Detachable Endoscopic Ablation Probe for Pancreatic Cancer

Overview
Current treatment methods for pancreatic cancer involve two separate procedures: radiofrequency ablation (RFA) and stereotactic body radiation therapy (SBRT). This project aims to develop a device that combines the two: destroying cancerous tissue through heat ablation and providing a target for radiation therapy after the device detaches from the guidewire of an endoscope.

Objectives
Our team designed two 3x scale prototypes, the “reverse peacock” and “coil”, that can be inserted into the working channel of an endoscope, perform RFA and detach to remain permanently in the body. The designs attempt to maximize the spherical shape of the heated region while minimizing migration after deployment.

Approach
- Customer specifications regarding size, price, biocompatibility, and functions were obtained through consultation with Hershey doctors Dr. Matthew Moyer, Dr. Charles Dye, and Dr. Heath Mackley
- Prototype generation relied on two concepts: a simple male-female attachment and the ability of nitinol to return to its initial shape after heating
- Patent search yielded no products that combined RFA and SBRT, only golden beads used in radiation therapy that needed to be inserted percutaneously
- CAD models of 3x scale reverse peacock and coil were made using SolidWorks as seen below
- Initial prototypes were 3D printed for feasibility studies with final 3x designs micromachined using a picosecond laser at Innovation Park
- Ablation testing was performed with egg whites which cook at the same temperature tissue does (60°C) while detachment testing was done in a synthesized gel matrix
- Reverse peacock design resulted in spherical ablation zone within 6 min of heating and deployed successfully with minimal migration within gel
- Final presentation of designs to Hershey doctors confirmed visibility of prototypes under CT/MRI and ability to remain stationary within the tissue

Outcomes
- Provides a way to consolidate many different medical procedures into one that is minimally invasive
- Will save surgeons and patients thousands of dollars in medical costs
- Offers a more intensive treatment of pancreatic tumors with minimal side effects