

# High Frequency Chest Wall Oscillation and Intrapulmonary Percussive Ventilation. Case Report



G. Ottonello, A Franceschi, R. Casciaro\*, A. De Alessandri\*, M. Haupt\*, M. Caso\*, E. Lampugnani, L. Minicucci\*, P Tuo. Pediatric Intensive Care; \*Pediatric Clinic University of Genoa. G Gaslini Institute, Genova, Italy.  
[giancarloottonello@ospedale-gaslini.ge.it](mailto:giancarloottonello@ospedale-gaslini.ge.it)

Intrapulmonary percussive ventilation (IPV) is a delivers air and aerosol to the lungs at frequencies of 200 to 300 cycles per minute at peak pressures from 20 to 40cmH<sub>2</sub>O. Breaths are delivered using a mouthpiece or a mask, and the lungs percussed for 5- to 15-second intervals over a 15- to 30-minute period. Proposed mechanisms of action include enhanced alveolar recruitment and mucociliary clearance through bronchodilation from a combination of bronchodilatory medication, and improved lung inflation.

High Frequency chest wall oscillation (HFCWO) was administered with a nonstretch, vinyl-coated polyester inflatable vest, which was worn over the entire thorax as shown in figure. The vest was closed at the front with 3 buckles and fit snugly. Two ports, located on the front panels of the vest, were connected to the air-pulse generator via 2 large-bore tubes. The air-pulse generator consisted of an air blower that delivered air pressure to the inflatable vest and a rotary valve that produced alternating positive and zero pressures. Oscillation frequencies of 10 and 15 Hz were selected because these 2 frequencies were previously identified to generate peak airflow during spontaneous breathing for subjects with CF.

## Case Report



A 4 years old girl patient (82 cm Height; 6,2 Kg Weight) affected by a malformative syndrome (Seckel-like) with growth delay, presented several episodes of bronchopneumonia since birth.

After two severe episodes of respiratory distress a CT scan revealed "near complete opacity of the left lung with homolateral mediastinal shift associated to bronchiectasis, Normal right lung

Left pulmonary resection was suggested by pulmonologist and thoracic surgeon to avoid risks of right lung infection.

A rescue treatment was started with Intrapulmonary Percussive Ventilation (IPV) and High Frequency Chest Wall Oscillation and Compression (HFCWC)

IPV (Pegaso, Dime Italy ®)  
 (60 Hz;  
 I/E=1.5:1;  
 Pressures  
 28cmH<sub>2</sub>O)



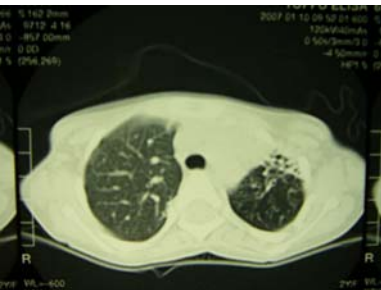
HFCWO (The Vest ® Hill Rom) (Pressure 4; Frequency 12 Hz)



Fiberoptic Bronchoscopy with lung lavage with natural surfactant

Lung Lavage with Surfactant:  
 Volume: 5 ml/Kg  
 Concentration: 10 mg/ml  
 Rotating position

## Results



3 days later. Partial ventilation of the upper segments of the upper lobe of the left lung

30 days later: X rays and Thorax CT evidenced a near complete lung expansion

Initial weight gain (1,5 Kg in 5 months)

## Conclusions

HFCWO is associated with improvements in ventilation distribution. IPV is effective in preventing and treating atelectasis/microatelectasis even in non collaborative patients because it provides assistance in mobilizing secretions. IPV applies positive pressure and does not require generation of an inspiratory force to prevent atelectasis. HFCWO, IPV and lung lavage with natural surfactant allowed in our described patient the savage of an atelectasis, thickened lung, scheduled for pulmonary resection

**References:** 1) CC Reardon, D Christiansen; ED Barnett; HJ. Cabral. Intrapulmonary Percussive Ventilation vs Incentive Spirometry for Children With Neuromuscular Disease. Arch Pediatr Adolesc Med. 2005;159:526-531  
 2) JC Darbee, JF Kanga, PJ Ohtake Physiologic Evidence for High-Frequency Chest Wall Oscillation and Positive Expiratory Pressure Breathing in Hospitalized Subjects With Cystic Fibrosis Physical Therapy , 85, 12. 2005

