MAYO CLINIC

Development of a Percutaneous Pericardiotomy Tool

Ammar M. Killu; Niyada Naksuk; Christopher V. DeSimone; Prakriti Gaba; Scott Suddendorf; Joanne Powers; DeJae Ladewig; Lilach O. Lerman; Barry Borlaug; Samuel J. Asirvatham

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Disclosures

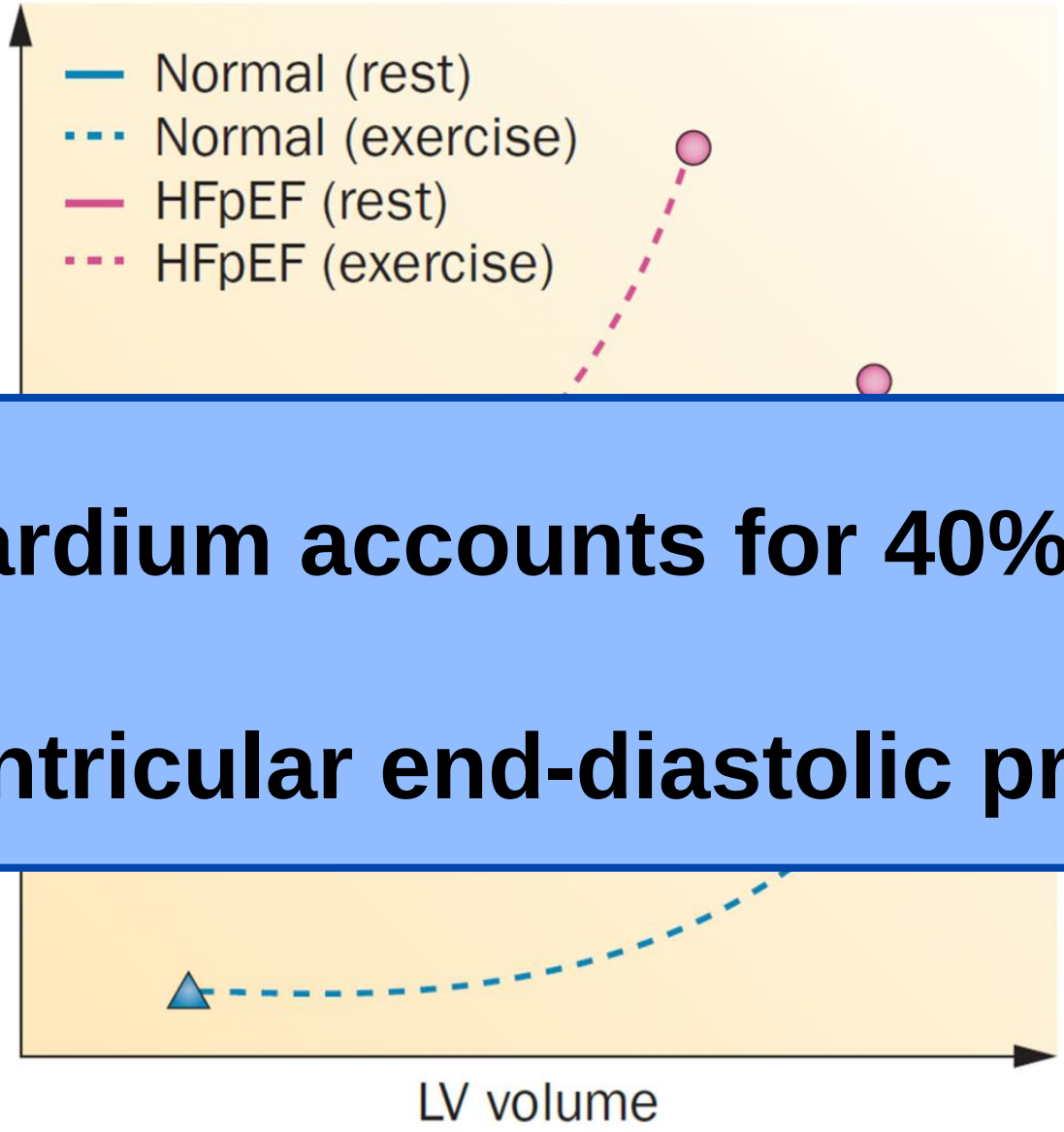
- **Mayo Clinic patent filing**
  - **Samuel Asirvatham**
  - **Barry Borlaug**

Introduction

- **Pericardial space used in EP procedures**
  - **Epicardial mapping**
  - **Atrial appendage occlusion**
- **Pericardium involved in disease**
  - **Constrictive pericarditis**
  - **HFpEF**

HFpEF

- **Therapy met with little success**
- **Myriad pathophysiological mechanisms**
- **Elevated filling pressure**

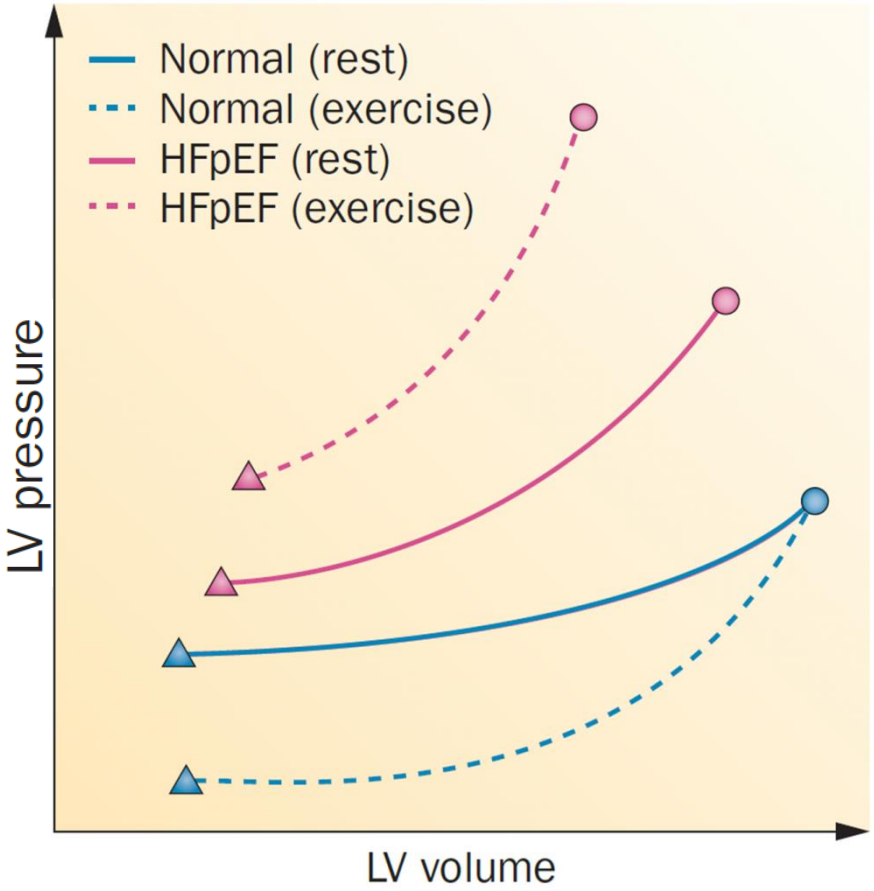


Pericardium accounts for 40% of the

left ventricular end-diastolic pressure

Borlaug, B. A. Nat. Rev. Cardiol. 11, 507–515 (2014)
Stray-Gundersen J et. al. *Circ Res*. 1986;58:523-530
Dauterman K et. al. *Ann Intern Med*. 1995;122:737-742

HFpEF



- **Pericardiectomy**
  - **↑ diastolic compliance**
  - **↑ cardiac output**
- **Morbidity with surgery**

Borlaug, B. A. Nat. Rev. Cardiol. 11, 507–515 (2014)
Stray-Gundersen J et. al. *Circ Res*. 1986;58:523-530

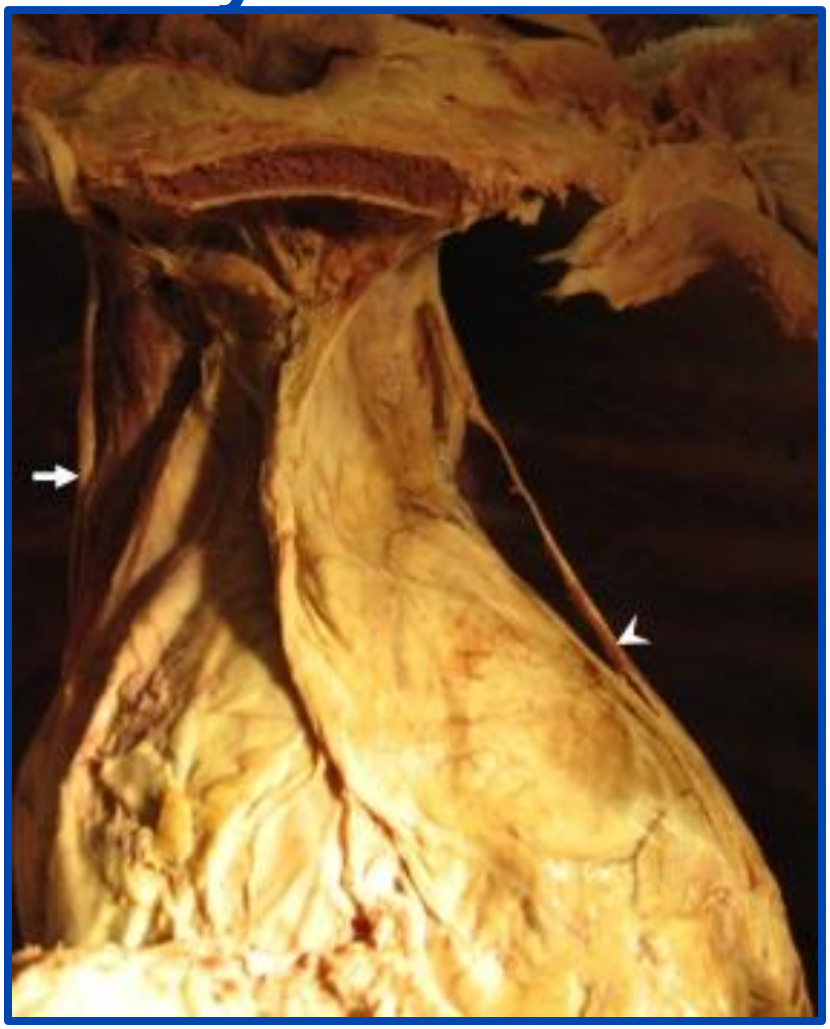
Aim

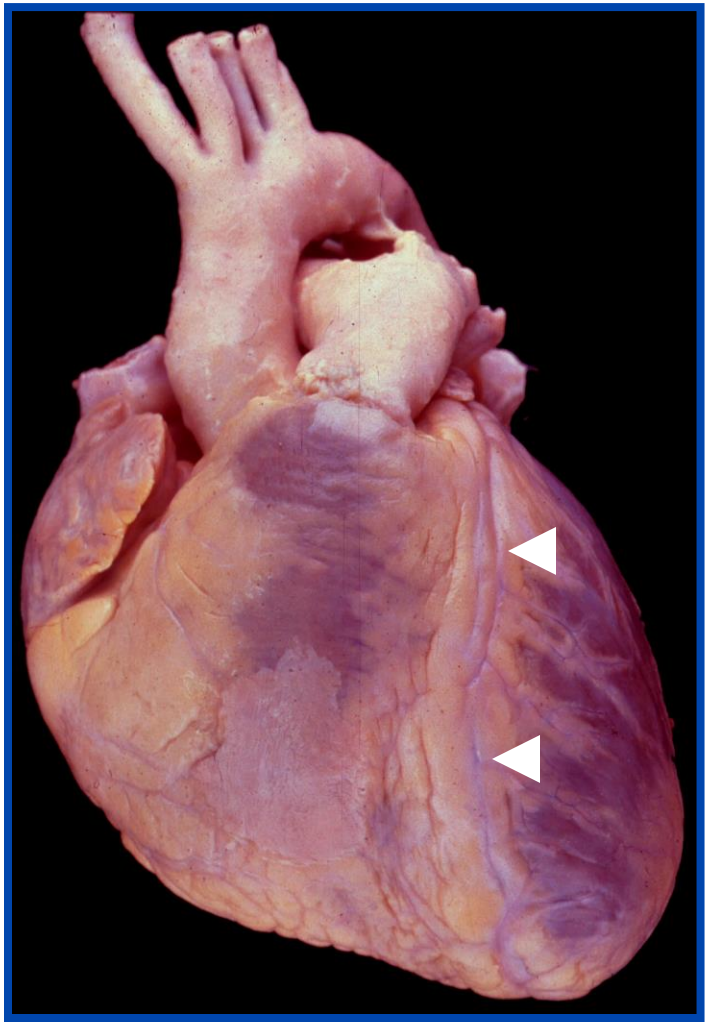
To develop a nonsurgical percutaneous pericardial incision, excision, and modification tool

Methods

- **Three novel devices – pericardial:**
  - **Scissors**
  - **Grasper**
  - **Slitter**
- **Percutaneous epicardial access**
- **Deployed over-the-wire**

Safety features

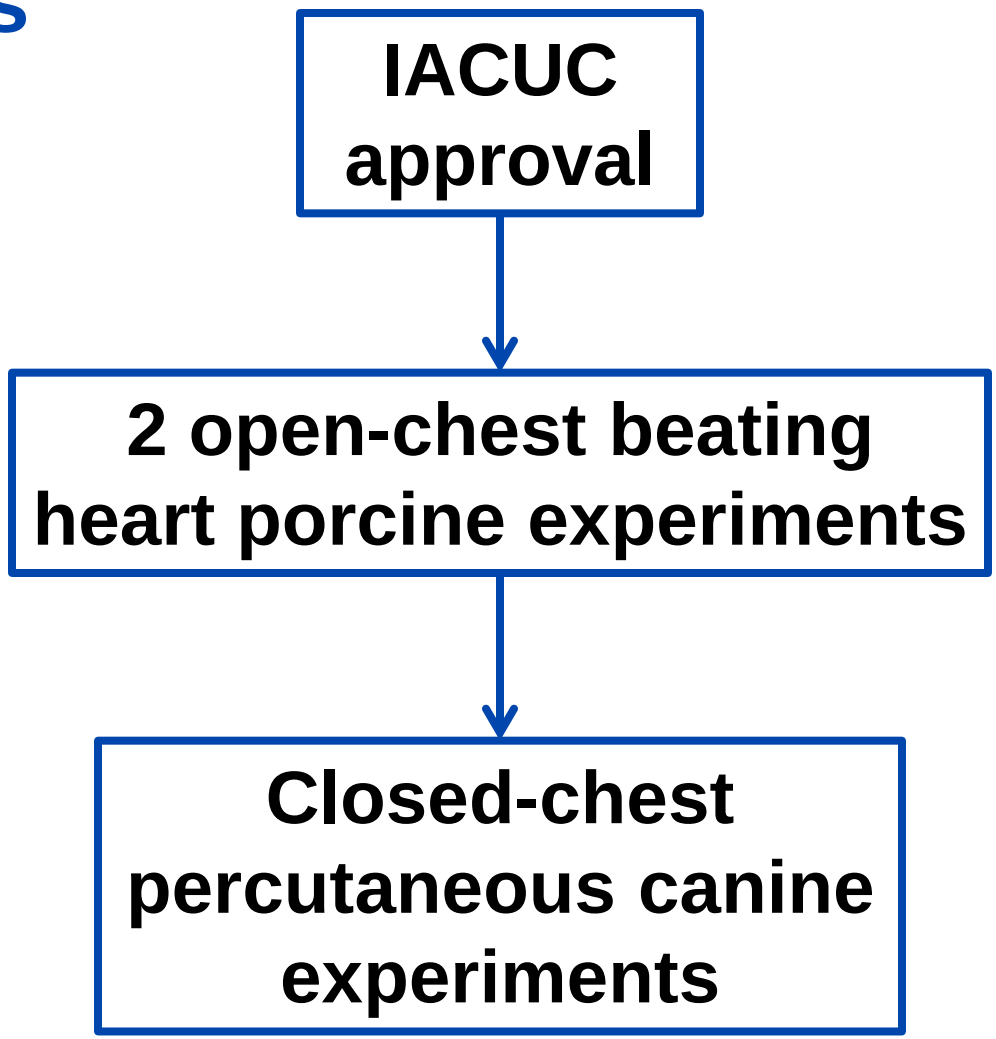




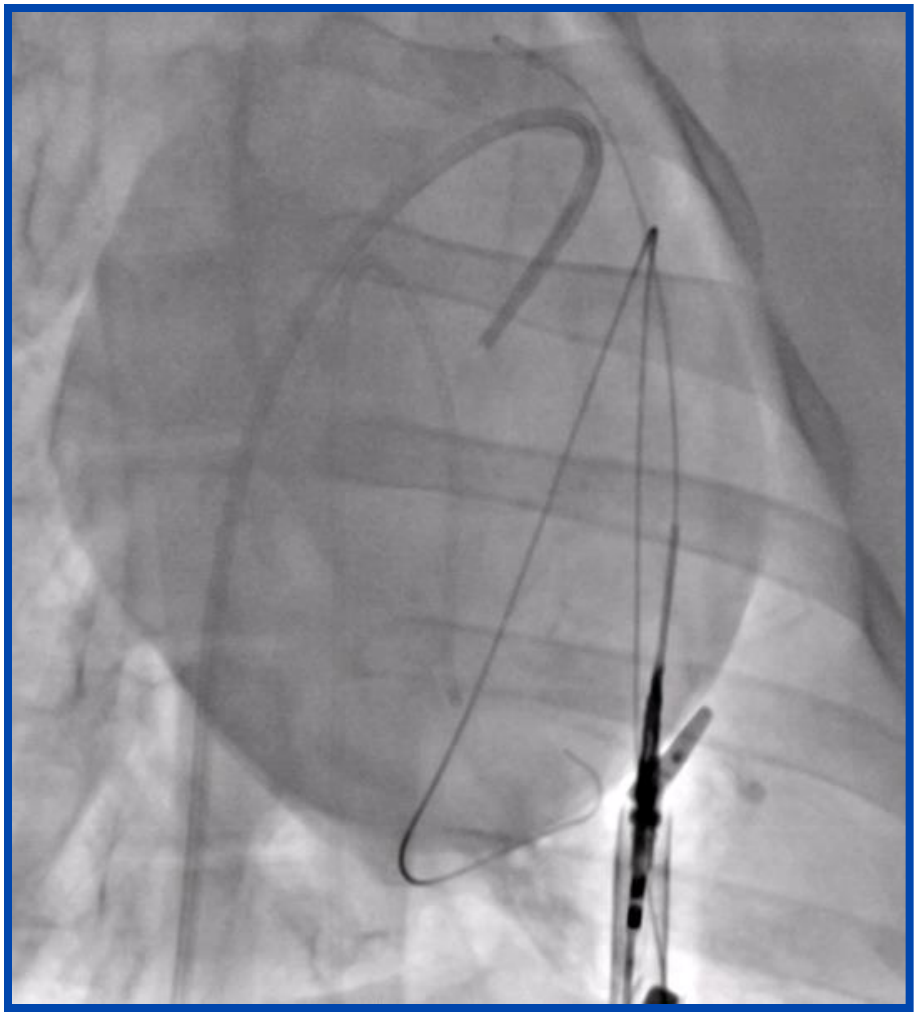
Safety features

- Contrast lumen
- Distal tip electrodes
  - Phrenic nerve stimulation
  - Myocardial signal
- Blunt base / tip
  - Cutting element away from the myocardium

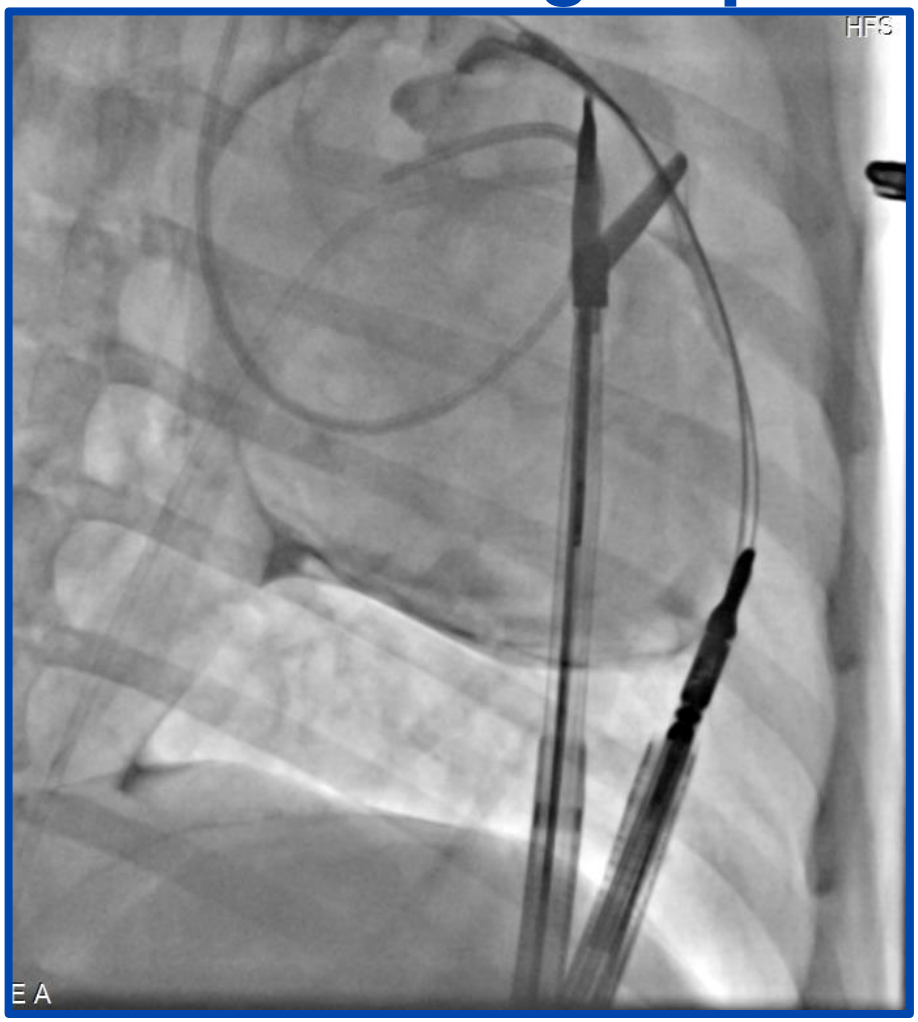
Methods



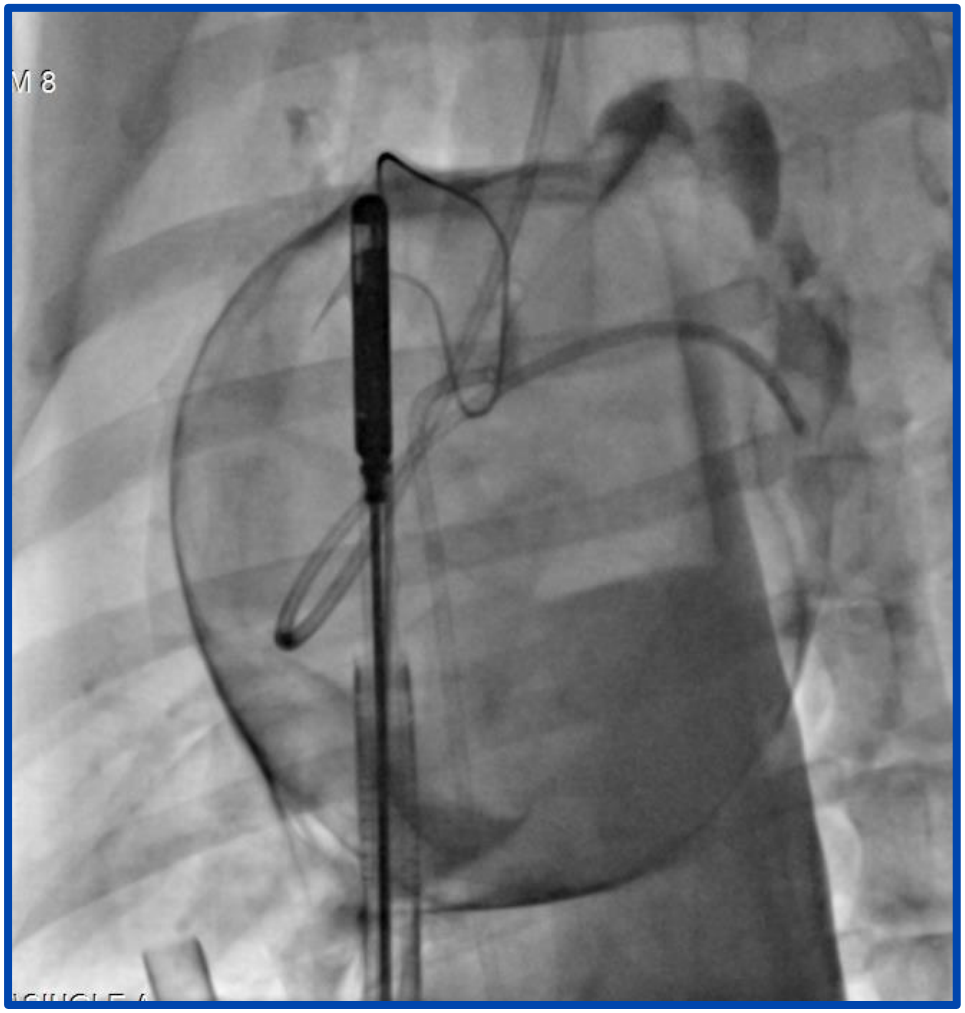
Pericardial scissor

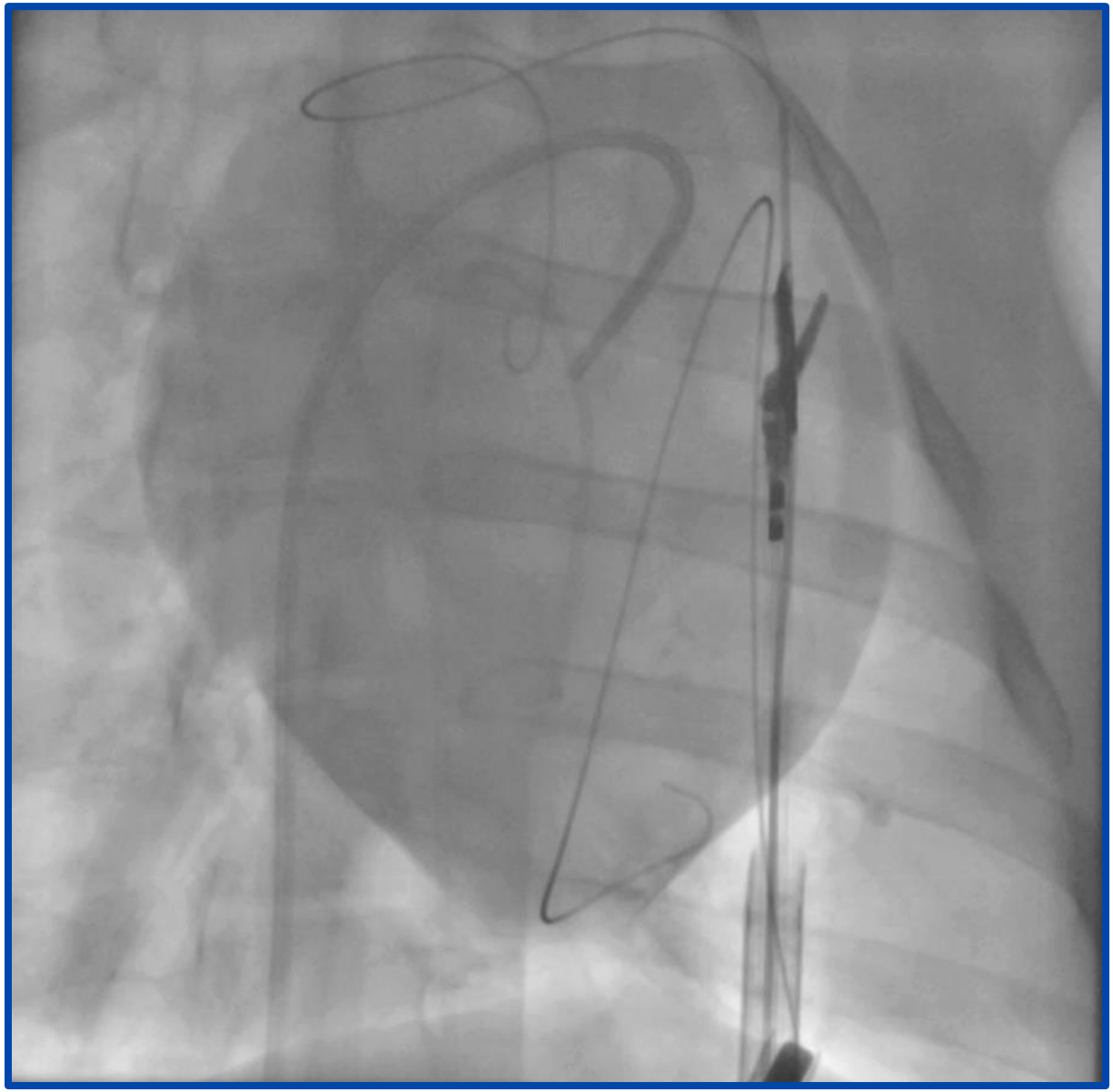


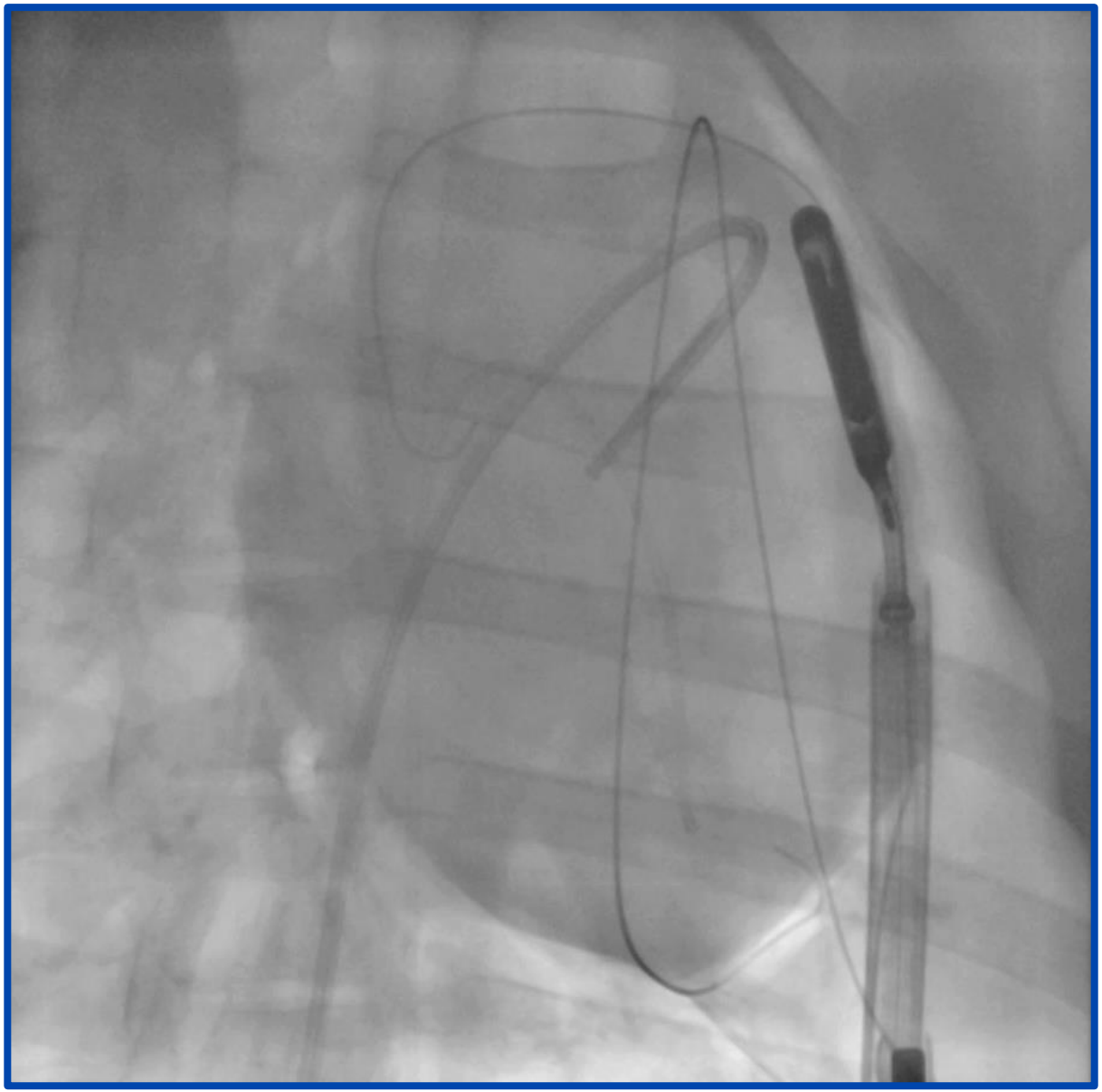
Pericardial grasper



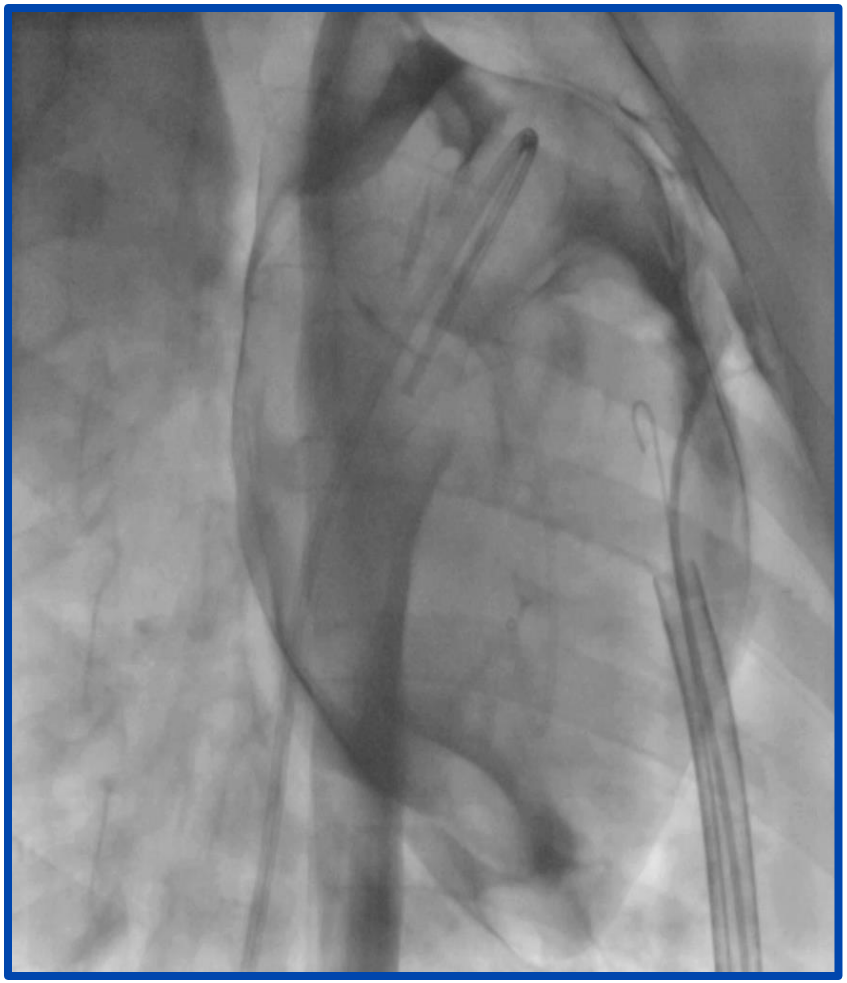
Pericardial slitter

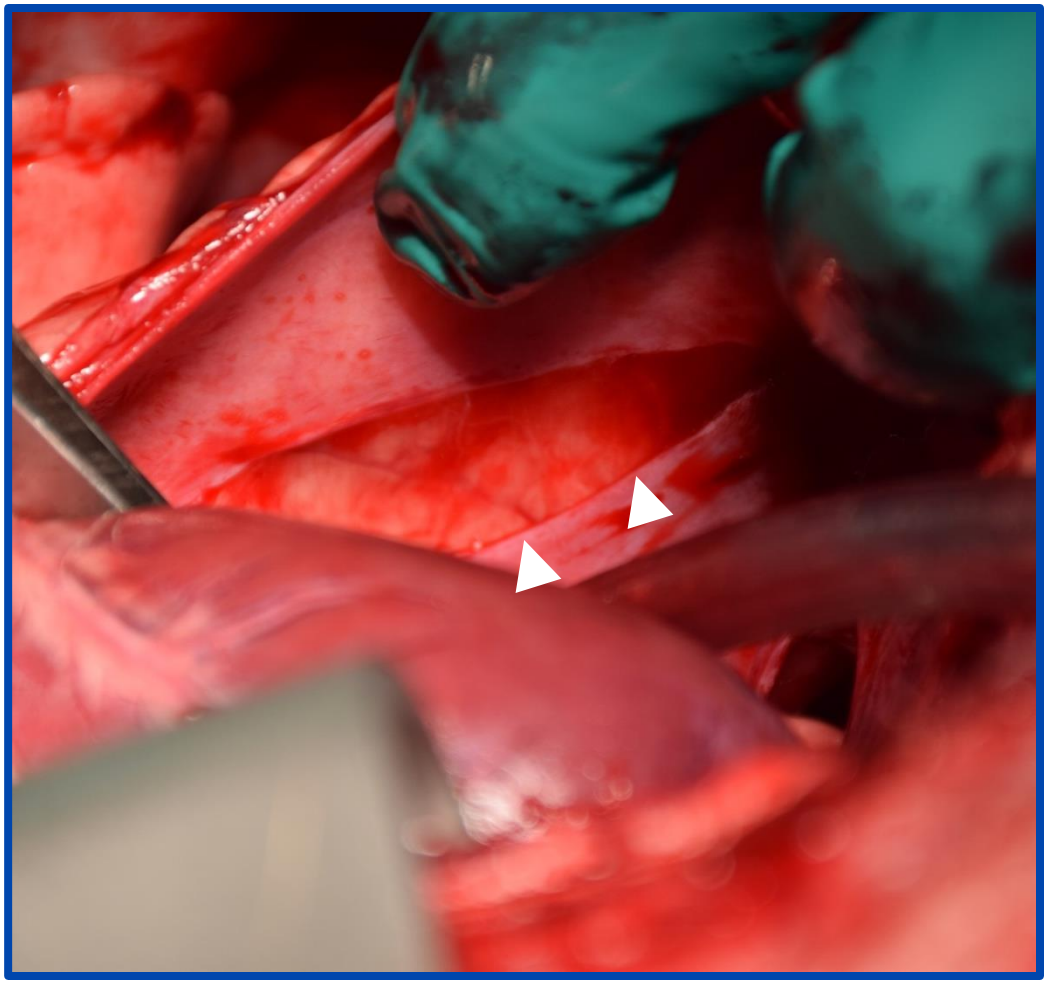






Confirmation of pericardiotomy

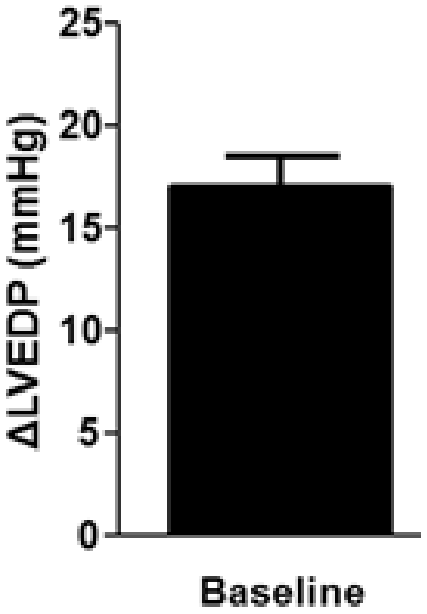


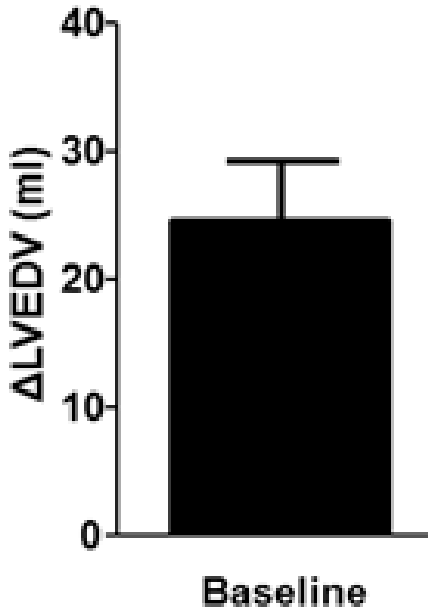


Results

- 9 closed-chest acute canine experiments
  - No phrenic nerve injury
  - No coronary artery lacerations
- No adverse effect on systolic function

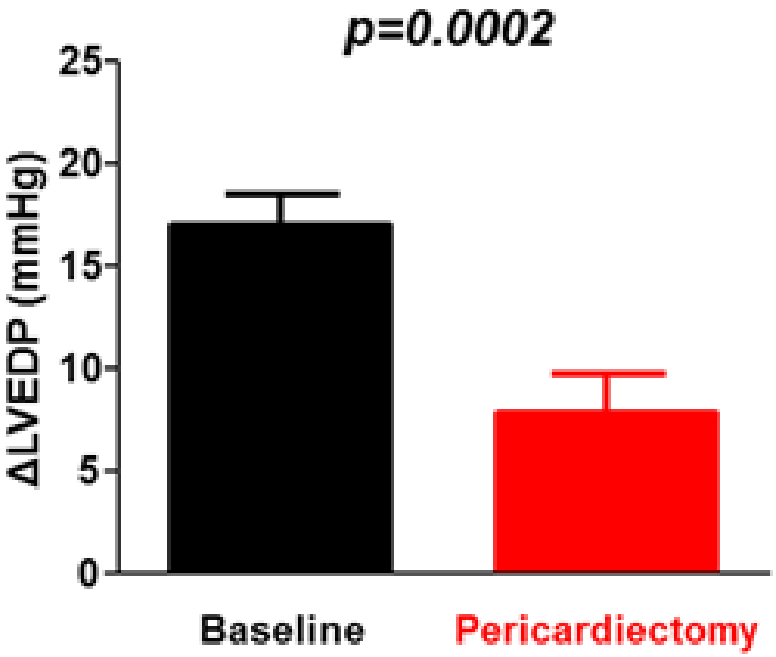
Hemodynamic changes

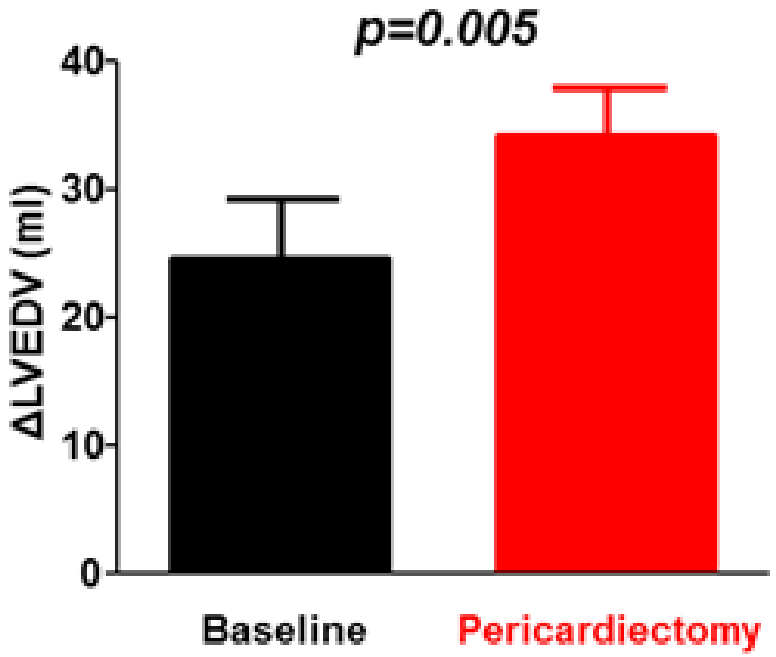




Borlaug, B…Asirvatham et. al. Submitted

Hemodynamic changes





Borlaug, B…Asirvatham et. al. (submitted)

Conclusion

- **Percutaneous pericardiotomy is feasible**
  - **Appears safe**
- **Treatment option**
  - **HFpEF**
  - **Epicardial based procedures**
- **Chronic studies are ongoing**

Thank You

Killu.ammar@mayo.edu