

ULTRASOUND EVALUATION OF THE MAGNITUDE OF PNEUMOTHORAX: A NEW CONCEPT

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(Sponsored by: Dulchavsky, S.A.)

Pneumothorax is commonly seen in trauma patients; the diagnosis is usually confirmed by radiography. Use of ultrasound for this purpose, in environments such as space flight and remote terrestrial areas where radiographic capabilities are absent, is being investigated by NASA. In this study, the ability of ultrasound to assess the magnitude of pneumothorax in a porcine model was evaluated.

Sonography was performed on anesthetized pigs (avg. wt. 50 kg) in both ground-based laboratory (n = 5) and microgravity conditions (0 g) aboard the KC-135 aircraft during parabolic flight (n = 4). Aliquots of air (50-100cc) were introduced into the chest through a catheter to simulate pneumothorax. Results were video-recorded and digitized for later interpretation by radiologists.

Several distinct sonographic patterns of partial lung sliding were noted, including the combination of a sliding zone with a still zone, and a "segmented" sliding zone. These "partial lung sliding" patterns exclude massive pneumothorax manifested by a complete separation of the lung from the parietal pleura. In 0 g, the sonographic picture was more diverse; 1 g differences between posterior and anterior aspects were diminished.

CONCLUSIONS: Modest pneumothorax can be inferred by the ultrasound sign of "partial lung sliding". This finding, which increases the negative predictive value of thoracic ultrasound, may be attributed to intermittent pleural contact, small air spaces, or alterations in pleural lubricant. Further studies of these phenomena are warranted.