

## The Changes of the Dimension of Intervertebral Disc,-Neural Foramen and Spinal Canal after Anterior Lumbar Interbody Fusion in the Lumbar Spine

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### – Abstract –

**Study Design:** A prospective radiological assessment was conducted.

**Objectives:** To analyze the changes in the heights of the intervertebral disc and neural foramen, and the diameters and areas of the dural sac and lateral recess following anterior lumbar interbody fusion and posterior fixation in lumbar degenerative disease.

**Summary of Literature Review:** Anterior lumbar interbody fusion distracts from the height of the intervertebral disc and neural foramen and increase the area of the spinal canal.

**Materials and Methods:** A mini-open anterior lumbar interbody fusion and posterior fixation was performed on 40 cases between January 1999 and March 2002. The measured factors included the height of the intervertebral disc and neural foramen, the midsagittal and lateral diameters of the dural sac, the area of the dural sac and the diameter of the lateral recess. These were measured with calipers in 1mm reconstructive computed tomography images before and 6 months after the anterior lumbar interbody fusion. The measured factors were independently taken by three different orthopaedic surgeons.

**Results:** The heights of the intervertebral disc and neural foramen were increased by means of 39.1 and 18.7% respectively. The midsagittal diameter of the dural sac was increased by a mean of 11.6% and that of the lateral dural sac decreased by a mean of 3.7%. The area of the dural sac was increased by a mean of 8.1% and the diameter of lateral recess by a mean of 26.3%. There were statistically significant increases in all the measured factors, with the exception of the lateral diameter of the dural sac.

**Conclusions:** Anterior lumbar interbody fusion significantly increases the heights of the intervertebral disc and neural foramen, the midsagittal diameter of the dural sac, the area of the dural sac and the diameter of the lateral recess, but not the lateral diameter of the dural sac.

**Key Words:** Lumbar spine, Intervertebral disc, Dural sac, Lateral recess, Anterior interbody fusion

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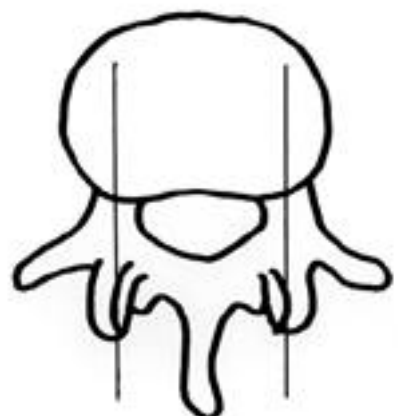
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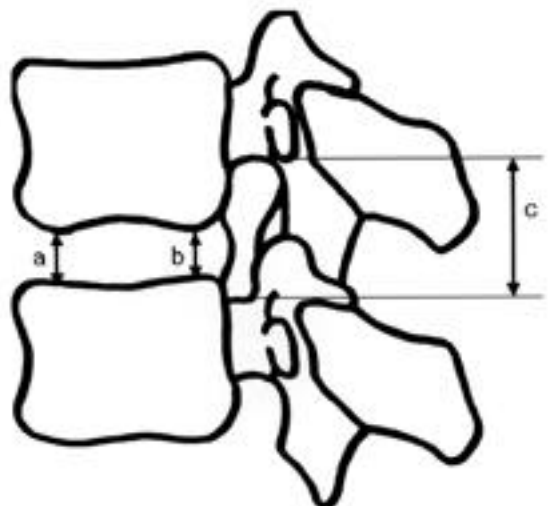
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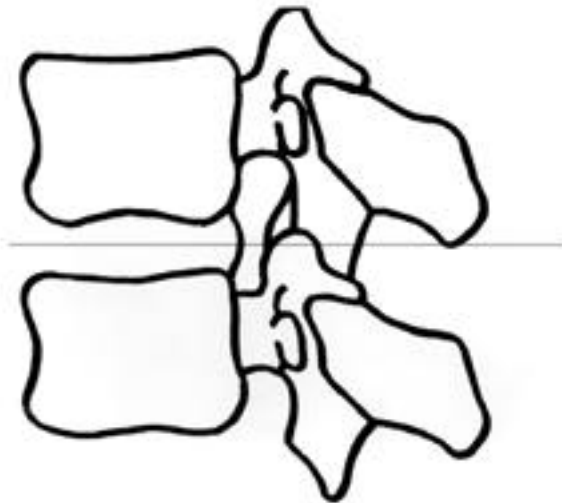
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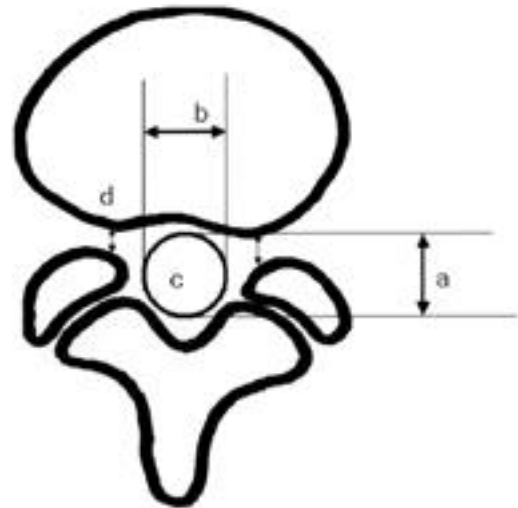
**Fig. 1.** CT measurement were done via sagittal reconstruction at the level of the mid pedicle on axial CT cut



**Fig. 2.** Diagram showing the measurements made in the discs and neural foramens. (a) anterior disc height, (b) posterior disc height, (c) height of neural foramen



**Fig. 3.** CT measurement were done via axial image at the level of midportion of the disc on sagittal CT cut



**Fig. 4.** Diagram showing the measurements made in the axial image at the level of the midportion of the disc (a) mid-sagittal diameter of dural sac, (b) lateral diameter of dural sac, (c) area of dural sac, (d) diameter of lateral recess of neural canal

**Table 1.** Changes of anatomical parameters after anterior lumbar interbody fusion and statistical results between the parameters by paired t-test.

Anatomical parameter		Pre-o	Post-o	Increase(%)	p-value	S.D.*
Disc height (mm)	Anterior	8.0	9.8	41.0	0.000	2.020
	Posterior	6.0	7.2	39.3		
	Average	7.0	8.5	39.1		
Foraminal height (mm)	Right	18.2	21.0	18.1	0.000	2.072
	Left	18.2	21.5	20.3		
	Average	18.2	21.2	18.7		
Diameter of dural sac (mm)	Midsagittal	8.2	9.1	11.6	0.000	1.261
	Lateral	10.9	11.2	3.7	0.213	1.622
Area of dural sac (mm <sup>2</sup> )		74.6	79.9	8.1	0.014	13.150
Diameter of lateral recess (mm)	Right	2.8	3.5	33.5	0.000	0.814
	Left	2.7	3.2	24.4		
	Average	2.7	3.4	26.3		

\*: Standard Deviation

(Fig. 2). ANOVA test (SPSS 8.0 for Windows)

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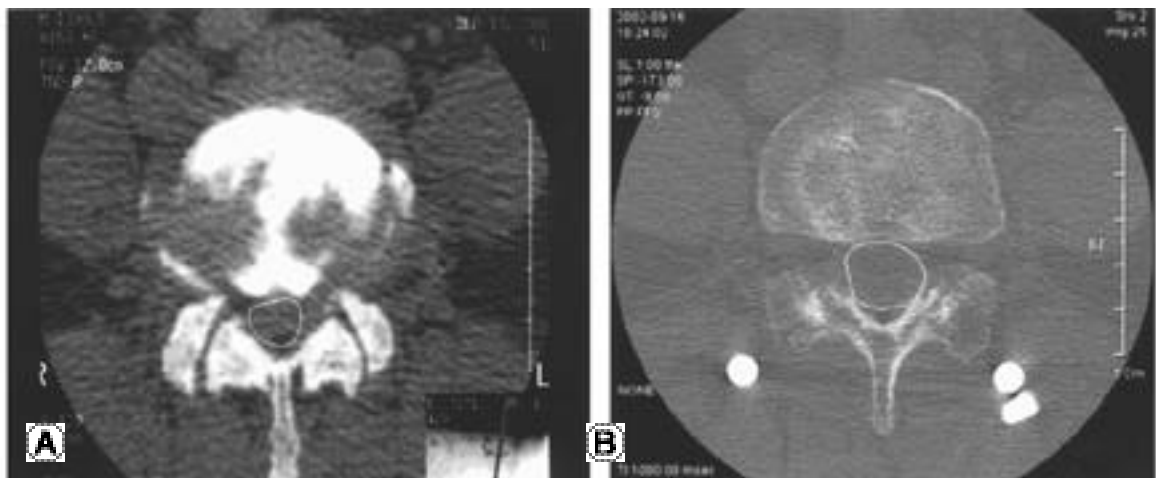
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**Fig. 5.** A 34-year-old woman with spinal stenosis on L4-5. (A) Left side sagittal reconstruction image on preoperative CT scans. (B) Left side sagittal reconstruction image of seven-month postoperative CT scan shows marked increase of the anterior disc height, the posterior disc height and the height of neural foramen.



**Fig. 6.** A 34-year-old woman with spinal stenosis on L4-5. (A) Axial image of level of the midporion of the disc level on preoperative CT scan shows 6.60 mm in midsagittal diameter of dural sac, 8.89 mm in lateral diameter of dural sac, 65.96 mm in area of dural sac and diameter of lateral recess (right:3.41 mm, left:2.89 mm). (B) Axial image of level of the midporion of the disc level on eight-month postoperative CT scan shows 7.73 mm in midsagittal diameter of dural sac, 9.11 mm in lateral diameter of dural sac, 76.14 mm in area of dural sac and diameter of lateral recess (right: 3.87 mm, left: 3.85 mm).

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29.0% 406.6% , 가 39.1% (- 18.7%(-7.9% 79.1%) .  
8.0 mm 9.8 mm 가 , 가 18.1%(-14.6% 83.0%) ,  
가 41.0% (-32.1% 418.9%) , 18.2 mm 21.5 mm 가 ,  
6.0 mm 7.2 mm 가 가 20.3%(-1.3% 75.5%) (Table 1) (Fig. 5).  
, 가 39.3% (-25.2% 387.5%) (Table 1)  
(Fig. 5).

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8.2 mm 9.1 mm 가 , 가 11.6% (-9.5% 57.2%) , 10.9 mm 11.2 mm 가 , 가 3.7% (-15.4% 46.3%) (Table 1) (Fig. 6).<sup>4)</sup>

5. <sup>5)</sup> , 가 (root mm<sup>2</sup> 가 , 가 8.1% (-10.7% 73.9%) (Table 1) (Fig. 6). sleeve) . , .

6. 10 mm, 12 mm, 15 mm <sup>6)</sup>, 130 150 mm<sup>2</sup> <sup>7)</sup> , 3 mm <sup>8)</sup> 가 11 19 3.4 mm 가 , 가 26.3% (-20.7% 172.2%) . mm 2.7 mm 3.5 mm 가 , 가 21% (2% 35%) <sup>9)</sup>. 33.5% (-26.7% 283.0%) , 2.7 mm 3.2 mm 가 , 가 24.4% (-15.7% 170.8%) (Table 1) (Fig. 6). , , , ,

7. <sup>10)</sup> . , , paired t-test (SPSS 8.0 for Windows) <sup>11)</sup>. 가 (P=0.000), (P=0.000), 가 (P=0.000), (P=0.014), (P=0.000), (P=0.000) 가 , (P=0.213) 가 (Table 1). ANOVA test (SPSS 8.0 for Windows) 가 P=0.738, 1932 Capener<sup>12)</sup>가 , 1944 가 P=1.000 , Lane and Moore<sup>13)</sup>가 0.7 가 P=0.770, 가 P=0.999 . Harmon<sup>14)</sup> 244 , , <sup>15,16)</sup>.



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