

Mechanism of Neural Complication Induced by Corrective Surgery for Spinal Deformity

-Multi-Institutional Survey by the Spinal Cord
Monitoring Working Group of the Japanese
Society for Spine Surgery and Related
Research-

*Kei Yamada, Yukihiro Matsuyama, Shigenori
Kawabata, Muneharu Ando, Naoya Yamamoto,
Sho Kobayashi, Shiro Imagama, Tsukasa
Kanchiku, Kanichiro Wada, Nobuaki Tadokoro*

Introduction

- The mechanism of insult to the neural structure during correction of spinal deformity has not been fully understood.
- The aim of this study is to investigate the mechanism of insult to the spinal cord and nerve root by studying the results of intraoperative spinal cord monitoring

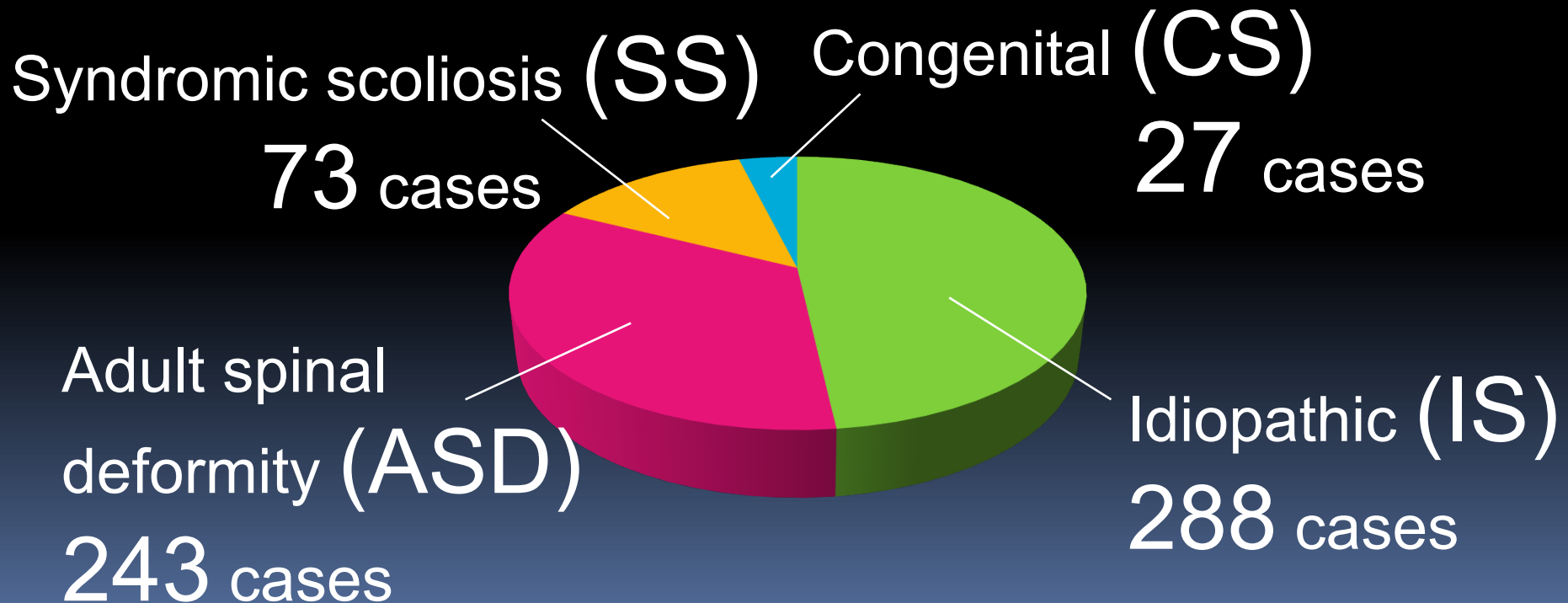
Material and Method

- Prospective observational study

Apr. 1st, 2010 – Dec. 31st, 2014

- 631 consecutive spinal deformity patients

(106 M) in 15 hospitals .



Material and Method

- Transcranial electrical stimulation muscle evoked potential (TES-MEP)
 - uniform anesthesia and monitoring conditions
 - uniform alarm criteria (alert) in 15 hospitals.



≥ 70% amplitude loss of baseline

Control TES-MEP

intraoperative TES-MEP

Investigation issue



1. Incidence of TES-MEP alert
2. Intervention after the alert
3. Postoperative newly developed neurological deficit

Results: Incidence of alert & alert-triggered procedure

	IS	ASD	SS	CS	P-value
Alert(n) (%)	25 (8.7)	28 (11.5)	11 (15.1)	2 (7.4)	0.33
Procedure					
Scoliosis COR	17	10	9		
Kyphosis COR		6		1	
Anterior OST		1		1	
Roots abscission		1			
Other	8	10	2		

COR: correction, OST: osteotomy

Intervention and postoperative neural deficit

	IS	ASD	SS	CS	P-value
Intervention					
Correction release	6	1	3		
Cease procedure	4	2	2		
decompression	1	13	2		
other		1	1	1	
Postoperative deficit					0.051
Transient deficit		5	1		
Persistent deficit		1		1	
					
		Nerve root abscission		Kyphosis correction	

Neural insult mechanism during spinal deformity surgery

IS
Elastic spinal curve

ASD / SS / CS
Rigid spinal curve, stenosis

↓ Correction ↓

↓ Correction ↓

Spinal cord ischemia

Nerve root over traction

Nerve root compression

↓ Intervention ↓

↓ Intervention ↓

Reversible

Irreversible

No neural deficit

Persistent neural deficit

Transient neural deficit

No neural deficit

Conclusion

1. The IS cases had elastic spinal curve without spinal stenosis. In these cases the spinal cord had reversible ischemia from the correction procedure.
2. The ASD, SS and CS patients had rigid spinal curve and stenosis. It was suggested that the correction procedure caused irreversible spinal cord ischemia, nerve root over-traction, resulting in neurological deficit. Decompression would have been useful in the case of nerve root compression.

Disclosure

The authors reported **no**
potential **conflict of**
interest relevant to this
article.