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MEETING ABSTRACT

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A wearable microwave detector for diagnosing thoracic injuries-test on a porcine pneumothorax model

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Background

In the prehospital setting, a point-of-care diagnostic test is needed to diagnose pneumothorax (PTX) and monitor its progression to prevent unnecessary patient morbidity and mortality. Ultrasonography is more sensitive than supine chest x-ray for diagnosing PTX, but the accuracy depends on the experience of the operator. Therefore, a non-operator dependent instrument would be valuable for detection and continuous monitoring of an evolving PTX.

Study objective

To evaluate the potential of a new microwave technology for diagnosing PTX.

Methods

An experimental PTX model was set up in two anesthetized pigs. A belt with eight microwave antennas was strapped around the pig's chest. Air was insufflated into a catheter in the right pleural space in twelve incremental steps (PTX volumes: 50, 100, 150, 200, 250, 300, 400, 500, 750, 1000, 1500, 2000 mL). Each injection was followed by a measurement with the microwave detector. A computer-based classification algorithm was used to distinguish between the measurements using a leave-one-out approach (i.e. the sample to be classified was not included in the training data matrix), where each PTX volume was treated as an individual class.

Results

The microwave belt was able to differentiate between normal lungs and PTX in both animals with an overall diagnostic accuracy of 100 % (i.e. a sensitivity and specificity of 100%). Furthermore, the classification accuracy for predicting the size of PTX was 100% and 98% for each pig, respectively.

Conclusion

The microwave technology proved promising in diagnosing and predicting size of PTX ranging from 50 mL to 2000 mL. This within-model experiment only differentiated PTX and normal lungs in individual pigs and not between different animals. A larger validation study needs to be done to further evaluate the diagnostic accuracy of the microwave detector.

Institution

This preliminary study was conducted at Sandnes Education and Research Center Høyland (SEARCH), Sandnes, Norway.

Conflict of interest

The authors state no conflicts of interest.

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