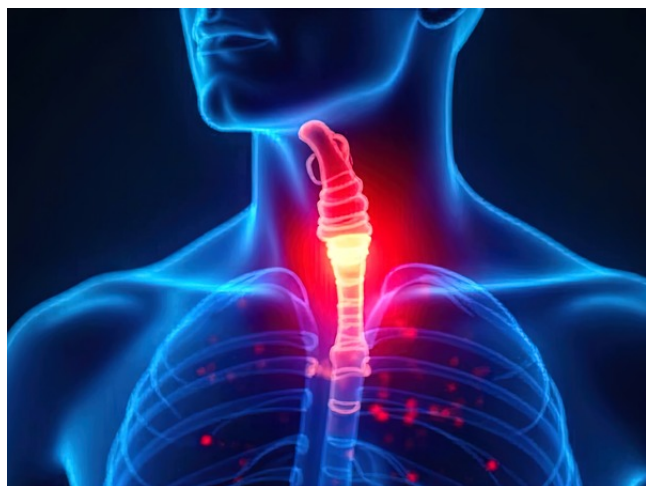




Esophageal Monitoring and Retraction System for Cardiac Ablation Procedures

TECHNOLOGY NUMBER: 2020-167



Technology ID

2020-167

Category

Medical Devices

Life Sciences

Accelerate Blue Foundry -
2025/Life Sciences

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Accelerate Blue Foundry - 2025 (Life Sciences)

OVERVIEW

This technology is a flexible, advanced luminal probe for cardiac ablation procedures that has the potential to create high-resolution 3D maps of esophageal temperature and tissue changes in real time, but can also gently move the esophagus away from the heart—offering physicians an unprecedented combination of monitoring, protection, and precise feedback to potentially reduce dangerous complications and improve patient outcomes.

DESCRIPTION

The system works by inserting a soft, flexible catheter into the esophagus, where its tip branches into sensor-equipped tendrils that can detect temperature, tissue damage, and deformation continuously along the esophageal wall, right where injuries from ablation often occur. Existing probes only measure surface temperature at a limited number of points, which given the heat transfer characteristics may only be a late indicator of tissue damage after injury. On the other hand, this invention has the potential to track temperature, mechanical stress, and tissue health in high detail across the entire contact area. The sensor array may use fiber optics and optional metal nodes for a multimodal picture: fiber sensors capture heat and strain (preventing false readings via smart placement and shielding), while embedded electrodes allow for an electrical tissue integrity field to be established to monitor changes within the tissue volume. Additionally, with a built-in retraction mechanism—such as a soft robotic arch or pull-wire system—the probe could also actively reposition the esophagus away



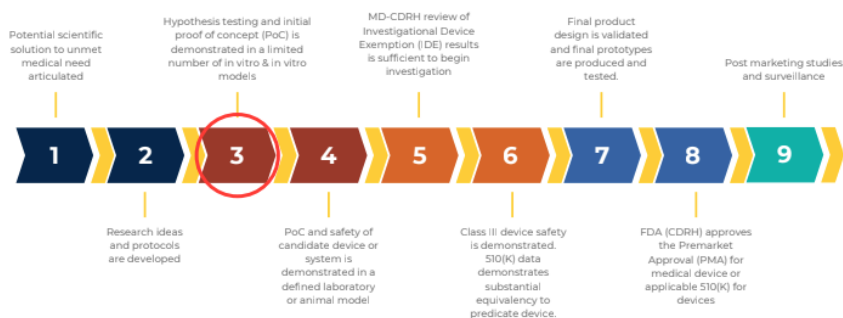
from high-risk ablation zones, thereby lowering the risk of injury from the thermally affected ablation zone.

VALUE PROPOSITION

- **Comprehensive Sensing:** Delivers real-time, high-resolution 3D maps of esophageal temperature, tissue damage, and mechanical deformation, far exceeding the limited, delayed data from current single- or linear multi-point probes.
- **Active Protection:** Can physically move the esophagus away from the atrium wall during ablation, offering proactive tissue protection not possible with standard probes or passive techniques.
- **Actionable Insights:** Allows physicians to pinpoint ablation catheter location relative to the esophagus and quantify both immediate and cumulative tissue changes, enabling more precise and effective ablation with potentially fewer complications.

TECHNOLOGY READINESS LEVEL

Medical Device Technology Readiness Levels



INTELLECTUAL PROPERTY STATUS

United States patent applications pending.

MARKET OPPORTUNITY

Atrial fibrillation ablation procedures are rapidly growing, with over half a million annually in the US alone and rising rates of associated esophageal injury—a major source of procedure-related complications and mortality. Hospitals, electrophysiology labs, and medical device companies are actively seeking safer, more reliable tools to reduce post-ablation injury, improve outcomes, and minimize legal and operational risks. High-risk cardiac centers and ablation referral centers will particularly benefit from advanced, real-time esophageal monitoring and protective solutions. The tissue integrity monitoring capability of this technology using an electric field may also have applicability in other medical specialties where changes in tissue composition (i.e. changes in hydration or cellular structure) need to be evaluated.

Despite broad adoption of esophageal temperature probes during thermal ablations, injury rates remain unacceptably high (over 10% in one study), underscoring an urgent unmet clinical need and strong demand for a more effective solution. More recently, Pulsed Field Ablation techniques have been introduced, reducing the need for temperature probes altogether; the impact of PFA on this device's commercialization strategy will need to be assessed.