

Pulmonary function and thoracic cage morphology during corrective cast treatment for EOS

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Introduction

Historically, corrective casts have been used for the treatment of scoliosis. Over the years, this approach has evolved through countless modifications and improvements. However, while corrective casts are currently used for the treatment of Early Onset Scoliosis (EOS), treatment has been reported to have adverse constrictive effects on the thorax. To date, there have been no studies regarding the effects of corrective casts on pulmonary function and thoracic cage morphology. We hypothesized that cast treatment would have a negative marginal effect on pulmonary function and thoracic cage morphology post-treatment. The purpose of this study was to investigate the inference of the corrective cast treatment on pulmonary function and thoracic cage morphology in patients with EOS.

Patients

May ~ Sep. 2011

Corrective cast For EOS

14 cases (Male : Female = 7 : 7)

Age : 3.6 ± 1.8 yo (1.0 ~ 6.8 yo)

Height : 96.7 ± 15.1 cm (79 ~ 126 cm)

Weight : 13.8 ± 3.3 kg (7.5 ~ 19 kg)

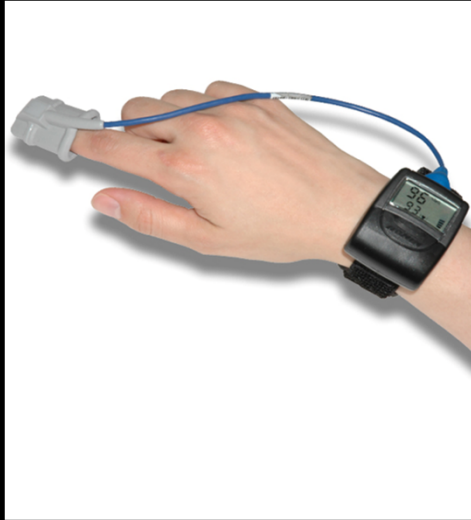
Syndromic : 8 , Congenital : 3 , Idiopathic : 3

Curve pattern : Thoracic curve : 10

Thoracolumbar curve : 3

Lumbar curve : 1

Methods

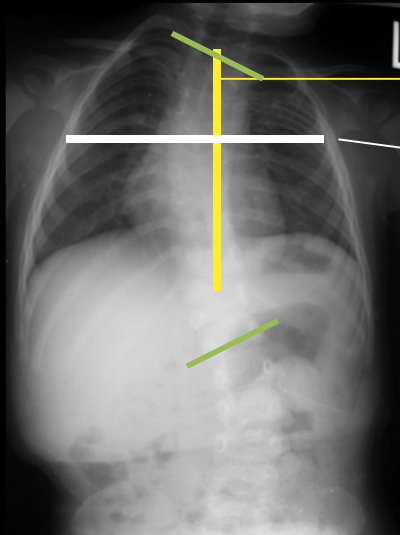


We analyzed the SaO₂ and x-ray parameters (i.e., thoracic spinal height, SAL, transverse diameter of thorax, sagittal diameter of thorax) in 14 patients. Measurements of SaO₂ were obtained pre- and post-casting during sleep using a pulse oximeter.

Cast was applied for every patient through the use of the Risser table with rotational correction posterolaterally by strap and counter rotation applied on the pelvis, with a head halter and pelvic traction. General Anesthesia was not used in any of the patients to avoid interference of general anesthesia on pulmonary function immediately after casting.



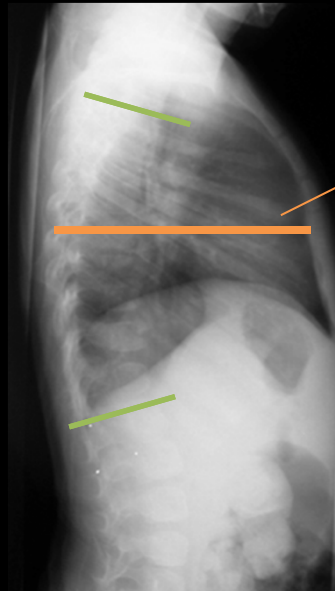
X- ray parameters



Thoracic Spinal height : T1 ~ T12

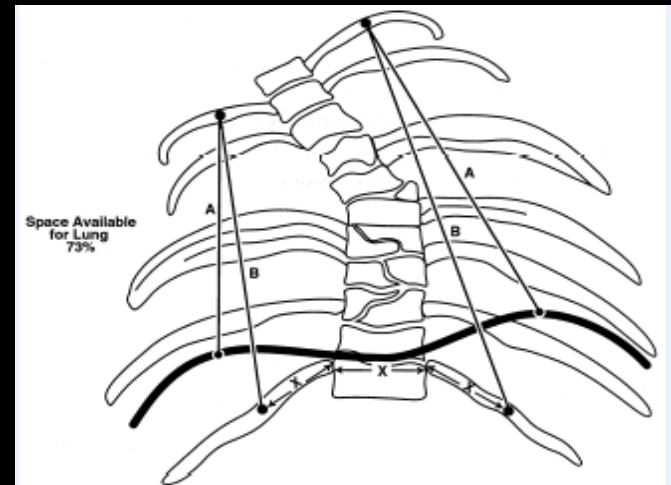
Transverse diameter of thorax : T6

Cobb angle



Sagittal diameter of thorax

Thoracic kyphosis



Space Available for Lung

Result – 1

	Cobb (Degrees)	SpO2 (%)	Pulse (/ min)	SpO2<90% (%)	SpO2<80% (%)
Pre-Cast	56.0±19.7	96.4±1.9	95.7±16.8	3.3±6.5	0.8±1.6
Post-Cast	28.6±9.4	96.9±1.5	94.4±15.2	0.9±2.9	0.2±0.5



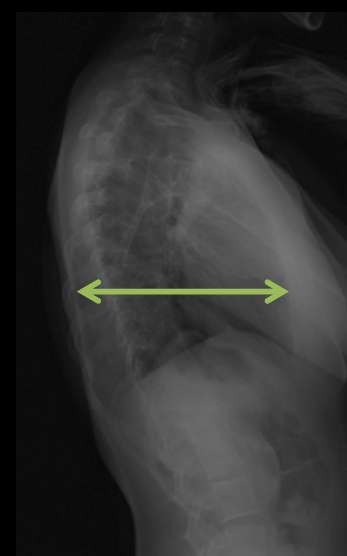
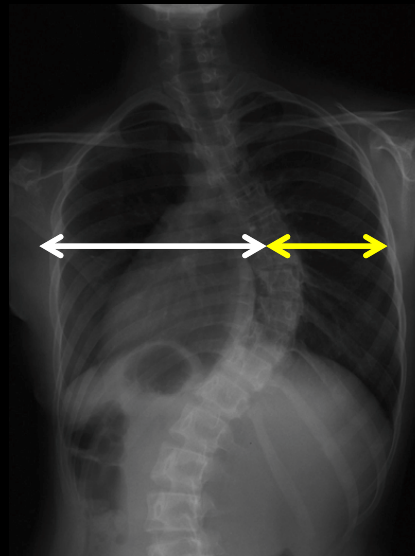
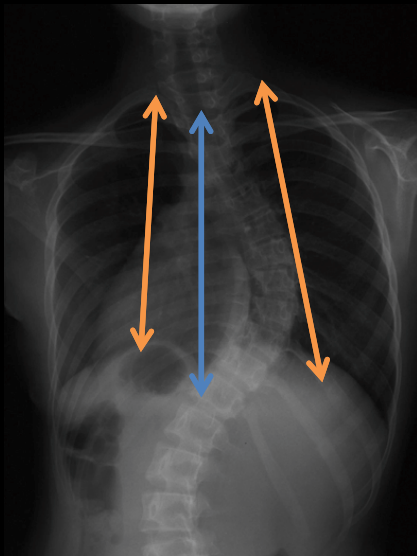
P = 0.1792



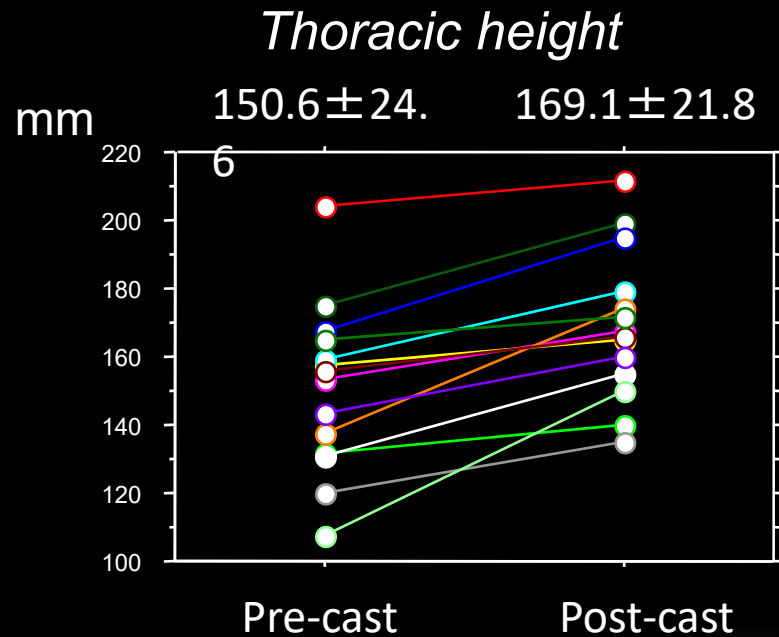
P = 0.4889

Result -2

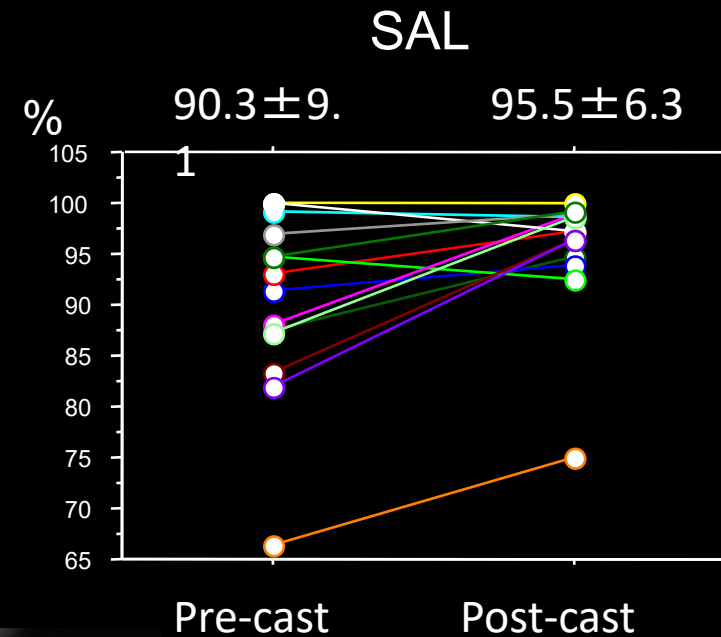
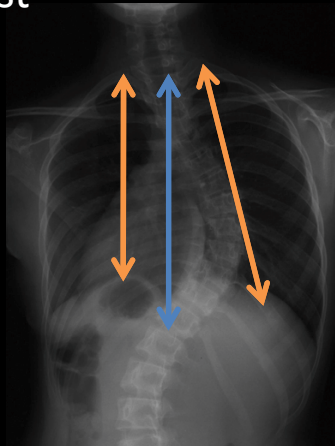
	Cobb (°)	Thoracic height (T1-12) (mm)	SAL (%)	Transverse diameter (convex) (mm)	Transverse diameter (concave) (mm)	Thoracic kyphosis (°)	Sagittal diameter (mm)
Pre- Cast	56.0 ±19.7	150.6 ±24.6	90.3 ±9.1	66.4±8.3	87.7±14.4	37.4±17.1	110.5±16.5
Post- Cast	28.6 ±9.4	169.1 ±21.8	95.5 ±6.3	73.4±9.3	90.8±14.6	26.7±14.1	114.5±12.2



Morphology : Thoracic height , SAL



$P < 0.0001$

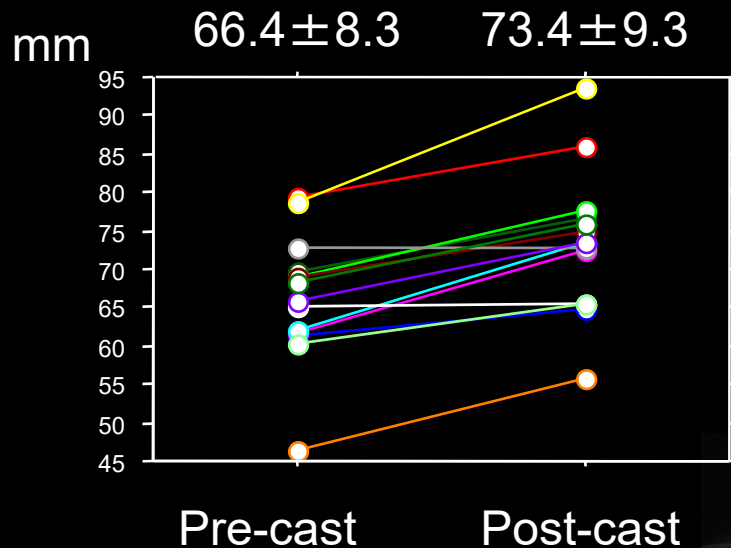


$P = 0.0052$

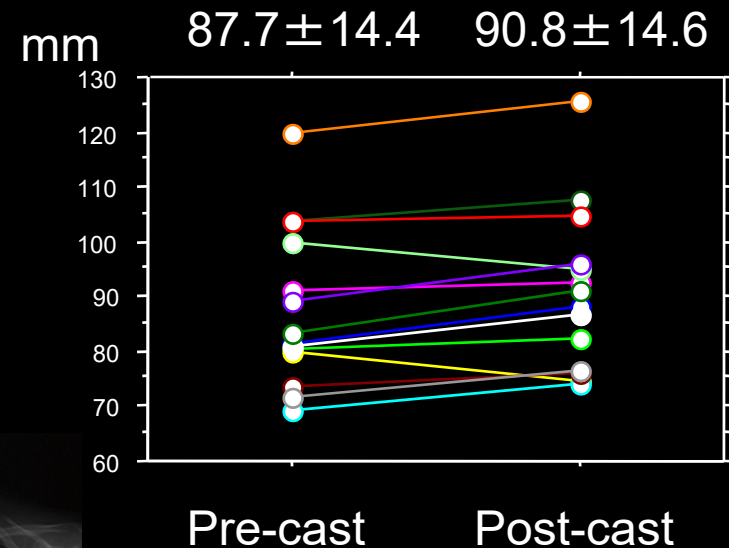
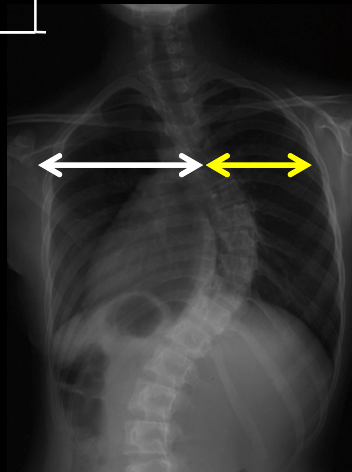
Morphology : Thoracic transverse diameter

Transverse diameter : convex

Transverse diameter : concave



$P < 0.0001$

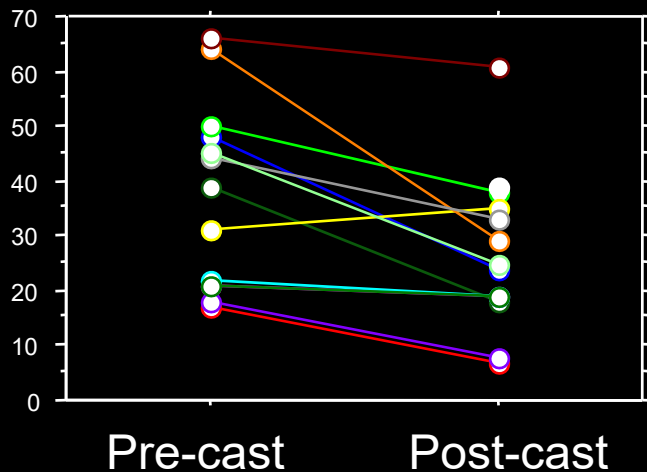


$P = 0.0128$

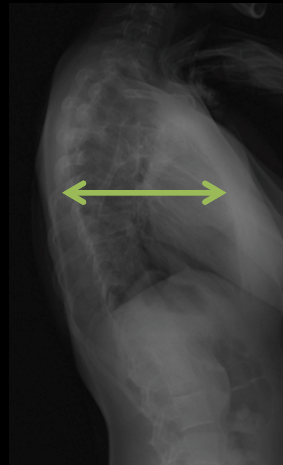
Morphology : Thoracic kyphosis , sagittal diameter

Thoracic kyphosis

degrees 37.4 ± 17.1 26.7 ± 14.1

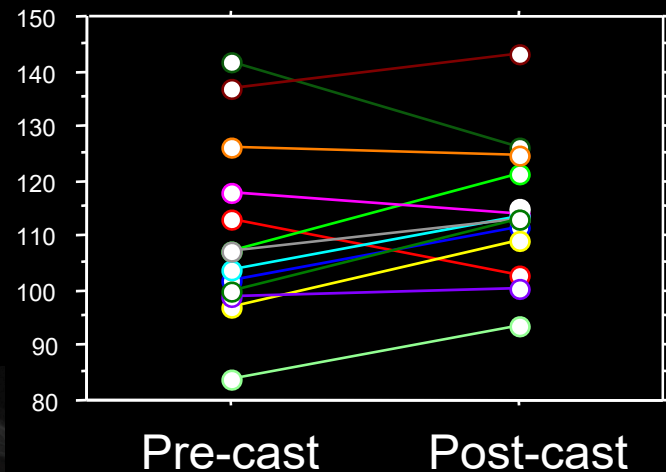


$P = 0.0023$



Sagittal diameter

mm 110.5 ± 16.5 114.5 ± 12.2



$P = 0.1516$

Discussion

1. Pre-cast SpO2 = Post-cast SpO2

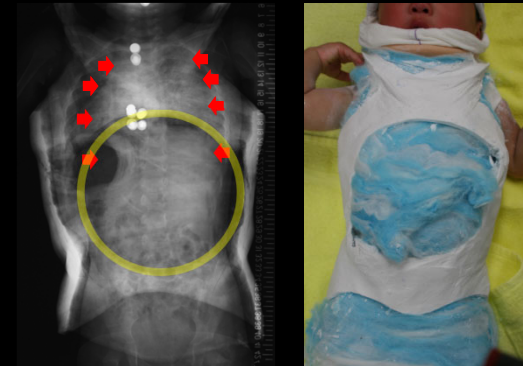
Pediatric breathing pattern

Newborn ~ infant : abdominal type

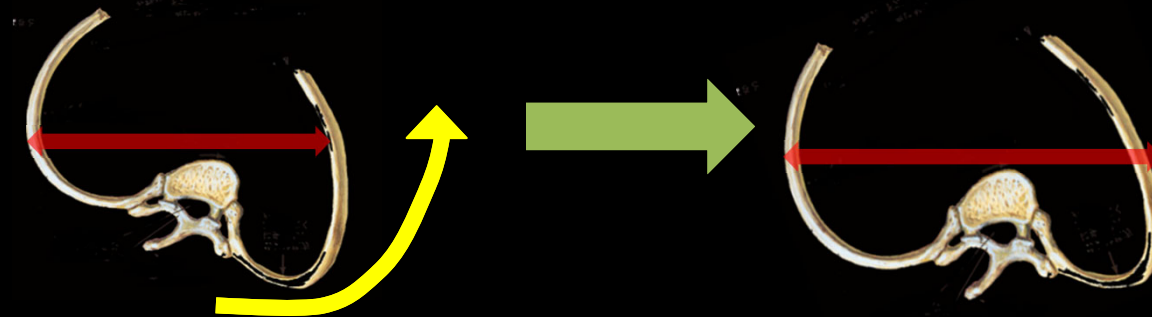
infant ~ 7.8 yo : mixed type

7.8 yo ~ thoracic type

→ Abdominal window save the breath



2. Pre-cast transverse diameter < Post-cast transverse diameter



Conclusion

Data obtained in this study did not exhibit a negative effect to pulmonary function and thoracic cage morphology at post treatment. This may have risen due to the correction of scoliosis via cast. Due to the limited number of patients, further research must be conducted with more patient data.

