



Abstract

Classification of Vertebral Body Fractures with Two-level Posterior Column Injuries of the Thoracolumbar Spine

Young-Do Koh, M.D., Hoon Jeong, M.D.*, and Sung-Gu Yeo, M.D.*

Department of Orthopedic Surgery, College of Medicine, Ewha Woman's University, Seoul, Korea,
Department of Orthopedic Surgery, Seoul Red-Cross Hospital, Seoul, Korea*

Purpose: We evaluate the characteristics of vertebral body fractures in two level flexion-distraction injuries of the thoracolumbar spine

Methods: The findings of radiographs, computed tomographs, and MRIs of 43 patients with flexion-distraction injuries combined with vertebral body fractures were retrospectively evaluated. We divided the patients with bursting fractures into two groups, the distractive group (posterior vertebral height ratio >1) and the compressive group (vertebral height ratio <1).

Results: There were 23 compression fractures and 20 bursting fractures. In bursting fractures, the distractive group had 5 cases, and the compressive group 15 cases. In 24 cases (55.8%), the interspinous distances were widened. The average of the canal encroachment was 4% in the distractive group and 40% in the compressive group. At last follow-up, the average loss of correction was 2.0 degree in compression fractures and 2.7 degree in bursting fractures.

Conclusion: The configurations of vertebral body fractures in flexion-distraction injuries of the thoracolumbar spine were varied as to the location of the axis of flexion. Because bursting fractures in flexion-distraction injuries had distractive or compressive features, one should consider that in establishing operative plan.

Key Words: Thoracolumbar spine, Flexion-distraction injury, Vertebral body fracture

* Address for Correspondence : **Young-Do Koh, M.D.**

Department of Orthopedic Surgery, College of Medicine, Ewha Woman's University
911-1 Mok-Dong, Yangcheon-Gu, Seoul 158-710, Korea
Tel : 82-2-2650-5564, Fax : 82-2-2642-0349, E-mail : ydkoh@ewha.ac.kr

— . —

20% 가
(8).

1948 , Chance(1) 3 가
가 1 , 1

. Howland (2) Cobb , .

Chance fracture
가
Gertzbein (3,4,5) -

Oner (19)
, state 1 가
(6). , state 2
, state 3
가 , state 4
가 (7,8,9,10,11).
가 , -
(8,12,13).

(7,11). 43 25 , 18
, 35 (14~70) .
가 25 가 , 가
12 , 5 . 19
, 13 .
11-12 가 14 , 12 - 1
2000 2003 가 12 , 1-2 가 14 .
- 1 가 15 , 12 가
43 14 , 2 가 9 .
(cephalic) 가 37 ,
(caudal) 가 6 .
, 34 . 23 , 20 .
0.81 , 0.61 .
1.00
, 0.91 .
, 가 1 5

— 18 1 —
 1.02 , 가 1 (60%) , 15 10
 15 , 0.88 . (67%) .
 가
 24 (55.8%) . 11 , 4% ,
 13 . 5 3 40% (Table 1).

Table 1. Configuration of Vertebral Body Fractures

	AVH* ratio	PVH [†] ratio	Canal Encroachment
Compression Fracture	0.81	1.0	-
Bursting Fracture	0.61	0.91	31%
Distractive Type	-	1.02	4%
Compressive Type	-	0.88	40%

AVH* : anterior vertebral height, PVH[†] : posterior vertebral height

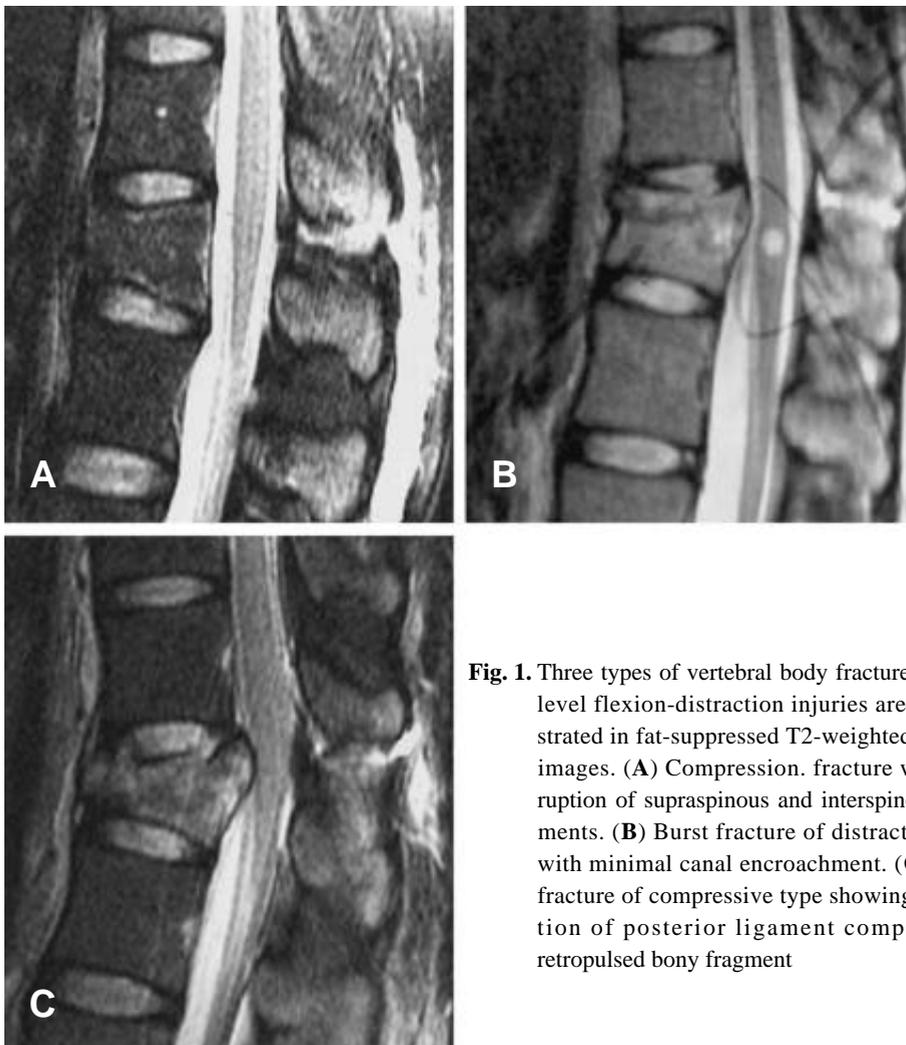


Fig. 1. Three types of vertebral body fractures of two level flexion-distraction injuries are demonstrated in fat-suppressed T2-weighted sagittal images. (A) Compression fracture with disruption of supraspinous and interspinous ligaments. (B) Burst fracture of distractive type with minimal canal encroachment. (C) Burst fracture of compressive type showing disruption of posterior ligament complex and retropulsed bony fragment

— 18 1 —

(12,17,18). 가 , 53%

, Chance 가 , B (posterior wall)

(5,13,15,17,19). (47%), (25%)

(13). Gertzbein (15) (25%)

가 가 1 (13).

가 (75%)

Abe (12)

가

Kaneda Denis(15) - 가 , McAfee (20)

가

Abe 가 Hoshikawa (6) - 가

가 (MAF, motion axis of fracture)

가

Table 2. Classification of Vertebral Body Fractures with Two Level Posterior Column Injuries in Thoracolumbar Spine

Type A
Compression Fracture of Anterior Body
1. Superior wedging
2. Lateral wedging
3. Inferior wedging
Type B
Bursting Fracture
1. Distractive
2. Compressive

(86%). A

13,17,21).

가

가

가 (6,

REFERENCES

- 1) Chance GQ. Note on a type of flexion fracture of the spine. *Br J Radiol* 1948;21: 452-452.
- 2) Howland WJ, Curry JL, Buffington CD, Fulcrum injuries of the lumbar spine. *JAMA* 1965;193: 240-241.
- 3) Gertzbein SD, Court-Brown CM. Flexion-distraction injuries of the lumbar spine: Mechanisms of injury and classification. *Clin Orthop* 1988;227: 52-60.
- 4) Gertzbein SD, Court-Brown CM. Rationale for the management of flexion-distraction injuries of the thoracolumbar spine based on a new classification. *J Spinal Disord* 1989;2: 176-183.
- 5) Triantafyllou SJ, Gertzbein SD. Flexion distraction injuries of the thoracolumbar spine: Review. *Orthopedics* 1992;15: 357-364.
- 6) Hoshikawa T, Tanaka Y, Kokubun S, Lu WW, Luk KD, Leong JCY. Flexion-distraction injuries in the thoracolumbar spine: An in vitro study of the relation between flexion angle and the motion axis of fracture. *J Spinal Disord Tech* 2002;15: 139-143.
- 7) Koh YD, Yun YH, Jeong H. MRI findings of posterior ligament complex injury in thoracolumbar bursting fractures. *J Korean Fracture Soc* 2003;16: 541-547.
- 8) Lee HM, Kim HS, Kim DJ, Suk KS, Park JO, Kim NH. Reliability of magnetic resonance imaging in detecting posterior ligament complex injury in thoracolumbar spinal fractures. *Spine* 2000;25: 2079-2084.
- 9) Oner FC, van Gils APG, Dhert WJA, Verbout AJ. MRI findings of thoracolumbar spine fractures: a categorization based on MRI examinations of 100 fractures. *Skeletal Radiol* 1999;28: 433-443.
- 10) Oner FC, van Gils APG, Faber JAJ, Dhert WJ, Verbout AJ. Some complications of common treatment schemes of thoracolumbar spine fractures can be predicted with magnetic resonance imaging: Prospective study of 53 patients with 71 fractures. *Spine* 2002;27: 629-636.
- 11) Petersilge CA, Pathria MN, Emery SE, Masaryk T. Thoracolumbar burst fractures: Evaluation with MR imaging. *Radiology* 1995;194: 49-54.
- 12) Abe E, Sato K, Shimada Y, Mizutani Y, Chiba M, Okuyama K. Thoracolumbar burst fracture with horizontal fracture of the posterior column. *Spine* 1997;22: 83-87.
- 13) Sar C, Bilen FE. Thoracolumbar flexion-distraction injuries combined with vertebral body fractures. *Am J Orthop* 2002;31: 147-151.
- 14) Gumley G, Taylor TKF, Ryan MD. Distraction fractures of the lumbar spine. *J Bone Joint Surg* 1982;64-B: 520-525.
- 15) Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. *Spine* 1983;8: 813-817.
- 16) Magerl F, Aebi M, Gertzbein SD, Harms J, Nazarian S. A comprehensive classification of thoracic and lumbar injuries. *Eur Spine J* 1994;3: 184-201.
- 17) Finkelstein JA, Wai EK, Jackson SS, Ahn H, Brighton-Knight M. Single-level fixation of flexion distraction injuries. *J Spinal Disord Tech* 2003;16: 236-242.
- 18) James KS, Wenger KH, Schlegel JD, Dunn HK. Biomechanical evaluation of the stability of thoracolumbar burst fractures. *Spine* 1994;19: 1731-1740.

- 19) Liu YJ, Chang MC, Wang ST, Yu WK, Liu CL, Chen TH. Flexion-distraction injury of the thoracolumbar spine. *Injury* 2003;34: 920-923.
- 20) McAfee PC, Yuan HA, Fredrickson BE, Lubicky JP. The value of computed tomography in thoracolumbar fractures. *J Bone Joint Surg* 1983;65-A: 461-473.
- 21) Jeanneret B, Ho PK, Magerl F. Burst-shear flexion-distraction injuries of the lumbar spine. *J Spinal Disord* 1993;6: 473-481.