

Outcome of Two Fusion Methods In Isthmic and Degenerative Spondylolisthesis of the Lumbar Spine

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– Abstract –

Design : A retrospective study was performed in isthmic and degenerative spondylolisthesis patients who had undergone posterolateral fusion (PLF) only (group) or posterolateral fusion (PLF) with posterior lumbar interbody fusion (PLIF) (group).

Objectives : The objective of this study was to help in the selection of a surgical treatment option for spondylolisthesis.

Summary of Literature Review : Irrespective of whether group or group , satisfactory results have been reported in the surgical treatment of spondylolisthesis. However, isthmic and degenerative types have not been investigated in terms of outcome.

Material and Methods : We analyzed 112 patients (Isthmic: group (32), group (22), Degenerative : group (37), group (21)) who underwent surgical treatment for spondylolisthesis between April 1995 and December 2000. Kirkaldy-Willis criteria, radiologic union state, reduction ratio of slippage, change of disc space and change of segmental angle were analyzed as indicators of outcome.

Results : We found the following by radiologic analysis: In isthmic spondylolisthesis, group was better than group in terms of reduction ratio of slippage (reduction loss: 3.38% vs. 2.3%, $P=0.15$), change of segmental angle (reduction loss : 2.11 ° vs. 1.6 °, $P=0.15$), bone union (83% vs. 92%, $P=0.45$) and change of disc space (reduction loss : 2.83 mm vs. 1.9 mm, $P=0.02$). In the degenerative spondylolisthesis, group did not show significant difference from group in terms of reduced slippage (reduction loss: 3.8% vs. 3.85%, $P=0.47$), change of segmental angle (reduction loss: 2.73° vs. 2.64°, $P=0.43$), bone union (80% vs. 87%, $P=0.72$) or disc height (reduction loss: 3.2 mm vs. 3.14 mm, $P=0.45$).

In terms of clinical outcome, group was better than groups in cases of isthmic spondylolisthesis (fair : 85% vs. 93%, $P=0.72$), however, groups was not better than groups in cases of degenerative spondylolisthesis (fair : 83% vs. 85%, $P=0.23$).

Conclusions : In the degenerative spondylolisthesis patient, no significant difference was found between group and group , but in the isthmic spondylolisthesis patient, group and group were found to be significantly different in terms of the reduction ratio of the disc heights.

Key Words : Spondylolisthesis, Isthmic, Degenerative, PLF, PLIF

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* 2002

(13~35) , group
20.3 (12~33) .
group 47.8 (25~64)
8 , 24 , group 50.5
(35~60) 5 , 17 .
group 58.4
(41~71) 10 , 27 , group
60.5 (45~68) 4 , 17
group
(group)
(group) 4-5 24 , 5 1 8
, group 4~5 16 ,
2,7,10,12,23,27) .
5 1 6 .
group 3~4 5 , 4-5
25 , 5 1 7
, group 3~4 2 , 4-
5 16 , 5 1 3
Meyerdung grade
(Table 1).

2.
1.
1995 4 2000 12
, , ,
32 (Group) Taillard²⁴⁾ ,
Novus Cage (Sofamor Danek. USA)
22
(Group)
group 37 group 21
group
17.5 (12~23) , group Lenke ¹⁵⁾ ,
16.2 (12~22)
group 21.5 가 A,

Table 1. Patient data

	Isthmic type		Degenerative type	
	PLF only (Group)	PLF+PLIF (Group)	PLF only (Group)	PLF+PLIF (Group)
Follow-up(month)	17.5	16.2	21.5	20.3
Age	47.8	50.5	58.4	60.5
Sex (M:F)	8:24	5:17	10:27	4:17
No. of fusion segment	2.0	2.0	2.0	2.0
Fusion level L3-4	0	0	5	2
L4-5	24	16	25	16
L5-S1	8	6	7	3

가 B, 가 group , 18.8%, 12.7%, 16% , 3.3% 2.8% 3.3% 19%, 8%, 10.3% 8.7% (P=0.15).

2). Independent sample t-test Chi-square 2.3% (P=0.05) group 17.8%, 7.7%, 11.5% 6.3% 3.8% 19.5%, 9.5%, 13.4% 6.1% 3.8% (P=0.47).

2.

(Table 3).

1. group 12.6 ° 15.2 ° 13.1 ° 0.5 ° 2.1 ° 13 ° 16.6 ° 15 ° 2 ° (P=0.15).

Taillard²⁴⁾ 1.6 °

Table 2. Kirkaldy-Willis 가

4 categories	
Excellent	The patient has returned to his normal work and other activities with little or no complaint.
Good	The patient has returned to his normal work but may have some restriction in other activities and may on occasion after heavy work have recurrent back pain requiring a few days` rest.
Fair	The patient has to reduce his working capacity, taking a lighter job or working part-time, and may occasionally have recurrence of pain requiring absence from work for one to two weeks, once or twice a year.
Poor	The patient does not return to work.

Table 3. Radiologic Measurements

Operation			Preop	Postop	Last follow-up	Reduction	Reduction loss
Isthmic type	PLF (Group)	Anterior translation	8.8%	12.7%	16%	2.8%	3.3%
		Segmental angle	12.6 °	15.2 °	13.1 °	0.5 °	2.1 °
		Disc height	9.0	11.2	8.4	-0.6	2.8
	PLF+PLIF (Group)	Anterior translation	19%	8%	10.3%	8.7%	2.3%
		Segmental angle	13 °	16.6 °	15 °	2 °	1.6 °
		Disc height	8.7 mm	11.7 mm	9.8 mm	1.1 mm	1.9 mm
Degenerative type	PLF (Group)	Anterior translation	17.8%	7.7%	11.5%	6.3%	3.8%
		Segmental angle	12.6 °	15.5 °	12.8 °	0.2 °	2.7 °
		Disc height	8.4 mm	11 mm	7.8 mm	-0.6 mm	3.2 mm
	PLF+PLIF (Group)	Anterior translation	19.5%	9.5%	13.4%	6.1%	3.8%
		Segmental angle	12.8 °	15.6 °	13 °	0.2 °	2.6 °
		Disc height	8.2 mm	12.1 mm	9.0 mm	0.8 mm	3.1 mm

group
12.6 °; 15.5 °; 12.8 °
2.6 °
12.8 °; 15.6 °; 13 ° 0.2 °
(P=0.43).

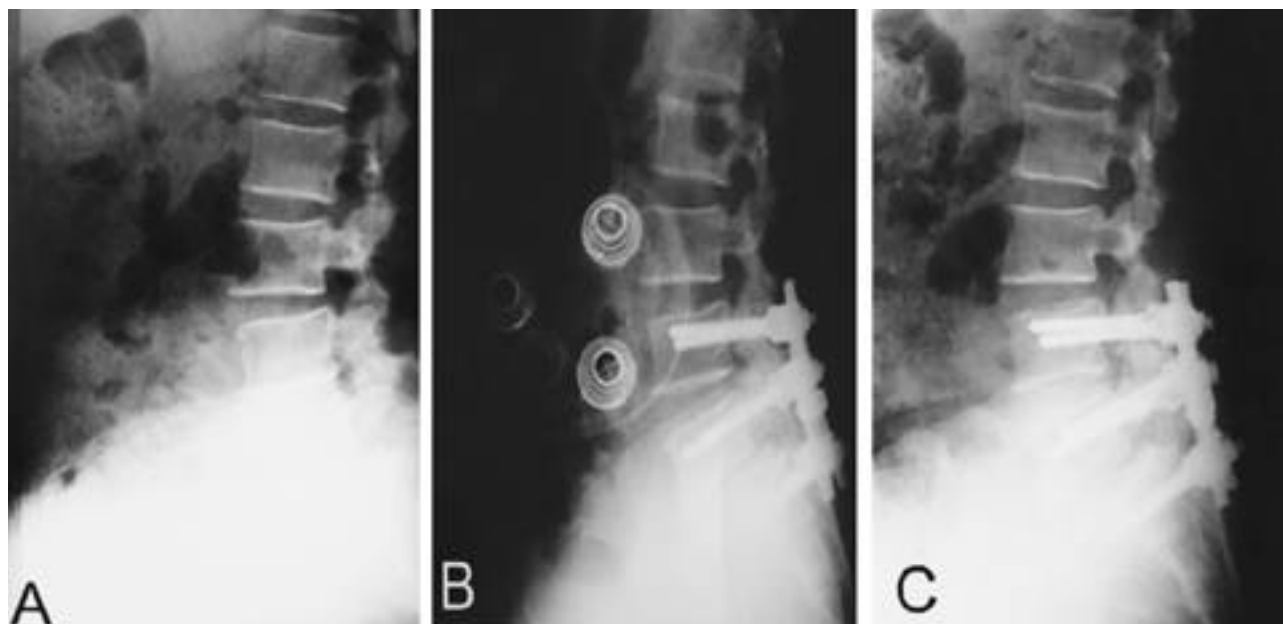


Fig. 1. Isthmic Spondylolisthesis with PLF

- A. Lateral radiograph of symptomatic isthmic spondylolisthesis in a 48-year-old female.
- B. Postoperative radiograph demonstrated correction of deformity.
- C. Last follow-up radiograph demonstrated loss of the correction.

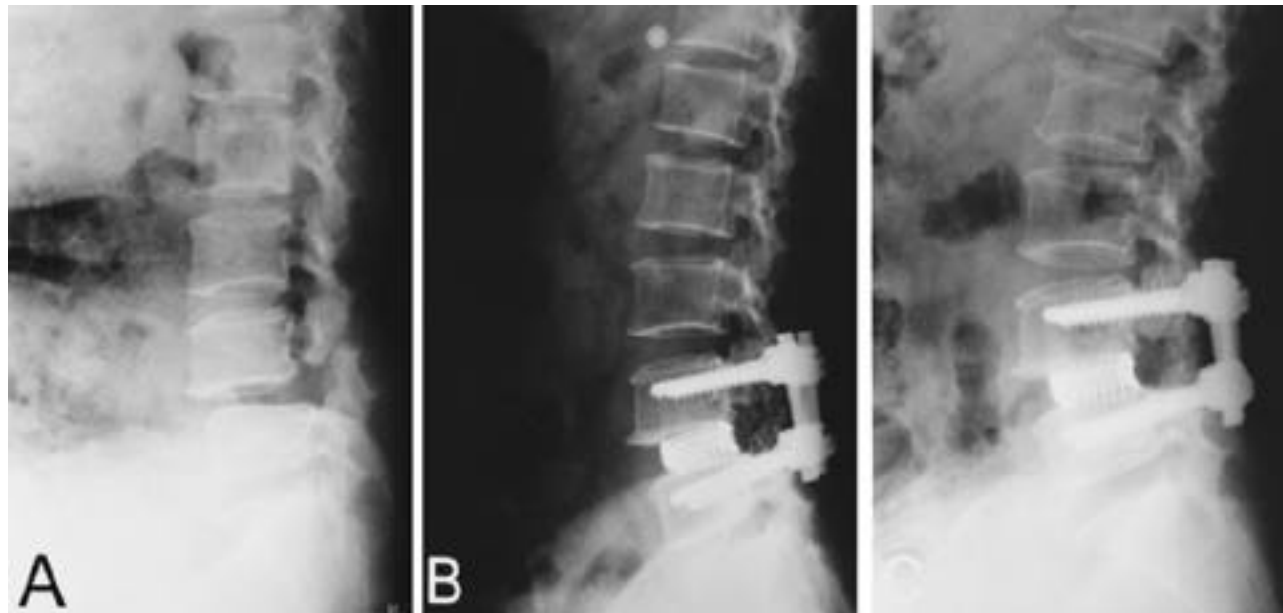


Fig. 2. Isthmic Spondylolisthesis with PLF and PLIF

- A. Lateral radiograph of symptomatic isthmic spondylolisthesis in a 53-year-old female.
- B. Postoperative radiograph demonstrated full correction of deformity.
- C. Last follow-up radiograph demonstrated well-consolidated interbody fusion without loss of the slippage.

3. (P=0.45).

Lenke ¹⁵⁾					group
			80%, group	87%	B
group	92%	83%,	(P=0.72).		
	group B				

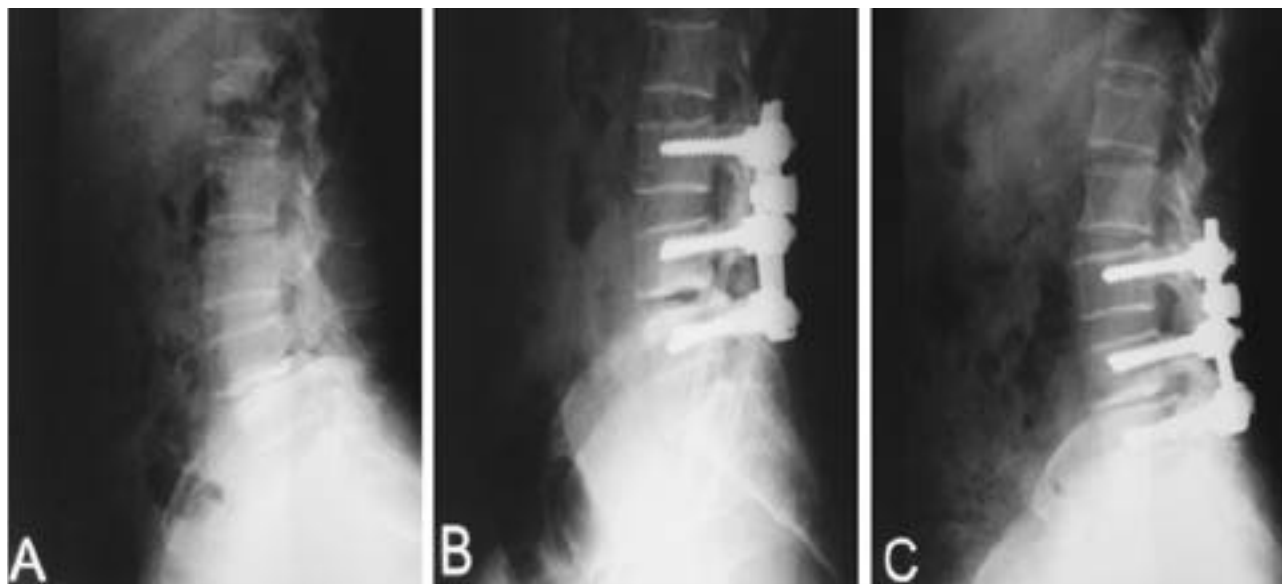


Fig. 3. Degenerative Spondylolisthesis with PLF
A. Lateral radiograph of symptomatic degenerative spondylolisthesis L4 on L5 in a 52-year-old female.
B. Postoperative radiograph demonstrated correction of deformity.
C. Last follow-up radiograph demonstrated loss of disc height.

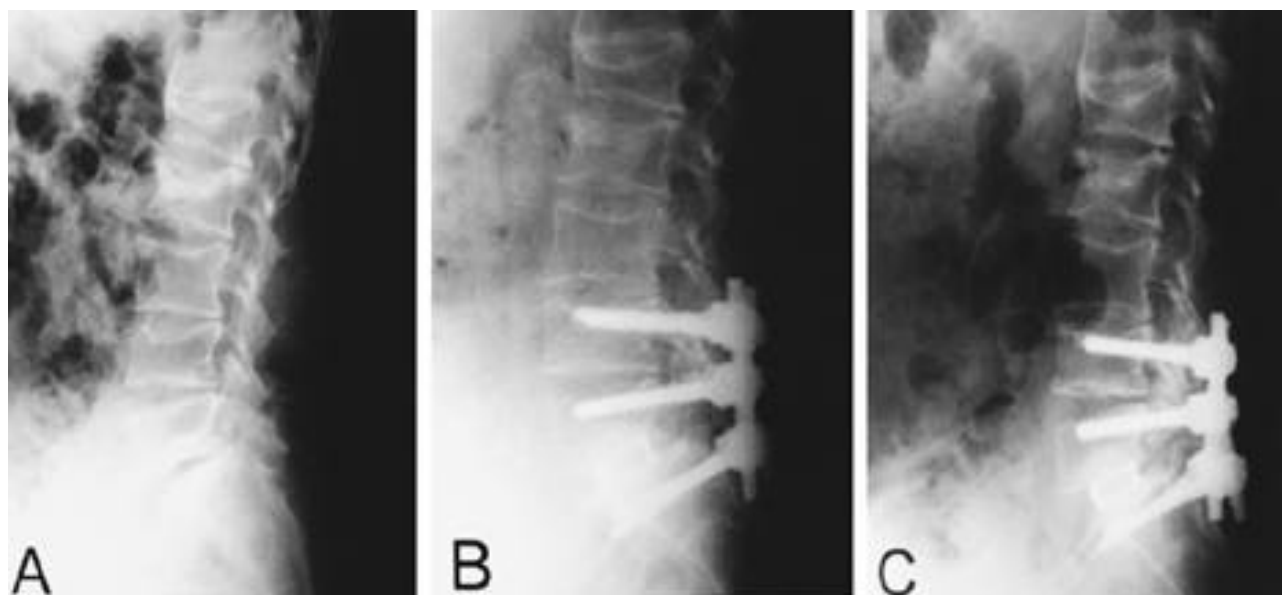


Fig. 4. Degenerative Spondylolisthesis with PLF and PLIF
A. Lateral radiograph of symptomatic degenerative spondylolisthesis in a 66-year-old female.
B. Postoperative radiograph demonstrated correction of deformity.
C. Last follow-up radiograph demonstrated loss of the correction and disc height.

4. 가 , , 가 . group , 9.0 mm, 11.2 mm, 8.4 mm , -0.6 mm 2.8 mm . group 8.7 mm, 11.7 mm, 9.8 mm , 1.1 mm 1.9 mm (P=0.02).

group , 8.4 mm, 11 mm, 7.8 mm , -0.6 mm 3.2 mm . group 8.2 mm, 12.1 mm, 9.0 mm , 0.8 mm 3.1 mm . (P=0.45).

5. 가 12) . Kirkaldy-Willis 14) group group , , (:85%/93%, P=0.72) . group (fair :83%/85%, P=0.23) , 70~95% 2,7,10,12,23) . 가 7,16,18,19,20,22) , Enker Steffee⁵⁾ 가 96% 86% . Wiltse 28) , , 1,3,4,5,13,23,27) . 가 가 , 가 8) . 가 1,5,6,13,23,27) . 가 가 11,17) . Newman Stone²¹⁾ 가 .60 10% 가 I II 가 9,25) . , , , 가 ,

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REFERENCE

- 1) **Boos N, Marchesi D, Zuber K and Aebi M** : *Treatment of severe spondylolisthesis by reduction and pedicular fixation: A 4-6 Year Follow Up Study. Spine, 18:1655-1661, 1993.*
- 2) **Bridwell KG, Sedgewick TA, O' Brien MF, Lenke LG and Baldus C** : *The role of fusion and instrumentation in the treatment of degenerative spondylolisthesis with spinal stenosis. J Spinal Disorder, 6:461-472, 1993.*
- 3) **Cho DY, Kim EH, Koh ES and Woo BC** : *The change of segmental sagittal angle in Low-grade spondylolisthesis after pedicular screw fixation with or without PLIF-PLIF+PLF versus PLF groups. J Korean Orthop Assoc, 30:842-851, 1995.*
- 4) **Cloward RB** : *Posterior lumbar interbody fusion updated. Clin Orthop. 193:20-37, 1985.*
- 5) **Enker P and Steffee AD** : *Interbody fusion and instrumentation. Clin Orthop, 300:90-101, 1994.*
- 6) **Esses S, Natout N and Kip P** : *Posterior interbody arthrodesis with a fibular strut graft in spondylolisthesis. J Bone Joint Surg, 77-A:172-176, 1995.*
- 7) **Esses SI, Sach BL and Dreyzin V** : *Complications associated with the technique of pedicle screw fixations. Spine, 18:2231-2239, 1993.*
- 8) **Fredrickson BE, Baker D, Mcholic WJ, Yuan HA and Lubicky JP** : *The natural history of spondylolysis and spondylolisthesis. J Bone Joint Surg, 66-A:699-707, 1984.*
- 9) **Garfin SR** : *Summation. Spine, 19(20S):2300S-2305S, 1994.*
- 10) **Heim SE** : *Transpedicle instrumentation in the degenerative spine. Clin Orthop, 337:97-110, 1997.*
- 11) **Herkowitz HN and Kurz ST** : *Degenerative lumbar spondylolisthesis with spinal stenosis. J Bone Joint Surg, 72-A:802-808, 1991.*
- 12) **Horowtch A, Peek RD, Thomas JC, Widell EH, Dimartino PP, Spencer CW, Weintein J and Wiltse LL** : *The pedicle screw fixation system, early clinical results. Spine, 14:461-467, 1989.*
- 13) **Kim SS, Denis F, Lonstein JE and Winter RB** : *Factors affecting fusion rate in adult spondylolisthesis. Spine, 15:979-983, 1990.*
- 14) **Kirkaldy-Willis WH, Paine KWE and Cauchoz J** :

- Lumbar spinal stenosis. Clin Orthop*, 99:30-52, 1974.
- 15) **Lenke LG, Birdwell KH, Bullis D, Betz RR, Baldus C and Schoenecker PL** : *Results of in situ fusion for isthmic spondylolisthesis. J Spinal Disorder*, 5:433-441, 1992.
 - 16) **Lin PM** : *Posterior lumbar interbody fusion technique : Complication and pitfalls. Clin Orthop*. 193:90-102, 1985.
 - 17) **Lombardi JS, Wiltse LL, Reynolds J, Widell EH and Spencer C** : *Treatment of degenerative spondylolisthesis. Spine*, 10:821-827, 1985.
 - 18) **Lorenz M, Zindrick M, Schwaegler P, Vrbos L, Collatz MA, Behal R and Cram R** : *A comparison of single level fusions with and without hardware. Spine*, 16:S455-S458, 1991.
 - 19) **Ma GWC** : *Posterior lumbar interbody fusion with posterior elements as chip bone graft. Clin Orthop*, 193:57-63, 1985.
 - 20) **Matthiass HH and Heine J** : *The surgical reduction of spondylolisthesis. J Bone Joint Surg*, 13:39-48, 1931.
 - 21) **Newman PH and Stone KH** : *The etiology of spondylolisthesis. J Bone Joint Surg*, 45-B:39-59, 1963.
 - 22) **Steffee AD and Sitkowski DJ** : *Posterior lumbar interbody fusion and plates. Clin Orthop*, 227:99-102, 1988.
 - 23) **Suk SI, Lee CK, Kim WJ and Kim HG** : *Adding posterior lumbar interbody fusion to pedicle screw fixation and posterolateral fusion after decompression in spondylolytic spondylolisthesis. J Korean Orthop Assoc*, 30:1638-1646, 1995.
 - 24) **Taillard W** : *Le Spondyloisthesis chez l'enfant et l'adolescent. Acta Orthop Scand*, 24:115, 1954.
 - 25) **Valkenburg HA, Haanen HCM** : *The epidemiology of low back pain. In: White AA, Gordon SL, eds, Proc Am Assoc Orthop Surg Symposium on Low Back Pain*, pp. 9-22, 1982.
 - 26) **Verlooy J, De Smedt K and Selosse P** : *Failure of a modified posterior lumbar interbody fusion technique to produce adequate pain relief in isthmic spondylolytic grade I spondylolisthesis patients. Spine*, 18:1491-1495, 1993.
 - 27) **Wang JM, Kim DJ and Yun YH** : *Posterior pedicular screw instrumentation and anterior interbody fusion in adult lumbar spondylolysis or grade I spondyloisthesis with segmental instability. J Spinal Disord* 9(2):83-8, 1996.
 - 28) **Wiltse LL, Newman PH and Macnab I** : *Classification of spondylolysis and spondylolisthesis. Clin Orthop*, 117:23-29, 1976.



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112 (: group (32), group (22) , : group (37), group (21))
가 Kirkaldy-Willis 가 , ,
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