

60-year-old male with fever



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HPI

- 60 year-old male s/p AICD with two months of fever, sweats, dry cough
- Symptoms started after AICD generator exchange 1/2010
- Had multiple visits with outpatient providers, but not etiology for symptoms discovered
- Treatment with amoxicillin (sinus congestion) week prior to admission

HPI continued

- Presented to OSH on 3/20/10
- T 101.6 F, HR 140s, WBC 12.9
- Treated with ceftriaxone and azithromycin for possible CAP
- CXR: negative
- CT sinus: air/fluid levels right maxillary sinus

HPI continued

- 3/22: BCx 1/1 set for coagulase negative staph
- Vancomycin started
- Has also been having tenderness/warmth over AICD generator
- Subsequently transferred to MVAMC

Past Medical Hx

- **Coronary Artery Disease**
 - s/p stents to RCA (placed 2/04 at an OSH)
- **Ventricular Tachycardia**
 - Occurred during stent placement
 - Single-lead ICD for secondary prevention of VT (placed 3/04 at OSH)
 - Generator exchange 1/3/10 at MVAMC
 - Treated with clindamycin for prophylaxis
- **DM-II**
 - Poorly controlled, last Hgb A1c 11.5
- **Hx Guillain-Barré Syndrome**
 - In 1970s, initially symptoms attributed to penicillin allergy

Thoughts?



Uhh now
what?

I thought
he'd know...

Admit to MVAMC

- Initially started on cefazolin overnight
- Received 1 dose, but held in AM by primary team
- Blood cultures were collected

11.1
7.9 300

N 59%
L 30%
M 7%
E
3.4%

CRP 24.86
MRSA (nares) negative

Imaging

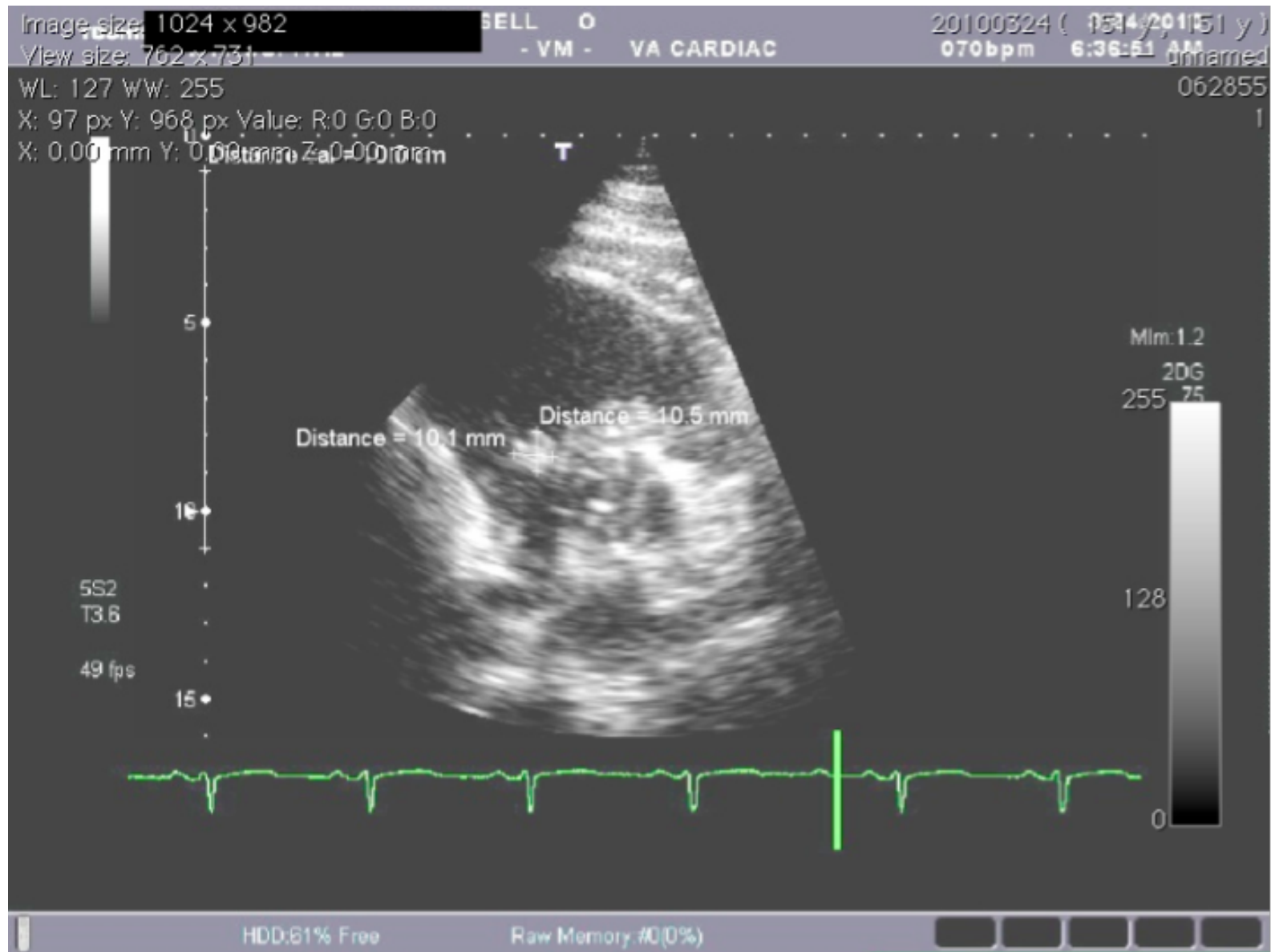
- TTE on 3/24/10

- EF normal
- Large (28 mm) multi-lobulated, mobile mass attached to the tricuspid valve
- Pacing wire seen in right atrium and ventricle, cannot exclude attached mass to wire.

- TEE on 3/24/10

- Multi-lobulated highly mobile mass appeared more likely attached to tricuspid valve, less likely to the ventricular or atrial pacer wire
 - One lobe 14 mm x 7 mm
 - Another lobe 10 mm x 10 mm
- 8 mm protruding right atrial mass

TEE



Thoughts?



Thoughts?

Looks like
IE to me



MedCalc: Duke Criteria for Infective Endocarditis

Durack DT, Lukes AS, Bright DK. New criteria for diagnosis of infective endocarditis: utilization of specific echocardiographic findings: Duke Endocarditis Service. *Am J Med.* 96:200-209, 1994.

Major criteria :

☐ Positive blood culture for Infective Endocarditis

Typical microorganism consistent with IE from 2 separate blood cultures, as noted below:

- viridans streptococci, *Streptococcus bovis*, or HACEK group (*what's this?*), or
- community-acquired *Staphylococcus aureus* or enterococci, in the absence of a primary focus

or

Microorganisms consistent with IE from persistently positive blood cultures defined as:

- 2 positive cultures of blood samples drawn >12 hours apart, or
- all of 3 or a majority of 4 separate cultures of blood (with first and last sample drawn 1 hour apart)

☒ Evidence of endocardial involvement

Positive echocardiogram for IE defined as :

- oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation, or
- abscess, or
- new partial dehiscence of prosthetic valve

or

New valvular regurgitation (worsening or changing of preexisting murmur not sufficient)

Minor criteria :

☒ **Predisposition:** predisposing heart condition or intravenous drug use

☒ **Fever:** temperature > 38.0° C (100.4° F)

☐ **Vascular phenomena:** major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, and Janeway lesions

☐ **Immunologic phenomena:** glomerulonephritis, Osler's nodes, Roth spots (*what's this?*), and rheumatoid factor

☒ **Microbiological evidence:** positive blood culture but does not meet a major criterion as noted above¹ or serological evidence of active infection with organism consistent with IE

☐ **Echocardiographic findings:** consistent with IE but do not meet a major criterion as noted above

¹ Excludes single positive cultures for coagulase-negative staphylococci, diphtheroids, and organisms that do not commonly cause endocarditis.

Duke Clinical Criteria for Infective Endocarditis:

Clinical criteria for infective endocarditis requires:

- Two major criteria, or
- One major and three minor criteria, or
- Five minor criteria

References :

- Durack DT, Lukes AS, Bright DK. New criteria for diagnosis of infective endocarditis: utilization of specific echocardiographic findings. Duke Endocarditis Service. *American Journal of Medicine.* 96(3):200-9, 1994.

Table 2. Published Case Series That Report Outcomes of CIED Infection

Reference	Year	n	Population	Treatment	Follow-Up, y	Outcomes
Arber et al ¹³	1994	44	Pacemaker endocarditis categorized as definite (n=25), probable (n=12), or possible (n=7)	?	?	?
Klug et al ¹⁴	1997	57	Pacemaker lead endocarditis	Plan for initial device removal and parenteral antibiotic therapy	1.67	7% Predischage mortality (2 before removal 2 after removal); 26.9% mortality at end of follow-up
O'Nunain et al ¹⁴	1997	21	ICD infection	Total system removal in 15; partial system removal in 2; no explantation in 4. All received parenteral antibiotics	1.75	No clinical recurrence of infection; 1 sudden death
Molina ¹⁵	1997	38	Pacemaker infection (n=21) or ICD infection (n=17)	(1) IV antibiotics without device removal (n=12); (2) complete system removal with 2 weeks of parenteral antimicrobials (n=19); (3) complete removal with 6 weeks of parenteral antimicrobials (n=7)	0.75 to 5 y	100% Failure and 17% mortality in those treated conservatively; no deaths or recurrent infections in the groups treated with device removal
Cacoub et al ¹²	1998	33	Definite pacemaker endocarditis	Lead removal and prolonged subsequent antibiotic therapy	1.83	24% Mortality
Chua et al ¹⁷	2000	123	Patients with either pacemaker (n=87) or ICD (n=36) infections	Extraction in 95% with antibiotic therapy (median 28 days)	1.08	8% Mortality, 3% relapse
Baddour ¹¹	2001	51	Patients with device-related infections not candidates for surgery (from survey of providers)	Long-term suppressive antibiotics (3 mo to 10 y)	Not specified	3 Developed relapsing infection
del Rio et al ¹⁰	2003	31	Pacemaker or ICD endocarditis	Initial conservative therapy (n=7); surgical removal (n=24)	3.17	Initial conservative therapy: 100% relapse, 1 death; initial surgical therapy: 1 relapse, 3 deaths
Rundstrom et al ¹⁶	2004	38	Pacemaker endocarditis (44 episodes in 38 patients)	Pacemaker removal in 28 episodes, conservative therapy in 16 episodes	Not specified	64% Infection-free in group with pacemaker removal; 19% infection-free in conservative-therapy group
Sohail et al ¹⁷	2007	189	Patients with CDI	Initial surgical removal in 183 (96%); removal after failure of medical therapy in 3 (2%); all received parenteral antimicrobial therapy, most for at least 2 wk	0.48	3.7% In-hospital mortality; of those followed up after discharge, 5% relapse or persistent pocket infection; 95% infection-free at end of follow-up
Sohail et al ¹⁷	2008	44	Pacemaker or ICD endocarditis (from 2007 series with CDI)	Surgical removal in 43 (98%) with parenteral antimicrobial therapy	0.5	14% In-hospital mortality

Baddour LM, et al. Update on Cardiovascular Implantable Electronic Device Infections and Their Management: A Scientific Statement From the American Heart Association. *Circulation*. 2010;121;458-477.

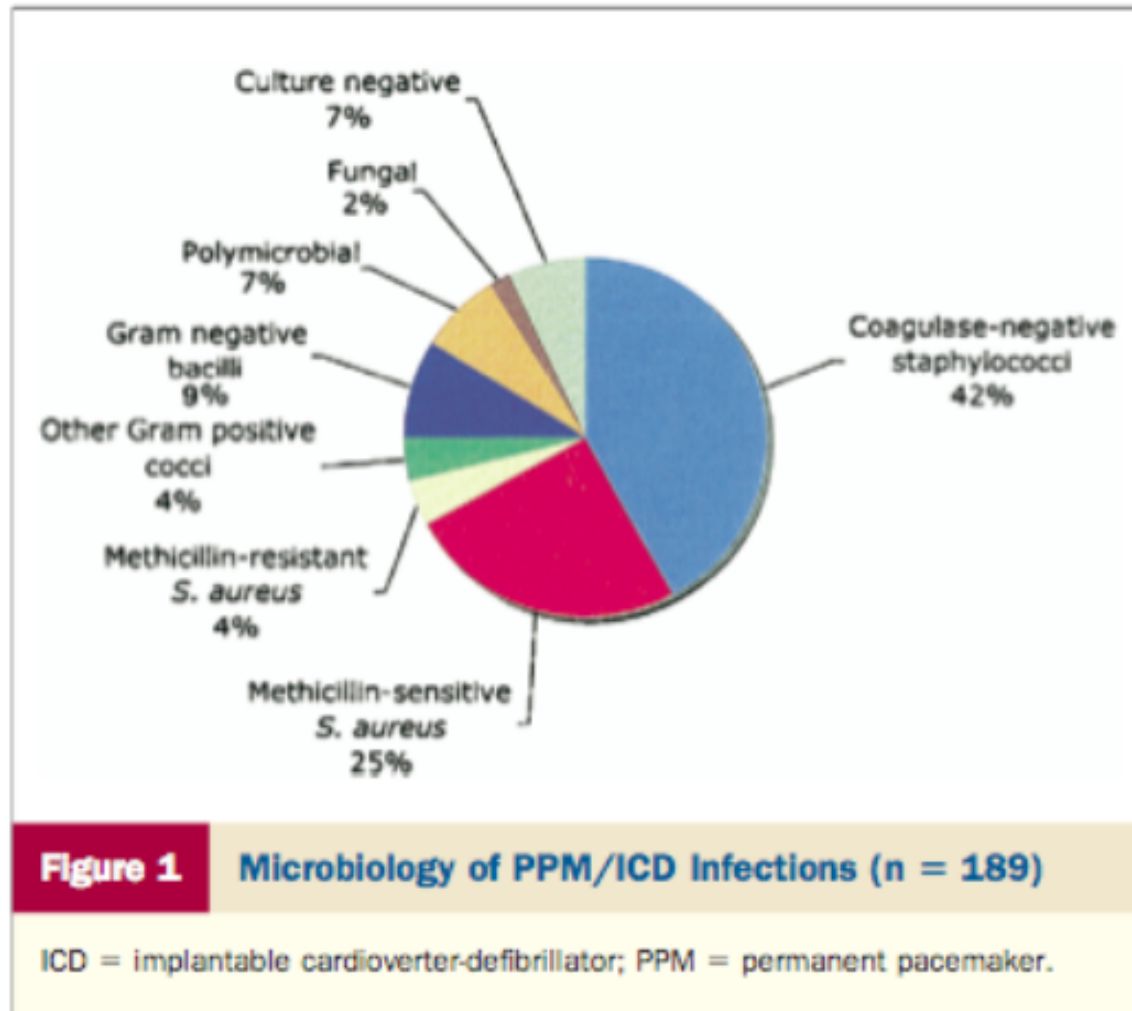
American Heart Recommendations

C. Recommendations for removal of infected CIED

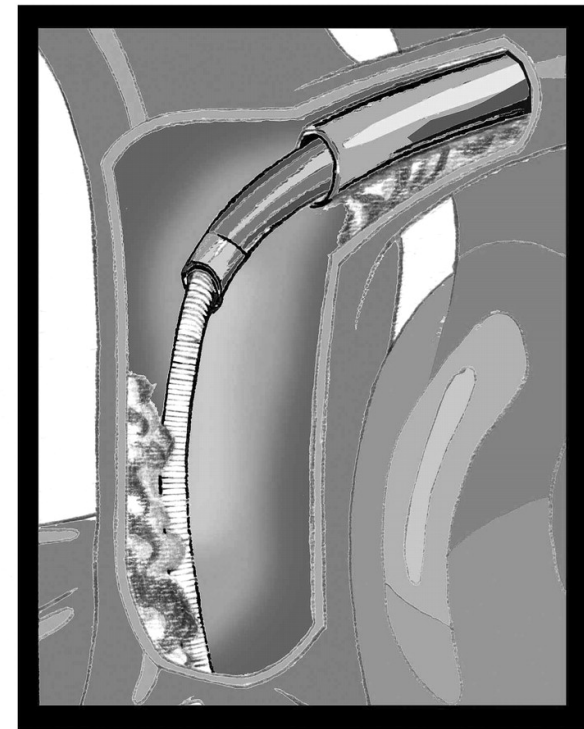
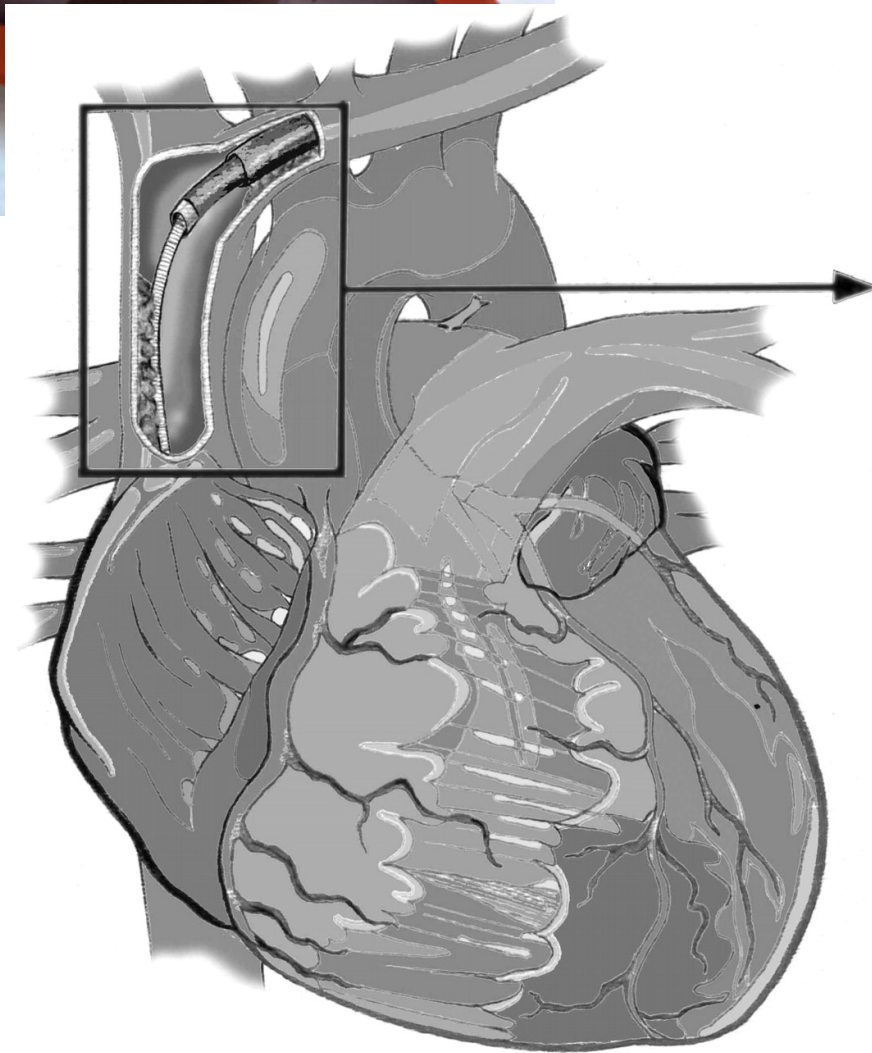
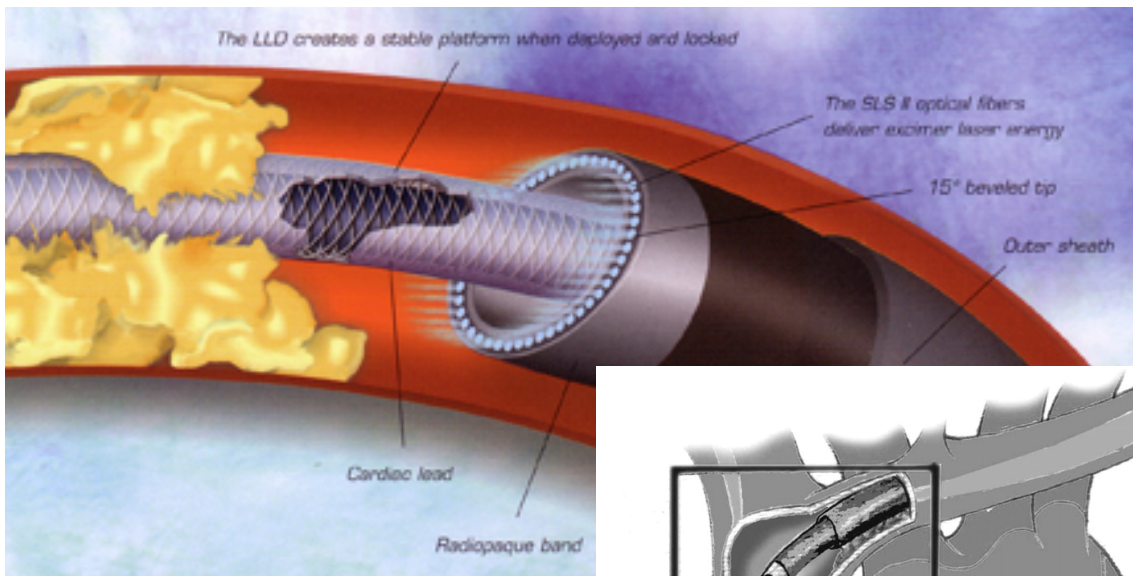
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|--|------|
| 1. Complete device and lead removal is recommended for all patients with definite CIED infection, as evidenced by valvular and/or lead endocarditis or sepsis. | IA |
| 2. Complete device and lead removal is recommended for all patients with CIEM pocket infection, as evidenced by abscess formation, device erosion, skin adherence, or chronic draining sinus without clinically evident involvement of the transvenous portion of the lead system. | 1B |
| 3. Complete device and lead removal is recommended for all patients with valvular endocarditis without definite involvement of the lead(s) and/or device. | 1B |
| 4. Complete device and lead removal is recommended for patients with occult staphylococcal bacteremia. | 1B |
| 5. Complete device and lead removal is reasonable in patients with persistent occult Gram-negative bacteremia despite appropriate antibiotic therapy. | IIaB |
| 6. CIED removal is not indicated for a superficial or incisional infection without involvement of the device and/or leads. | IIIC |
| 7. CIED removal is not indicated for relapsing bloodstream infection due to a source other than a CIED and for which long-term suppressive antimicrobials are required. | IIIC |

Baddour LM, et al. Update on Cardiovascular Implantable Electronic Device Infections and Their Management: A Scientific Statement From the American Heart Association. *Circulation*. 2010;121;458-477.

Which bugs?



Laser Lead Extraction



1. http://www.wehealny.org/services/slr_cardiology/arr_laser.html

2. Hauser, et al. Deaths and cardiovascular deaths due to device-assisted implanted cardioverter-defibrillator and pacemaker lead extraction. EP Europace. 2010. 12 (3).

Risks?

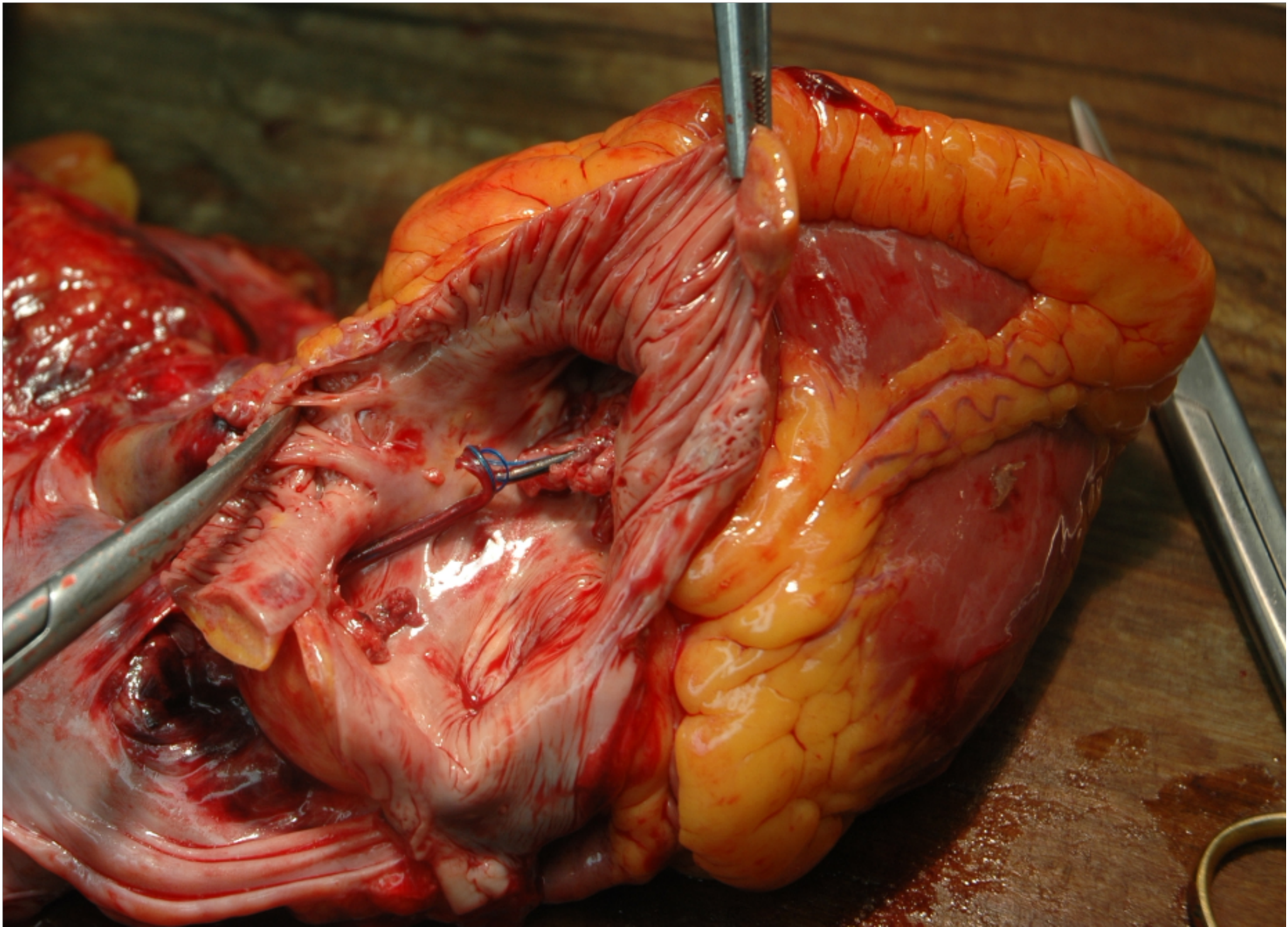
- Reports of major complications from laser extraction of chronically implanted leads range from 1.9% to 3.4%.¹
- Death:
 - 3/112 2.6%¹
 - 13/1684 0.8%²
 - 8/1299 0.6%³
 - 1/301 (p=NS)⁴

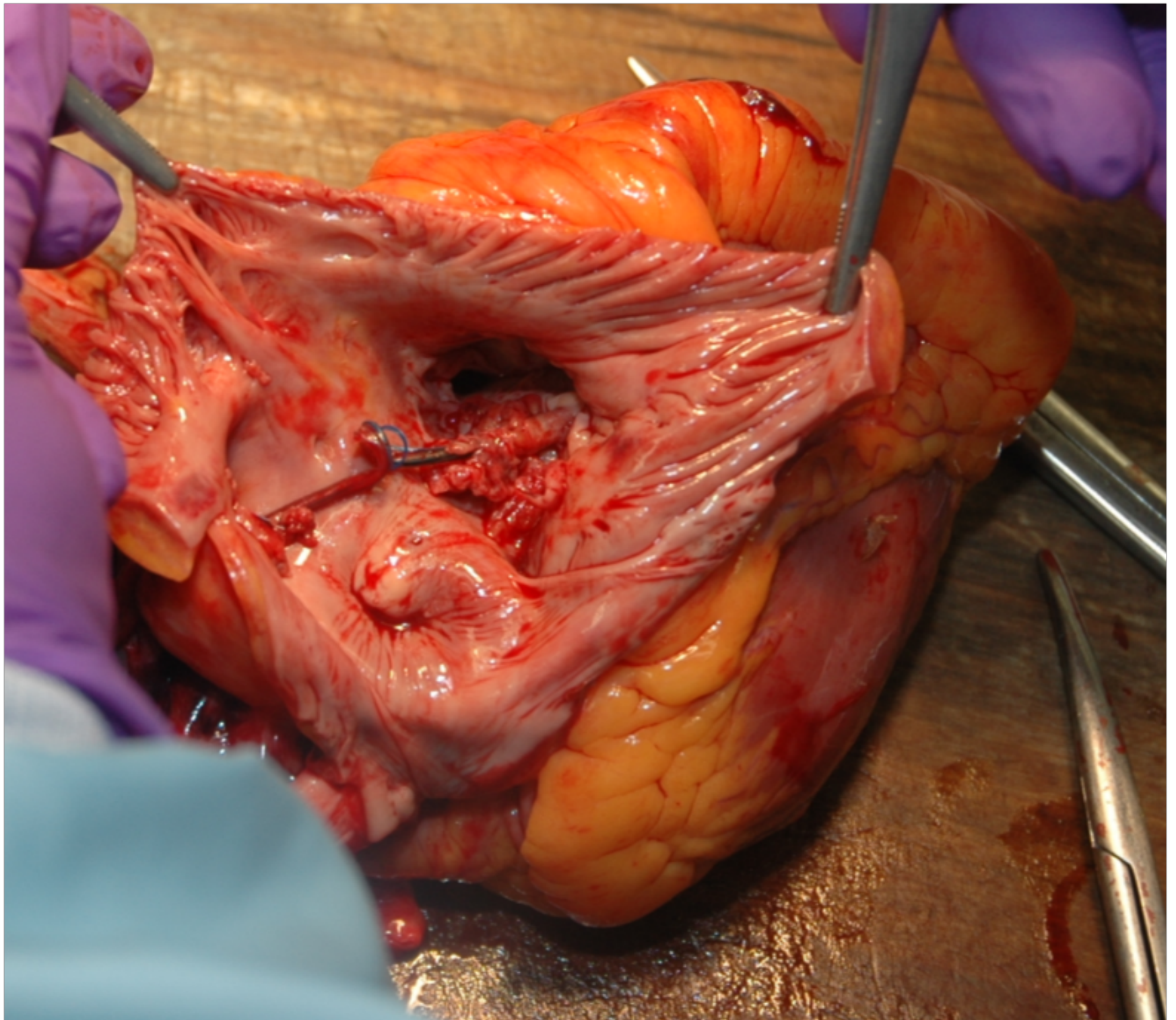
1. Gaca JG, *et al.* Laser-Assisted Extraction of Pacemaker and Defibrillator Leads: The Role of the Cardiac Surgeon. *Ann Thorac Surg.* 2009;87:1446-51.
2. Byrd CL, *et al.* Clinical Study of the Laser Sheath for Lead Extraction: The Total Experience of the United States. *PACE.* 2002;25:804-8.
3. Smith HJ, *et al.* Five-Years Experience with Intravascular Lead Extraction. *PACE.* 1994;17:2016-20.
4. Wilkoff BL, *et al.* Pacemaker Lead Extraction With the Laser Sheath: Results of the Pacing Lead Extraction with the Excimer Sheath (PLEXES) Trial. *J Am Coll Cardiol.* 1999;33:1671-6.

Back to our patient

- Went to EP lab for laser extraction of ICD
- Had difficulty fully advancing catheters
- Developed hypotension
- Cardiothoracic Surgeon was present who performed thoracotomy
- A 4cm SVC tear was identified

- Blood bank Massive Transfusion Protocol initiated
- The surgeon also placed an IV directly into the heart
- They were unable to contain or repair the laceration
- Resuscitation efforts were stopped, and the patient died





Micro follow-up

- Blood cultures:
8/8 sets NGTD
- Tissue culture:
2+ Staphylococcus, coagulase-negative

References

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Sohail MR, *et al.* Management and Outcome of Permanent Pacemaker and Implantable Cardioverter-Defibrillator Infections. *JACC*. May 8, 2007: 1851-9.

Wilkoff BL, *et al.* Pacemaker Lead Extraction With the Laser Sheath: Results of the Pacing Lead Extraction with the Excimer Sheath (PLEXES) Trial. *J Am Coll Cardiol*. 1999;33:1671-6.

<http://www.medcalc.com/endocarditis.html>

Access this talk again at:
<http://keithmurphy.org/talks>