

# Extrakce stimulačních a defibrilačních elektrod (Patient and lead management)

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# The EHRA White Book 2017

The Current Status of Cardiac Electrophysiology  
in ESC Member Countries

G. Hindricks, J. Camm, B. Merkely, P. Raatikainen, D.O. Arnar

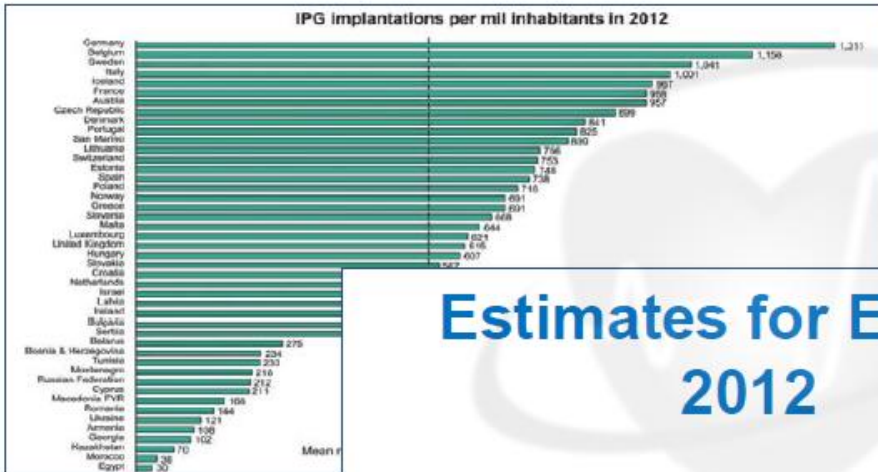
ČR 2016:

• Primoimplantace PM:	6795 (20 LCPs)	} ~ 20 000 elektrod ročně
• Primoimplantace CRTP:	450	
• Primoimplantace CRTD:	1643	
• Primoimplantace ICD:	~ 1800	

TLA: 5 centers, n= 350

« Europe » = 893 M inhabitants

Total 2012 = 493,573 PMs implanted



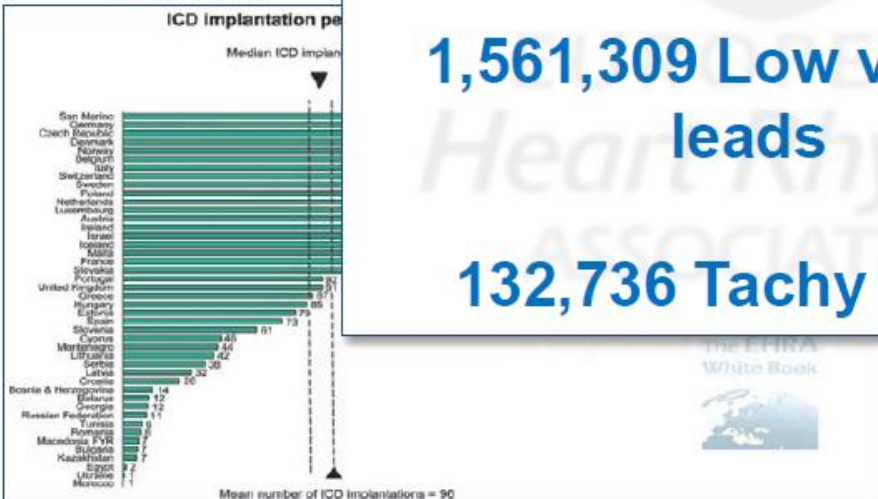
Estimates for Europe  
2012

1,561,309 Low voltage  
leads

132,736 Tachy leads



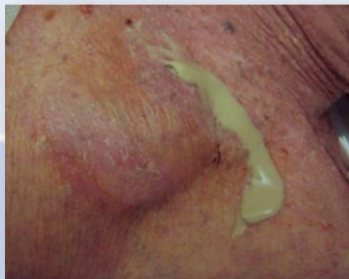
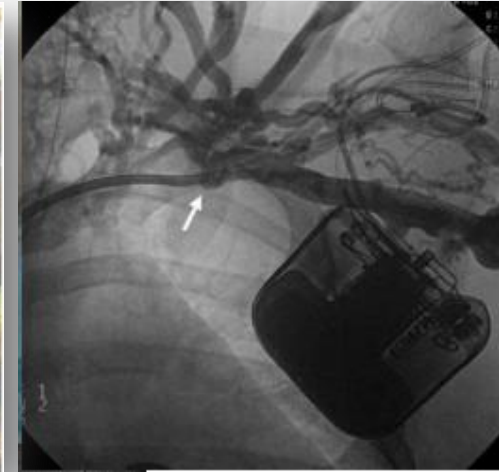
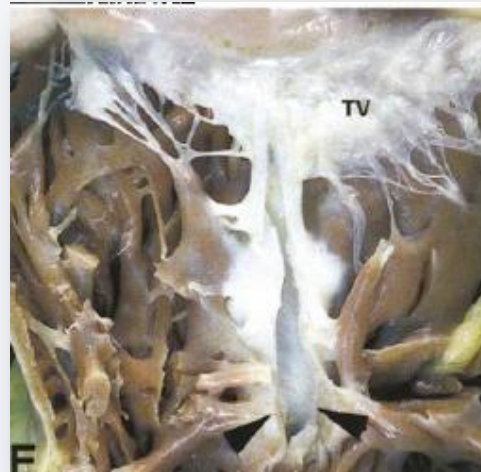
Total 2012 = 84,716 ICDs implanted



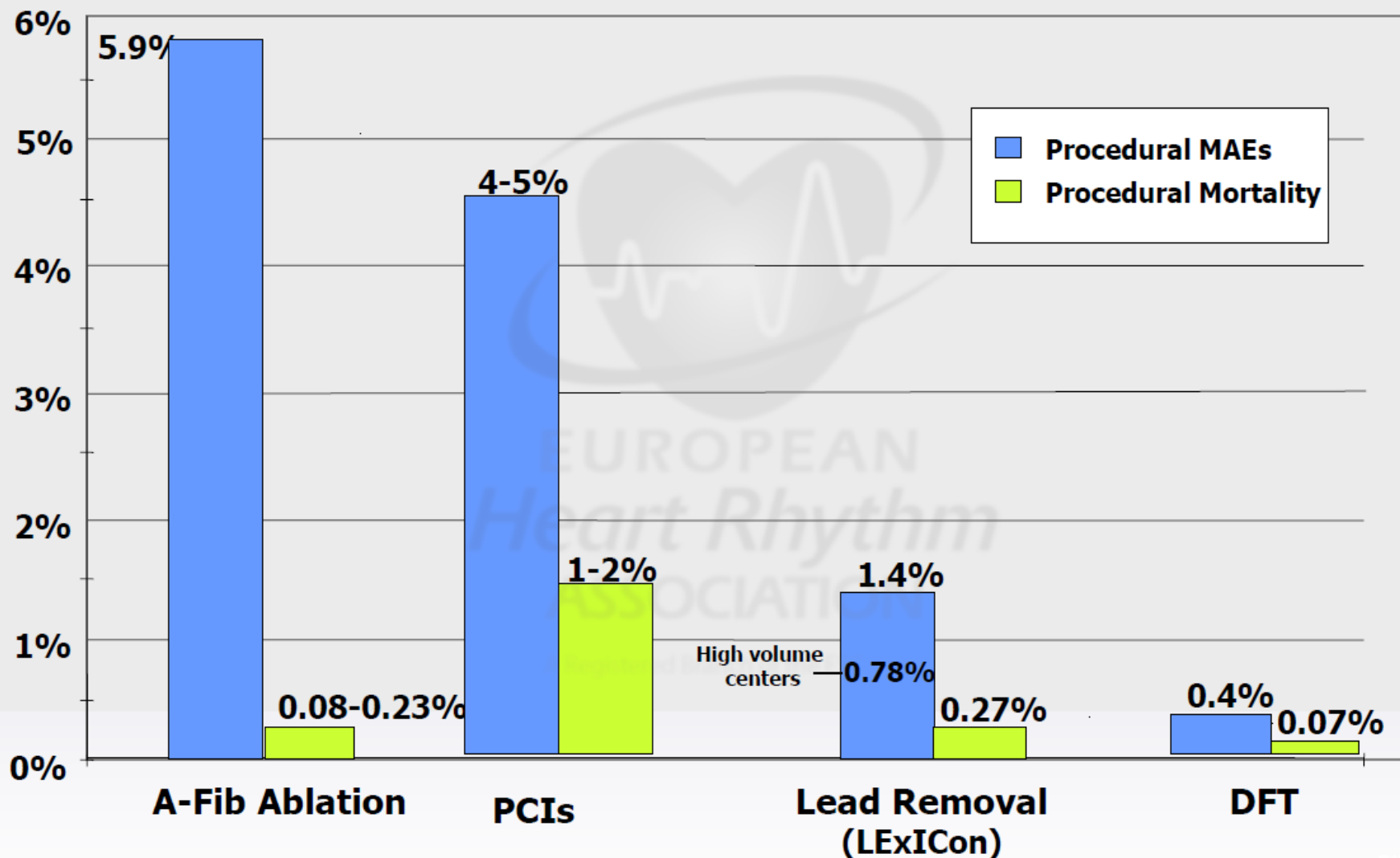
Arribas F et al., Europace 2014,16:i1-i78

# Komplikace elektrod

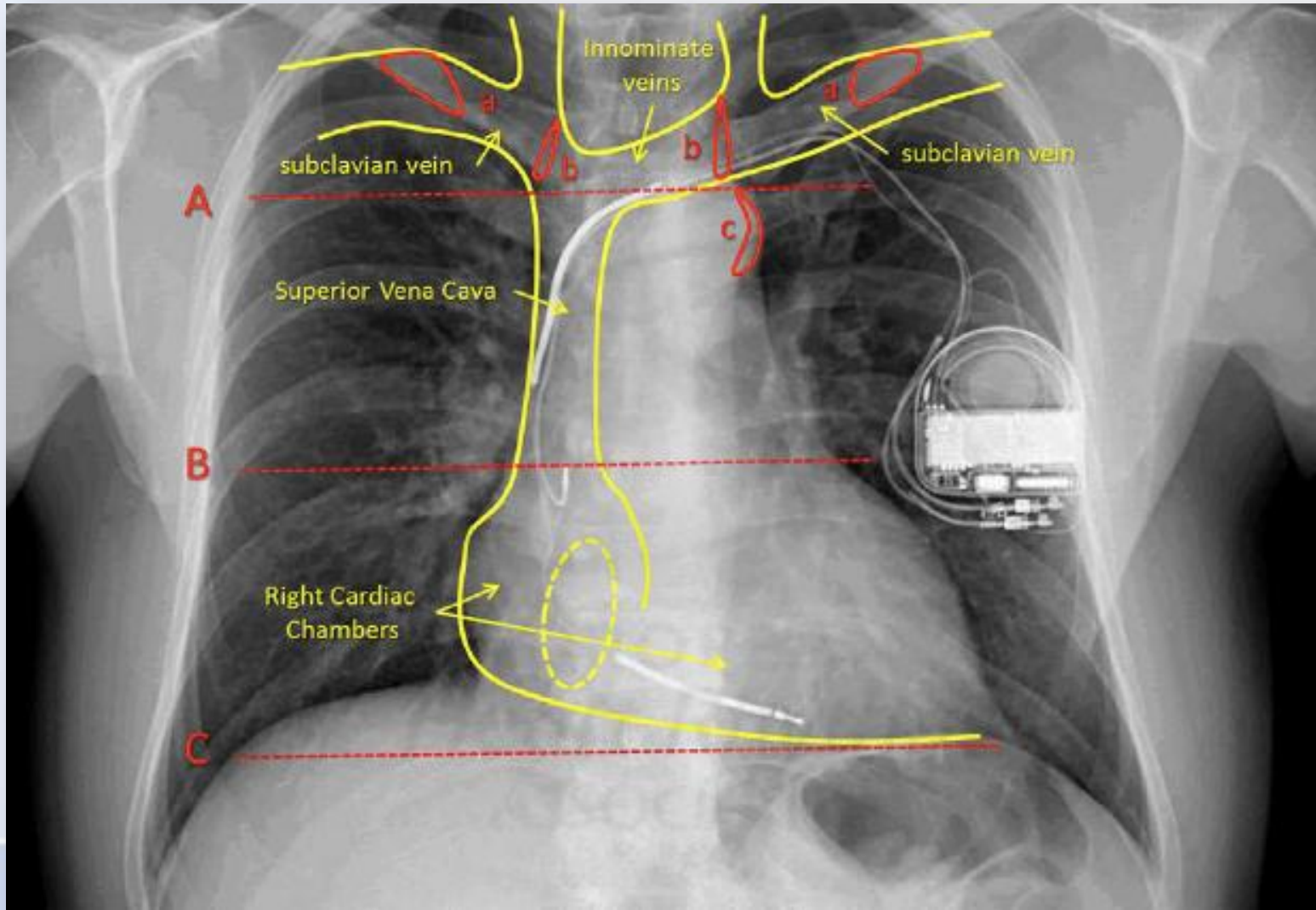
- Infekce CIEDs, IE
- Neadekvátní terapie ICD
- Destrukce trikuspidální chlopně
- Komplikace v kapse
- Žilní okluze
- Migrace elektrod
- Bolestivé syndromy
- Inkompatibilita s MR
- Interakce „lead-on-box“
- Interakce „box-on-lead“
- Inhibice stimulace



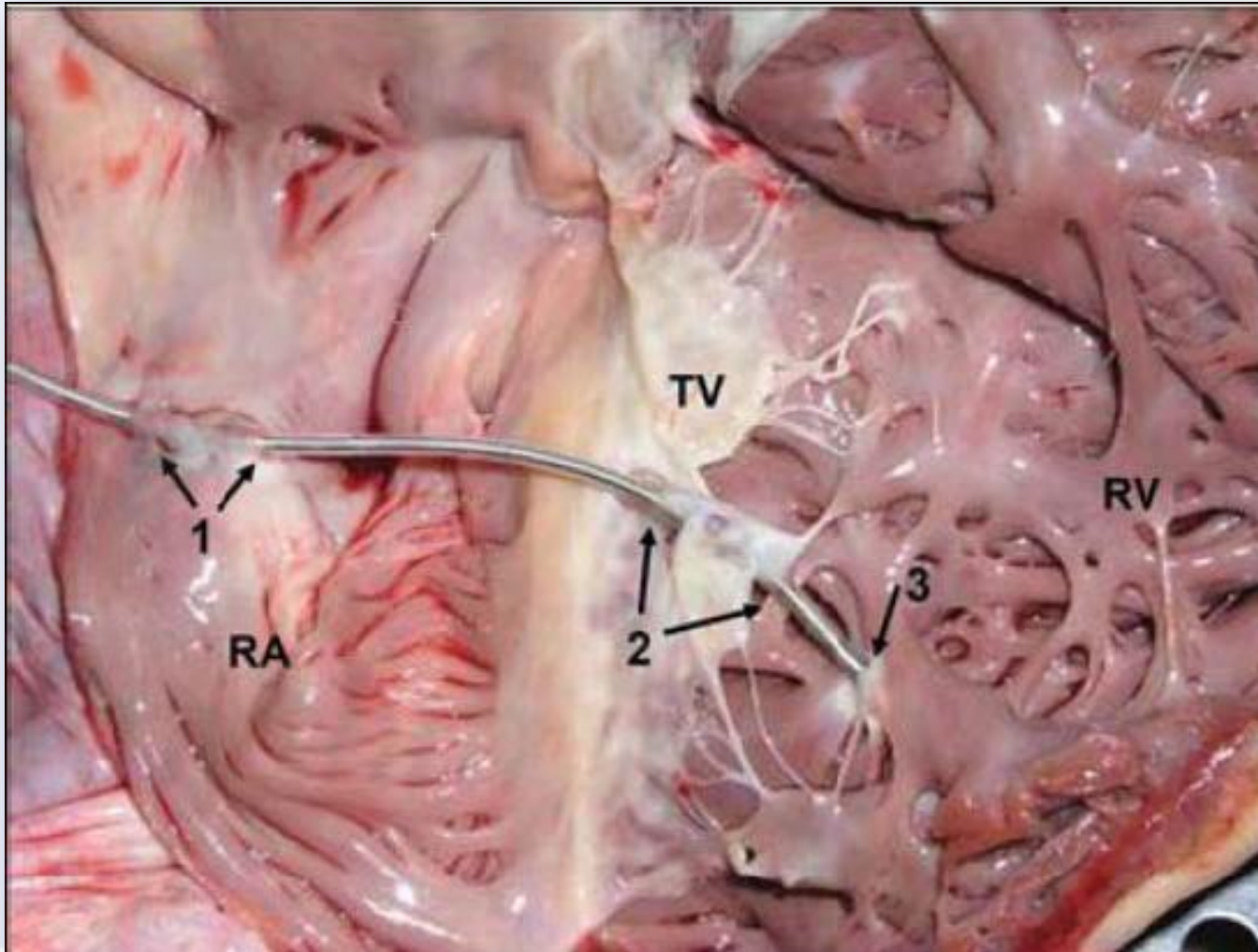
# Mortalitní riziko invazivních výkonů



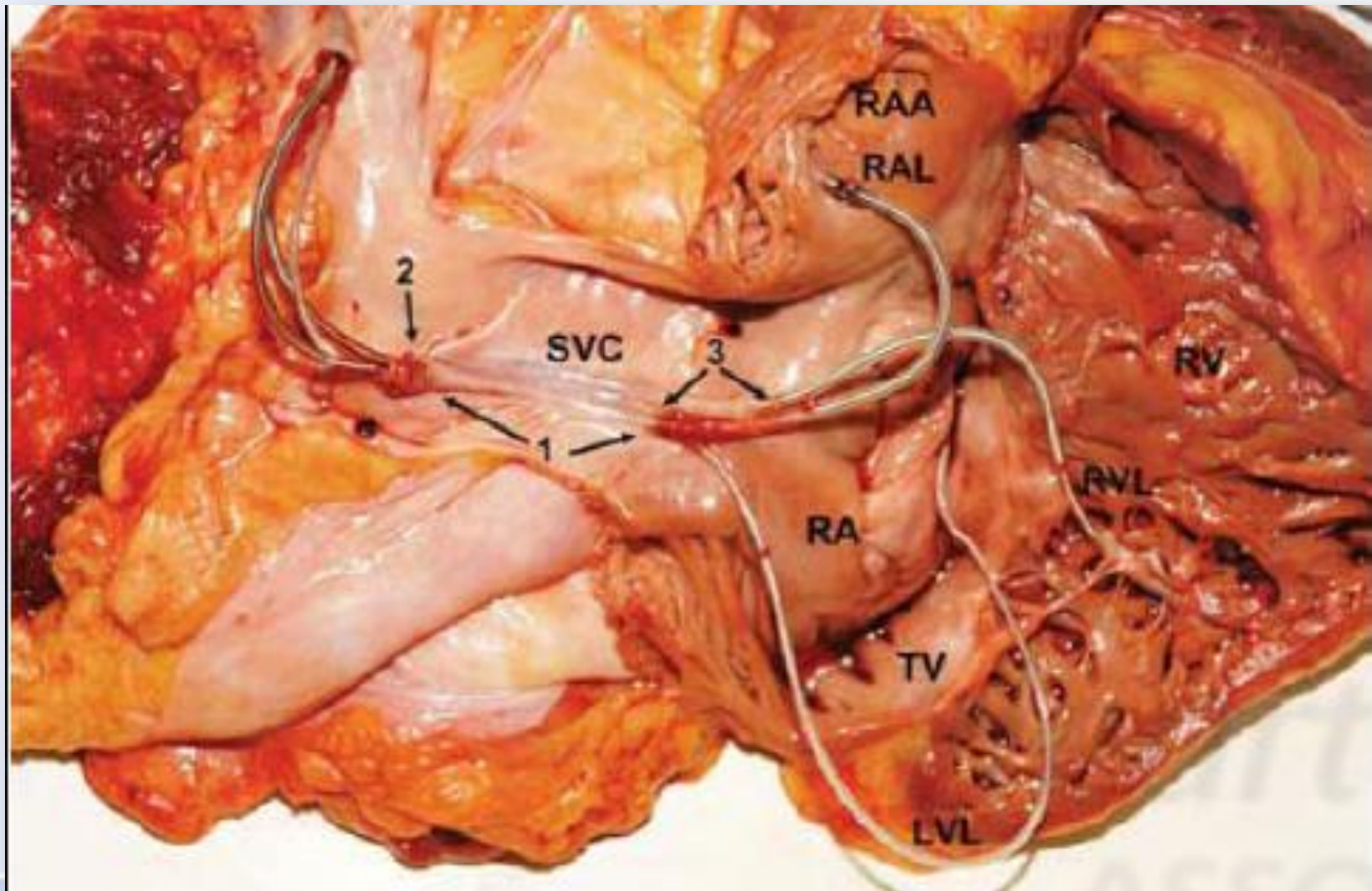
# Místa fibrózních adherencí



# Místa fibrózních adherencí

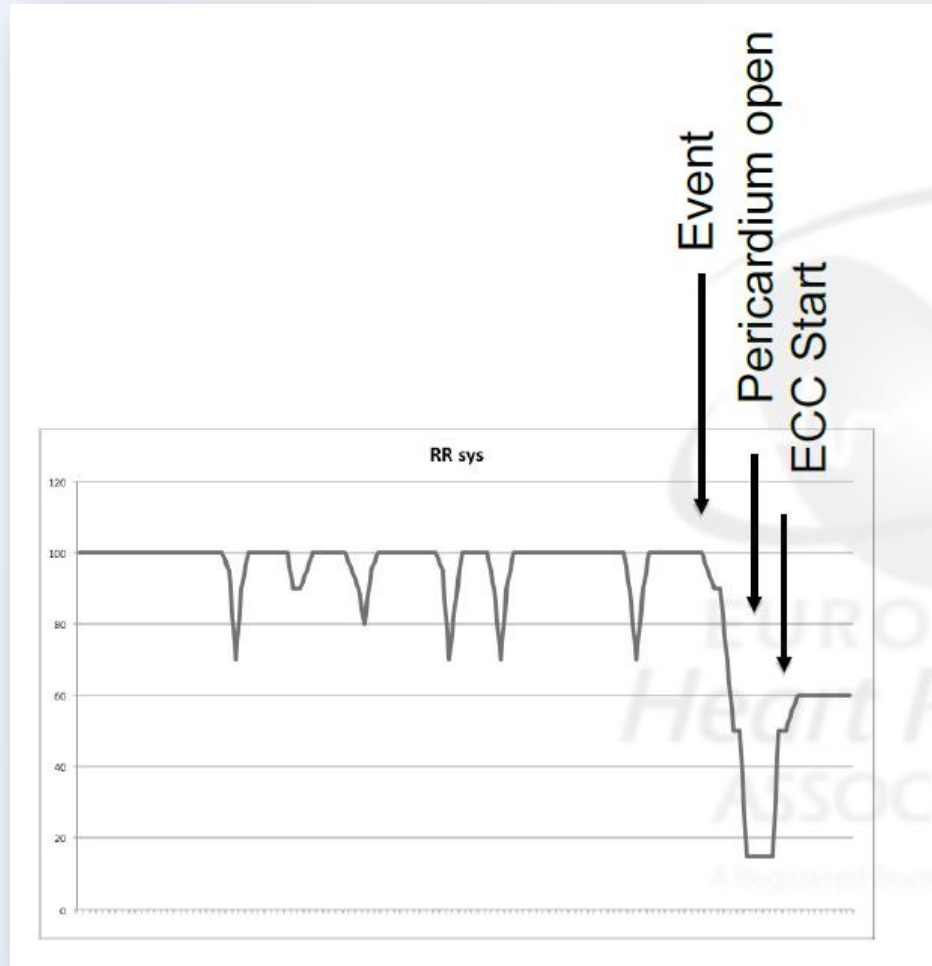


# Místa fibrózních adherencí





# Procedurální mortalita u TLE



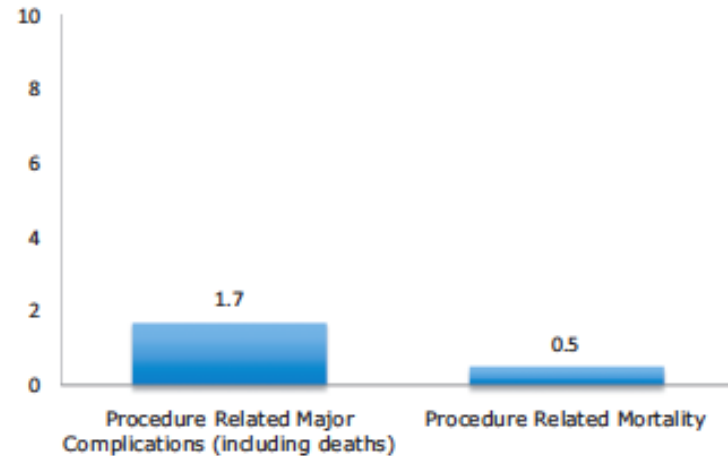
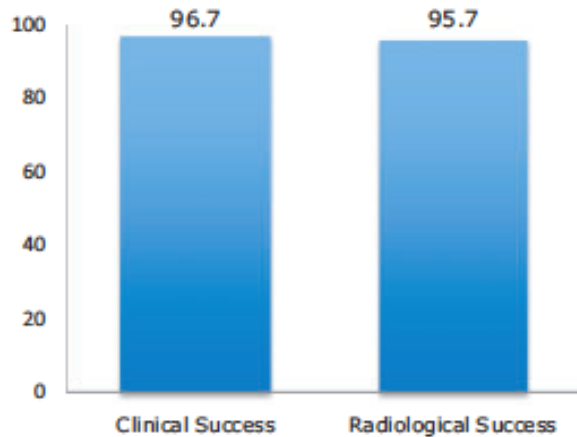
# ELECTRa

## European Lead Extraction ConTrolled Registry

73 centers in 19 European countries  
3510 patients with 6493 leads  
75.7% pacing leads & 24.3% ICD leads

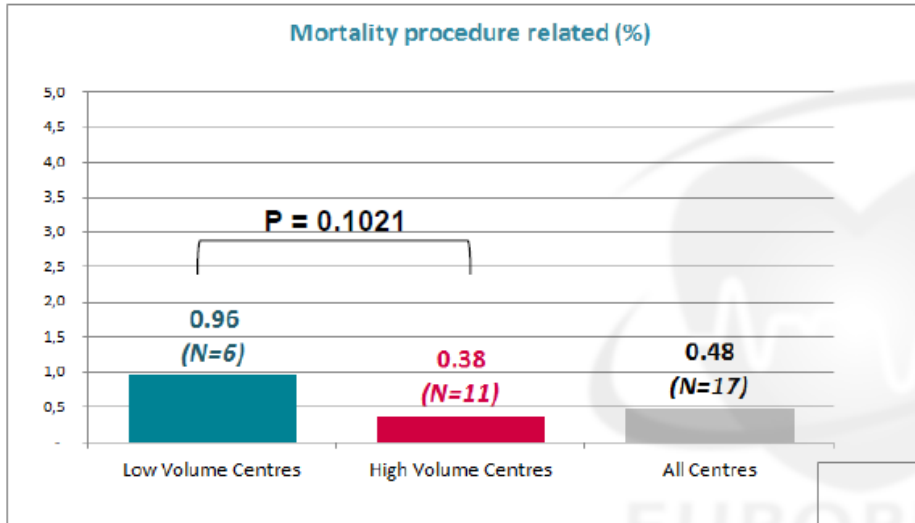
Transvenous Lead Extractions  
Indications  
52.8% infective & 47.3 % non-infective

### OUTCOMES

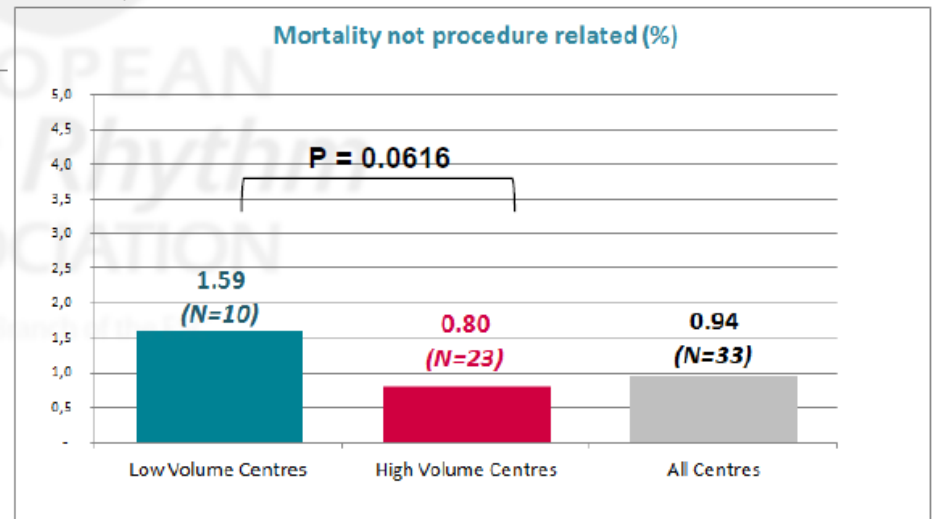


Bongiorni, M. G., et al. (2017). "The European Lead Extraction ConTrolled (ELECTRa) study: a European Heart Rhythm Association (EHRA) Registry of Transvenous Lead Extraction Outcomes." Eur Heart J.

# ELECTRA Registry



Mortality:	N	%
Total	50	1.42
Procedure related	17	0.48
Not procedure related	33	0.94



**High Volume Centre**  
*> 30 pts/year*

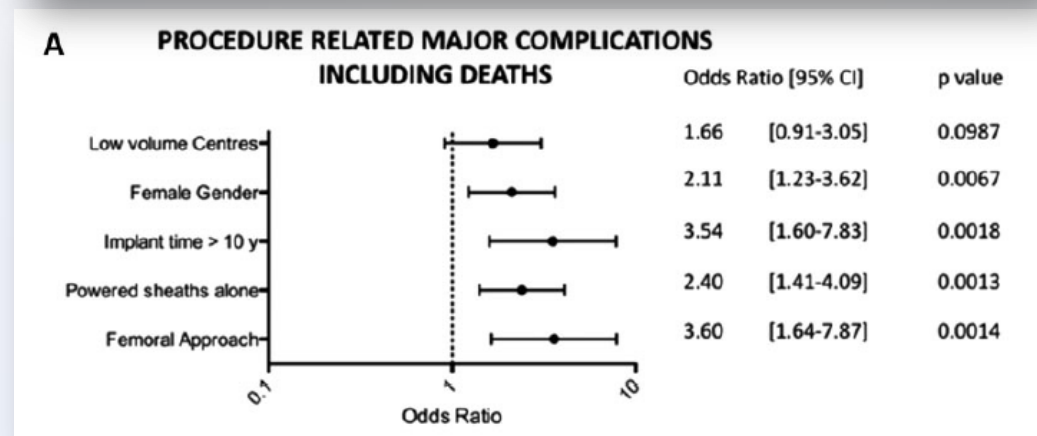
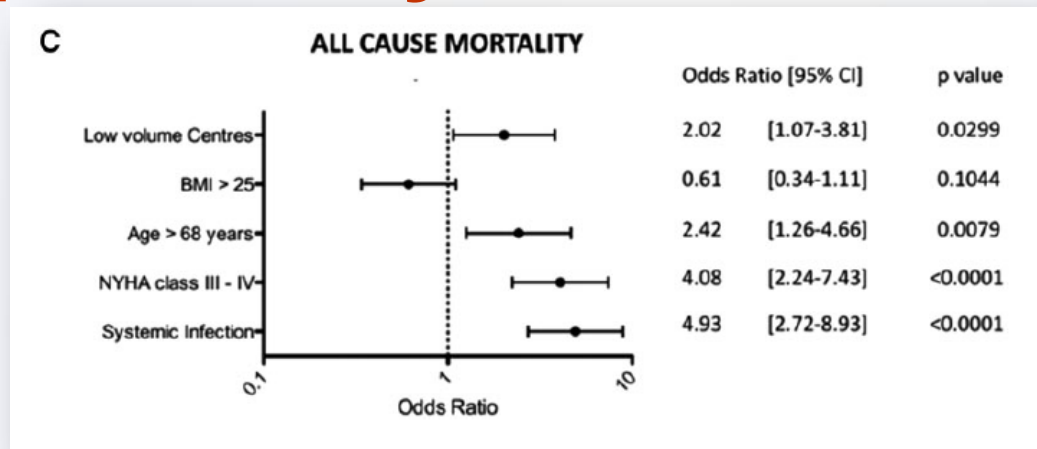
**Low volume Centre**  
*≤ 30 pts/year*

**N=3,510 patients with TLE**

Bongiorni, M. G., et al. (2017). "The European Lead Extraction ConTRolled (ELECTRa) study: a European Heart Rhythm Association (EHRA) Registry of Transvenous Lead Extraction Outcomes." Eur Heart J.

# Rizikové prediktory extrakcí

- Sepse
- Srdeční selhání
- Věkové extrémny
- Ženy
- Nízký a vysoký BMI
- Stáří elektrod
- Počet elektrod
- Typ elektrod
- Septický stav
- Dependence
- Dialýza/kalicifikace
- Antikoagulace
- Pravostranné nebo oboustranné extrakce
- Imunosuprese



Bongiorni, M. G., et al. (2017). "The European Lead Extraction ConTRolled (ELECTRa) study: a European Heart Rhythm Association (EHRA) Registry of Transvenous Lead Extraction Outcomes." Eur Heart J.

# Faktory rozhodování o TLE

- Očekávané přežití (věk)
- Potenciální prospěch
- Počet elektrod (> 4 ipsilaterálně, > 5 in SVC)
- Riziko kolaterálního poškození funkčních elektrod
- Jiné komplikace
- Zkušenost operátora a vybavení centra

# Guidelines pro extrakce elektrod

## 2017 HRS expert consensus statement on cardiovascular implantable electronic device lead management and extraction

Fred M. Kusumoto, MD, FHRS, FACC (Chair),<sup>1</sup>

Mark H. Schoenfeld, MD, FHRS, FACC, FAHA, CCDS (Vice-Chair),<sup>2</sup>

Bruce L. Wilkoff, MD, FHRS, CCDS (Vice-Chair),<sup>3</sup> Charles I. Berul, MD, FHRS,<sup>4,\*</sup>

Ulrika M. Birgersdotter-Green, MD, FHRS,<sup>5</sup> Roger Carrillo, MD, MBA, FHRS,<sup>6</sup> Yong-Mei Cha, MD,<sup>7</sup>

Jude Clancy, MD,<sup>2</sup> Jean-Claude Deharo, MD, FESC,<sup>8</sup> Kenneth A. Ellenbogen, MD, FHRS,<sup>9</sup>

Derek Exner, MD, MPH, FHRS,<sup>10</sup> Ayman A. Hussein, MD, FACC,<sup>11</sup>

Charles Kennergren, MD, PhD, FETCS, FHRS,<sup>12,‡</sup> Andrew Krahn, MD, FRCPC, FHRS,<sup>13</sup>

Richard Lee, MD, MBA,<sup>14,§</sup> Charles J. Love, MD, CCDS, FHRS, FACC, FAHA,<sup>15,¶</sup>

Ruth A. Madden, MPH, RN,<sup>11</sup> Hector Alfredo Mazzetti, MD,<sup>16,#</sup> JoEllyn Carol Moore, MD, FACC,<sup>17</sup>

Jeffrey Parsonnet, MD,<sup>18,\*\*</sup> Kristen K. Patton, MD,<sup>19,‡‡</sup> Marc A. Rozner, PhD, MD, CCDS,<sup>20,†,§§</sup>

Kimberly A. Selzman, MD, MPH, FHRS, FACC,<sup>21</sup> Morio Shoda, MD, PhD,<sup>22</sup>

Komandoor Srivathsan, MD,<sup>23</sup> Neil F. Strathmore, MBBS, FHRS,<sup>24,¶¶</sup>

Charles D. Swerdlow, MD, FHRS,<sup>25</sup> Christine Tompkins, MD,<sup>26</sup> Oussama Wazni, MD, MBA<sup>11</sup>

# Extrakce elektrod u infekcí CIEDs

## Třída I

1. Kompletní explantace přístroje včetně elektrod u pacientů s jistou infekcí CIEDs (systémová infekce, endokarditida, sepse)

***(Level of evidence: B)***

2. Kompletní explantace přístroje včetně elektrod u pacientů s jistou infekcí kapsy CIEDs (absces, decubitus, retrakce, píštěl) i bez postižení transvenosních elektrod

***(Level of evidence: B)***

3. Kompletní explantace systému včetně elektrod u všech pacientů s chlopenní endokarditidou i bez zjevného postižení elektrod

***(Level of evidence: B) X Evropa: IIbC!!***

4. Kompletní explantace přístroje včetně elektrod u pacientů s perzistující nebo rekurentní bakterémií, fungémií přes adekvátní terapii, pokud není zjistitelný jiný zdroj.

***(Level of evidence: B)***

# Chronická bolest

**Class I -> Class IIa**

# Trombóza, vaskulární komplikace

**Class I:** TE příhody, syndrom HDŽ

**Class IIa:** získání cévního vstupu

# Ostatní

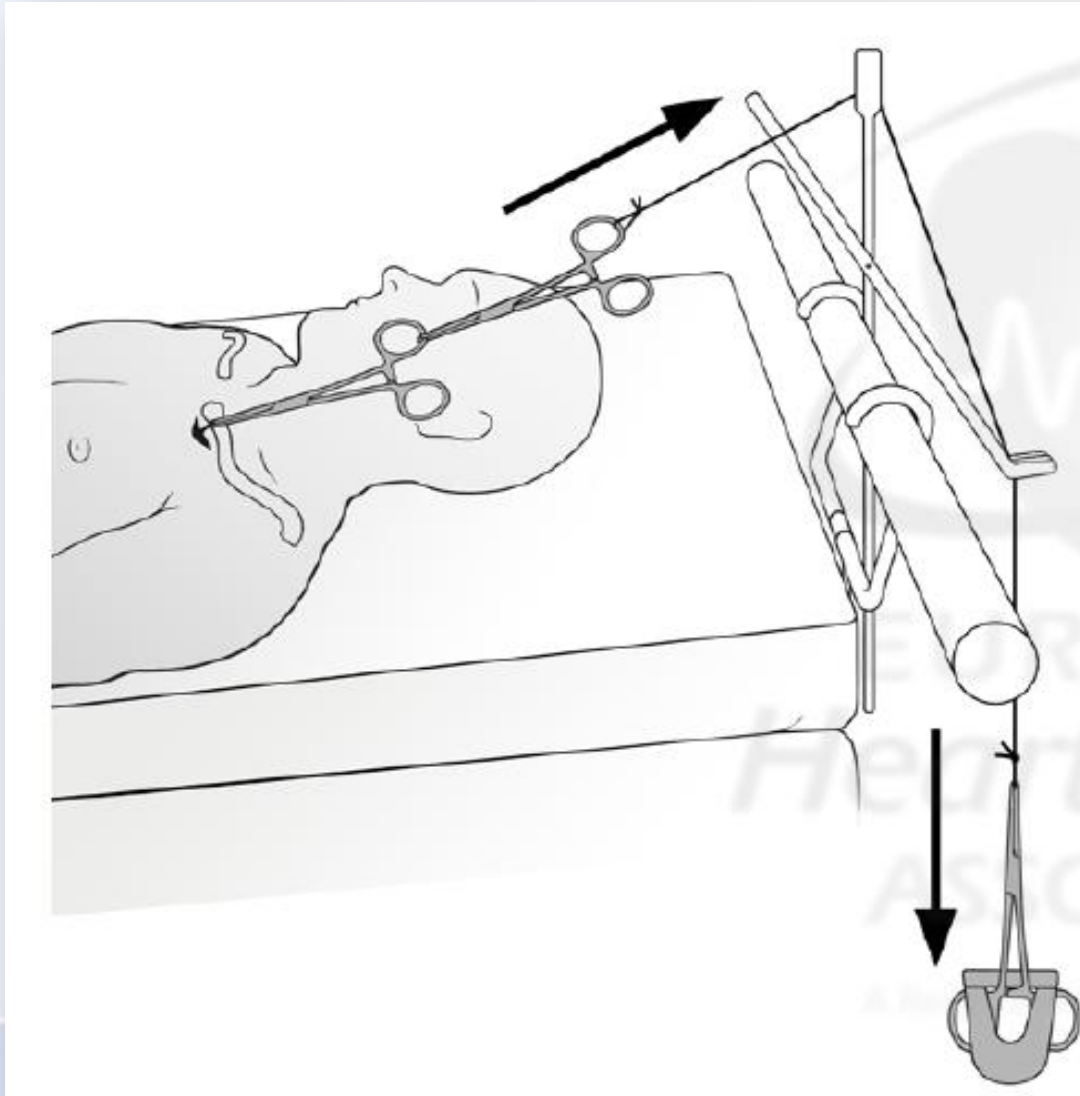
**Class I:** Arytmie, nebezpečné nebo interferující elektrody

**Class IIa:** k umožnění onkologické terapie, příliš mnoho elektrod, interakce elektrod

**Class IIb:** Nepoužívané elektrody, potřeba MR bez alternativ

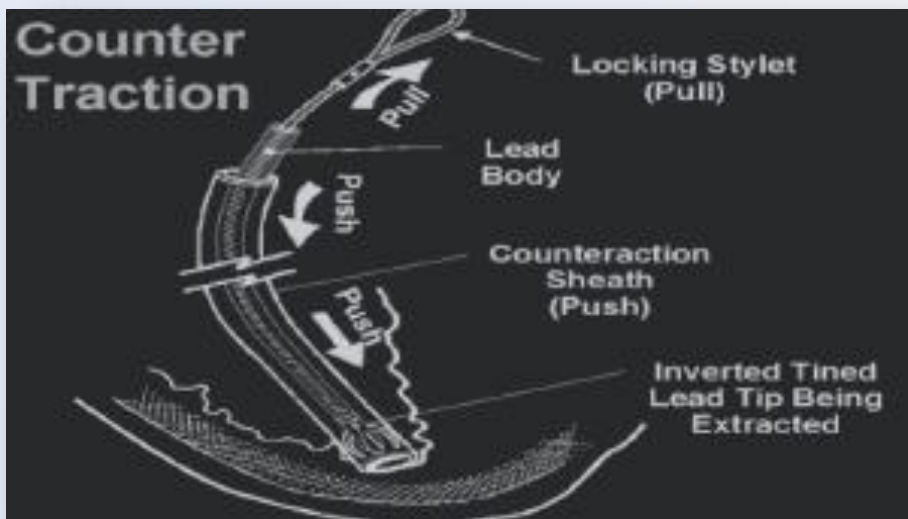


# Historie



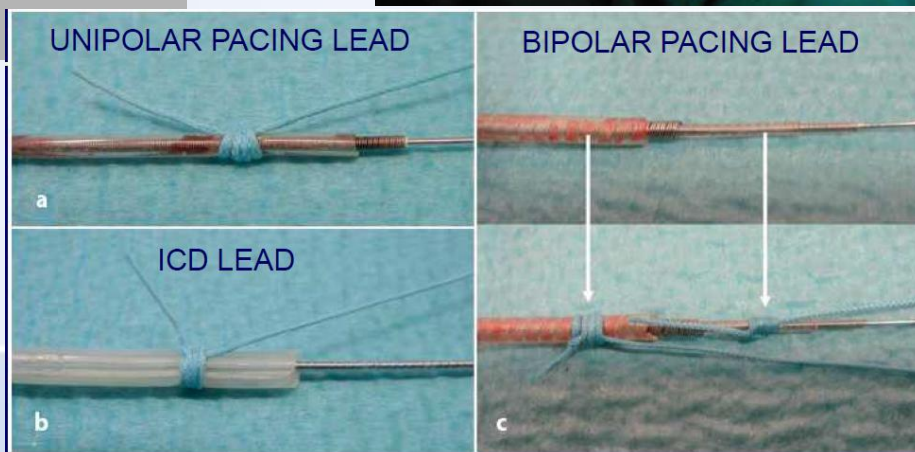
# Současný přístup k TLE

- Minimální trakce
- Bezpečné uvolnění adhezí

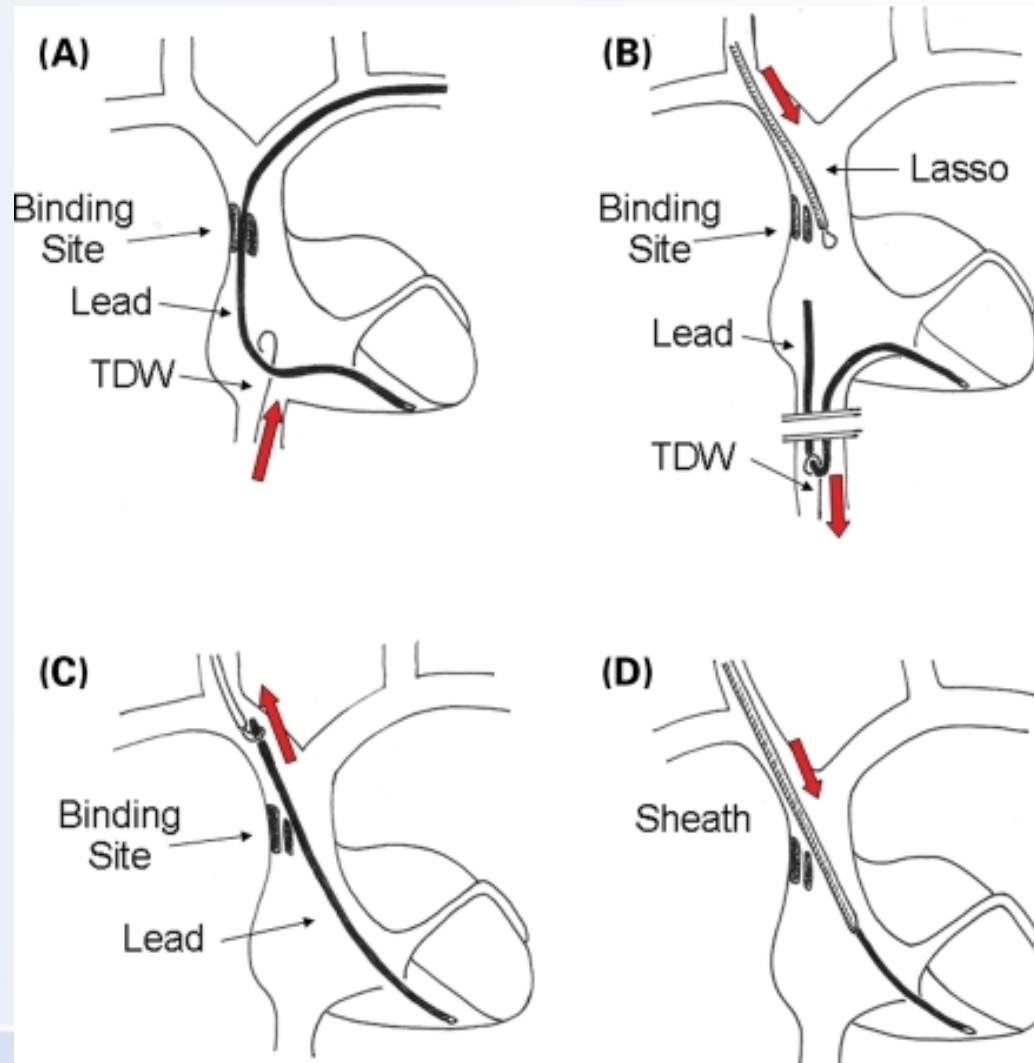


I had two goals: one is safety and the other is success...I'm not talking about financial success or all that, I'm talking about success in liberating leads from the body.  
— *Dr. Charles Byrd*

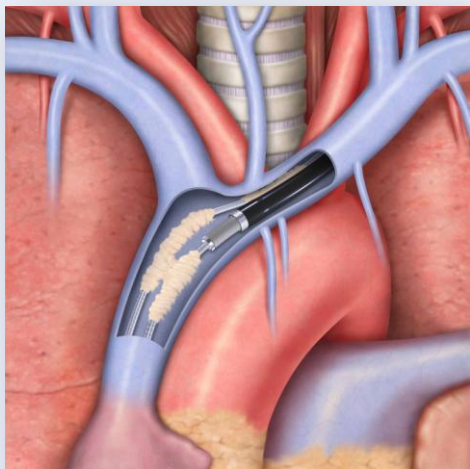
# „Bongiorni“ “Pisa“ technique



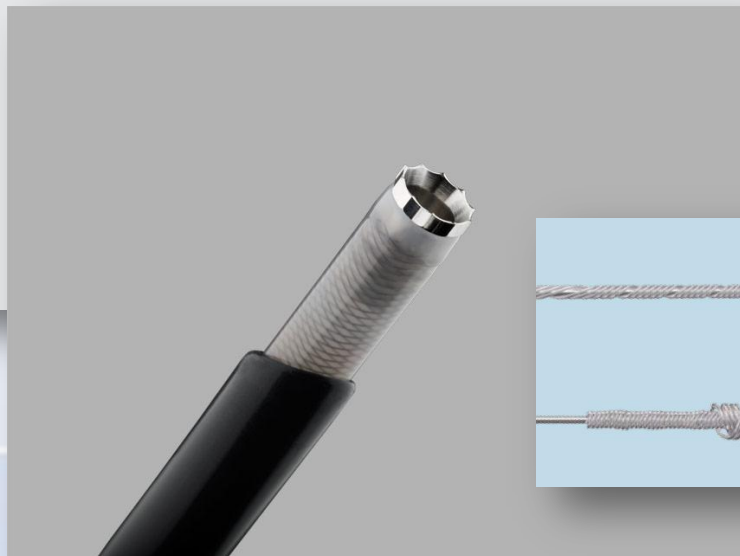
# Pisa (M.G. Bongiorno) TLE technique



# Evolution (Cook Medical)



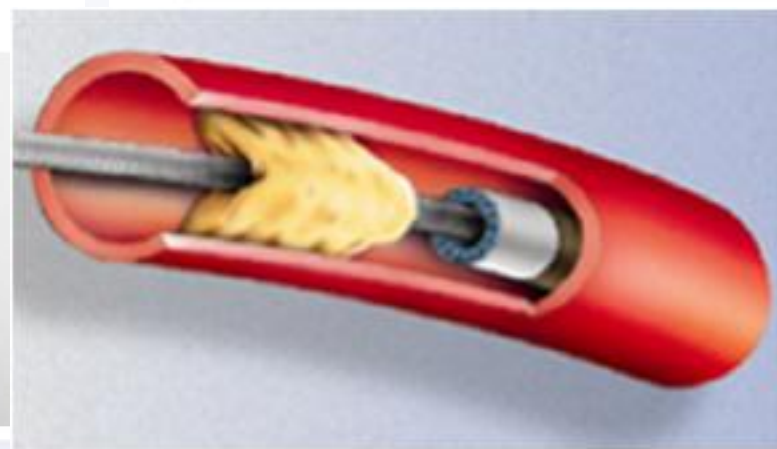
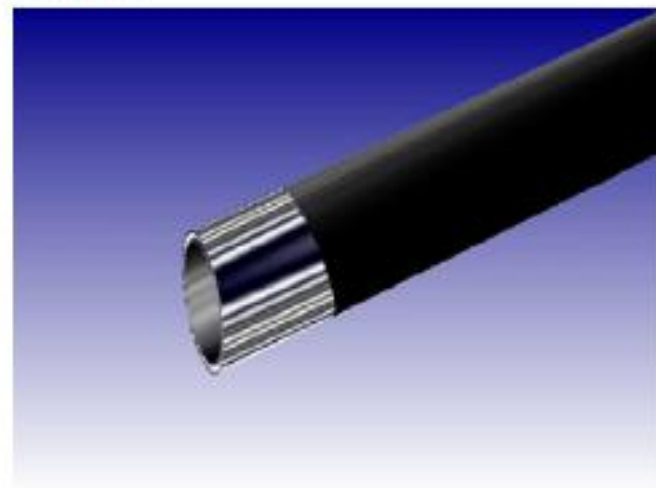
to extract leads by  
ions along the entire  
cardiac lead. The PTFE  
to disrupt tissue and  
e Evolution RL comes in  
nmodates both pacing



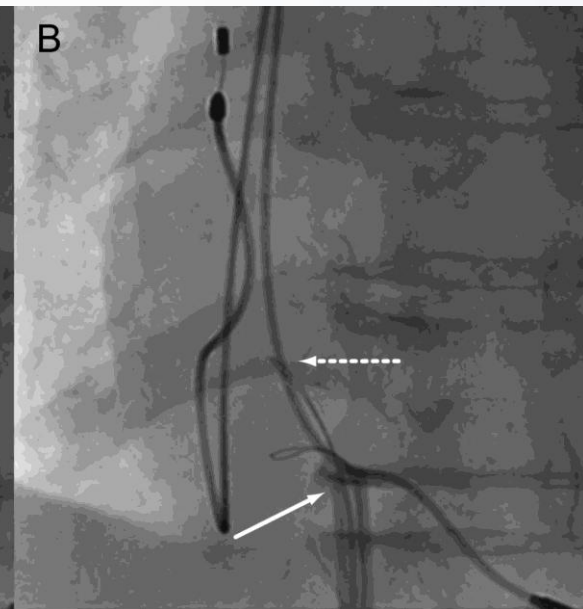
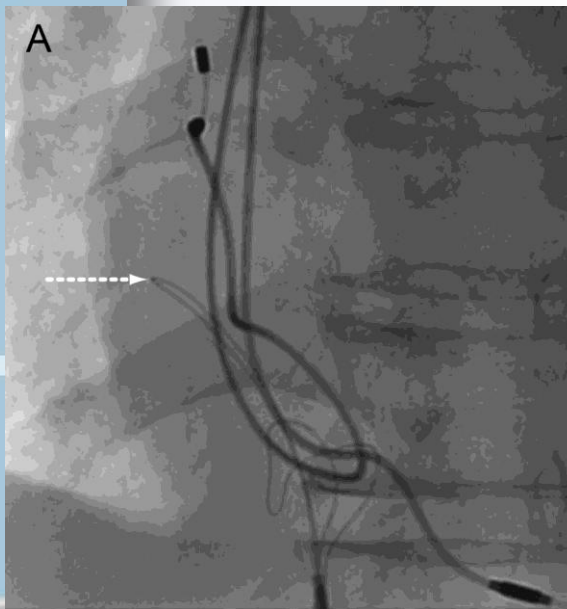
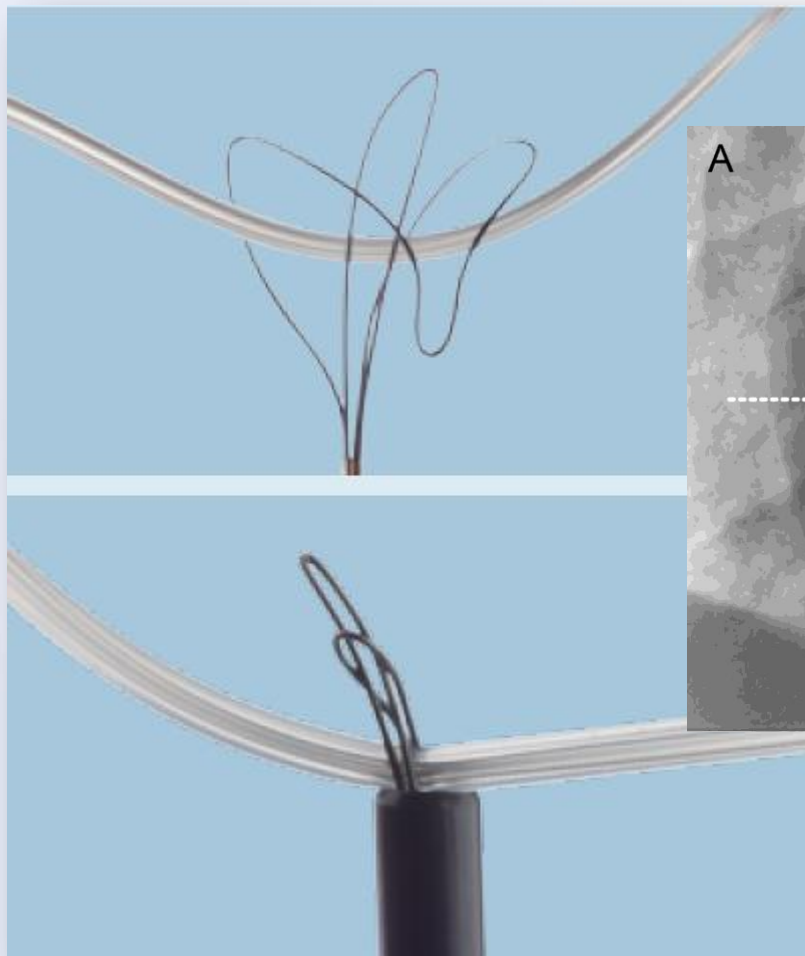
# Laserové sheathy (Spectranetics)

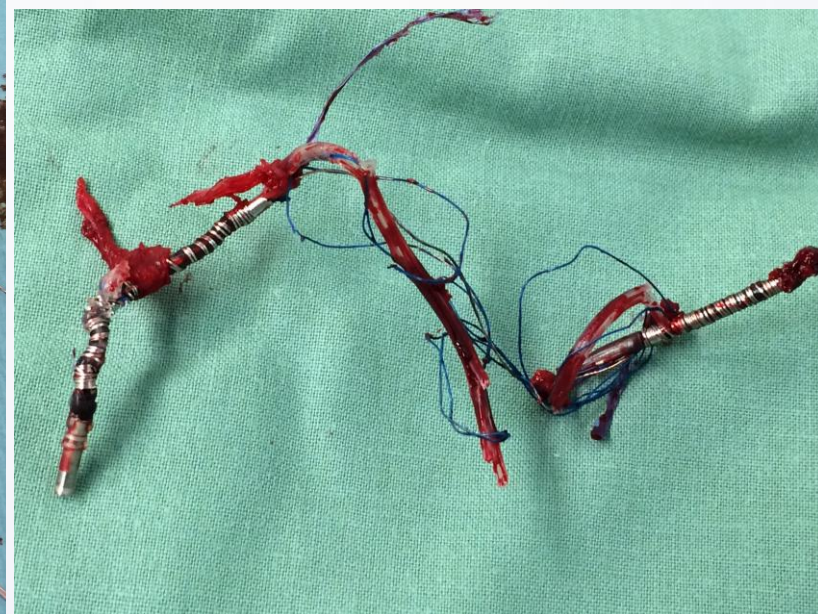
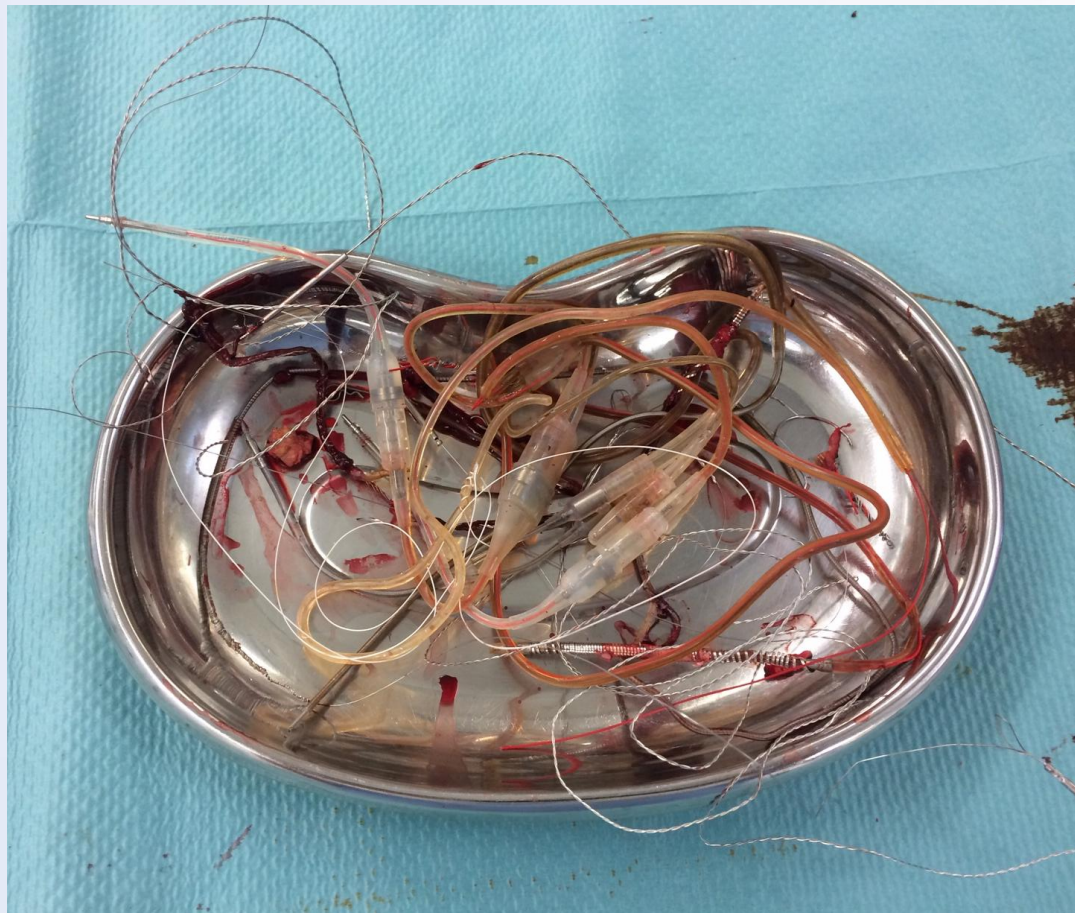


SLS II



# Femorální instrumenty







# Operační check-list pro TLE

## Predoperační

Dokumentace  
EKG  
TTE (TEE), CT  
Interogace  
Laboratoř  
Anesteziologická příprava  
Deriváty  
Strategie  
- TLE  
- Reimplantace

## Intraoperační

Hybridní sál  
CPB stand-by  
Extrakční vybavení  
Set pro perikardiocentézu  
  
Anestezie:  
EKG, oxymetrie, externí  
defibrilace, arterie  
Programace  
Dočasná stimulace  
TEE (ICE)

## Pooperační

Pooperační odd. (JIP)  
Invazivní monitorace TK  
6-12 h  
TTE – výpotek  
Dočasná stimulace  
ATB

# Chirurgický back-up

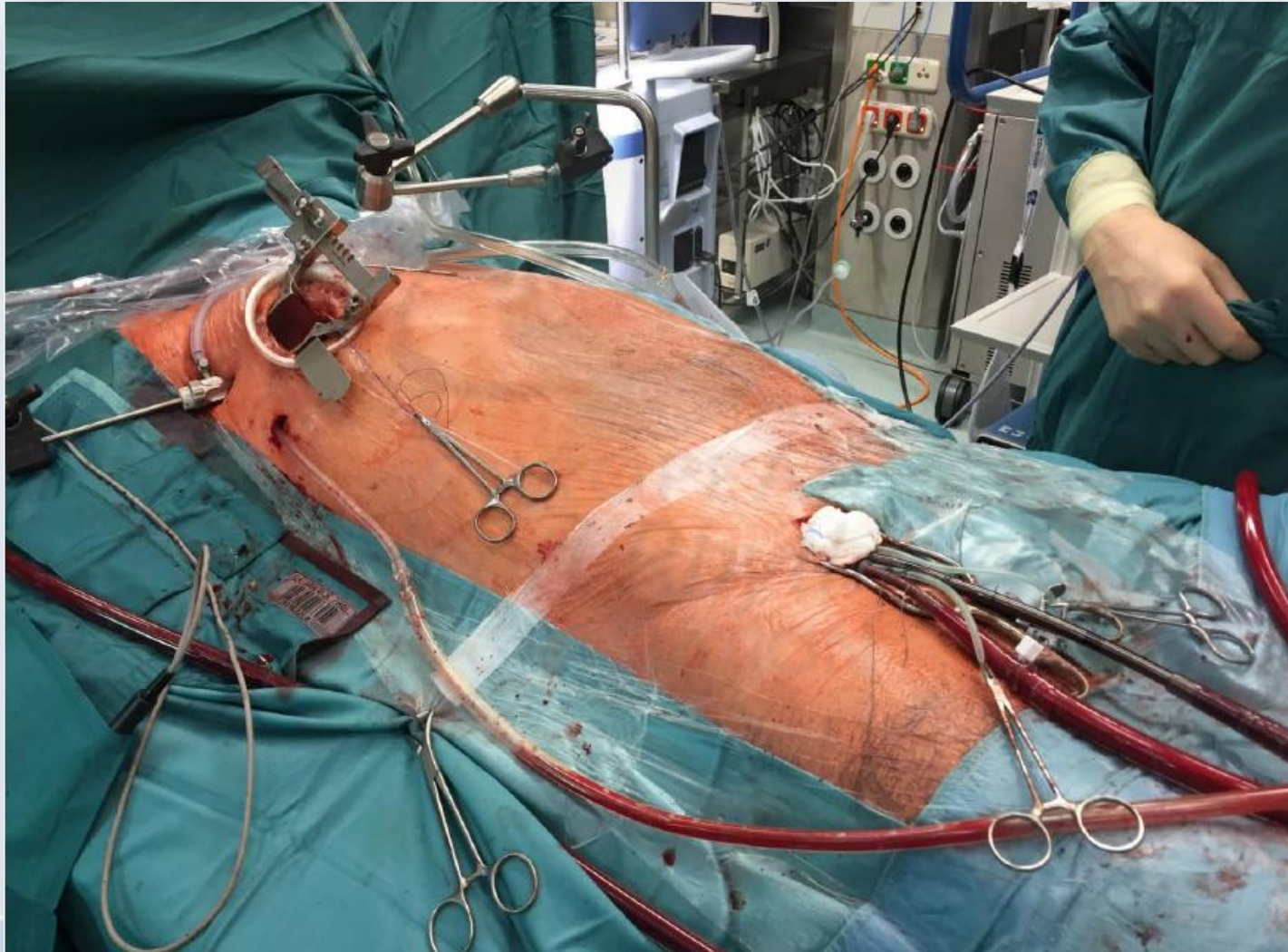
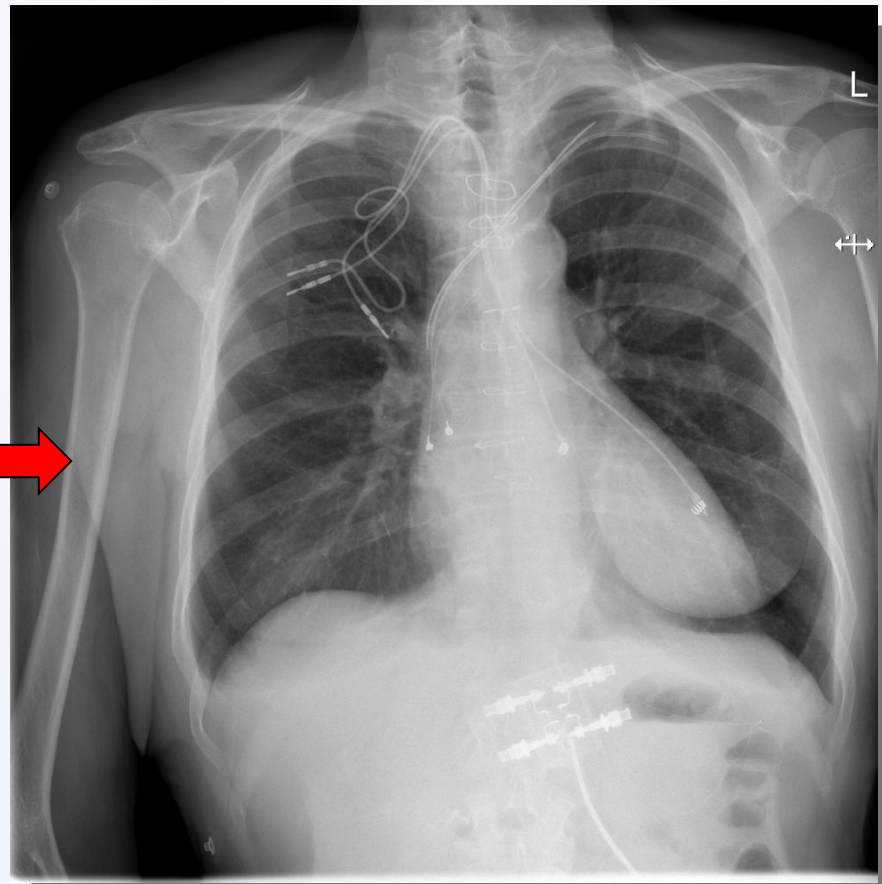
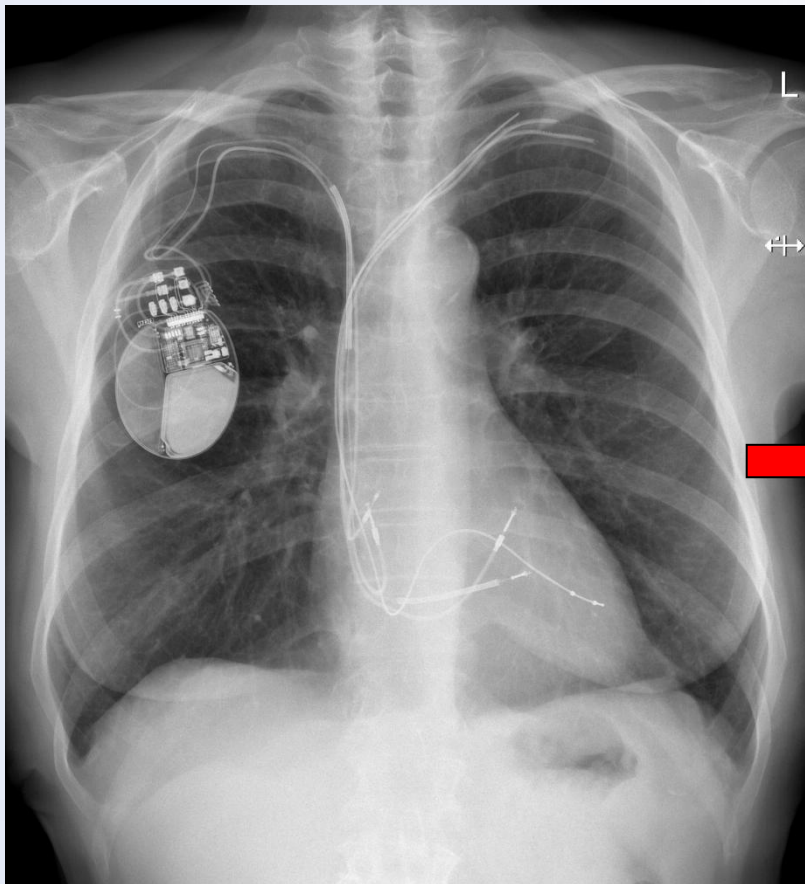


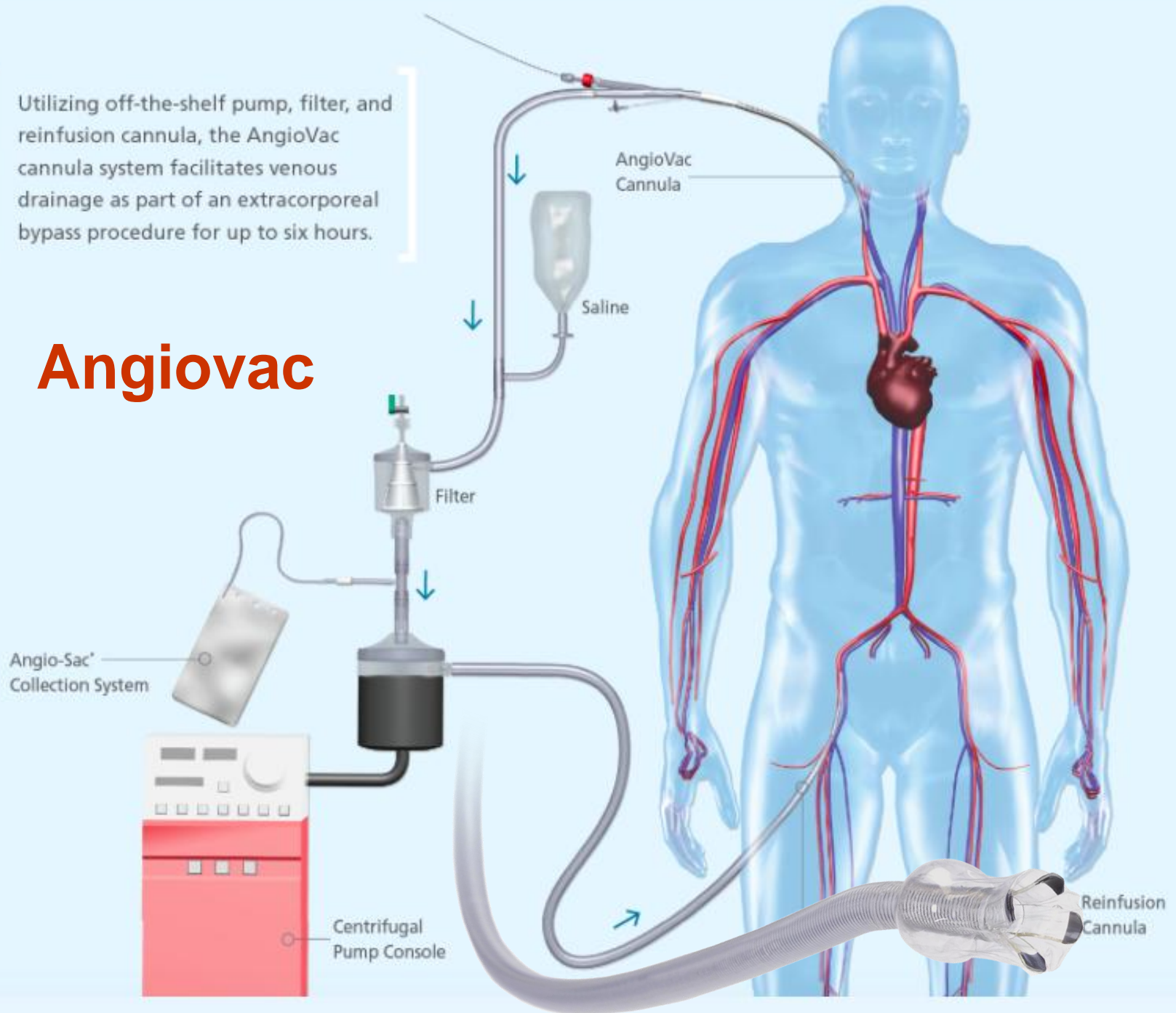
Photo: C. Starck, DHZ Berlin

# Kompletně epikardiální CRT

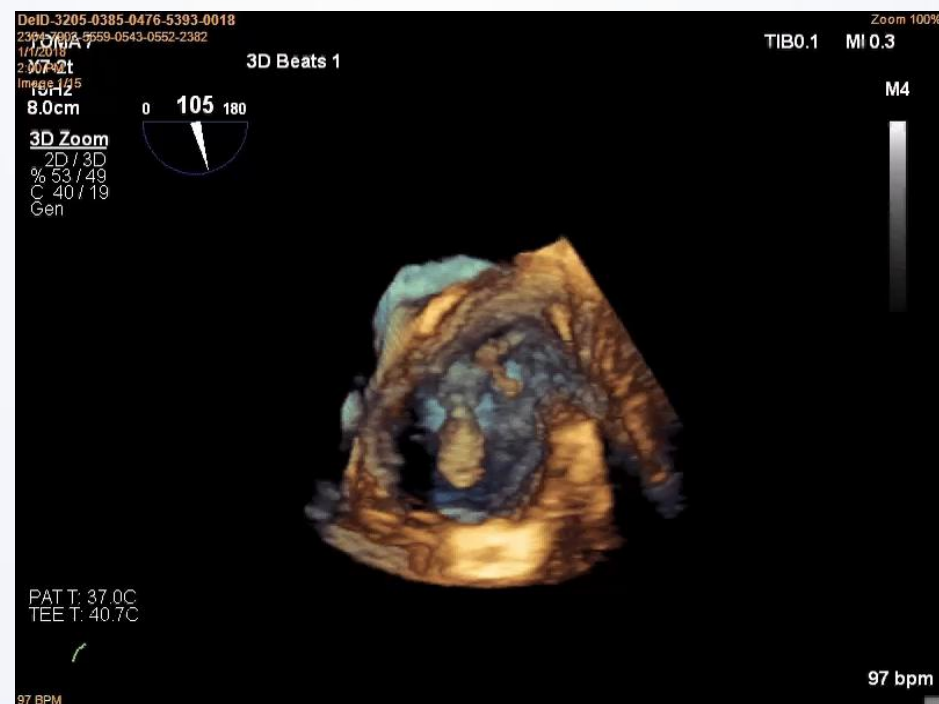


Utilizing off-the-shelf pump, filter, and reinfusion cannula, the AngioVac cannula system facilitates venous drainage as part of an extracorporeal bypass procedure for up to six hours.

# Angiovac



# Mobilní trombus HDŽ/PS





# Závěr

- TLE je standardizovaným výkonem s vyspělou dostupnou technologií
- Rizika MAEs je malé ale ne zanedbatelné
- Klíčové je předoperační zhodnocení a strategické plánování
- Většina TLE by měla být prováděna na hybridním sále v centrech s vysokým objemem těchto výkonů
- Reimplantační strategie jsou individualizované
- V budoucnu lze očekávat proaktivní přístup k TLE
- Nové výzvy: LCPs, endovaskulární intervence
- Řešení komplikací CIEDs: tak, aby nevznikaly **komplikované komplikace**

# WISDOM OF YODA

Try not. Do. Or do not.  
There is no try.

Once you start down the dark path,  
forever will it dominate your destiny,  
consume you it will.

You must feel the Force around you.

That is the way of things... The way of  
the Force.

If you choose the quick and easy  
path... You will become an agent of evil.

Fear is the path to the dark side. Fear  
leads to anger. Anger leads to hate.  
Hate leads to suffering.

Size matters not.

The dark side clouds everything. Impossible to  
see the future is.



When nine hundred years old you reach, look as good you will not.

Luminous beings are  
we... Not this crude matter.

[Luke:] I can't believe it.  
[Yoda:] That is why you fail.

Wars not make one great.

You must unlearn what you have learned.

Named must your fear be before banish it you can.

Beware of the dark side. Anger...fear...agression.

Adventure. Heh! Excitement. Heh! A Jedi  
craves not these things.

A Jedi must have the deepest commitment,  
the most serious mind.

Control, control. You must learn control.

Death is a natural part of life. Rejoice for those  
around you who transform into the Force.  
Mourn them do not. Miss them do not.

Mind what you have learned. Save you it can.



# THE WISDOM OF YODA

Try not. Do. Or do not. There is no try.

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