

Assessment of ventilatory mechanics in respiratory muscle weakness using structured light plethysmography

James Stockley, Liam O'Reilly, Brendan Cooper

Rationale: Structured Light Plethysmography (SLP) allows for non-contact, non-volitional assessment of ventilatory mechanics. Respiratory muscle diseases are associated with impaired ventilation which, in early disease, may be undetectable by routine spirometry and muscle function. The usefulness of SLP as a diagnostic tool in respiratory muscle disease has yet to be investigated.

Methods: 25 patients with respiratory muscle disease were assessed in a seated and supine position using SLP (Pneumacare, UK). Outcomes included relative thoracic contribution (RTC), IE50 (ratio of inspiratory to expiratory flow at 50% tidal volume), Ti:Ttot (ratio of inspiratory time to tidal volume time) and Phase Angle, which assesses thoracoabdominal synchronicity (0° = fully synchronous, 180° = fully paradoxical). Results were compared to reference ranges from healthy individuals previously tested within our department.

Results: The signal during seated SLP was generally poor, resulting in indeterminable results in most cases. The signal when supine was superior and yielded results in all fields for all but 5 patients. When supine, Ti:Ttot was abnormal in only 1 patient and 1 other patient had an IE50 above the normal range. However, 7 patients exhibited abnormal RTC and 5 patients had an abnormally high Phase Angle.

Conclusions: Generally, work of breathing (Ti:Ttot) and airflow (IE50) was normal. However, SLP can detect thoracoabdominal asynchrony and altered thoracic effort in patients with respiratory muscle weakness when supine. Furthermore, SLP is simple and quick to set up and measure unlike other systems (e.g. magnetometry, optoelectronic plethysmography).