

## **VIBRATION RESPONSE IMAGING (VRI\*) – A NEW MODALITY BASED ON VIBRATION TECHNIQUES**

**Meir Botbol and Igal Kushnir, MD  
Deep Breeze Ltd, Or Akiva, Israel.**

### **BACKGROUND:**

Lung imaging modalities have 3 major drawbacks: radiation risk, a still snapshot rather than a dynamic image of respiration cycle, and an image that is anatomical rather than functional. The VRI is a new radiation free imaging technique, which may fill these gaps and contribute to diagnosis of lung diseases. Goal: To describe VRI technology.

### **DESCRIPTION:**

The VRI system is a software-oriented device; hardware is composed of a planar matrix of 40 sensors which are attached to the back by vacuum and a multi-channel a/d that converts the signals during tidal breathing to digital data. Noise reduction procedures clean background noise and heart beats. The VRI algorithm selects those bands which carry the essential information required to assemble a lung image. The thorax is a complex mechanical structure, which vibrates in response to the air flow circulating along the bronchial segments. Based on samples provided by the planar matrix, vibration field values of any coordinates on the back are obtained by a diffusion equation. This algorithm is repeated for frames of 0.17 seconds duration. Changes in tissue composition or alteration of airflow impact the vibration field, leading to modifications in one of more characteristics of the VRI image: intensity, distribution, or dynamics/symmetry.

### **SUBJECTS:**

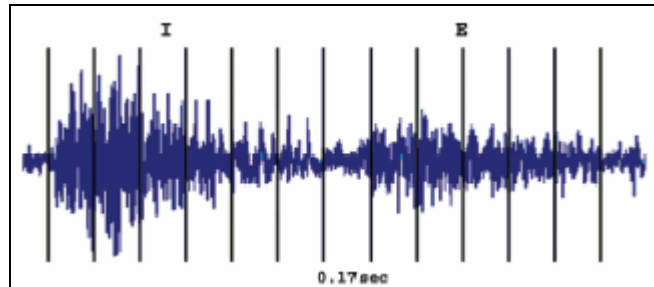
Healthy adults and patients with lung abnormalities.

### **RESULTS:**

Normal image: As inspiration starts, intensity and spatial distribution of the image increase, almost symmetrically, first in the upper zones. During expiration in which the intensity is lower, the image fades gradually towards the center. Disease states: Lung tumors affect the intensity and distribution. Airway and parenchymal diseases affect the time sequence and symmetry.

A vibration  
signal recorded by 1/40  
sensors.

I=Inspiration Phase,  
E=Expiration Phase



**CONCLUSION:**

The VRI provides a dynamic lung image that differs significantly between healthy and diseased lungs. Vibration Response Imaging may provide an accurate, noninvasive, radiation-free method for evaluating lung condition.

<http://www.abstracts2view.com/ats05/>