

# The Susceptibility and Recovery of Esophageal Tissue Layers to Pulsed Electric Fields

(Q. Castellvi, R. Neal, A. Vachani, S. Girourd, J. Evans)

## BACKGROUND

Thermal cardiac ablation can cause collateral esophageal injury that may degenerate to an atrio-esophageal fistula. Pulsed electric fields (PEFs) induce cell death independently from thermal processes, potentially preventing esophageal damage. However, the implications of worst-case treatment effects to the esophagus must be characterized.

## OBJECTIVE

This preclinical animal study evaluates the acute and chronic effects of PEFs to esophageal tissue.

## METHODS

Monopolar, biphasic PEF therapy was applied directly to the esophageal mucosa in 3 swine using a commercial focal ablation catheter and clinically-applicable treatment parameters (n=6 per pig). Irrigation (10-17ml/min) was provided during treatment to compensate for blood flow. Survivals were acute (n=1) and 28-day (n=2). The esophagus was removed, gross examination was performed, and regions of interest were submitted for histology.

## RESULTS

Acute PEF grossly resulted in focal pale regions in the mucosa which extended transmurally through the serosa. Histology indicated affected regions presenting submucosal edema, with intact vasculature, and avital epithelial tissue and smooth muscle cells remaining in situ. Conversely, the 28-day esophagi were unremarkable grossly. Serial sections were collected and further histology did not indicate any appreciable signs of PEF treatment.

## CONCLUSIONS

Clinically relevant PEF therapy can generate treatment effects when directly applied to the esophageal mucosa. However, preservation of the extracellular matrix, a hallmark of properly titrated PEF therapy, facilitates complete recovery of the tissue by 28 days post-treatment.

Character count: 1,432

