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Functional Outcome of the Surgical Correction of Neuromuscular Scoliosis

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– Abstract –

Study Design : A retrospective study of functional outcome after surgical correction of neuromuscular scoliosis.

Objectives : To assess functional outcomes and their significances after the surgical correction of neuromuscular scoliosis.

Summary of Literature Review : The surgical correction of neuromuscular scoliosis has been used to stabilize the trunk for balanced sitting, to improve cardiopulmonary function, and the function of the upper extremities. Many authors have reported favorable surgical results, but few studies have been undertaken on functional assessment after surgery.

Materials and Methods : Eighteen adult patients with neuromuscular scoliosis underwent surgical correction. Functional assessments were performed in terms of impairments, disabilities, and handicaps. The impairments included sitting ability, coronal Cobb's angle, pain after surgery, and cosmesis after surgery. The disabilities included dressing, feeding, toilet/bathing, locomotion, and the use of both hands, and the handicaps included the effort and time to care for patients. Each parameter was checked preoperatively, 6 months after surgery, and at the last follow-up.

Results : In terms of impairments, sitting ability, coronal Cobb's angle, pain, and cosmesis were improved by surgery. In terms of disabilities, dressing, toilet/bathing, and locomotion were not improved after surgical correction. However, the feeding and use of both hands were significantly improved. And, in terms of handicaps, both the effort and the time required for care were reduced post-surgically.

Conclusions : We conclude that impairments, handicaps, and the functions of the upper extremities were improved after surgical intervention to stabilize the trunk and spine in cases of neuromuscular scoliosis, but that overall disabilities were unaffected. This latter apparent shortcoming is attributed to the inability of surgery to treat previous systemic disease affecting physical disabilities of lower extremities. However, surgical correction of neuromuscular scoliosis was found to be clinically significant in terms of improving the functions of the trunk and of the upper extremities.

Key Words : Neuromuscular scoliosis, Surgical correction, Impairment, Disability, Handicap

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18
 32.8 (20~44) 가 3
 가 15 가 13 ,
 가 3 , 2
 , 8
 , 10
 7 3-rod
 , 7 Galvestone
 4.6 (2~9)
 가 (, Cobb ,
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 , 6 ,
 가
 Mulcahy ¹¹⁾
 (Table 1). Cobb
 , 5 ,
 4 , 3 , 2 ,
 가 7,13) 1
 Hallet ⁴⁾ 가 ,
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 가 (Table 2).

Table 1. Levels of sitting ability with an individual placed on a flat box of the correct height, feet on floor by Mulcahy et al.

Level	Description
1. Unplaceable	Wiggles and slides and cannot be placed in a sitting position
2. Placeable, not able to maintain position	Can be placed in a sitting position but needs holding to stay in position-at best can balance momentarily
3. Able to maintain position but not move	When placed in a sitting position can just keep balance as long as there is no movement
4. Able to maintain position and move within base	Once placed in a sitting position can sit independently and can move trunk forward over sitting base but cannot recover balance after reaching to one side
5. Able to maintain position and move outside base	Can sit independently, can use either hand freely to the side of the body and can recover balance after leaning or falling to either side
6. Able to move out of position	Can sit independently and can transfer weight across the surface of a seat but can not regain a correct sitting position
7. Able to attain position	Can regain sitting position after moving out of it

Table 2. The independent scores of locomotion and activities of daily living by Hallet et al, and use of both hands by Rhyu et al.

Activities	Score	Description
Locomotion	0	Immobile
	1	Mobile only with wheelchair
	2	Walk with aids and/or help. and uses wheelchair or such for most of the day
	3	Walk independently, with or without aid, but uses wheelchair for part of the day
	4	Walks independently with aid
	5	Walks independently with some difficulty
Activities of daily living (feeding, dressing, toilet/bathing)	6	Walks normally
	1	Moderate with guidance and assistance, with or without aids
	2	Alone with aids or with minimum assistance
Use of both hands	3	No assistance required
	1	Moderate with guidance and assistance, with or without aids
	2	Alone with aids or with minimum assistance
	3	No assistance required

Table 3. The mean scores after surgical correction for the neuromuscular scoliosis.

		Preop.	6 mos. after op.	Last FU
Impairments	Sitting ability	4.9	6.4*	6.2
	Coronal Cobb 's angle			
	Thoracic	63.5 ± 18.5。	43.7 ± 15.3。*	45.5 ± 15.6。
	Lumbar	82.5 ± 17.9。	52.4 ± 19.3。*	54.5 ± 18.2。
	Pain		4.1	4.1
	Cosmesis		4.2	4.2
Disabilities	Feeding	1.6	2.9*	2.8
	Dressing	2.5	2.3	2.5
	Toilet/bathing	2.6	2.4	2.7
	Locomotion	3.7	3.4	3.6
	Use of both hands	1.7	2.9*	2.8
Handicaps	Efforts to care	18.1	25.8*	26.4
	Time to care	2.9	3.9*	3.9

* : p<0.05

Samuelsson ¹³⁾

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4 , 6 , 3 , 2 , 5 , 1

6 , 6 , 4 , 6~12 1.

3 , 13~18 2 , 19~24 1 , 4.9 , 6

가 , 6.4 , 6.2

(p<0.05). Cobb

가 , 63.5 ± 18.5。(39~88。), 6 43.7

± 15.3。(22~63。), 45.5 ± 15.6。(24~67。)

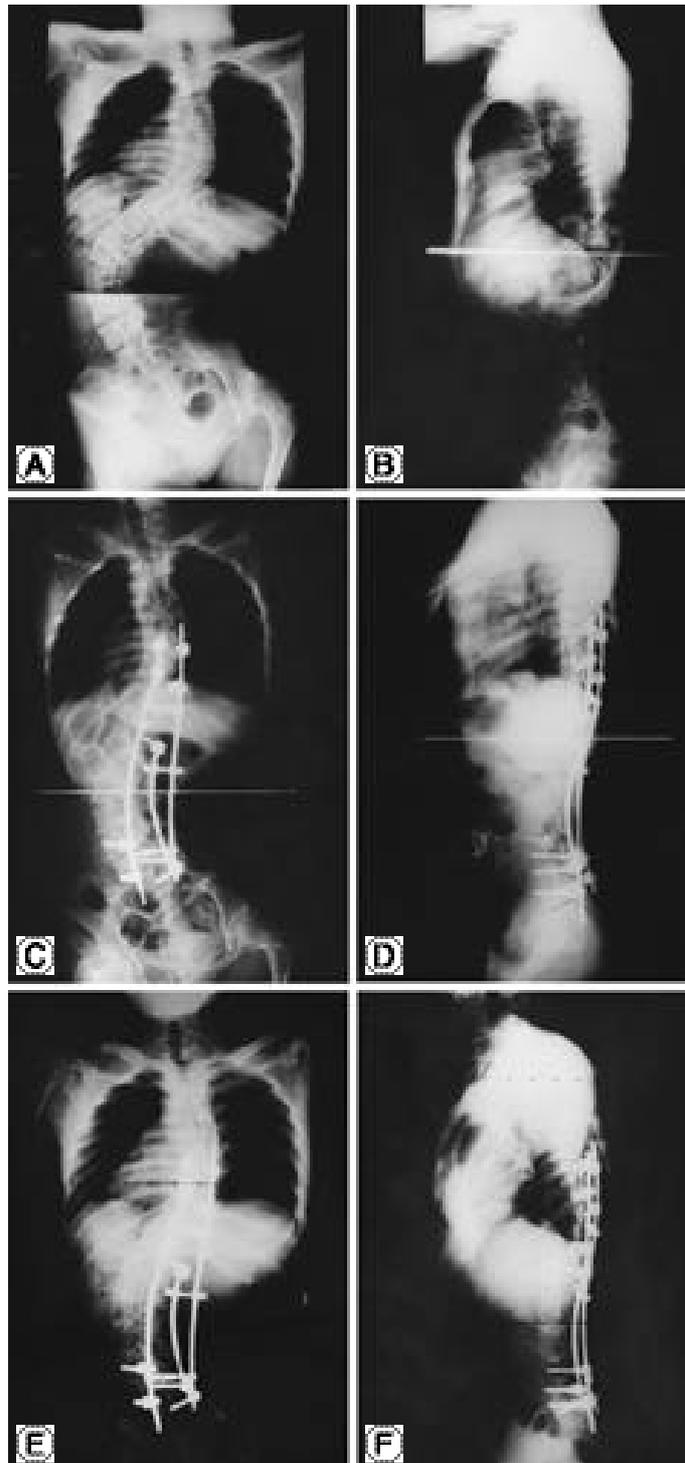


Fig. 1. The 18 years old female patient with poliomyelitis. The preoperative Cobb's angles are 70° in thoracic and 85° in lumbar spine (A, B). She had been suffered from pain due to costo-pelvic impingement, asymmetric sitting posture, and useless upper extremities because they had been used for trunkal support only. The deformities were changed to 45° in thoracic and 60° in lumbar spine postoperatively (C, D). The fixation and fusion were extended to sacrum for the correction of severe lumbar curve. The deformities were 55° in thoracic and 65° in lumbar spine finally (E, F), and the operative construct were well maintained. The final outcome showed that there were no significant changes in general disabilities. But the impairments and handicaps related to the functions of upper extremities were significantly improved by well maintained trunkal support. And there were significant improvement in the aspect of pain and general appearance.

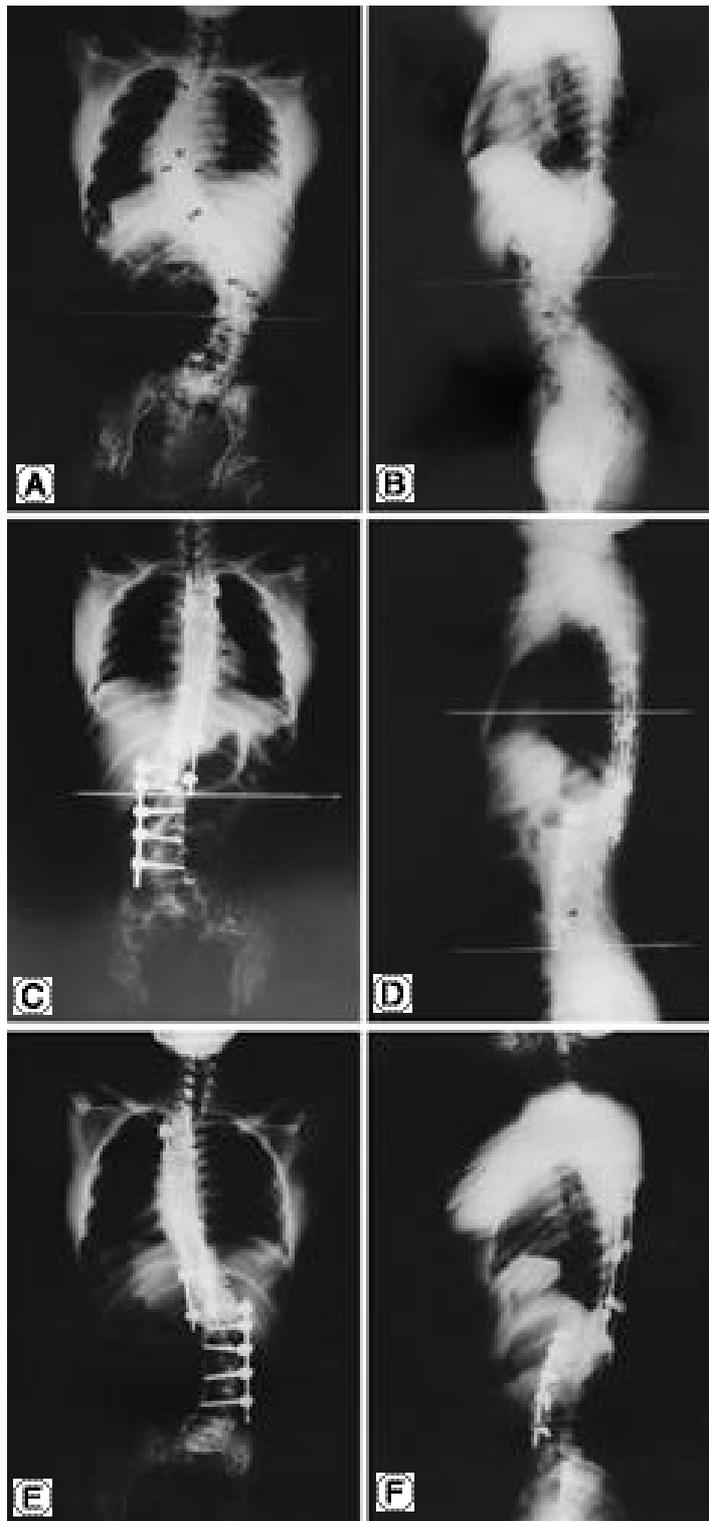


Fig. 2. The 24 years old female patient with poliomyelitis. The Cobb's angles are 57° in thoracic and 67° in lumbar spine (A, B) pre-operatively. The deformities were changed to 22° in thoracic and 32° in lumbar spine after two-staged antero-posterior surgery (C, D). The final Cobbs angles were 35° in thoracic and 40° in lumbar spine finally (E, F). She had had trunkal shift to right side and had used right arm for support. And she had been unable to sit symmetrically and stably. After operation, there were significant improvement in the impairments and handicaps related to the sitting and functions of upper extremities because of well maintained trunkal support. The functional status were maintained to the final follow-up period.

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, Askin ¹⁾

75%

¹²⁾ 88.9%

94.4%

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collapsing spine. *J Bone J Surg*, 43-A:474-484, 1961.

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