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Considerations for the management of scoliosis in pediatric and adolescent spinal cord injuries

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Objective

Neuromuscular scoliosis is a complex secondary condition of pediatric spinal cord injury that develops in high percent of children whose spinal cord is injured prior to skeletal maturity. The effects of paralysis on growth of musculoskeletal system should be carefully considered in case of pediatric spinal cord injury (SCI). In many studies, significant efforts have been made to prevent spinal cord deformation while maintaining upright posture or maintaining ambulation using orthosis. At 12 years of age, the fulcrum last settles at C5 to C6, where it remains throughout adulthood. Younger children are therefore at higher risk of upper cervical injury and spinal deformity. Therefore this study aims to assess the related factors with the scoliosis in pediatric and adolescent spinal cord injured patients.

Method

Medical records of pediatric and adolescent SCI patients aged 18 years old or younger, who visited the University rehabilitation hospital during year 2000-2015, were reviewed retrospectively. Only the scoliosis patients who were diagnosed by whole spine radiographs (AP and lateral) were included. Exclusion criteria was the patient with a history of scoliosis or spinal deformity before spinal cord injury. The relevance between scoliosis severity and several parameters such as onset age of injury, etiology of injury, neurological status, ASIA classification, level of spinal cord lesion and functional level were analyzed.

Result

Total 64 patients (34 males and 30 females) were included in this study and their onset age of injury was 7.65±5.19 years (range 0y-17y 5mo). There was a significant difference between Cobb's angle values according to onset age, etiology, level of injury, completeness, ASIA classification. Scoliosis occurred more severe those injured at younger age than 12, 18.62', compared with 8.2' in those injured later ($P<0.05$). Complete injury and ASIA classification A showed higher cobb's angle ($P<0.05$). In terms of injury caused by the trauma, the Cobb's angle of sports injured patients was significantly higher than other traumas ($P<0.05$). Patients with thoracic level injury showed Cobb's angle 20.72' which is significantly higher than cervical and lumbar injury patients ($P<0.05$).

Conclusion

As subjects with complete cord lesion, thoracic lesion, younger onset age demonstrated more severe scoliosis than other conditions, more careful consideration about spinal care

is needed during rehabilitation treatment of pediatric and adolescent SCI patients with above characteristics.

Risk factors		N	Cobb's angle (degree)	p-value
Onset age	Over 12 years old	18	8.20±7.72	0.0272*
	Under the age of 12	46	18.62±18.86	
Etiology	Traumatic	35	18.08±19.49	0.2222
	Non-traumatic	29	12.80±13.45	
Trauma	Motor vehicle	19	24.23±20.17	0.0346*
	Fall down	9	8.23±5.63	
Non-trauma	Violences	5	5.12±2.58	
	Sports	2	36.35±47.02	
	Myelitis	10	13.54±18.38	0.8436
	Tumor	13	11.90±10.55	
	Surgery	3	8.67±8.57	
	Vascular lesion	3	18.40±13.86	
Paraplysis	Tetraplegia	19	12.87±15.29	0.3967
	Paraplegia	45	16.88±17.84	
Injury severity	Complete injury	37	20.81±19.84	0.0042**
	Incomplete injury	27	8.67±8.66	
Injury level	Cervical	18	11.43±14.34	0.0455*
	Thoracic	33	20.72±19.15	
	Lumbar	13	8.82±10.89	
ASIA classification	A	37	20.81±19.84	0.0260*
	B	1	-	
	C	16	11.49±10.13	
	D	10	4.49±3.27	
Functional level				
Sitting	Independent sitting	48	14.04±15.90	0.1375
	Sitting with holding	15	21.61±20.34	
Standing	Independent standing	8	4.23±3.69	0.1100
	Standing with holding	12	11.66±12.21	
	No standing	41	19.22±18.96	
	Therapeutic standing	2	18.10±21.21	
Walking	Independent gait outdoor	4	5.45±5.12	0.1022
	Independent gait indoor	3	5.57±4.53	
	Gait with device	6	2.67±1.10	
	Therapeutic gait	5	19.44±15.13	
	No gait	45	18.80±18.49	

Values are mean ± SD

*P<0.05, **P<0.001

Cobb's angle according to several parameters