Indications for Lead extraction

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Why we need lead removal?

• Infection

• Lead malfunction

• Venous stenosis and thrombosis
Removing lead

• **Lead Removal:**
  Removal of a pacing or defibrillator lead using any technique.

• **Lead Explant:**
  A lead removal using *simple traction* techniques (no locking stylet, telescoping sheaths or femoral extraction tools).

• **Lead Extraction:**
  Removal of a lead that has been implanted for *more than one year*, or
  a lead regardless of duration of implant requiring the *assistance of specialized equipment* that is not included as part of the typical implant package, and/or
  removal of a lead from a route *other than via the implant vein*.

Heart Rhythm Society Expert Consensus 2009
Lead Extraction Approach

- **Implant Vein:**
  same transvenous access by which they were inserted, termed the implant vein.

- **Non-implant vein:**
  femoral, jugular or subclavian veins.
  via a trans-atrial or via a ventriculotomy approach.

Heart Rhythm Society Expert Consensus 2009
Why we need extraction rather than explant
Gross pathology of ICD

Epstein AE, Circulation, 1998
Epstein AE, Circulation, 1998
Encapsulating fibrous tissue on extracted lead
Fibrous tissue peeled from encapsulated lead
Indications for transvenous lead extraction*

Recommendations for lead extraction apply only to those patients in whom the benefits of lead removal outweigh the risks when assessed based on individualized patient factors and operator specific experience and outcomes.
Indications for transvenous lead extraction*

1. Infection
2. Chronic pain
3. Thrombosis and venous stenosis
4. Functioning lead
5. Nonfunctioning lead
Indications for transvenous lead extraction: Infection

Class I
1. Complete device and lead removal is recommended in all patients with **definite CIED system infection**, as evidenced by valvular endocarditis, lead endocarditis or sepsis. *(Level of evidence: B)*
2. Complete device and lead removal is recommended in all patients with **CIED pocket infection** as evidenced by pocket abscess, device erosion, skin adherence, or chronic draining sinus without clinically evident involvement of the transvenous portion of the lead system. *(Level of evidence: B)*
Indications for transvenous lead extraction: Infection

Class I

3. Complete device and lead removal is recommended in all patients with *valvular endocarditis* without definite involvement of the lead(s) and/or device.

 *(Level of evidence: B)*

4. Complete device and lead removal is recommended in patients with *occult gram-positive bacteremia* (not contaminant).

 *(Level of evidence: B)*
Indications for transvenous lead extraction: Infection

Class IIa
1. Complete device and lead removal is reasonable in patients with persistent occult gram-negative bacteremia. *(Level of evidence: B)*

Class III
1. CIED removal is not indicated for a superficial or incisional infection without involvement of the device and/or leads *(Level of evidence: C)*
2. CIED removal is not indicated to treat chronic bacteremia due to a source other than the CIED, when long-term suppressive antibiotics are required. *(Level of evidence: C)*
56/M
Pocket infection
Indwelling time
172 months
56/M
Pocket infection
Indwelling time
172 months
Indications for transvenous lead extraction: Chronic Pain

Class IIa

1. Device and/or lead removal can be useful for patients with severe chronic pain at the device or lead insertion site or believed to be secondary to the device, which causes significant patient discomfort, is not manageable by medical or surgical techniques, and for which there is no acceptable alternative (C-EO)
Indications for transvenous lead extraction:
Thrombosis or Venous Stenosis

**Class I**

1. Lead removal is recommended for patients with clinically significant thromboembolic events attributable to thrombus on a lead or a lead fragment that cannot be treated by other means (C-EO)

2. Lead removal is recommended for patients with SVC stenosis or occlusion that prevents implantation of a necessary lead (C-EO)

3. Lead removal is recommended for patients with planned stent deployment in a vein already containing a transvenous lead, to avoid entrapment of the lead (C-EO)
Indications for transvenous lead extraction: Thrombosis or Venous Stenosis

Class I
4. Lead removal as part of a comprehensive plan for maintaining patency is recommended for patients with SVC stenosis or occlusion with limiting symptoms (C-EO)

Class IIa
1. Lead removal can be useful for patients with ipsilateral venous occlusion preventing access to the venous circulation for required placement of an additional lead (C-LD)
Indications for transvenous lead extraction: Functional Leads

Class I

1. Lead removal is recommended for patients with life-threatening arrhythmias secondary to retained leads (C-EO)

Class IIa

1. Lead removal can be useful for patients with a CIED location that interferes with the treatment of a malignancy (C-EO)
2. Lead removal can be useful for patients if a CIED implantation would require more than four leads on one side or more than five leads through the SVC.
3. Lead removal can be useful for patients with an abandoned lead that interferes with the operation of a CIED system.
48/M, Brugada syndrome
VF survivor
Lead malfunction
(22 months)
24/M
Brugada syndrome
Aborted sudden cardiac arrest due to VF
2004/2/9
ICD implantation
(RIATA1570, Photon mVR)
Progressive decrease of pacing impedance
460(implant) $\rightarrow$ 265 (6 Mo later)
$\rightarrow$ 206 (1 yr post implant)
$\rightarrow$ 185-190 Ohm (2 yr post implant)
$\rightarrow$ Inappropriate shock to noise detection

2006-7-4
RIATA 1580 lead reinsertion

If exact same patient present in 2015,
1. Extract preexisting ICD lead (2 yr 5 Months old)
2. New implant (single coil ICD)
2010-4-5
RV capture threshold 7.5V/0.50 ms
Impedance > 2000 Ohm
R=9.4 mV

If exact same patient present in 2015,
1. Extraction of distal (RV coil) from the IVC using snare
2. Removal of proximal coil by surgical dissection
2010-4-21
ICD reimplantation
(RIATA1580, Current VR RF 1207-36)
DFT 15 J

Pain in implant site

If exact same patient present in 2015,
1. Extract the preexisting ICD lead
2. Venoplasty or stenting. If there is stenosis in the vein
3. Reimplant new ICD in the left pectoral region
2010-6-3
RFCA for frequent VPC, nonsustained VT
Defibrillation failed @ 15 J
Defibrillation failed @ 20 J
Defibrillation success @ 36 J
2010-6-7
Lead revision
** induced VF(DC fibber) 4회 **
1) DC fibber 2sec : induction failed =>NSR
2) DC fibber 2.5sec -> fixed P.sidth 450V(10.3J):Failed->750V (28.7J) : NSR
4) DC fibber 2.5sec : induction failed
   DC fibber 3.0sec-> fixed P.sidth 650V(21.7J): NSR
If exact same patient present in 2015,
1. Continue to use right pectoral region
2. ICD reprogramming to reduced DFT

If exact same patient present with lead malfunction in the future,
1. Extract all leads
2. Reexamination of patency of left subclavian vein
3. If occlusion of vein → PTA/Stenting of CTO of left subclavian vein + ICD
4. Reinsertion of new ICD in left side

If exact same patient present with infection in the future
1. OMG, True nightmare
2. Generator and lead extraction
3. NO safe entry site in the upper veins.
The END ?
Conclusion

• Lead extraction is indicated in infection CIED pocket infection as well as definite CIED system infection.

• Increasing number of patients with non-infectious cause (vein occlusion, ICD lead malfunction) need lead extraction.