Diagnosing Post-operative Pulmonary Complications (PPC) via Its effect of Chest Wall Mechanics

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Rationale:

Post-operative pulmonary complications (PPC) are the major causes of death following lung resection. Early detection is fundamental in treating PPC. PPC leads to a decrease in the lung compliance and expansion. Our hypothesis is that these changes will be detected by chest wall motion technology. We aim to correlate recovery and complications with chest motion.

Methods

We used Structured Light Plethysmography to measure chest wall motion of 3 patients with post-operative pulmonary complication (PPC group) and 8 controls (CG). The SLP measurements were made before surgery and every day after surgery until discharge date.

Results

On day 1 after surgery there was a significant difference in % change (compared to the value before surgery) in the level of synchronization between the rib cage and the abdomen in the CG and the PPC group 28 +/- 39 % and 90 +/- 99% respectively $p < 0.05$. (Table 1). None of the patients were clinically diagnosed with pneumonia in the 1st post-operative day. PPC score was not diagnostic of PPC in the 1st post-operative day. PPC score was diagnostic of PPC only on day 2 after surgery.

Conclusion

Our data showed how a SLP could detect signs of PPC in the first post- operative day by analysing chest wall motion before the clinical diagnosis (or PPC scoring system diagnosis) of PPC could be made.

% Change from Before Surgery	Day 1 After Surgery				
	C		PG		
	MEAN	SD	Mean	SD	P
Borg score	2	3	1	2	0.309
Pain score	1	1	1	1	0.279
O2	-1	2	-3	5	0.466
FEV1 Litre	-53	26	-60	3	0.356
FEV1 %	170	558	-58	4	0.208
FVC Litre	-49	29	-61	6	0.397
FVC %	-39	17	-60	6	0.387
Number of drains	1	0	1	1	0.074
CXR Atelectasis/consolidation	0	0	1	1	0.000
White Blood Count > 11.2 or Antibiotics	0	0	1	1	0.072
Temperature >38	0	0	0	0	
Positive sputum in microbiology	0	0	0	0	
O2 saturation of <90% Room air	0	0	0	1	0.012
Clinical Diagnosis of pneumonia	0	0	0	0	
Readmission to ITU	0	0	0	1	0.012
Productive caught	0	0	0	1	0.130
PPC score	0	1	2	1	0.001
Respiratory Rate	11	26	12	44	0.498
Inspiratory time	-6	14	1	38	0.139
Expiratory time	-4	28	28	80	0.056
Total time of respiratory cycle	-6	20	17	63	0.061
Overall Chest Wall Motion	3	10	11	18	0.074
Motion of operated side	-17	20	-17	6	0.351
Synchronization between the rib cage and abdomen (Respiratory cycle)	28	39	90	99	0.029
Synchronization between the rib cage and abdomen (Inspiratory phase)	2	148	402	516	0.007
Synchronization between the rib cage and abdomen (expiratory phase)	34	205	-348	137	0.021
Time to reach maximum expiratory flow	15	46	-4	5	0.215
Time to reach maximum inspiratory flow	-1	3	5	3	0.003

Table 1: Changes in respiratory parameters day 1 after surgery.