

Use of Pleth Variability Index (PVI) to Detect Changes in Intrathoracic Pressure.
Goldstein M., Lopez M., Saesim D., Peverini R. *Proceedings of the 2007 Annual Meeting of the American Association for Respiratory Care.* A1287.

Introduction

Because PVI corresponds to the cyclic changes in the plethysmographic waveform, it can potentially be used to track change in the patient’s clinical condition. As PVI is influenced by changes in PI over time and is dependent on changes in the cardiopulmonary dynamic, trending of PVI may be important in patients with respiratory or cardiac failure, in evaluating the interrelationship between intrathoracic pressures and cardiac function. To study this effect, we examined a patient where an intended treatment could influence chest dynamics and thus PVI.

Case Summary

The patient was a 38 6/7 week gestation male infant with a known left congenital diaphragmatic hernia diagnosed via a 28 week ultrasound. The baby was delivered NSVD. Apgars were 6 at one, 6 at five, and eight at 10 minutes of age. The baby was intubated in the delivery room and placed on high frequency ventilation shortly after arrival to the NICU. The baby had a protracted hospital course complicated by severe persistent pulmonary hypertension. Surgery to correct the diaphragmatic defect was delayed for 5 weeks. Post-surgical management was significant for a pulmonary effusion requiring left chest tube placement. Despite conservative management, chest tube output increased to several hundred milliliters a day. A decision was made to tamponade the output and release the chest tube for a two minute interval every eight hours with the intention of using increased intrathoracic pressure to decrease the rate of effusion.

Discussion

During these procedures, the baby had standard monitoring equipment including a Masimo Radical-7 oximeter. To better understand, the effect of intrathoracic pressure/volume release on the PVI, we extracted trend data of numeric value for PVI at 0.5 Hz (TrendCom, Masimo, Irvine, CA). The PVI in the hour before the tap was compared to the hour after the tap. See table. Four taps were qualified. The “pre” and “post” epochs were analyzed using ANOVA (StatSoft, Inc. 2006 STATISTICA data analysis software system, version 7.1. www.statsoft.com). PVI was significantly increased in all “post” tap epochs ($p < 0.001$). An increase in the PVI dynamic could be correlated to the release of intrathoracic pressure. PVI may have significant value in the diagnosis and treatment of processes that produce increased intrathoracic pressure such as pneumothorax, chylothorax, and in this case pulmonary effusion.

Pre and Post Drainage PVI Values	
PRE	POST
17.6±3.0	21.8±2.9
25.2±7.4	33.8±12.8
17.6±5.0	20.0±7.0
19.9±10.1	25.1±5.5