% ( 50.9 )  
 15.7 ( 17.5 ) 28.8% ( 26.0% ) 가 .  
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 4 2 .  
 :  
 11 11 9 .

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