

RESPIRATORY CARE

The Science Journal of the American Association for Respiratory Care

2006 OPEN FORUM Abstracts

SPECIAL CONCERNS RELATING TO THE ADMINISTRATION OF AEROSOLS

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Background: Over the past few months there has been growing doubt among some members of our team that an aerosol treatment can be effectively delivered when passed through a humidifier. We decided to perform an experiment to determine what effect nebulizer placement within the ventilator circuit has upon aerosol deposition.

Methods: We fabricated a test lung of rubber that would be strong enough to simulate a mechanically ventilated lung and yet light enough to allow us to accurately weigh and calculate the deposition of our bronchodilator. The experiment began by running the ventilator through a ten minute treatment cycle using an empty nebulizer which was delivering 8 liters per minute of flow. This gave us a baseline weight for the water that would be delivered to the patient during the treatment period. In order to obtain an average, we did the experiment a total of 3 times with the nebulizer at the wye, and three times with the nebulizer inline behind the humidifier. The water was collected in test lung via a standard 4.0 micron filter connected in line at the circuit wye, and was determined by weighing the filter and balloon both before and after the test. Albuterol was then added to the nebulizers at standard concentration of 0.5 mg/3ml. The test lung and filter was again weighed after 10 minutes and the expected water subtracted to reveal the amount of albuterol delivered. This was performed 3 times at the wye, and 3 times behind the humidifier. Ventilator settings were as follows: CMV, tidal volume 500 ml, peep 10 cmH₂O, rate 10 bpm, flow 30 lpm.

Results:

Test #1: Baseline water collected during treatment cycle. Nebulizer at wye.

Init.Wt. filter	Init. Wt. lung	Final Wt. lung	Final Wt. filter	Water collected
3.11g	29.44g	3.24g	29.64g	0.33g
3.24g	29.31g	3.38g	29.90g	0.43g
3.43g	29.70g	3.45g	30.05g	0.37g