Novel thoraco-abdominal motion analysis technology can measure early respiratory changes following lung resection

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Introduction

Pulmonary complications (atelectasis, pneumonia) are common following lung resection and are a major cause of morbidity. Identifying complications early and 'at risk' patients may allow us to target more effective therapy. Thus we evaluated the viability of Thora3Di™ SLP, a novel non-contact portable device, to measure regional thoraco-abdominal movement before and immediately after lung resection.

Methods

SLP measures thoracic and abdominal motion using a grid of light which is simultaneously 'seen' by a digital vision system. Grid movement during breathing is analysed and displayed by the PneumaView™ 3D software in terms of regional thoraco-abdominal movement parameters as well as a 3D reconstruction.

Measurements of Relative Expired Contribution (%) of left and right thorax were recorded during 5 minutes of quiet breathing in the seated position, before and up to 4 days post operatively.

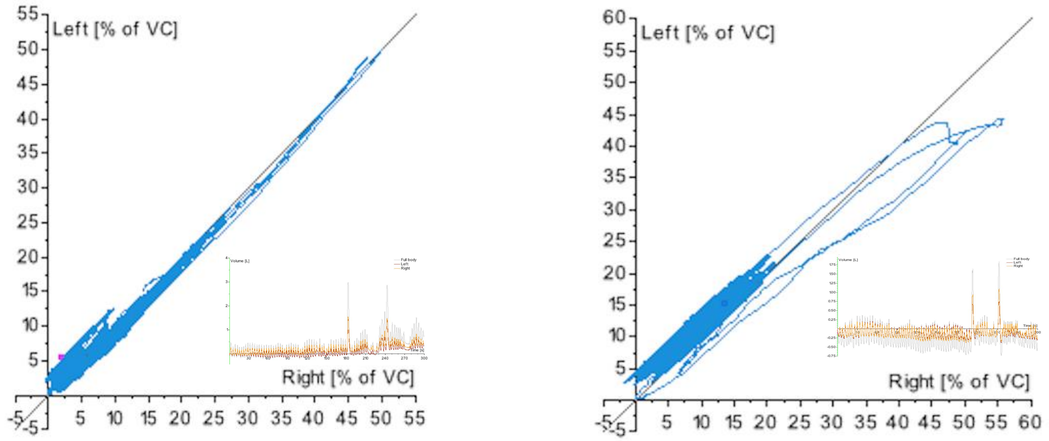

Figure 1: These figures illustrate the percentage contribution of right versus left chest wall motion to overall chest motion before (left) and one day after left VATS lung resection (right).

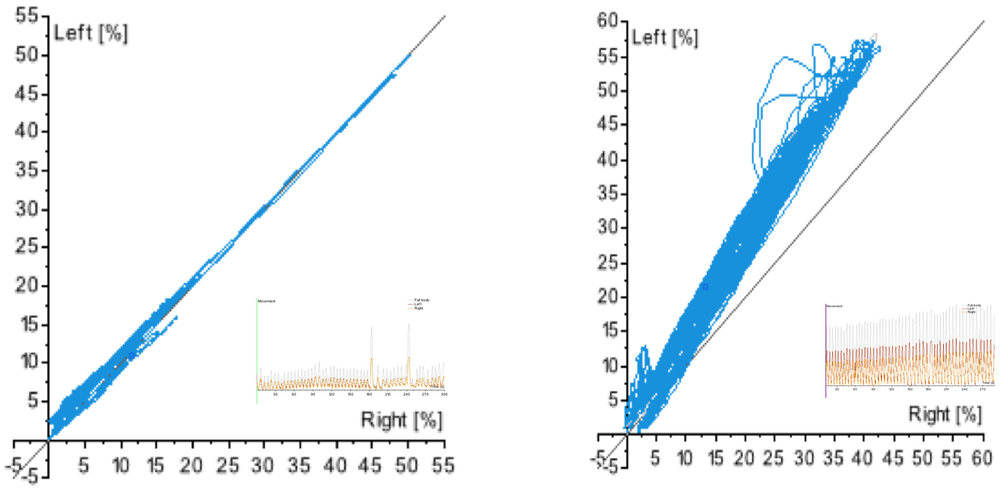

Figure 2: These figures illustrate the % Relative Expired Contribution of right versus left chest wall motion compared to overall chest motion before (left) and one day after right thoracotomy lung resection (right).

Results

9 male patients with a mean age of 72 (range from 63 to 82) years, who underwent lung resection either via VATS (video assisted thoracic surgery) (n:4) or Thoracotomy (n:5) were recruited.

96% of all planned measurements could be performed, all without complications or discomfort to patients.

SLP detected a significant reduction in Relative Expired Contribution (%) to overall ventilation on the operated side in all patients one day after surgery compared to pre-operative values (7±5.4% p<0.001)

This impairment was more marked following Thoracotomy (9±-5%.p<0.001) than VATS (4.5±4.6% p<0.001).

The impairment did not significantly improve prior to hospital discharge.

Conclusions

SLP is a feasible, acceptable safe technique that can detect immediate regional changes in ventilation following lung resection and it can differentiate types of surgery.

Further studies are required to determine usefulness of measures.