Vibration Response Imaging (VRI™) Technology In Patients With Pulmonary Congestion Due To Heart Failure

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Background: The main methods used to assess patients with congestive heart failure (CHF) include clinical history, physical examination, lung function, thoracic ultrasound (US), electrocardiogram (ECG), echocardiogram and chest X-Ray (CXR). As fluid retention and increase of regional lung water volume are frequently observed in acute CHF, clinical methods that assess temporal changes in pulmonary vascular engorgement and interstitial and alveolar edema are highly desirable. The Vibration Response Imaging (VRI™) technology, which provides a dynamic lung image and quantitative lung function data, was tested as a potential diagnostic/monitoring tool for CHF.

Objective: Evaluation of VRI™ technology as a complementary tool in patients before and during treatment of acute CHF in comparison to standard methods for detection of pulmonary congestion.

Methods: 23 patients with CHF, (5 females, median age73.0 years) performed up to 4 VRI™ technology recordings during treatment with diuretics and until hospital discharge. In addition patients were assessed by standard methods. Results of the VRI™ technology were assessed both qualitatively and quantitatively (relative regional assessment (RRA)).

Results: On admission, areas of reduced ventilation in the recordings of VRI™ technology corresponded with pleural congestion on the CXR or US. Following treatment, either deterioration or improvement was presented qualitatively and quantitatively by the VRI™ technology in correspondence with part of or all standard methods. For example, when an improvement was observed, images by the VRI™ technology demonstrated an increase in vibration energy signals in areas that were previously poorly ventilated.

Conclusions: Regional changes within the lungs were observed by the VRI™ technology during treatment of CHF. Thus, the VRI™ technology has the potential as a complementary diagnostic/monitoring tool for CHF with the advantage of being both non-invasive and radiation-free. Further studies are required to define the role of the VRI™ technology for the detection and follow-up of pulmonary congestion during treatment of CHF.