Anesthesia and Lead Extractions

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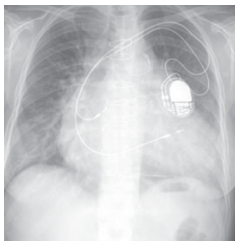


Disclosures

- None

Objectives

- Define lead extraction procedures and why Anesthesiologists should be familiar with them.
- Discuss perioperative and anesthetic management of lead extractions.
- Gain a basic understanding of how transesophageal echocardiography can be a useful monitor in these cases.

Lead Extractions:

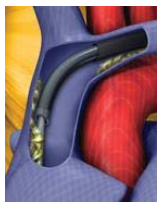
- High number of pacemakers / AICD (CIED) implanted annually
- Leads become defective, fracture, or get infected routinely
- Lead Extraction becoming more and more common. Estimates that as many as 52,000 must be extracted annually

Lead Removal Techniques

- Traction
- Traction Devices
- Mechanical Sheaths
- Rotating Threaded Tip Sheath
- Electrosurgical Sheath (Bovie)

Lead Removal Techniques

- Laser Sheaths



Laser Specifications

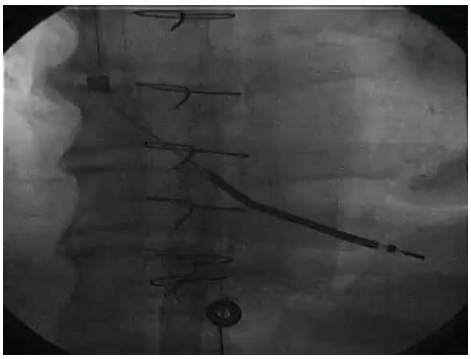
(Spectranetics Inc., Colorado Springs, CO)

- "Excimer" XeCl low temperature (50°C)
- High energy short-duration ultraviolet pulses (135 nsec)
- Shallow tissue penetration: 100 µM
  - Safety: Clear goggles
- Produces water, gas microbubbles, and small tissue particles (< 100 µM in diameter)

Hauser RG, Europace 2010;12:395-401

Laser Sheath

Cardiac Lead Removal Using the Spectranetics SLS® II Laser Sheath and LLD EZ™ Lead Locking Device



Laser Lead Extraction Evidence

- Wilkoff, Byrd et al, 1999. Pacemaker lead extraction with the laser sheath: results of the pacing lead extraction with the excimer sheath (PLEXES) trial. J Am Coll Cardiol 33(6):1671-6.
- Byrd CL, Wilkoff BL, 2002. Clinical study of the laser sheath for lead extraction: the total experience in the United States. Pacing Clin Electrophysiol 25(5):804-8.

Complications in Lead extraction:

- Reports of major complications **1.9% to 3.4%**

Major complications include:

- **Cardiac avulsion**
- **Vascular avulsion**
- **Pulmonary embolism**
- **Stroke**
- **New device infection**
- **Death**

2009 HRS society statement:

Transvenous Lead Extraction: Heart Rhythm Society Expert Consensus on Facilities, Training, Indications, and Patient Management

This document was endorsed by the American Heart Association (AHA).

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2009 HRS society statement:

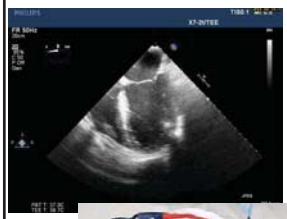
Required Personnel

- Primary Operator
- Cardiothoracic surgeon- if not PO, immediately available
- Scrubbed and non scrubbed assistant
- Flouroscopy support
- Echocardiographer available
- Anesthesia available

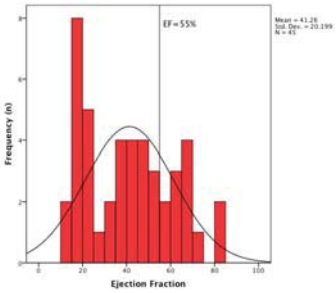
2009 HRS society statement

- Basically no mention or position on type of anesthesia, or method of monitoring.
- ?

Lead Extraction Population

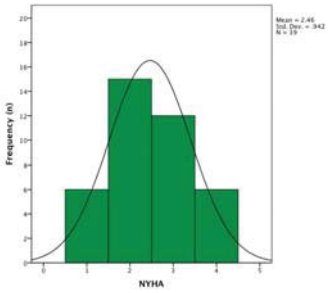


Ejection Fraction



Ahlgren, et al.

NYHA Classification



Ahlgren, et al.

Procedural Factors

- Length of time lead implantation
- ICD lead, especially dual coil
- Endocarditis and/or pocket infection?
- Plan for venous access?

Multicenter Observational Study

Wazni O, JACC 2010;55:579-86

- 13 Centers, 1449 consecutive Pts, 2406 leads
  - 20-270 procedures/site
- Major adverse events 1.4%, Mortality 0.3% procedural, in-hospital 1.86%
- Associated with mortality: endocarditis (4.3%), endocarditis+DM (7.9%), endocarditis and creatinine>2 (12.4%)
- Unrelated to MAEs: GA *vs* sedation or EP lab *vs* OR

Protocol at the University of Colorado

- General Anesthesia
- Done in hybrid room or cardiac operating room with flouroscopy available
- CT surgeon in room and usually opens device pocket
- CT anesthesiologist
- Perfusionist standing by with pump "wet down"
- Cardiac trained operating room staff

Protocol at the University of Colorado

Monitoring

- Standard ASA monitors
- Arterial line- +/- prior to induction
- 2 large bore IV's
- Medications for CPB/resucitation drawn up and ready to go on anesthesia cart
- Real time TEE

TEE in Laser Lead Extraction

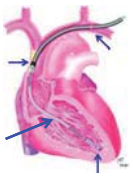
TRANSESOPHAGEAL ECHO

Clinical Utility of Intraprocedural Transesophageal Echocardiography during Transvenous Lead Extraction

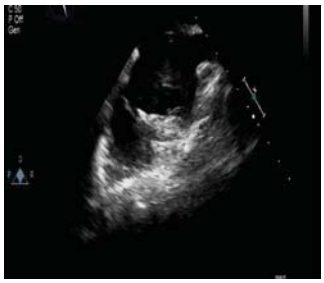
Yuka Endo, MD, PhD, FACC, John E. O'Mara, MD, Stanislav Weiner, MD, Jennifer Han, MD, Mark H. Goldberger, MD, Garet M. Gordon, MD, Michele Nanna, MD, Kevin J. Ferrick, MD, and Jay N. Gross, MD, *New York, New York*

- Intra-procedural TEE during transvenous lead extraction provides valuable real-time information and may change procedural management in up to 16% of cases

Take a ride into the "Danger Zone"

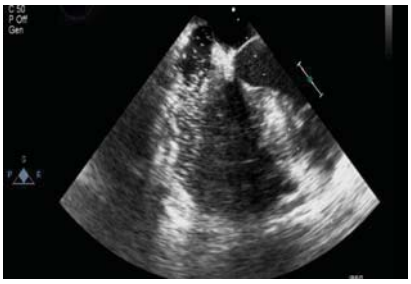


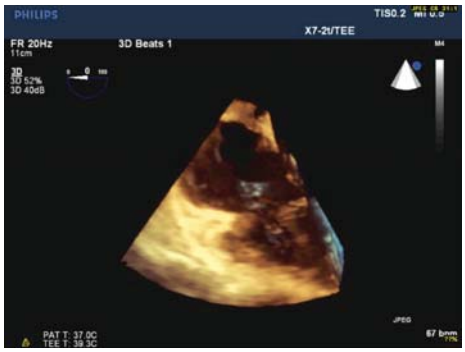
SVC



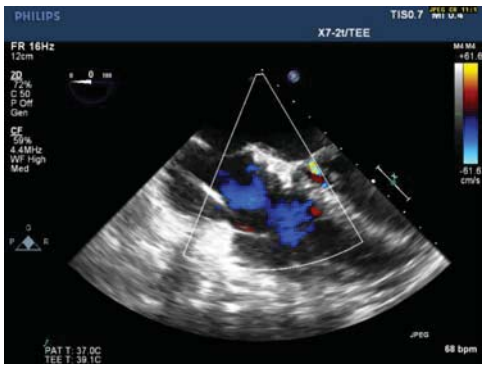
When to Get Nervous

Tricuspid Fibrosis

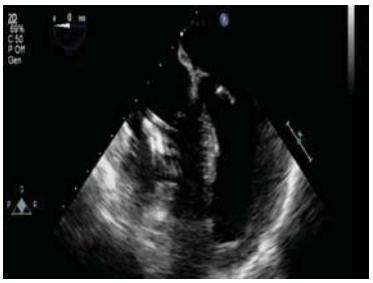




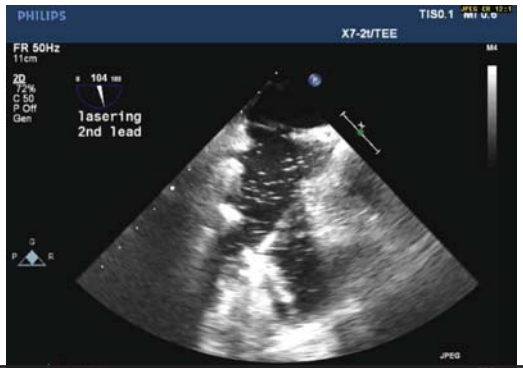
New TR?



RV Lead



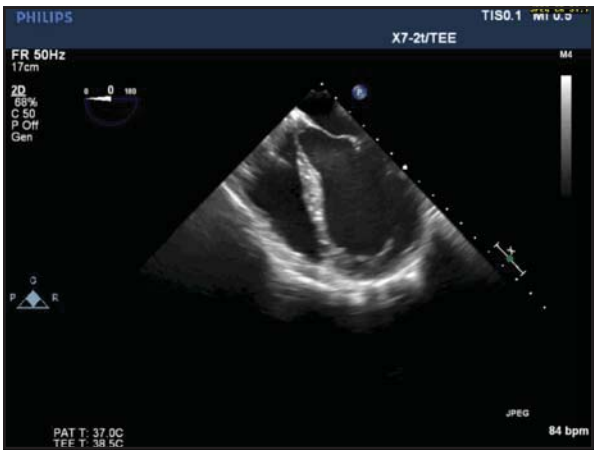
RV Invagination

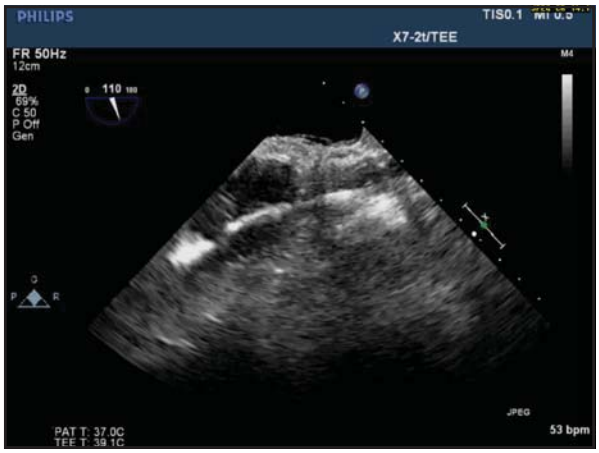


TEE for Lead Re-implant Positioning

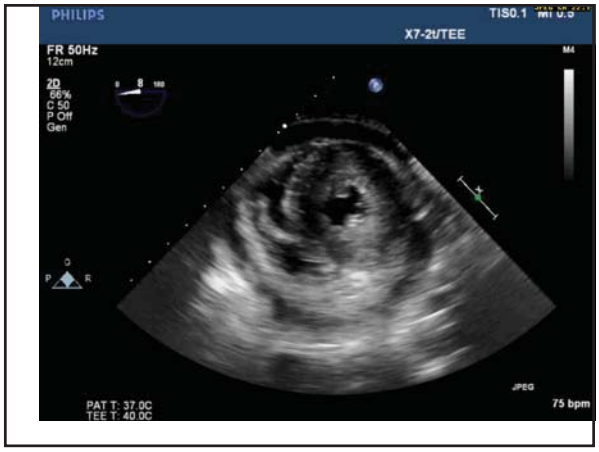
Case:

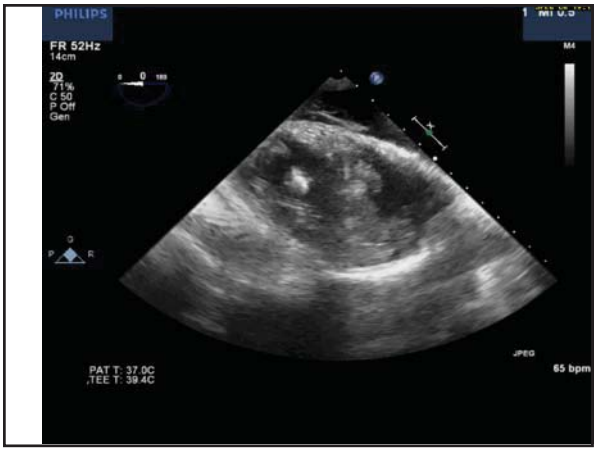
- 34 yo female – developed post partum cardiomyopathy 8 years ago
- CIED placed at that time
- Heart function has since recovered, with near normal LV systolic function
- Plan is to remove leads / device




PHILIPS
X7-2t/TEE
FR 50Hz
12cm
53 bpm


PHILIPS
X7-2t/TEE
FR 50Hz
17cm
138 bpm


PHILIPS
X7-2t/TEE
FR 50Hz
12cm
75 bpm


PHILIPS
FR 52Hz
14cm
65 bpm


PHILIPS
X7-2t/TEE
FR 50Hz
12cm
112 bpm


PHILIPS
X7-2t/TEE
FR 50Hz
14cm
POST CPB
118 bpm

Other fun events to watch out for…

Conclusions

- Growing procedure, you may be likely to encounter increasing number of these cases.
- Risk factors for potentially more difficult cases
- “Best” anesthetic management still controversial though may be leaning towards GA with readiness for CPB
- TEE can be useful intra-operative tool