

4-12-2010

Do High Frequency Oscillation Vests Reduce Vital Capacity in Normal Subjects?

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DO HIGH FREQUENCY OSCILLATION VESTS REDUCE VITAL CAPACITY IN NORMAL SUBJECTS?

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Background: High frequency oscillation vests are an important therapy in numerous disease states. The therapy vests physically compress and shake the chest serving to loosen and mobilize pulmonary secretions. Aerosolized medications are frequently delivered concurrently with vest therapy. Patients receiving aerosolized medications are instructed to breathe deeply. However, the design and operation of the vest may affect a patient's ability to do so. It is our hypothesis that a healthy person's vital capacity (VC) will decrease with the use of these vests at medium and high pressure and frequency settings.

Method: Our study used four subjects with healthy lungs. We obtained a baseline slow VC using a Medical Graphics Corporation 1085/D Spirometer calibrated following American Thoracic Society guidelines and using BreezeSuite 6.2 software, these measurements served as our control. Participants were then fitted with the Vest[®] Airway Clearance System: Model number 104 and slow VC measurements were repeated. We performed measurements at medium settings of 15 Hz, 6 or 60% pressure and high settings of 20 Hz and 9 or 90% pressure. Subjects wore a thin single layer of cotton clothing and were sitting throughout testing. This process was then repeated using the inCourage™ RespirTech Model number ICS-IM-US. Manufactures specific full vests, tubing, and connections were used and fitted according to manufacturer's instruction for both the inCourage™ and the Vest[®] Airway Clearance Systems. Results: See Table 1

		Subject One		Subject Two		Subject Three		Subject Four	
	Baseline VC	3.98 L	96%*	4.52 L	108%	4.54 L	110%	5.39L	105%
The Vest [®] Airway Clearance System	Frequency 15Hz Pressure 6	VC ↓ 140cc	92%	VC ↓ 210 cc	103%	VC ↓ 810 cc	91%	VC ↓ 510 cc	95%
	Frequency 20Hz Pressure 9	VC ↓ 170 cc	91%	VC ↓ 210 cc	103%	VC ↓ 890 cc	89%	VC ↓ 620 cc	93%
RespirTech inCourage™	Frequency 15Hz Pressure 60%	VC↓ 110 cc	93%	VC ↓ 50 cc	107%	VC ↓ 780 cc	92%	VC ↓ 350 cc	98%
	Frequency 20Hz Pressure 90%	VC ↓ 240 cc	90%	VC ↓ 260 cc	102%	VC ↓ 1380 cc	77%	VC ↓ 460 cc	96%
*All percentages are % of predicted Vital Capacity									

Conclusion: The VC of all subjects was lower when wearing the high frequency oscillation devices. The VC of subject three was significantly reduced. In most cases the high pressure settings resulted in the lowest VC measurements. VC reductions ranged from 50cc's to 1380 cc's. We were unable to easily explain the large reduction in VC for subject 3, as vest fit was correct and similar to other subjects and four VC measurements demonstrated reproducibility. These reductions may be clinically significant. Further testing is required to fully realize the impact of combining high frequency chest oscillation vests with nebulized medication therapy.