Canadian Innovations in Imaging Technologies and Devices:

Electrical Imaging

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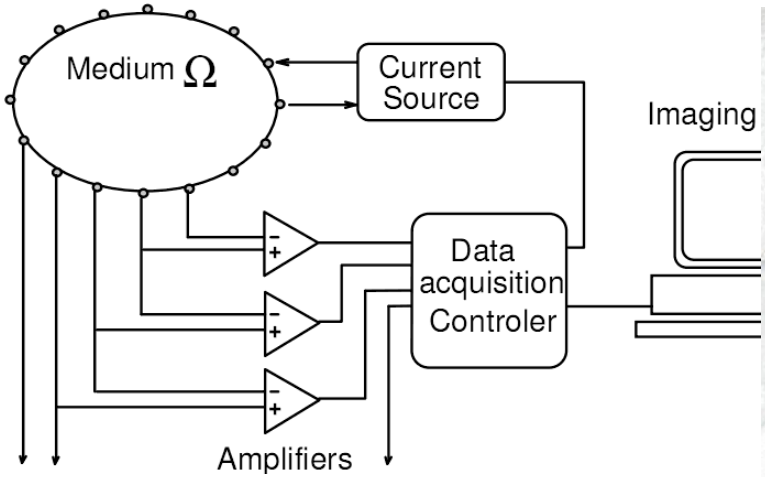
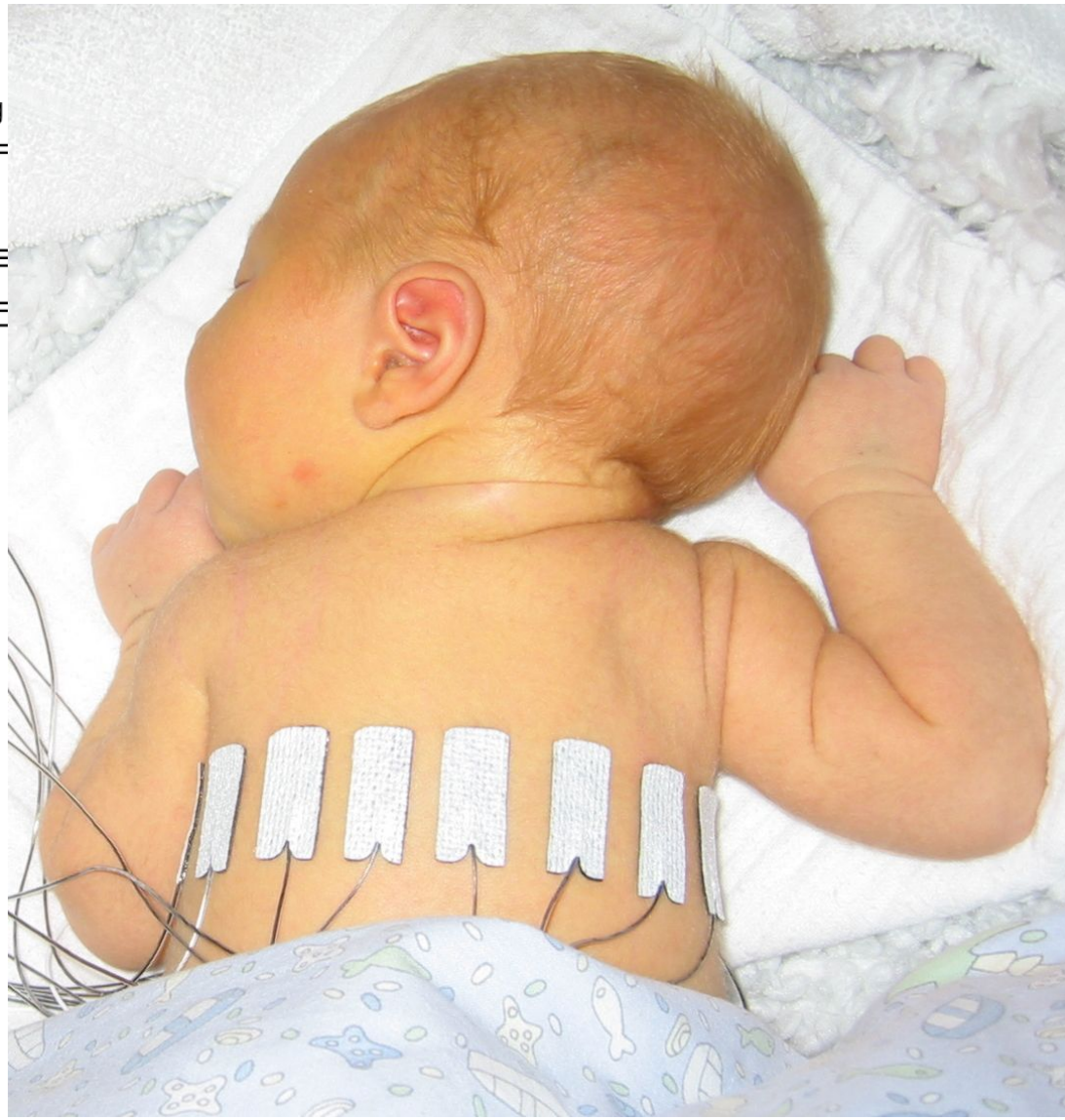
Canadian Innovations in Imaging Technologies . . .

Electrical Imaging

- ECG Imaging – Cardiac mapping
  - Calgary, Halifax, Montréal, Ottawa, Québec Toronto
- Electrical Impedance Tomography
  - Montréal, Ottawa, Winnipeg

Electrical Imaging – Electrical Impedance Tomography

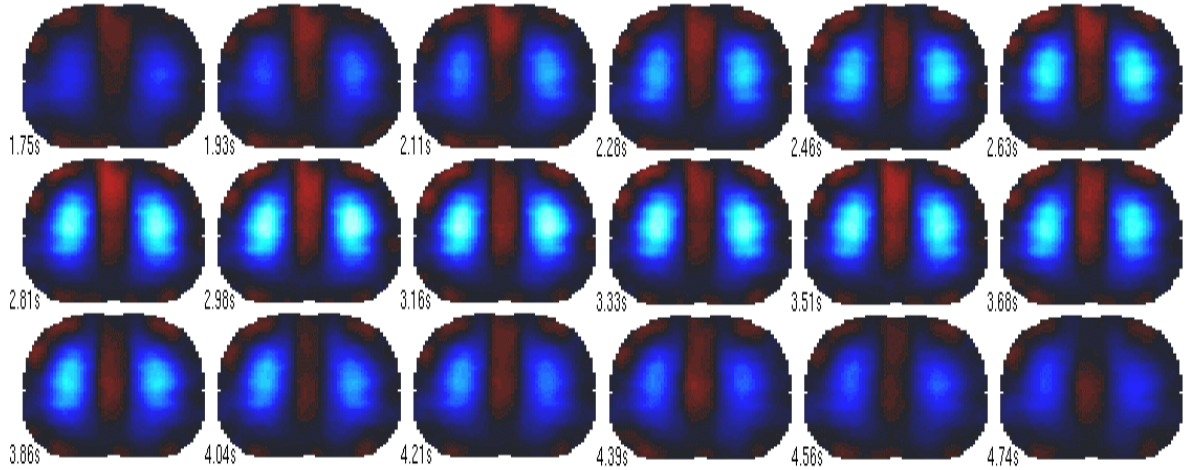




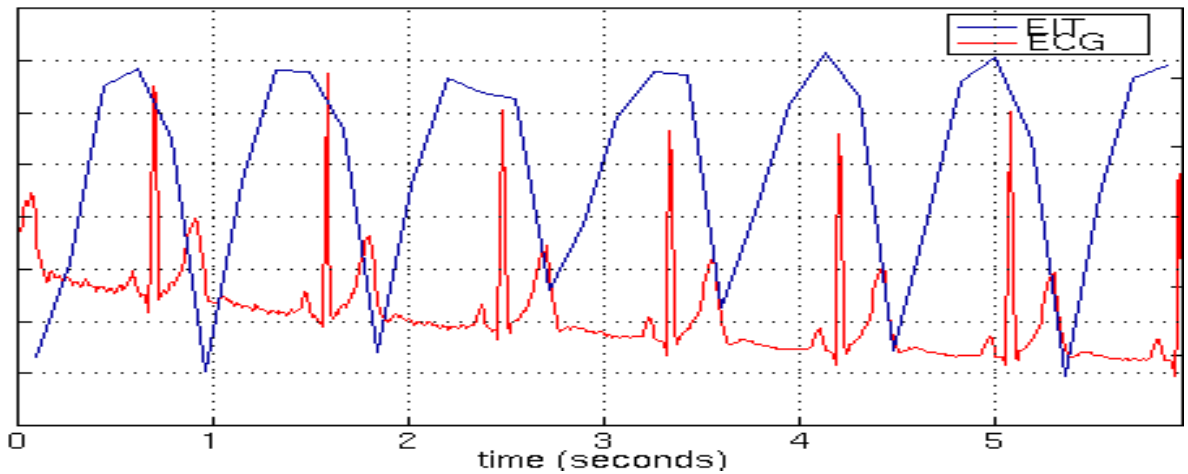
10-day old healthy baby with EIT electrodes

Source:
eidors3d.sf.net/data_contrib
/if-neonate-spontaneous

EIT images movement of air and blood



Chest images of tidal breathing in healthy adult

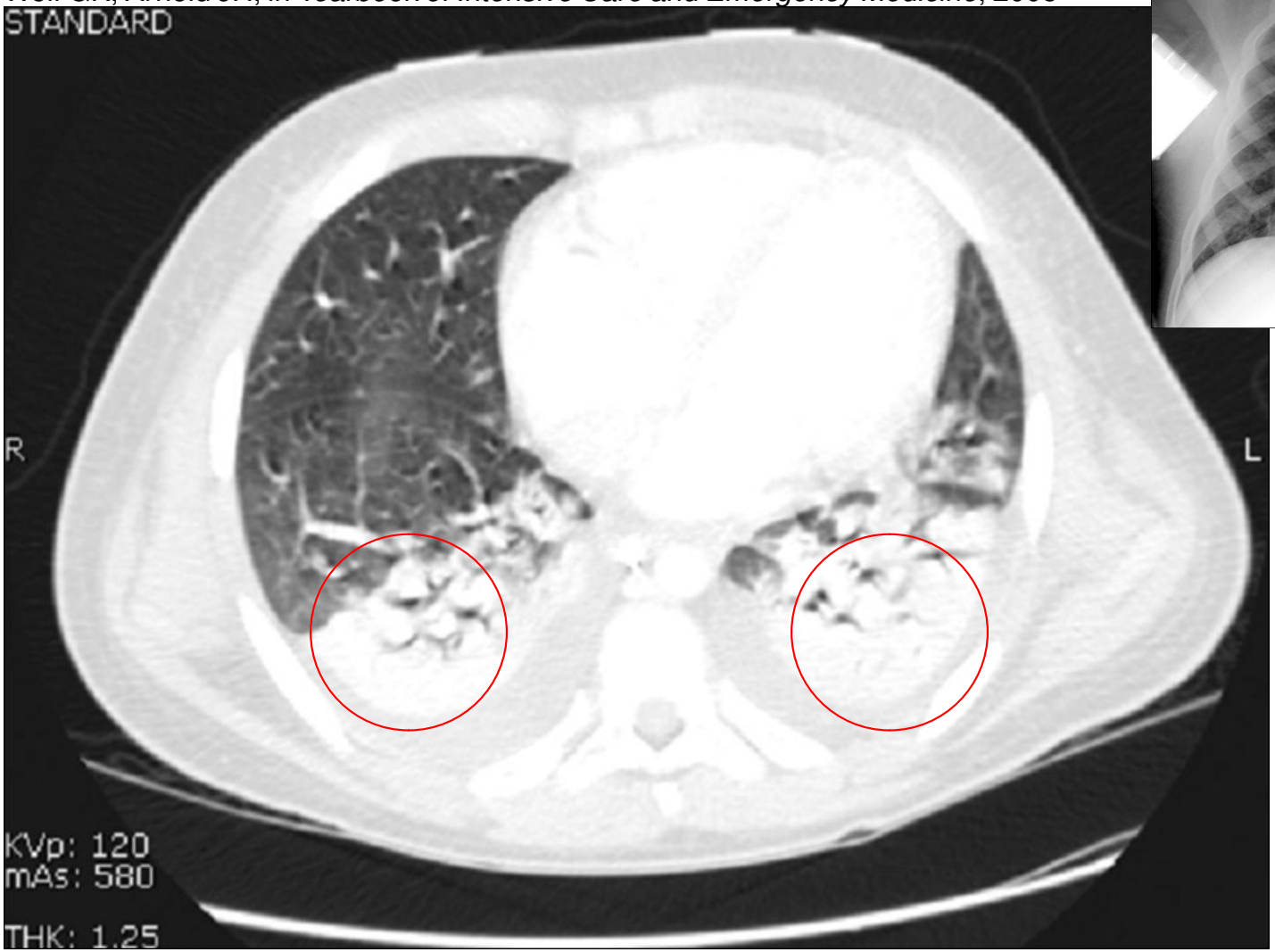


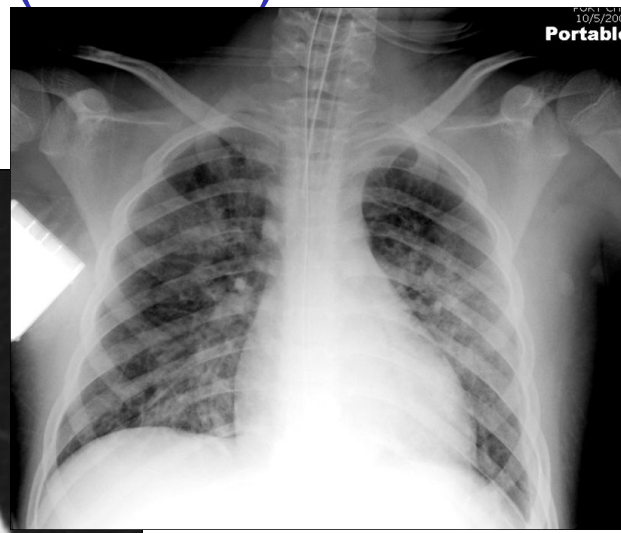
EIT Signal in ROI around heart (and ECG)

Acute Respiratory Distress Syndrome (ARDS)

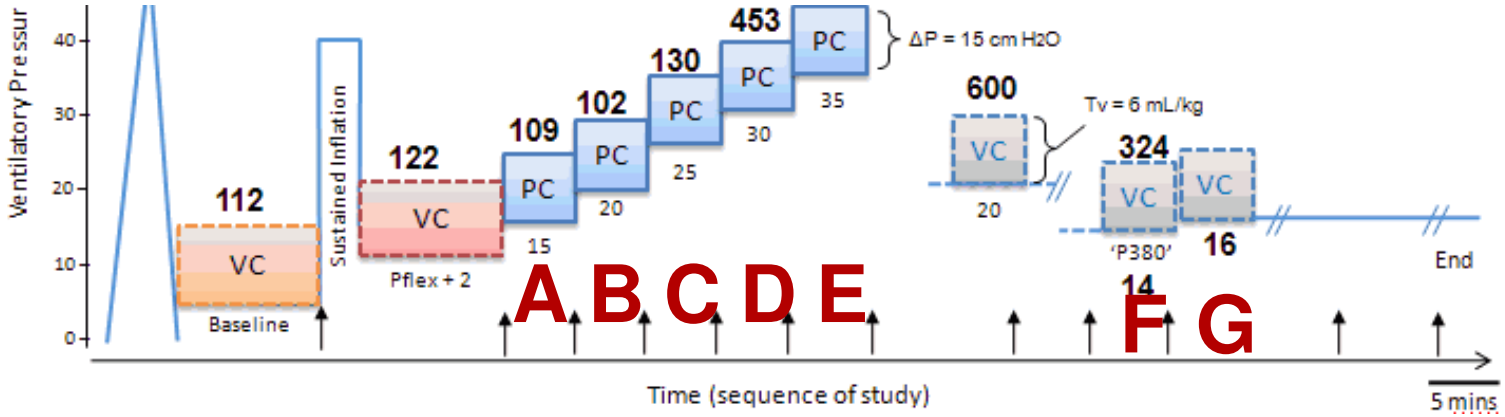
Chest X-ray of paediatric patient

Source:
Wolf GK, Arnold JH, in *Yearbook of Intensive Care and Emergency Medicine*, 2005

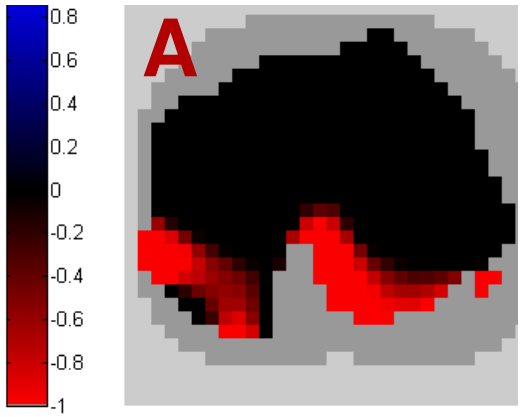




EIT + Lung State



Overdistension



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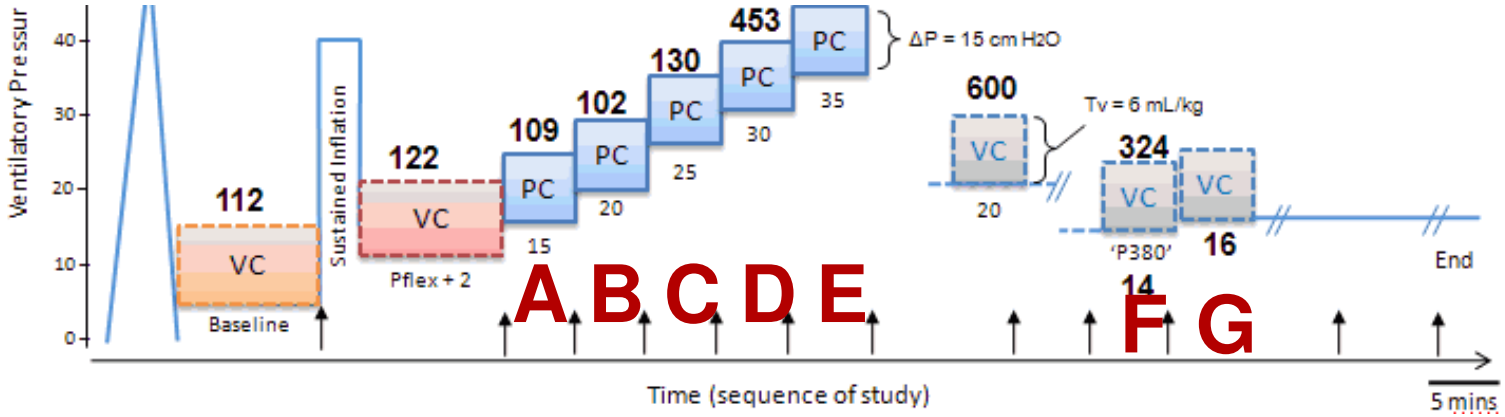
EIT + Lung State



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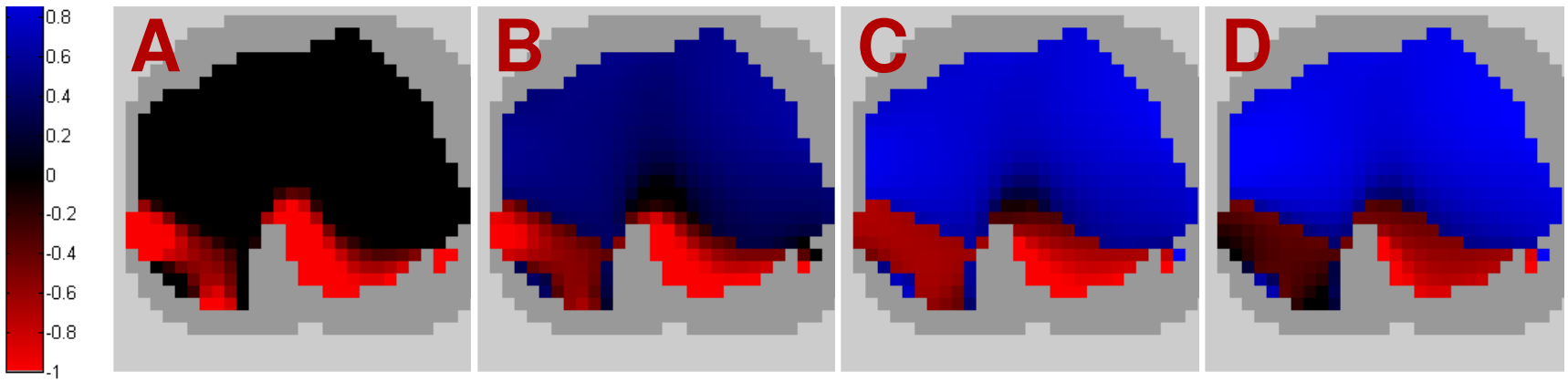

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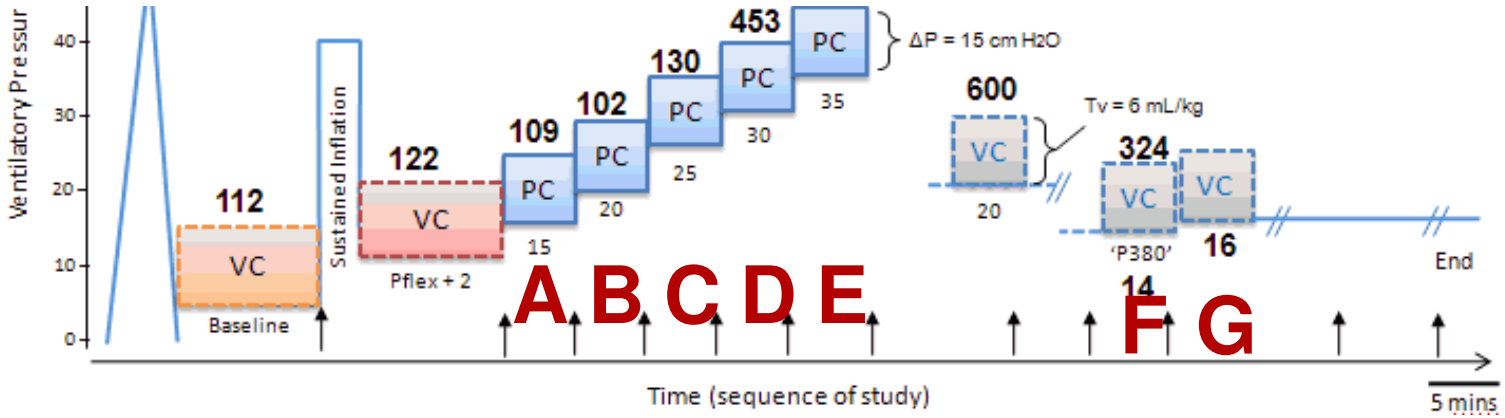

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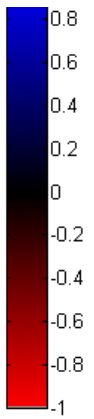

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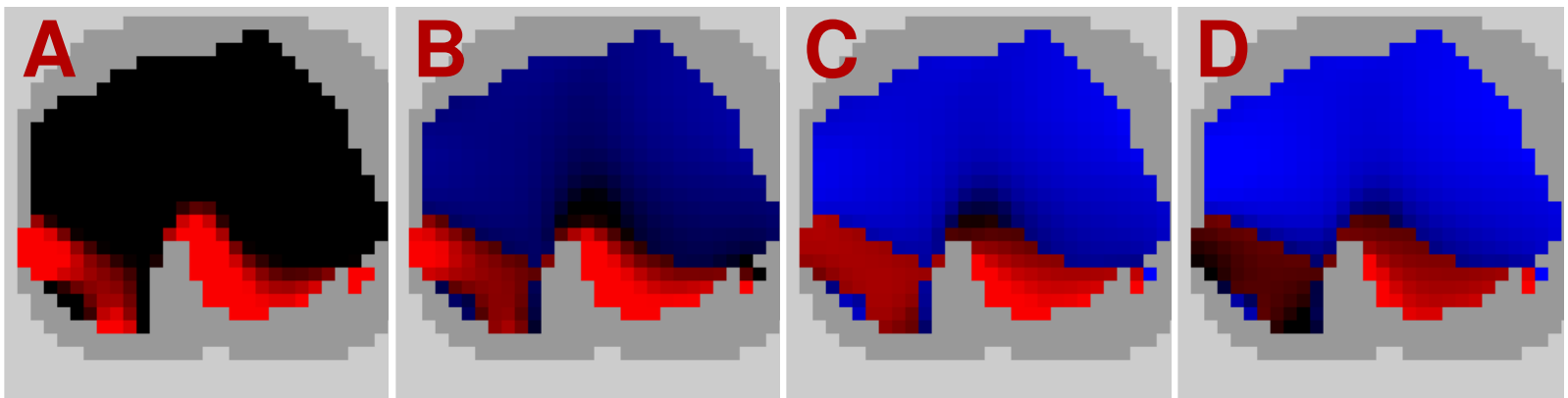
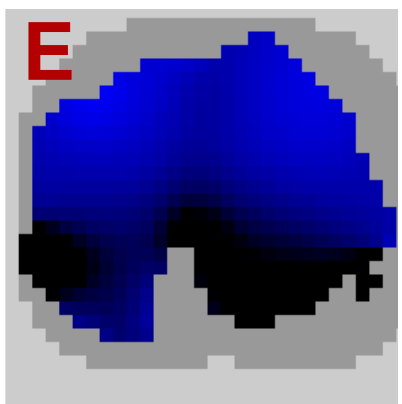
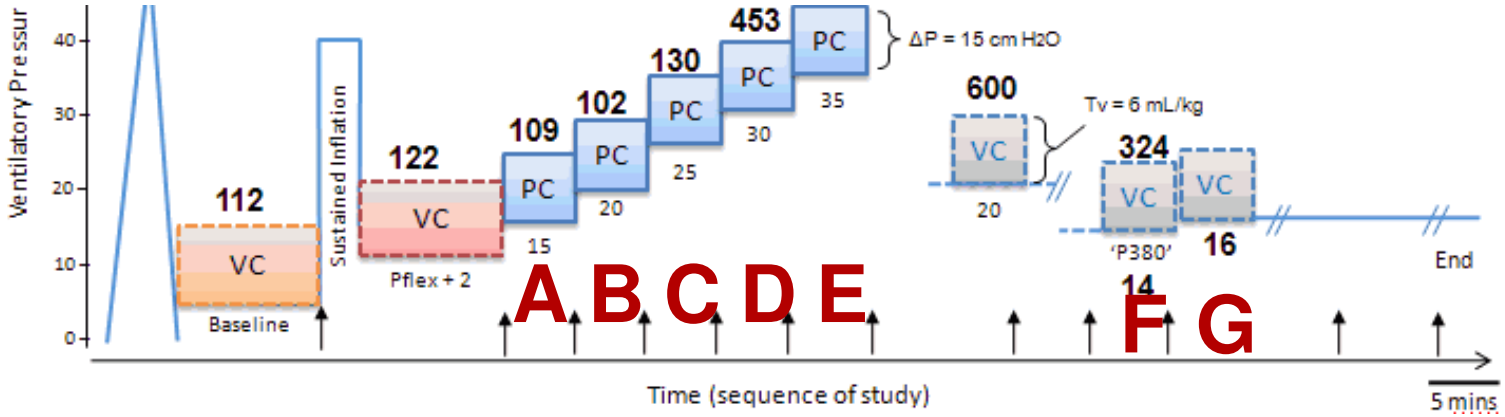




EIT + Lung State



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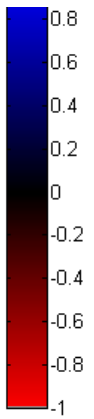

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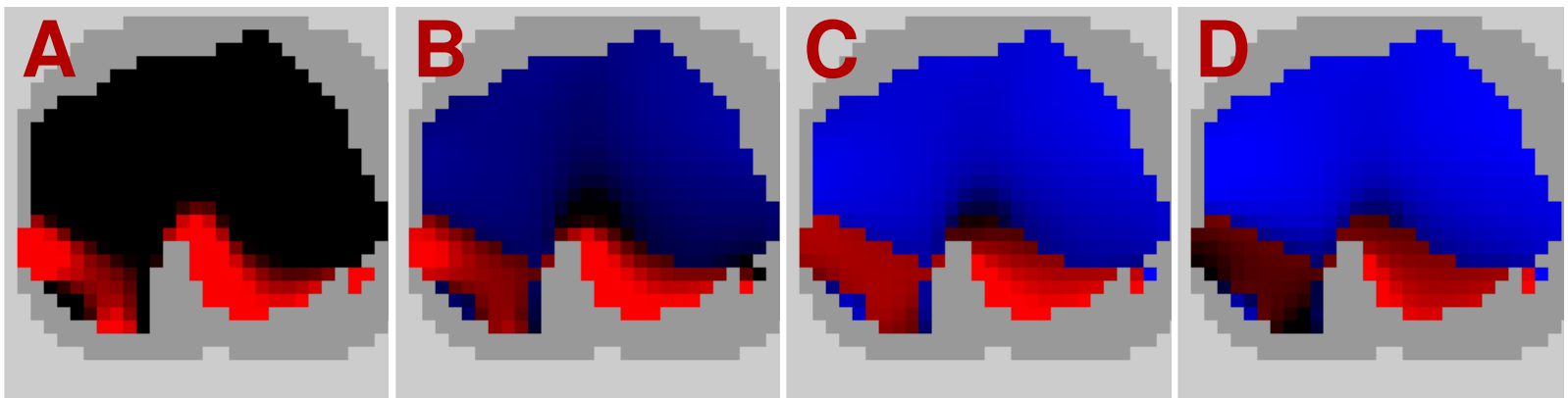
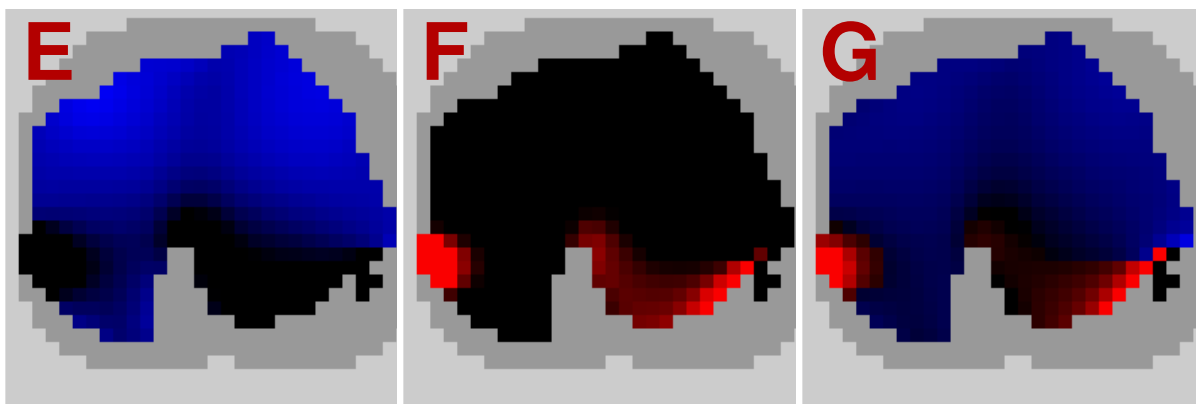
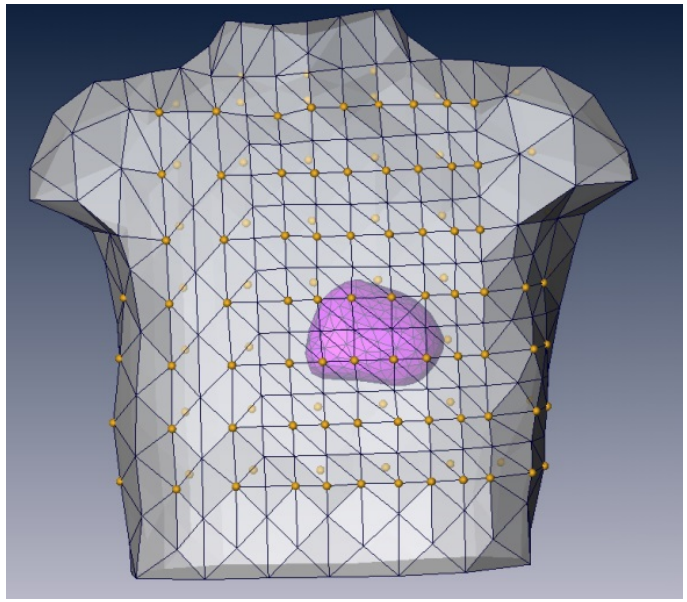




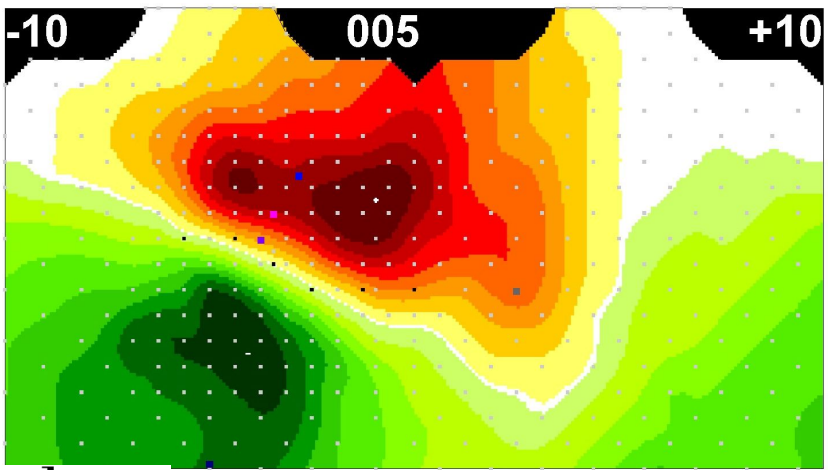
Body-Surface Potential Mapping

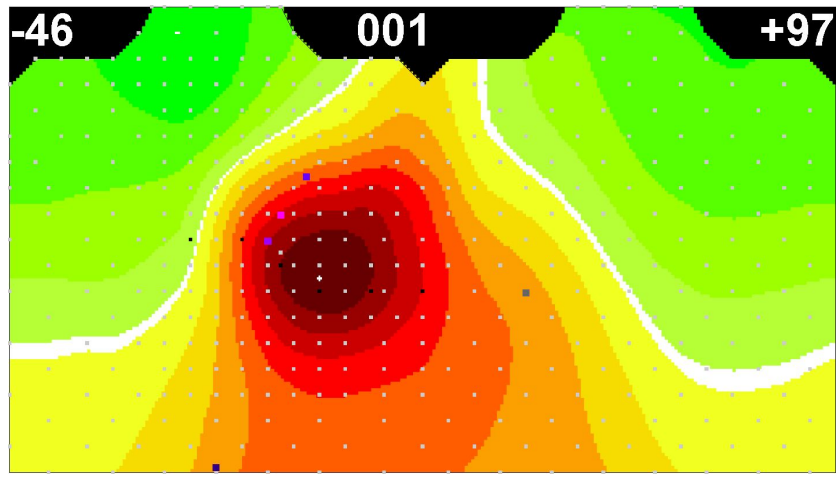


Electrode Locations

source: Ph.D Thesis: Hubley-Kozey (1993)

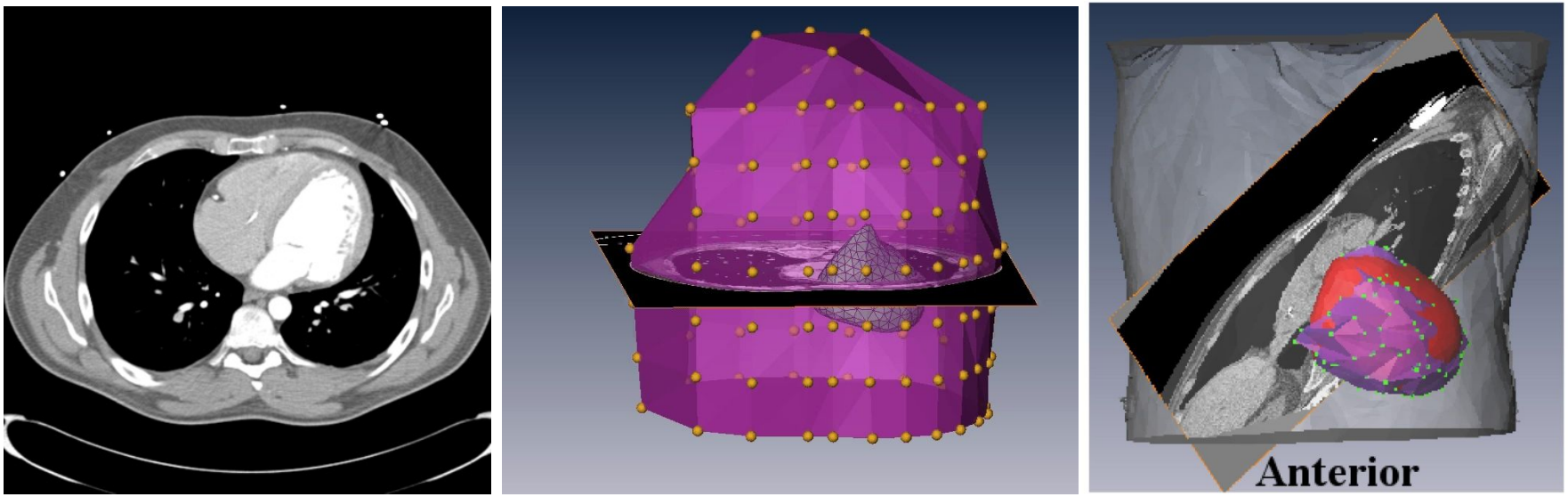
Body surface ECG at two time points





Patient-Specific Electrocardiographic Imaging

CT-based model including heart



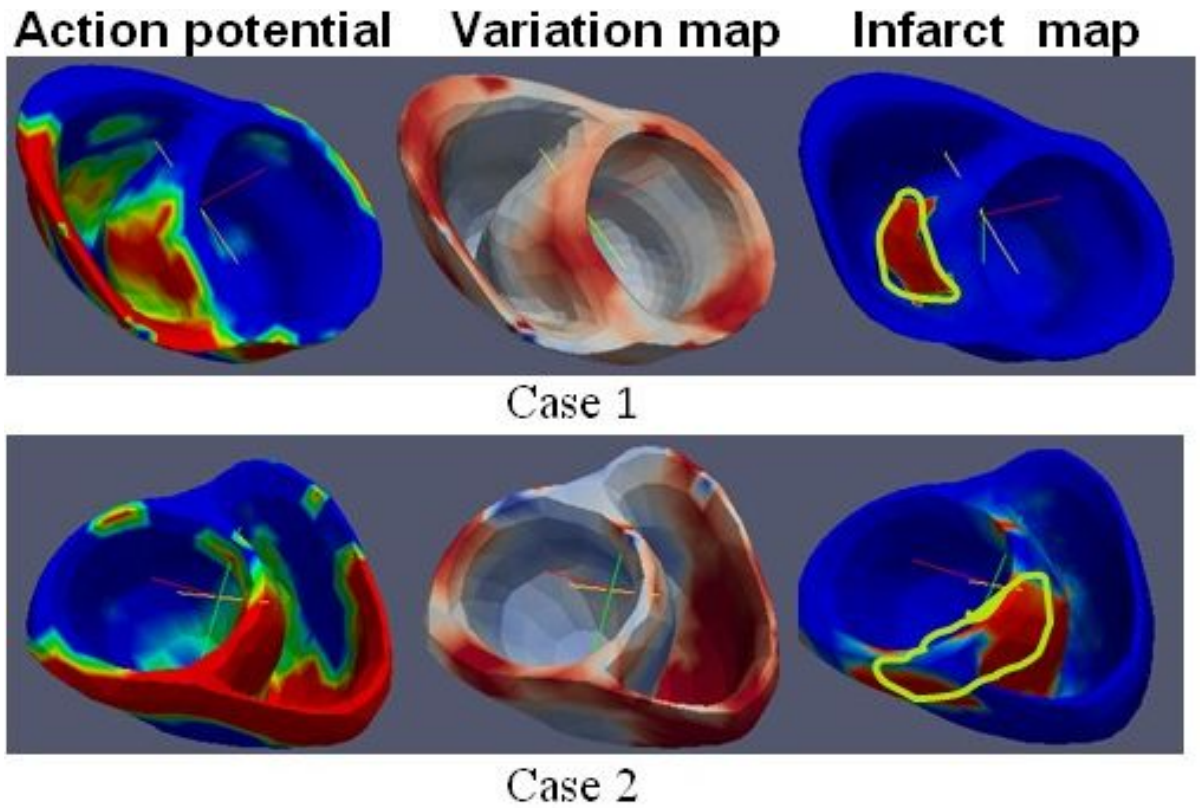
source: Ph.D. Thesis: Dawoud (2009)

ECG Imaging

Goal: help improve treatment of arrhythmia

- Ablation planning of scar-related ventricular tachycardia
- Innovations in hardware and electronics instrumentation
- Data analysis using patient-specific model and inverse solutions

3-D delineation of infarct scar



Infarct map based on temporal sequence of ECG images.
Variation map indicates uncertainty

Post-infarction patients with MRI and body-surface ECG data.
Source: Xu, Rahimi, Gao, Wang. IEEE TMI 2014