Endoscopic Ultrasound Guided Radiofrequency Ablation Probe for Pancreatic Cancer

Overview
Pancreatic Cancer is one of the leading causes of cancer related deaths, and when major surgery is not a favorable option, there are few alternatives. Penn State Hershey Medical Center is pioneering the dual energy approach with two alternative minimally invasive procedures to create treatment for pancreatic cancer. The multi-modal approach includes both radiofrequency ablation (RFA) and stereotactic body radiation therapy (SBRT) in conjunction with one another to destroy the cancer cells within the pancreas.

Objectives
- Design an interactive large display and two small, robust displays that can be used in various educational settings.
- Develop a complete how-to guide to re-build the displays, along with CAD drawings.
Both the large and small displays must illustrate how current RFA devices are used through endoscopes. They also show how SBRT is used in conjunction with RFA devices when the endoscope is removed.

Approach
- Brainstorm main display ideas for all displays based on sponsor needs
- Meet with sponsor on a weekly basis to give status updates and discuss design plans
- Generate SolidWorks models of both display types
- Create alpha 0 prototypes with elementary supplies
- Test wiring capabilities of LED lighting
- Construct alpha 1 prototypes based on feedback from sponsor
- Test thermochromic pigment in multiple materials and thicknesses
- Optimize heating and cooling system through the use of different heating methods
- Construct alpha 2 prototypes with new suggestions from sponsor
- Perform computational analyses to determine large display heat dissipation and small display durability
- Construct final beta prototypes

Outcomes
The sponsor will be able to use both the small and large displays to educate doctors, researchers and future investors on their research. They will be able to conveniently bring their displays to various medical conferences and seminars in the future and engage their audience in a more effective manor.

This project resulted in a unique simulation of radiofrequency ablation therapy which used heat and thermochromic material. This model clearly shows the profile that the probe would heat up to ablate the tumor.