

Does Casting Have Negative Implications on Pulmonary Function in Early Onset Scoliosis? Evaluation of Pulse Oximetry in Pre- and Post Casting



*Kazuki Kawakami, Toshiki Saito, Ryoji Tauchi,
Tetsuya Ohara, Noriaki Kawakami*

Meijo Hospital, Nagoya, Japan

Disclosure Statement

Kazuki Kawakami,
Noriaki Kawakami

- NPO Japan Spinal Deformity Institute (JSDI) (a, e)
- Medtronic (b)
- DepuySynthes (b)
- Kisco (b)
- EOS imaging (a)

Other co-authors

- None

- a. Grants/Research Support
- b. Consultant
- c. Stock/Shareholder
- d. Speakers' Bureau
- e. Other Financial Support

Background

Corrective cast and/or brace treatment may prevent growth of thoracic cage and respiratory function. Noble-Jamieson CM et al. 1986



Priftis KN et al. 2003

Sevastikoglou JA et al. 1976

Gaining popularity of Growth-sparing operation (raditional Growing Rods, VEPTR, MCGR, Shilla, Phenix, etc.)



Higher rate of perioperative complications, esp. for the very immature patients.



Bess S, B.A. Akbarnia et al. 2010

Return of the Cast for time saving

Sanders JO et al. 2009

Purpose

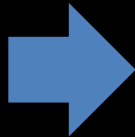
The purpose of this study was to investigate whether casting has negative implications on pulmonary function in patients with EOS.

Material and Methods

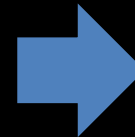
- 86 patients (53 pts received nonsurgical treatment, and 33 pts led to surgical treatment after attempts at non-surgical intervention)
- All pts treated (2010-2016 who had both casting and pulse-oximetry results were considered) F/U period : 3.8 ± 1.8 years
- Examination with Pulse Oximetry both at the night before casting and the night after casting during the evening when patient was asleep at night.
- Pulse Oximetry was used to measure SpO₂ and pulse at pre & post-casting during sleep using Pulse Oximeter (WristOx™)
- All Complete Pair (Pre- & Post- Casting) results were considered (Included 161 Paired Measurements)
- Pulse Oximetry Recordings < 4hrs due to technical errors or pts removing the monitor in their sleep have been removed from analysis.



Measurement of SpO₂



Application of Cast



Measurement of SpO₂

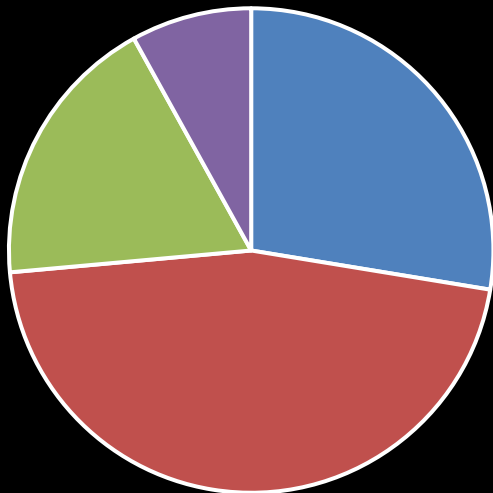
No form of any General Anesthesia was applied during the casting process

Demographic Data

	Pre CCT	Final FU before op. or last cast in non-op
Sex	M: 32, F: 54	
Age (yo.)	3.2 ± 1.9	6.8 ± 2.6
Height (cm)	84.3 ± 15.9	114.3 ± 16.3
BW (kg)	11.6 ± 3.4	20.5 ± 6.3
BMI	15.7 ± 1.8	15.4 ± 2.3

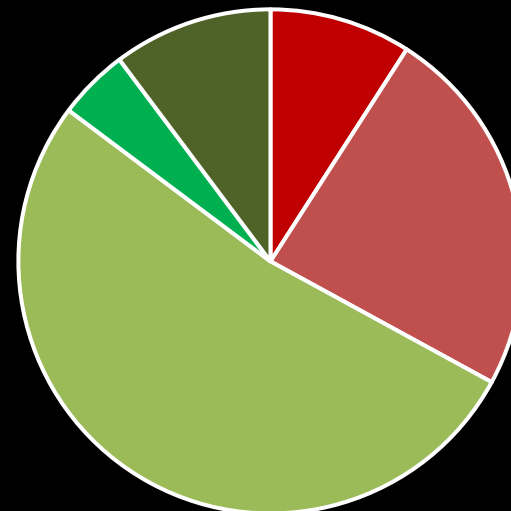
Total Casting Count Amongst all included pts: 659 times
Mean Total number of Casting per pt. 7.6 ± 4.7 (1~21) times

Diagnosis



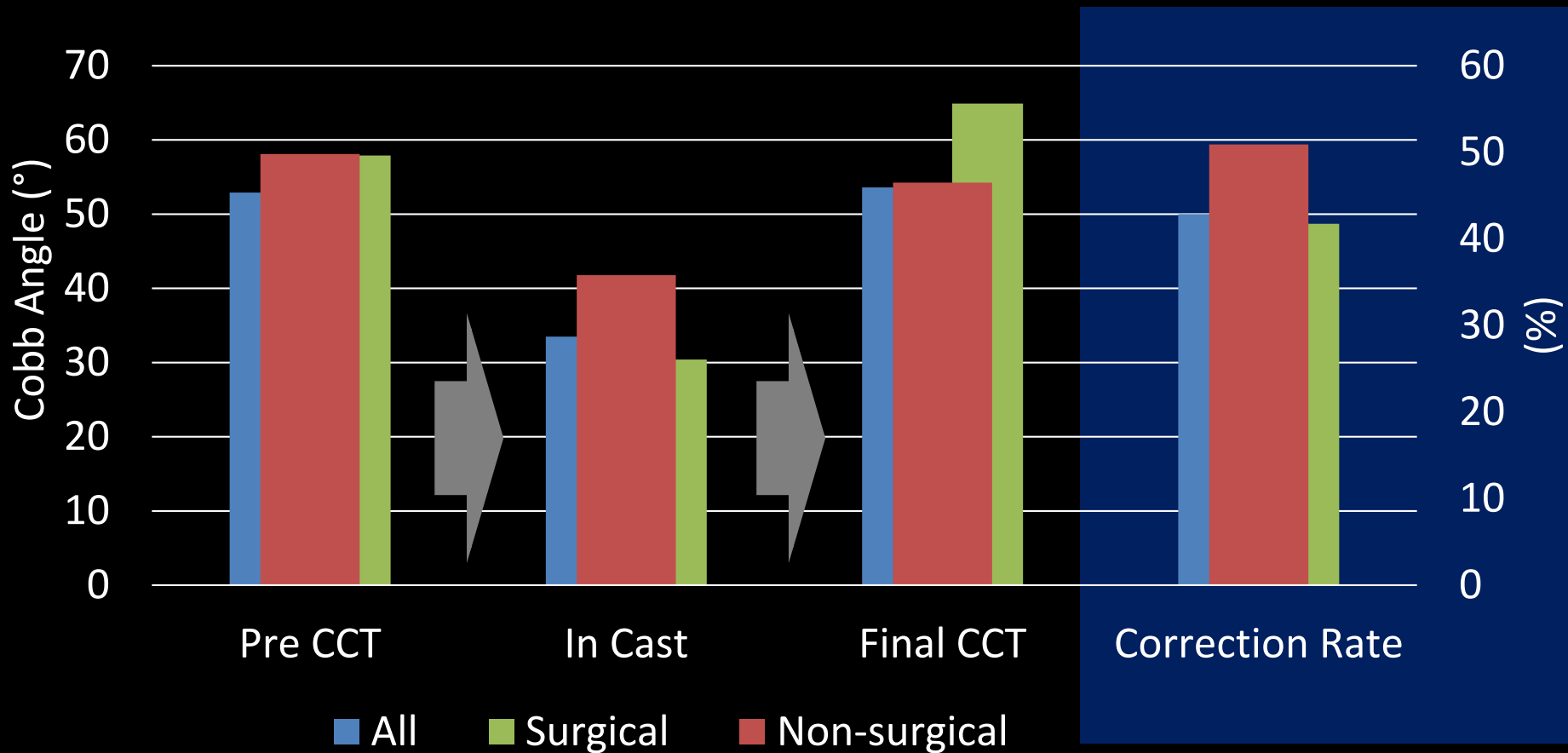
- Syndromic
- Congenital
- Idiopathic
- Neuromuscular

Location



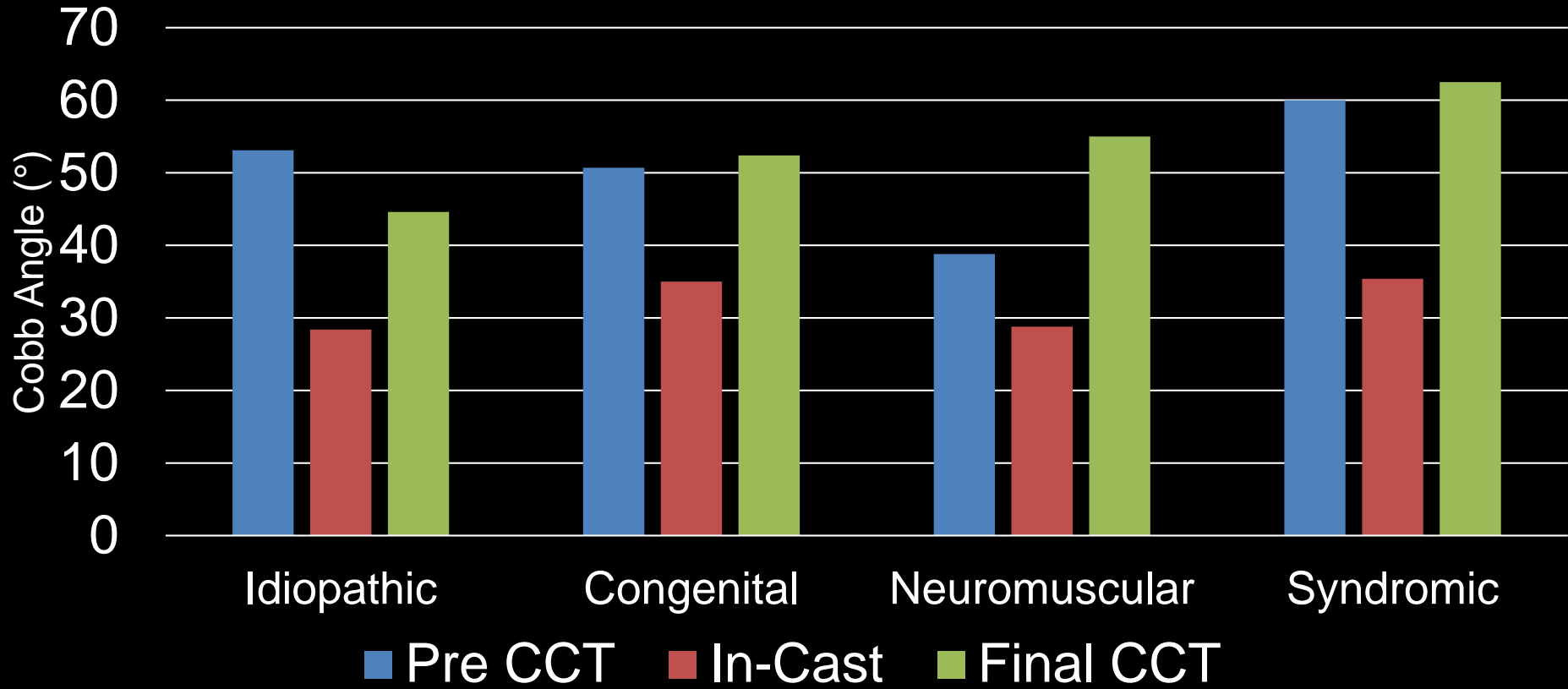
- Cervical-lumbar
- Thoracic
- Thoracic-lumbar
- Thoracic-sacrum
- Lumbar

Correction of Scoliosis in CCT



Groups	N	Age at Initial CCT	Age at Final CCT
Non-Surgical	53	2.9 ± 2.0	6.5 ± 2.7
Surgical	33	3.6 ± 1.9	7.2 ± 2.2
P Value		0.0241	0.1785

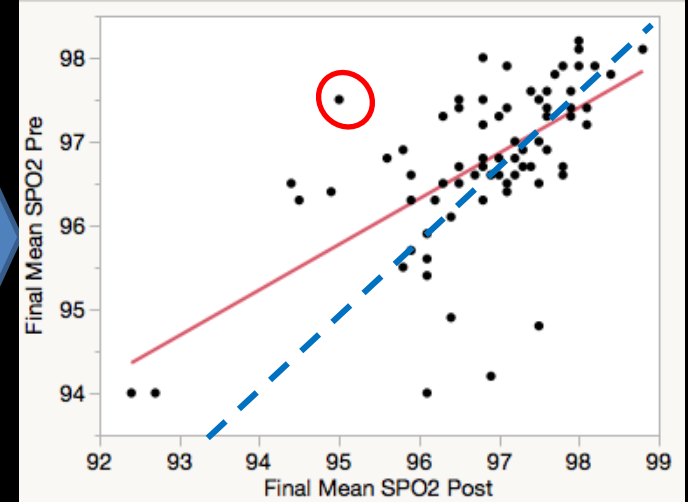
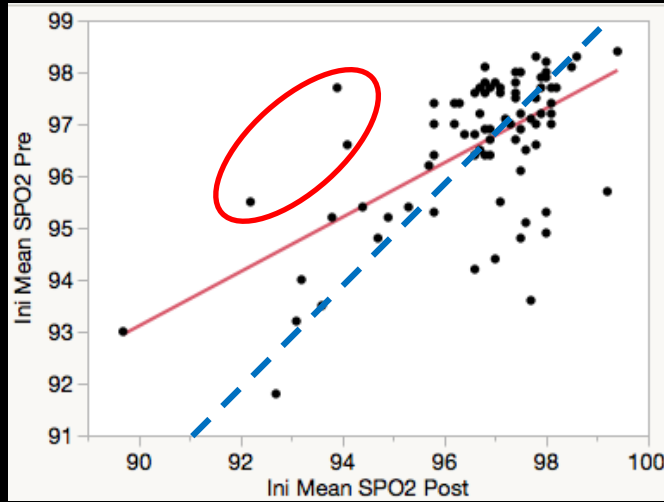
Comparison of Scoliosis by Etiology



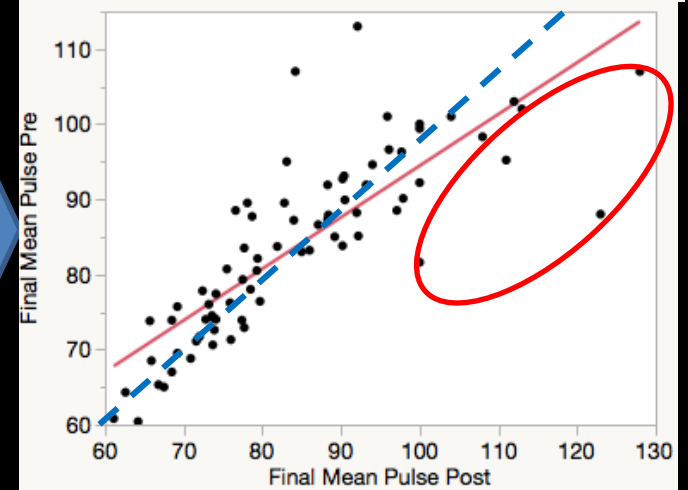
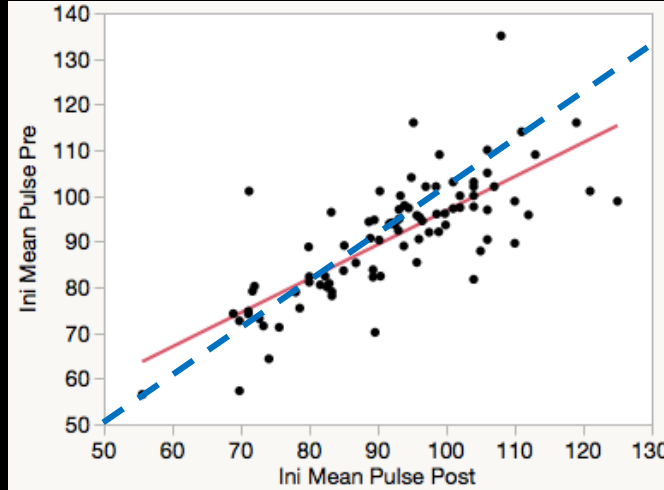
	Idiopathic	Congenital	Neuromuscular	Syndromic
N	17	41	5	23
Correction Rate	62.9 ± 12.3	42.1 ± 15.5	39.8 ± 20.3	59.2 ± 20.1
P value	<0.0001		0.0019	
	0.00362			

Correlation between Pre and Post Casting in SPO₂ & Pulse

SPO₂



Pulse

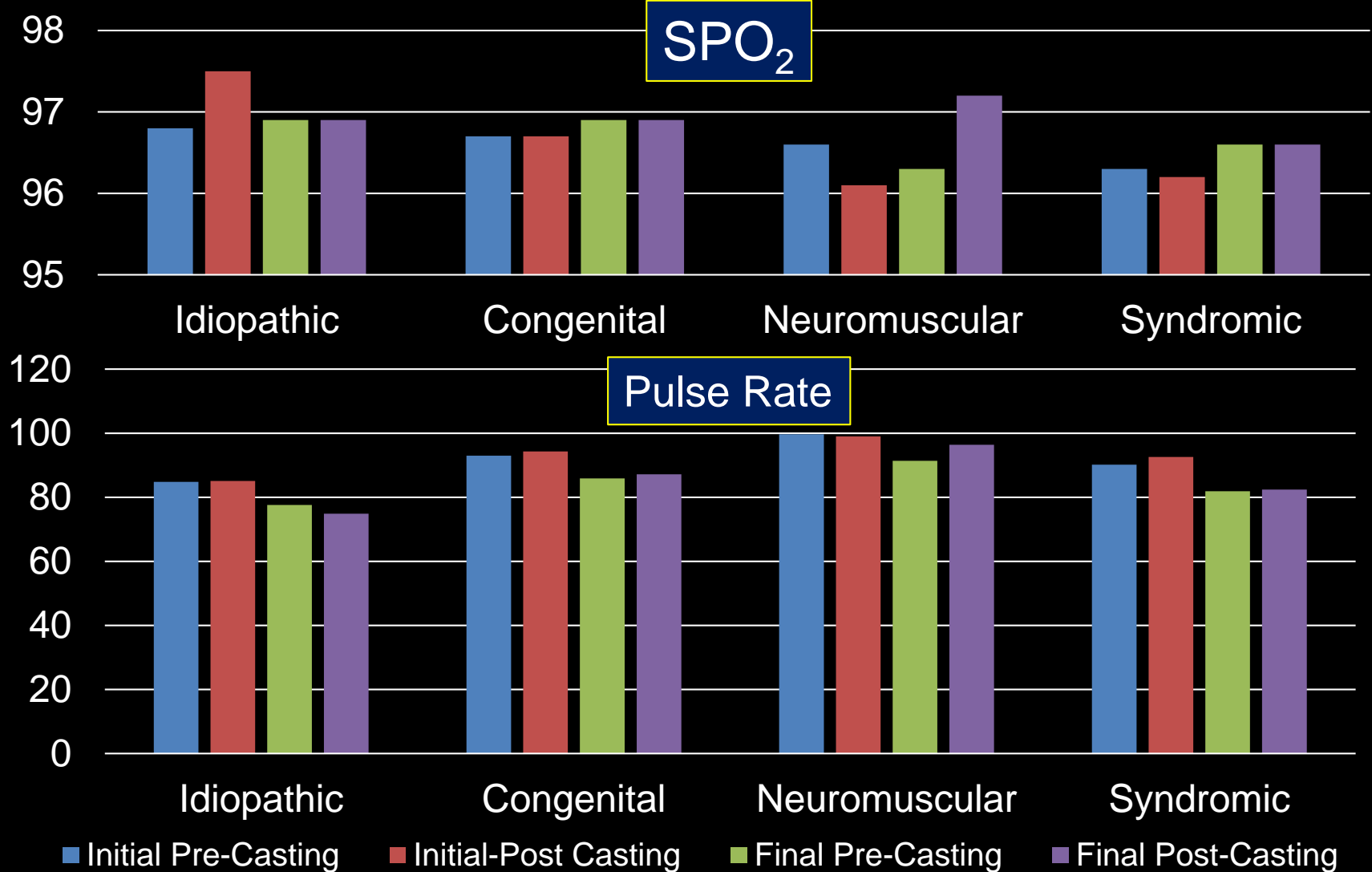


Initial Casting

Final Casting

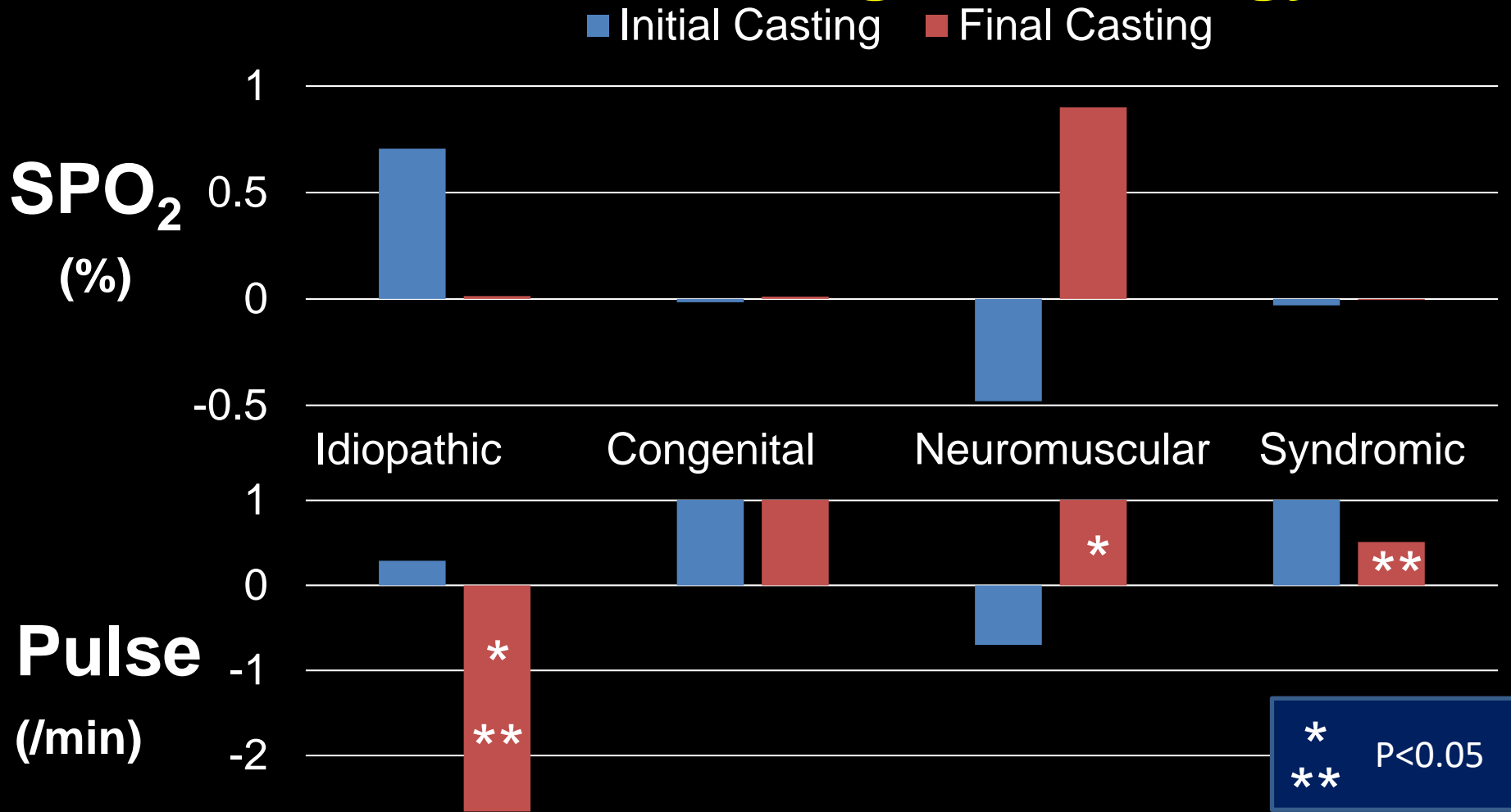
Dotted Blue Line Indicates Line of Change for each parameter. (E.g. Patients who had their values to the left of the dotted line indicates those that had lower SPO₂ post Casting.)
Few patients (indicated with red circles) have shown abnormal increase/decrease in Pulse Oximetry parameters with casting.

Differences of SPO₂ & Pulse Rate between Initial and Final Casting in Each Etiology



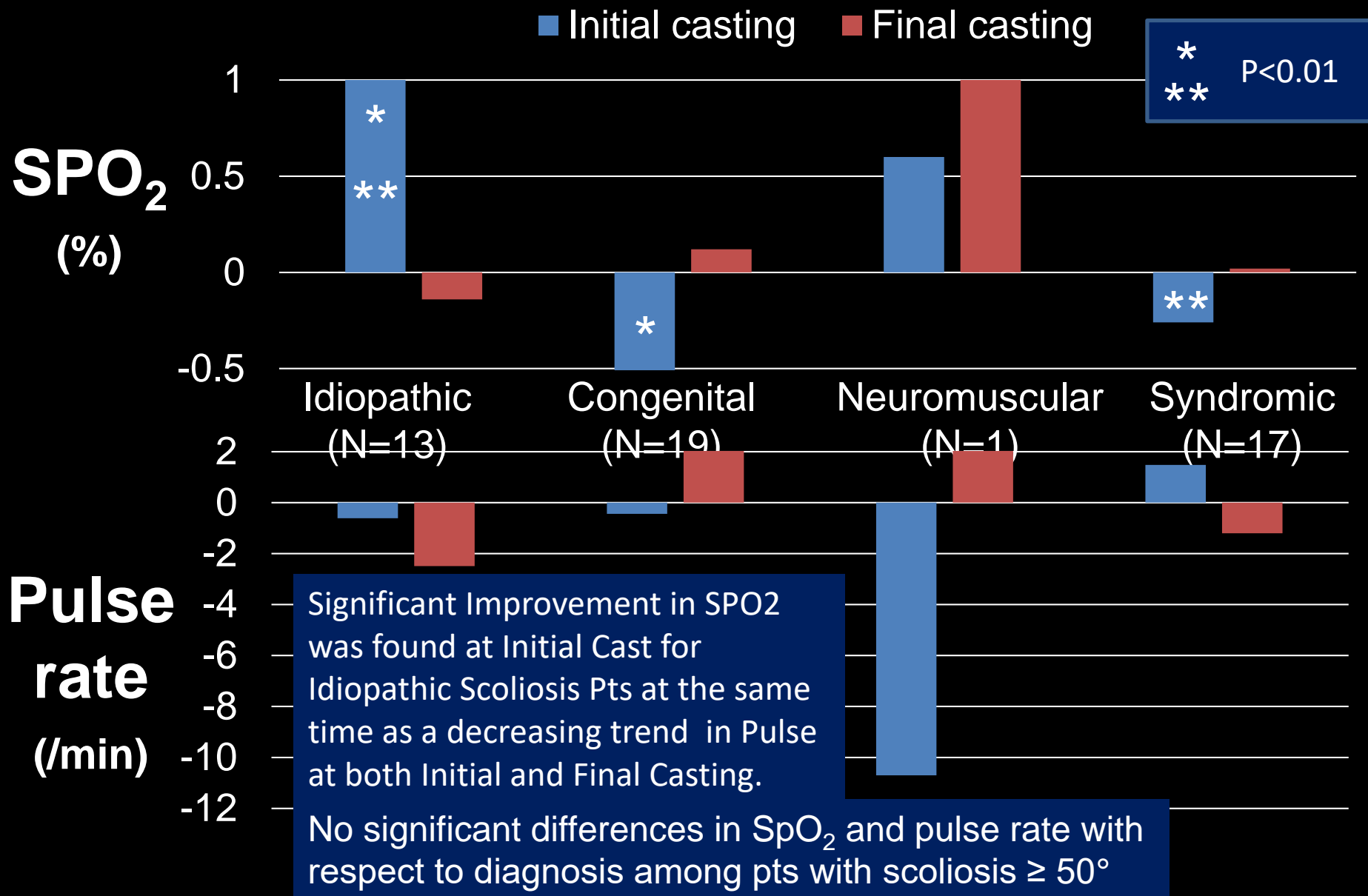
No significant differences in initial and final pre-cast SpO₂ or pulse rates amongst all types of scoliosis.

Differences of SpO_2 & Pulse Rate between Pre and Post Casting Per Etiology



While no significant differences in SpO_2 with respect to diagnosis among all pts, an increasing trend was seen in Idiopathic Pts. At the same time, a significant decrease in Pulse was seen in Idiopathic Pts.

Differences of SPO₂ & Pulse Rate in Patients with ≥ 50° Per Etiology



Conclusion

- Casting did not cause a clinically relevant reduction in pulse oximetry readings suggesting that its effect on cardiopulmonary function is limited.
- Casting had shown an significant or improving trend in cardiopulmonary function among pts with Idiopathic scoliosis.
- Nevertheless, casting may negatively affect SpO₂ or pulse rate in pts with greater scoliosis magnitude and with particular etiologies (such as Neuromuscular and Syndromic).
- Pulse oximetry results obtained for initial pre- and post-casting may be affected by emotional factors that the pts may feel during their first hospitalization that can negatively influence cardiopulmonary function (Increased Pulse Rate and Decrease SaO₂) that may not be present at further casting events.