

The Effect of Shoe Lift on Lumbar Scoliosis Associated with Pelvic Obliquity

Yong-Min Kim, M.D., Dong-Soo Kim, M.D., Eui-Sung Choi, M.D. Hyun-Chul Shon, M.D.,
Kyung-Jin Park M.D., Yung-Sung Kim, M.D.

Department of Orthopedic Surgery, Chungbuk National University Hospital, Cheongju, Korea

- Abstract -

Study design: A retrospective study designed to evaluate the effect of a shoe lift on the lumbar scoliosis associated with pelvic obliquity.

Objectives: To analyze the changes in pelvic height, Cobb angle and clinical manifestations after application of a shoe lift.

Summary of Literature Review: The most common form of scoliosis in adolescence is idiopathic (85% of scoliosis), which is a form of structural scoliosis. Some non-structural scoliosis may be assessed as an idiopathic form, which can result in an unnecessary treatment, such as bracing. Pelvic obliquity may be a cause of non-structural scoliosis, and a shoe lift may be used for its correction.

Materials and Methods: Twelve cases of lumbar scoliosis associated with pelvic obliquity, between April, 1998 and October, 2002, were investigated for the changes in the pelvic height and Cobb angle. Standing T-L AP and standing pelvic AP for measuring the Cobb angle and pelvic obliquity, respectively, were checked before and after application of a shoe lift. The Bell-Thompson method was used for measuring the limb length discrepancy. The shoe lift was composed of a compact cork pad and soft sponge tissue. The extent of a shoe lift was determined with the use of the most comfortable wood block height on standing still. The radiological and clinical outcomes of the shoe lift were investigated.

Results: After the introduction of the shoe lift, 9 cases (75%) achieved a leveled pelvis (height difference less than 0.3cm) 1 week post-shoe lift. The mean Cobb angle before treatment was 16 °, ranging from 9 to 26 °, which was reduced to 6.7 °, ranging from 0 to 23 °, due to the shoe lift 1 week post-shoe lift. The mean correction of the Cobb angle after the introduction of a shoe lift was 73.9%. Clinically, 2 cases with low back pain achieved an improvement in the pain, and most patients expressed that walking and standing had become more comfortable.

Conclusion: A shoe lift seems to be significantly effective in correcting the Cobb angle and pelvic height in lumbar scoliosis associated with pelvic obliquity.

Key Words: Lumbar spine, Lumbar scoliosis, Pelvic obliquity, Shoe lift

Address reprint requests to

Yong-Min Kim, M.D.

Chungbuk National University Hospital Department Of Orthopaedic Surgery

Chungbuk Chong-Jusi Heungdukgo Gaeshindong

Tel: 82-43-269-6077, Fax: 82-43-274-8719, E-mail: ymkim@med.chungbuk.ac.kr

Table 1. Profiles of each patients with their respective results.

Case	Sex /Age	Extent of scoliosis	Pre-management			Amount of Shoe Lift	After Shoe Lift(1week)	
			Cobb angle	Pelvic obliquity	B-T study		Cobb angle	Pelvic obliquity
1	F/21	L1-L4	9 °	Lt.-1.0cm	Lt.-0.3cm	1.3cm	2 °	Lt.+0.3cm
2*	F/8	T12-L5	15 °	Lt.-3.0cm	Lt.-1.4cm	2.5cm	0 °	Same
3	M/13	T12-L4	14 °	Lt.-1.3cm	Lt.-0.2cm	1.5cm	11 °	Same
4	M/29	T12-L4	12 °	Lt.-1.1cm	Lt.-0.1cm	1.3cm	6 °	Lt.+ 0.1cm
5	F/9	L1-L4	13 °	Lt.-0.4cm	Lt.-0.5cm	0.5cm	2 °	Lt.-0.2cm
6	F/13	T12-L4	26 °	Lt.-1.7cm	Lt.-2.0cm	2.0cm	19 °	Lt.-0.1cm
7*	F/7	T12-L5	26 °	Lt.-3.5cm	Lt.-3.2cm	3.5cm	0 °	Lt.-0.4cm
8	F/11	T12-L4	8 °	Lt.-0.7cm	Lt.-0.3cm	1.0cm	0 °	Lt.+0.5cm
9	F/13	T11-L4	18 °	Lt.-2.5cm	Lt.-1.2cm	2.0cm	6 °	Lt.-0.3cm
10	F/12	T11-L3	26 °	Lt.-1.1cm	Same	1.0cm	7 °	Lt.-0.5cm
11	F/13	L2-S1	16 °	Lt.-0.6cm	Same	1.0cm	7 °	Same
12	F/41	T12-L5	10 °	Lt.-2.0cm	(-) [†]	2.0cm	4 °	Lt.+0.1cm

Sex: M: male, F: female, B-T: Bell -Thompson.

*: known causes of limb length discrepancy.

[†]: B-T study not done.

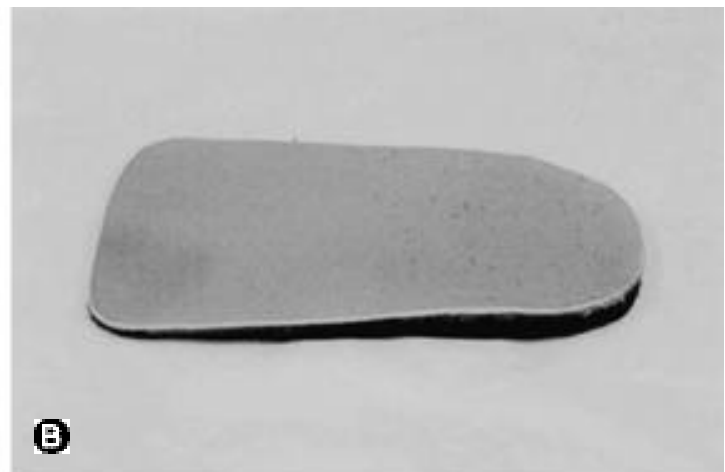


Fig. 1. (A) Amount of shoe lift was determined by the most comfortable height of wood block on standstill.(B) Photograph of shoe lift made of compact cork pad enveloped in sponge tissue.

p<0.05

SAS VER. 6.12

Cobb
Cobb
Spier-

man

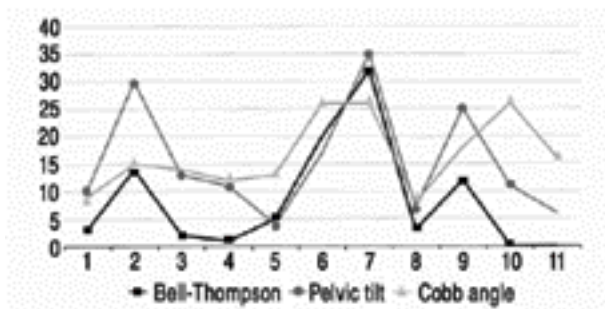


Fig. 2. Graph showing significant correlation between pelvic obliquity and LLD . But Cobb angle showed neither correlation with LLD nor pelvic obliquity.

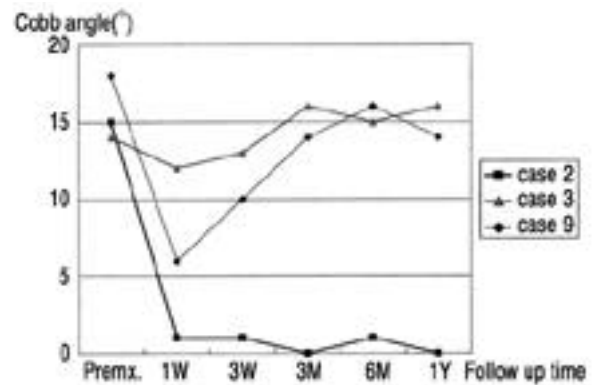


Fig. 3. Follow-up of pelvic height and Cobb angle showed grossly two patterns. In first pattern(case 2), satisfactory maintenance of correction was observed, but pattern 2(case 3,9) showed gradual decrease of correction according to follow-up time.

1.

1) (Pelvic obliquity)
12, 0.4 cm, 3.5 cm, 1.57 cm .

2) (Limb length discrepancy)
12, 4, 1 cm, 8, .11, 9 가

Bell-Thompson
.2 가

3) (Lumbar curve)
11, 1, 12, 4, 가 4, 가
, 5, 가 3, .12, 8
. Cobb 9
26, 16, (convex) .

4)
가 (p=0.0399), Cobb
가 (p=0.3944), Cobb
(p=0.0698)(Fig. 2).

2.

1) 0.00 cm, 0.70 cm, 0.23 cm, 1.3 cm
가 0.3 cm (leveled pelvis)

, 12, 9 (75%)
. 9 가
3 가 . 가
4 0.1 cm, 0.1 cm,
0.3 cm, 0.5 cm .

2) 9, 26, 16, Cobb
.12, 10 (83%), Cobb 7
.5 (41%) Cobb
2 가 Cobb 4
.5 Cobb
7, 2
19, 11 . Cobb

, 73%, 50%
12, 10 (84%), .10, 3
Cobb 13, 26 (18) ,
0, 2 (0.6) 17.4
. 10 Cobb 8
26 (15) 2 19 (
6.8) 8.2 .

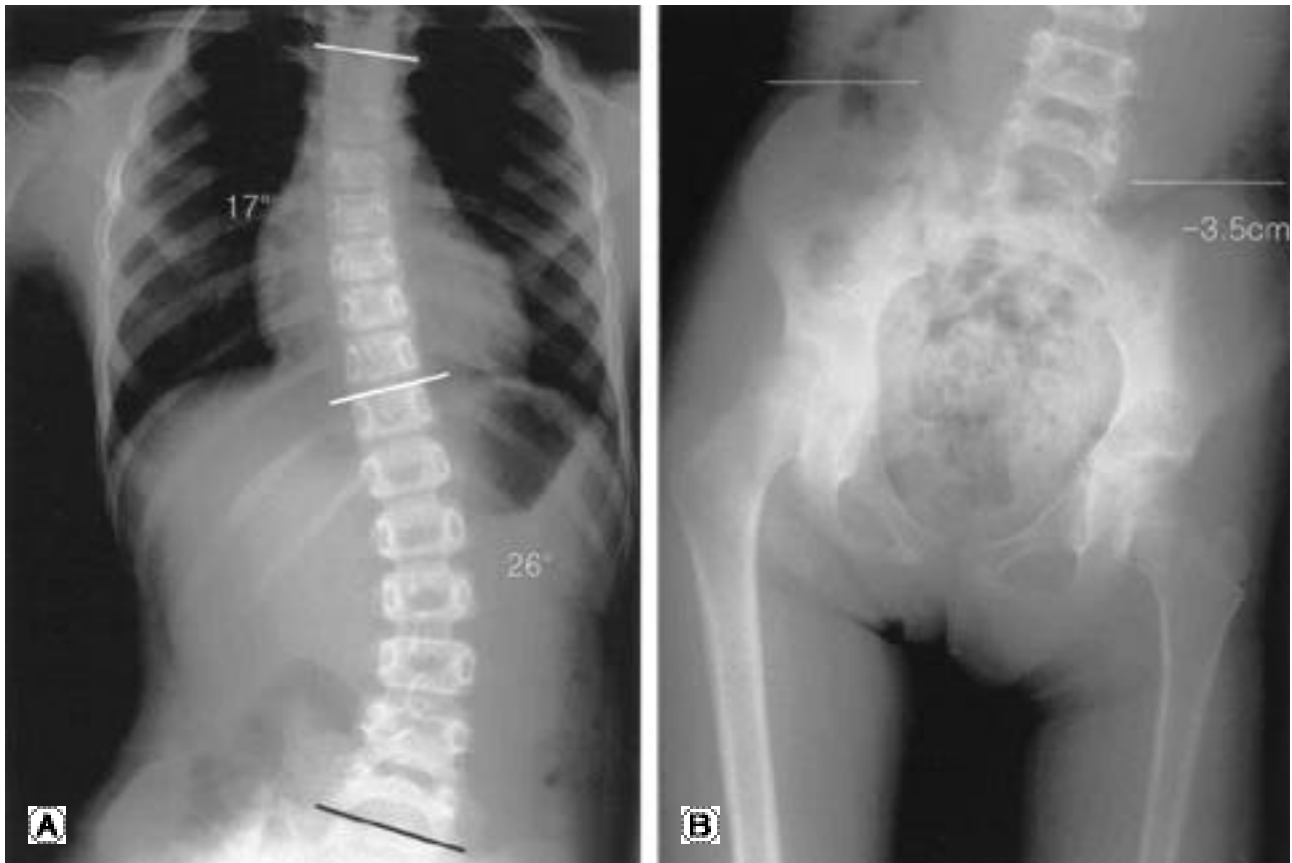


Fig. 4. Pre-management radiograph of a 7 year-old girl. (A) showing 26° lumbar curve and 17° compensatory thoracic curve. (B) pelvic obliquity in standing pelvis AP view; left pelvis was 3.5cm lower than right side before application of shoe lift.



Fig. 5. Photograph showing a lateral ray deficiency of left foot.

4)

Cobb	(Cobb	-	Cobb
/	- shoe lift)		
12				5%
		5		(Fig. 3).
4				가
95%				3
67%				12
67%				7
	가			
2		5		가

3)

2

7

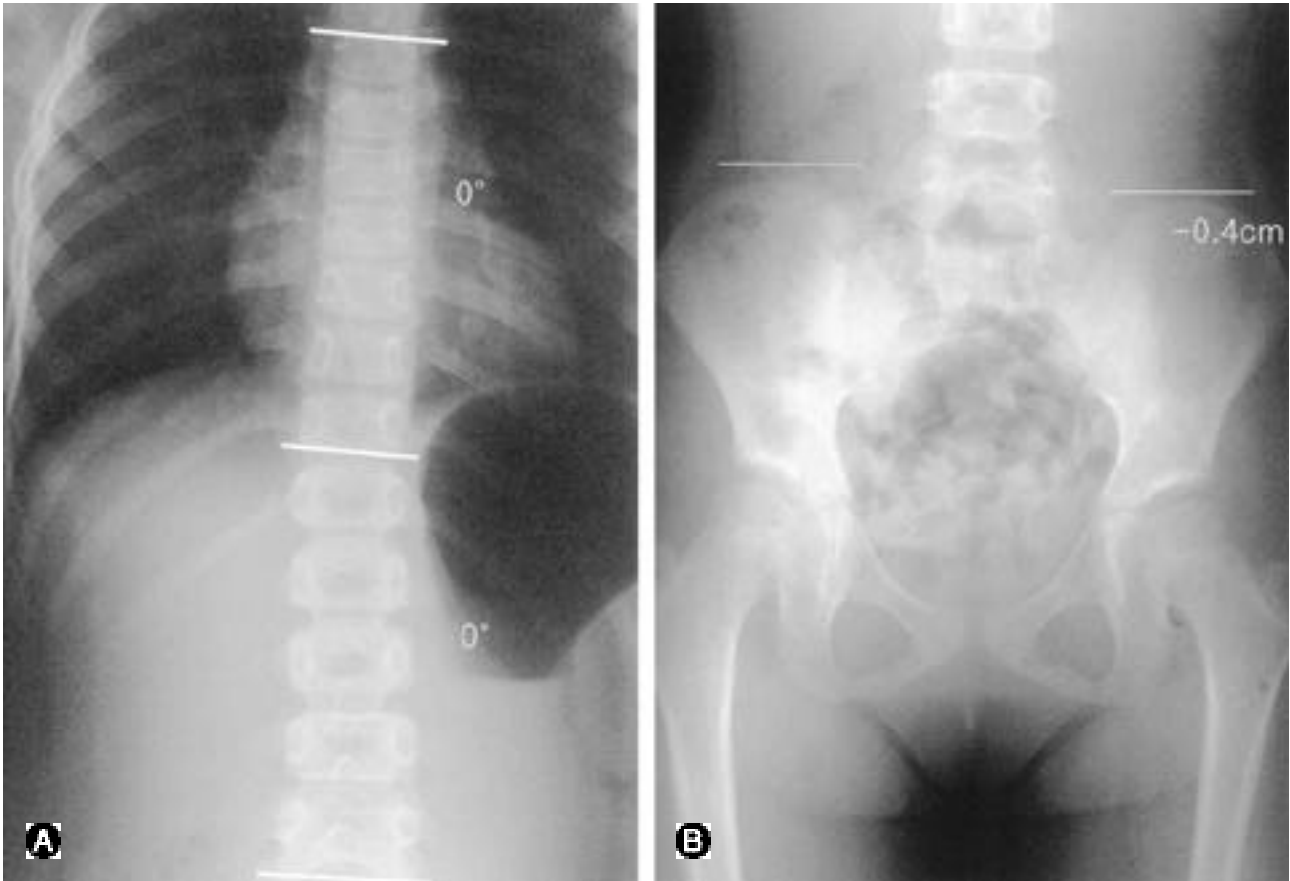


Fig. 6. After shoe lift. (A) Lumbar and thoracic curves were straightened. (B) pelvic obliquity was decreased to 0.4 cm.

12 5 Cobb 26
Cobb 15
3.5 cm
(Fig. 4).
(Fig. 5). Bell-Thompson
3.2 cm
가 3.5 cm
. 1 Cobb
0 Cobb
0 (Fig. 6A).
0.4 cm (Fig. 6B).
. 1
Cobb 3
가
Zabeck 5) 1 가
(nonstructural scoliosis)
(orientation) (geometry)

가 . James³⁾ 가 , Zabjek
 , , 5)
 . ,
 가 7,9,10,14-16) 1 , 50
 . ,
 13),
 . 12 8 가 가
 , Wiels 가
 Sweetmann⁴⁾ William¹¹⁾ 25% 93% 6-10)
 . Klein Buckley¹³⁾ 가 가
 가 1.1 cm
 .
 1.1 cm 4 8
 12,13) Gibson¹²⁾ 가
 23
 가 , 가
 가 가
 17) 가 가
 , ,
 , 가 Dickinson²¹⁾ Walker
 (school screening)
 12 , 가
 (Fig. 2).
 Cummings¹⁸⁾ 가
 0.63 cm 2.22 cm
 ,
 .
 .
 가 가
 가 4) Gofton¹⁹⁾ 가
 , Gibson¹²⁾
 . Giles Taylor^{1,20)} 9 mm 가 , 2.2 cm
 가 가 가

Cobb 2 12
(Fig. 6). 5 12 9 (75%)
, 5 , 2 가 10 (83%) Cobb
가 , 2 .
가 5 Cobb
Shoe lift
가 가
(compliance)가
Shoe lift 가
, 1 Cobb
5 (41%)
(pad)
(compliance)가 ,
가 .
2 10 50% ,
가 가 .
가 가
가 가
가 shoe lift 가
가 , shoe lift
shoe lift
가 shoe lift
가 가
가 가

REFERENCE

- 1) **Giles LGF and Taylor JR:** *Lumbar spine structural change associated with leg length inequality. Spine 1982;7:159-162.*
- 2) **Apley A:** *System of Orthopaedics and Fractures. 5th ed. London, Butterworths:25-209, 1977.*
- 3) **James JIP:** *Scoliosis. 2nd edition. Edinburgh, Churchill Livingstone:1976.*
- 4) **Wiels P and Sweetmann R:** *Compensatory lateral curvature. Essentials of Orthopedics London. J & A Churchill:16-17, 1965.*
- 5) **Zabjek KE, Leroux MA, Coillard C, et al:** *Acute postural adaptation induced by a shoe lift in idiopathic scoliosis patients. Eur Spine J 2001;10:107-113.*
- 6) **Cyriax J:** *Textbook of Orthopaedic Medicine. Vol. 1. 5th edition. London, Cassell & Co:442, 1969.*
- 7) **Giles LGF:** *Leg length inequalities associated with low back pain. JCCA 1976;20:25-32.*
- 8) **Sicuranza Bj, Richards J and Tisdall LH:** *The short leg syndrome in obstetrics and gynecology. Am J Obstet Gynecol 1970;107:217-217.*
- 9) **Stoddard A:** *Manual of Osteopedic Technique. London, Hutchinson Medical Publications:212, 1959.*
- 10) **Yates A:** *The lumbar spine and back pain, Treatment of Back Pain. Edited by M Jayson. London, Sector Publishing Ltd:341-353, 1976.*
- 11) **William D, Bandy WD and Sinning WE:** *Kinematic effects of heel lift use to correct lower limb length difference. Journal of Orthopedic and Sports Physical Therapy 1986;7:173-179.*
- 12) **Gibson PH, Papaioannou T and Kenwright J:** *The influence of the spine of leg length discrepancy after femoral fracture. J Bone Joint Surg 1983; 65-B:584-587.*
- 13) **Papaioannou T, Stroke I and Kenwright J:** *Scoliosis*

- associated limb length inequality. *J Bone Joint Surg* 1982;64-A:59-61.
- 14) **Bourdillon JF**: *Spinal Manipulation*. London, William Heinemann Medical Books Ltd:1970.
 - 15) **Nichols PJR**: Short-leg syndrome. *Br Med J* 1960;1863-1865.
 - 16) **Rush WA and Steiner HA**: A study of lower extremity length inequality. *Am J Roentgen* 1946;56:616-623.
 - 17) **Steven M. Blustein and Joseph C. D 'Amico**: Limb length discrepancy. *J Am Podiatr Med Assoc* 1985;4:200-206.
 - 18) **Cummings G, Scholz MS and Barnes K**: The effect of imposed leg length difference on pelvic bone symmetry. *Spine* 1993;18:368-373.
 - 19) **Gofton JP**: Studies in osteoarthritis of the hip. Biomechanics and clinical considerations. *Can Med Assoc J* 1971;104:1007.
 - 20) **Giles LGF and Taylor JR**: Low back pain associated with leg length inequality. *Spine* 1981;6:510-521.
 - 21) **Walker AP and Dickinson RA**: School screening and pelvic tilt scoliosis. *Lancet* 1984;21:152-154

