

# **SONARMED AIRWAVE ABILITY TO MONITOR ENDOTRACHEAL TUBE DISPLACEMENT WHEN USED DURING AIRWAY PRESSURE RELEASE VENTILATION**

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**BACKGROUND:** The SonarMed Airwave (SonarMed Inc, Indianapolis IN) is a relatively new device that uses acoustic reflectometry to monitor displacement of an endotracheal tube (ETT). Previous bench studies have shown the success of the device when using conventional modes of ventilation; however there has been little research on how well the device works using unconventional modes of ventilation such as Airway Pressure Release Ventilation (APRV). The purpose of this bench study was to determine if given the ventilatory pattern seen in APRV with brief release times, the Airwave could accurately detect ETT displacement. **METHOD:** The Airwave was tested on an adult circuit attached to a Drager V500 ventilator. This was attached to a number eight endotracheal tube (ETT) placed in a simulated airway made of Polyvinyl chloride. The simulated airway was then attached to a test lung. The initial ventilator settings were APRV: P-High 25, P-Low 0, Time-High 4.3 seconds and starting with a Time-low (T-Low) of 0.7 seconds. The ETT was positioned at 24 cm and subsequently zeroed. The ETT was pulled out 1 cm at a time from 24-21 cm and then pulled out completely then advanced 1 cm at a time from 24-27 cm. This method was then repeated using a T-low setting of 0.6 and 0.5 seconds. The measurements the monitor read were documented after each movement and the device calibrated after each trial. **RESULTS:** The data table reflects that at each T-Low setting the device was able to detect that the tube was being withdrawn and advanced each centimeter. When the ETT was advanced to 3 cm, the end of the tube hit the small orifice of the test lung, which prompted the device to read “ETT too Low”, “Small Passageway” and alarmed appropriately. **CONCLUSION:** The SonarMed Airwave was able to detect movement of the ETT very precisely and alarmed appropriately even when there was only a brief interruption period of 0.5 seconds. Utilization of this device could be extremely useful in determining airway displacement even during the presence of a nonconventional type of ventilation such as APRV.

Time Low Setting (T-Low)	Reading after 1 cm withdrawal	Reading after 2 cm withdrawal	Reading after 3 cm withdrawal	Reading after 1 cm advanced	Reading after 2 cm advanced	Reading after 3 cm advanced
0.7 sec	1 cm	2 cm	2.8-3 cm	0.9 cm	1.9 cm	“Small Passageway”
0.6 sec	1 cm	1.9-2 cm	2.8-2.9 cm	0.9 cm	1.8-1.9 cm	“Small Passageway”
0.5 sec	1-1.1 cm	2 cm	2.8-2.9 cm	1-1.1 cm	1.8-1.9 cm	“Small Passageway”