

JHRS Corner

**Device and lead trouble-shooting
- standard strategy and technical option -**

**Technical option of
surgical approach for trouble-shooting**

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NO CONFLICT OF INTEREST TO DECLARE

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Complications of implanting devices

Complications of implanting devices should be related:
surgical/hardware
programming/software
normal device function

Classification of implanting devices will be divided:

venous access related
lead related
pocket related
infection

For all troubles,
we occasionally need
a surgical options.



Surgical Needs for Complications of Implanting Devices:

(1) venous access related

Surgical lead placement



Venous access related complications

Surgical needs for lead implantation

When standard transvenous lead placement is either not feasible or contraindicated.

- 1) inability or failure to place an adequate LV lead in patients requiring biventricular pacing,
- 2) indications for permanent pacing in certain pediatric patients and in pediatric or adult patients with tricuspid valve prostheses or recurrent or prolonged bacteremia
- 3) congenital acquired venous anomalies that preclude transvenous access to the heart

ACC/AHA/HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities
Circulation 2008;117:e350-e408



When we need a surgical lead placement?

Failed percutaneous LV lead placement

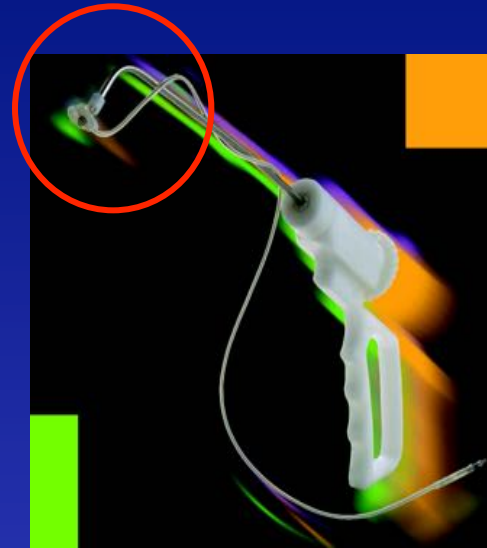
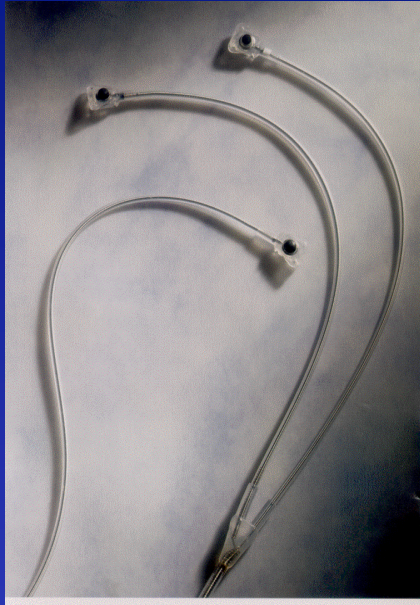
	MIRACLE	InSync III	Contak-CD	InSync ICD	Total
Implants attempted	591	334	517	636	2028
Implants completed	545(92%)	318(95%)	448(87%)	567(88%)	1878(90%)
Periprocedural death	2/591(0,3%)	1/334(0,3%)	2/517(0,4%)	2/567(0,4%)	7/2009(0,3%)
30-day Mortality	9/493(1,8%)	5/284(1,8%)	12/517(2,3%)	4/424(1%)	30/1718(1,7%)
Lead-related complications	52/591(9,5%)	11/301(4%)	40/448(9%)	76/636(12%)	179/1976(9%)
Coronary sinus complications / traumas	6/591(1%)	5/334(1%)	10/517(2%)	24/636(4%)	45/2078(2%)
Infections	1%	0,6%	1,6%	2%	1,3%

Failed percutaneous **LV lead** placement: 1-19%

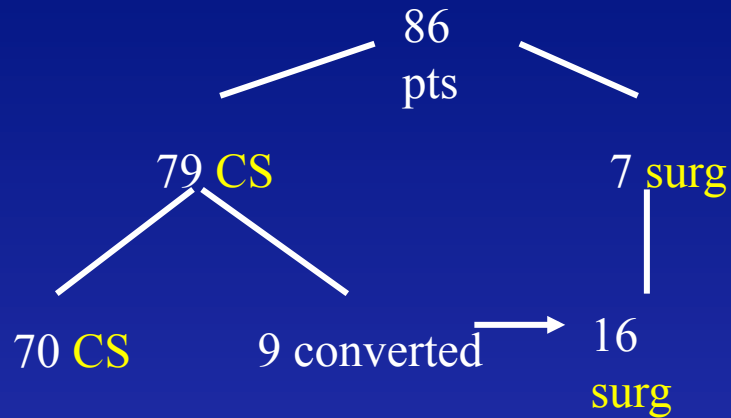
Shah Congest Heart Fail. 2006;12:312– 6, Koos. Am J Cardiol.2004;94:59–63.



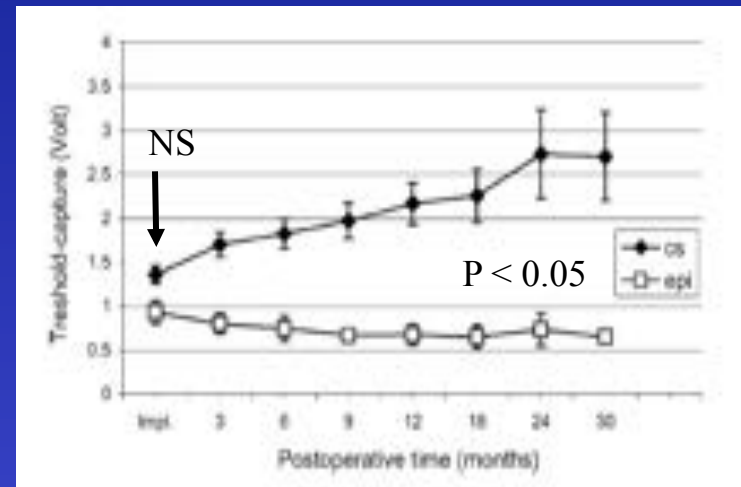
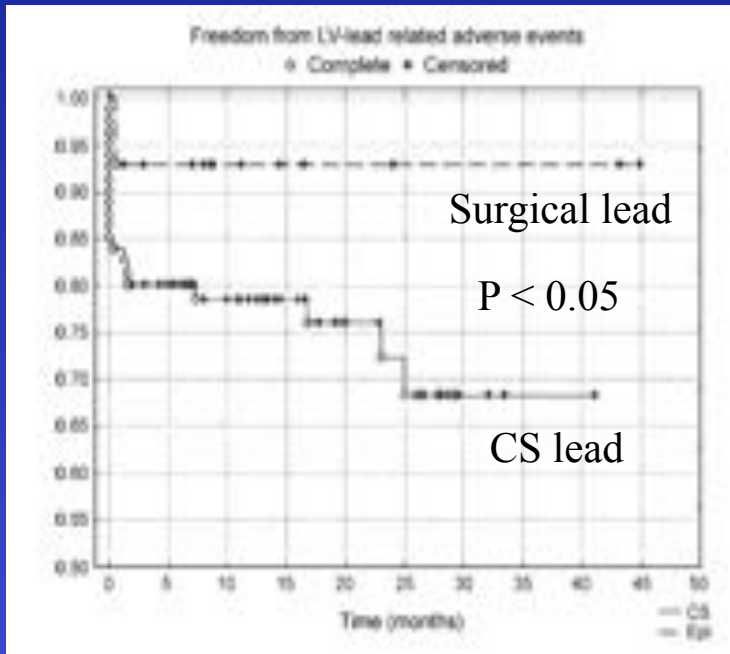
Epicardial lead and its implant tool



Epicardial LV lead V.S. CS lead



Baseline clinical characteristics of the study groups			
	CS-group	Epi-group	P-value
Age (years)	64.0 ± 9.9	62.9 ± 9.7	0.28
DCMP (%)	73	75	0.56
ICMP (%)	27	25	0.89
Pacemaker (%)	59	75	0.55
ICD (n)	29	4	0.46
EF (%)	22 ± 7	21 ± 6	0.40



Mair, et al. :European Journal of Cardio-Thoracic Surgery 2005;27:235-242

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Surgical lead placement

The implantation of an epicardial lead is:

- a simple procedure with a low incidence of complications availability
- *ideal* in case of patients when attempts of transvenous implantation were ineffective
- may be the first choice in severely compromised patients
- considering both approaches (transvenous and epicardial) we can offer pacing therapy to every patient



Surgical Needs for Complications of Implanting Devices:

(2) lead related

Chamber Rupture

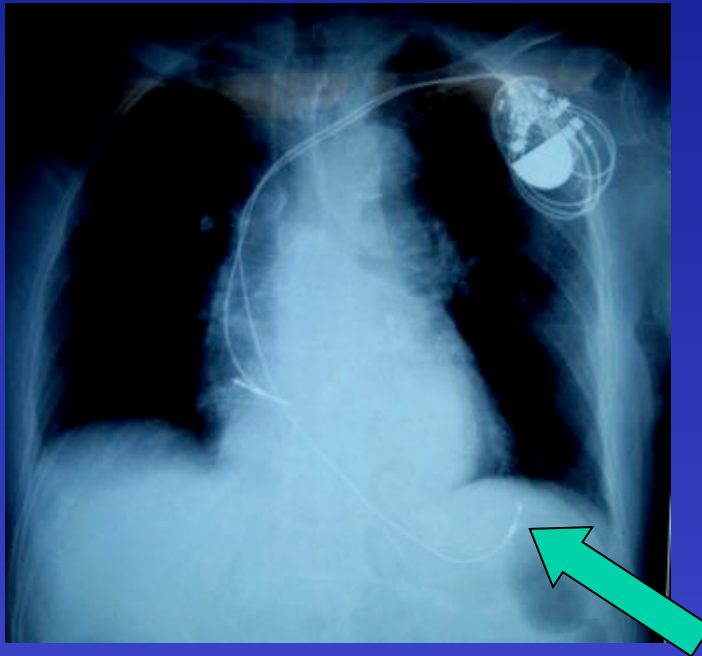


RV rupture: Case 1 (acute)

Case: 90 y.o female

Diagnosis: Complete AV block (DDD case)

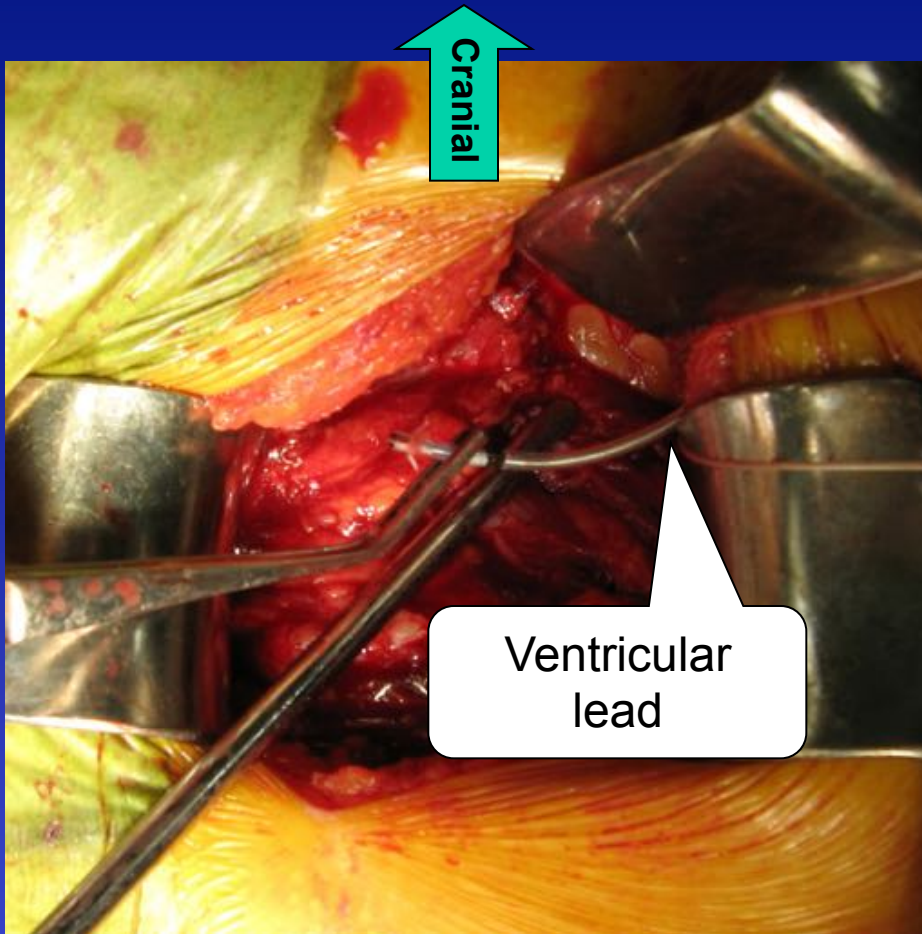
History: Pacing failure on the day of operation



UCG:

- pericardial effusion
- diastolic failure

RV rupture: Case 1 (acute)



Subxiphoidal minimal approach

Unstable hemodynamics



Emergency operation (under general anesthesia)



When the lead was extracted, blood blowouted from the ruptured site.

The bleeding **did not stop without surgical suture** of myocardium.

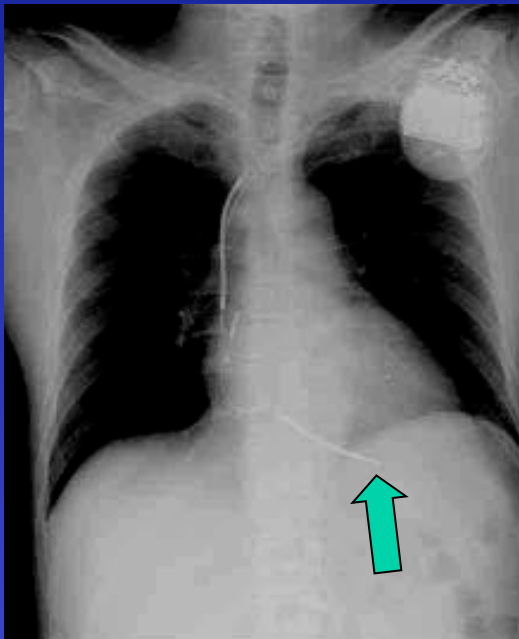


RV rupture: Case 2 (subacute)

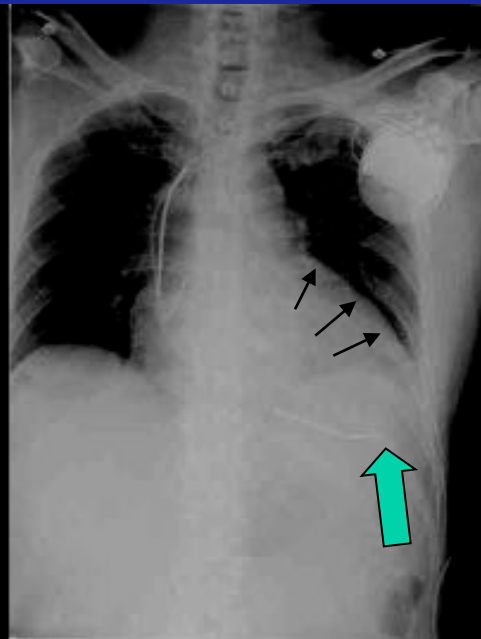
Case: 66 y.o male

Diagnosis: OMI, VT, CHF (CRTD case)

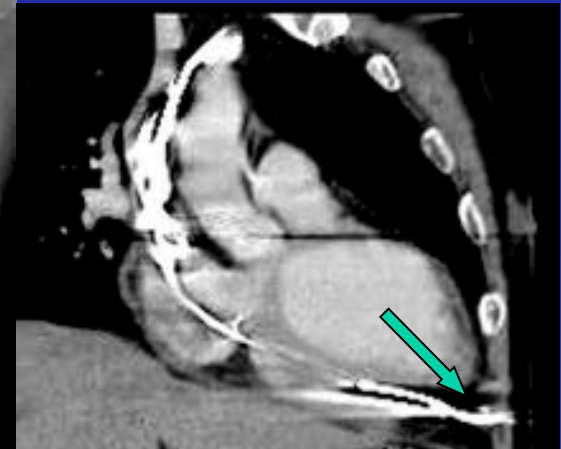
History: Abdominal pain at two weeks after the implant operation
(no remarkable findings at one week after operation)



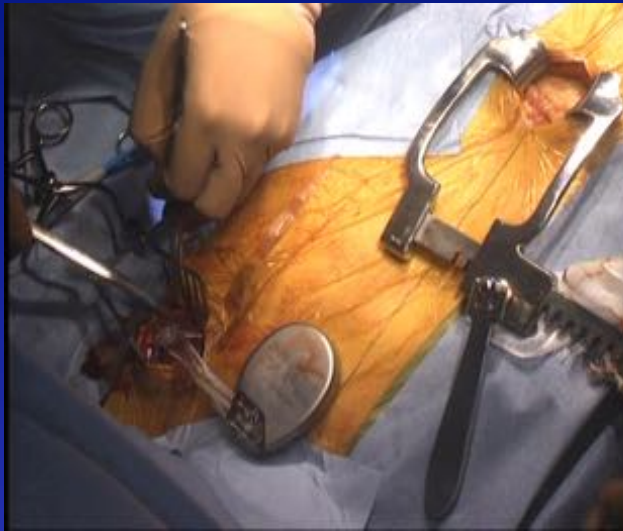
at implantation



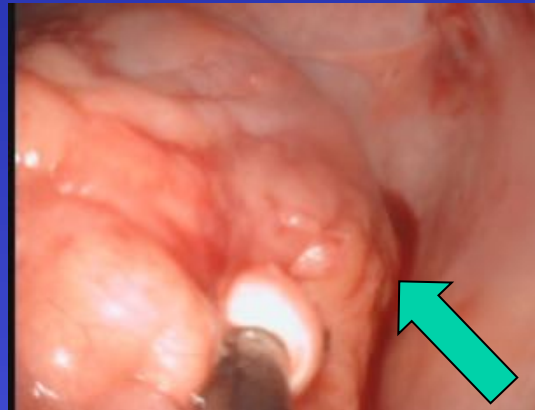
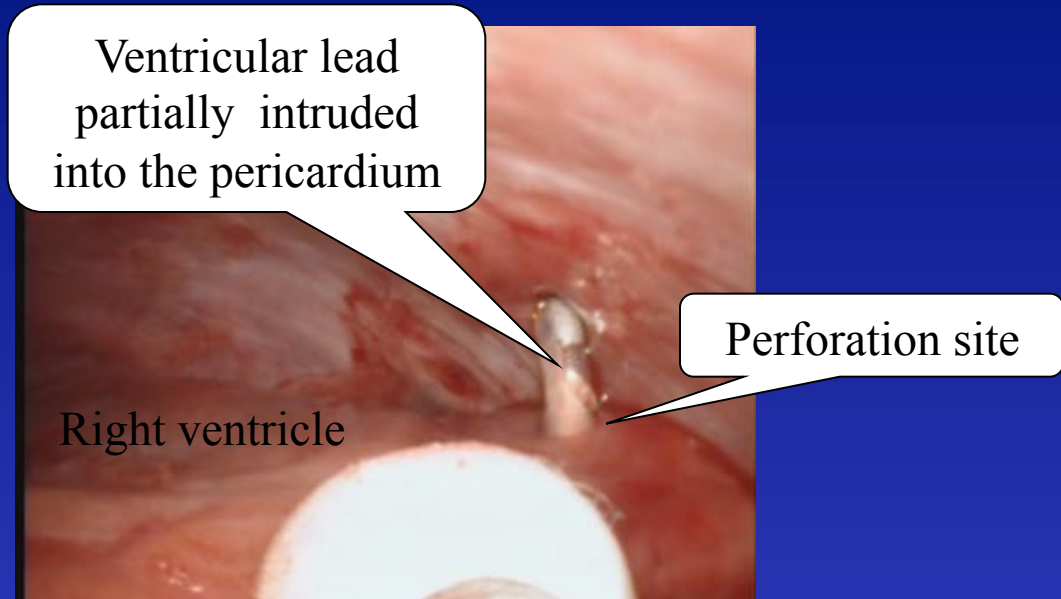
two weeks after ipmlantation



RV rupture: Case 2 (subacute)



Subxiphoidal minimal approach
(Endoscopic video-assisted)



When the lead was extracted, blood **did not blowouted** from the ruptured site.

The bleeding stopped **without surgical suture** of myocardium.



RV rupture

Case 1: Acute case (diagnosed on the day of operation)

- * Need a surgical suture of myocardium

Case 2: Sub-acute case (diagnosed at two weeks after operation)

- * Needless surgical suture (as a result)
- * Need removing lead and manual oppression of perforation site
- * Need pericardiocentesis only?



It is controlled whether to perform surgical intervention **at time from the onset.**

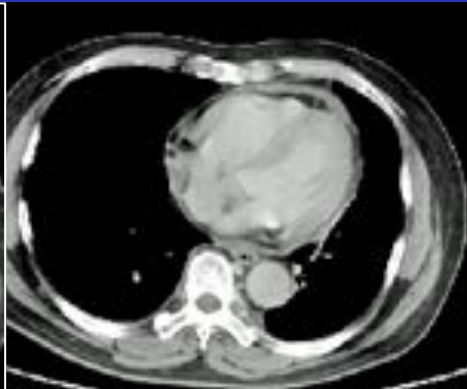
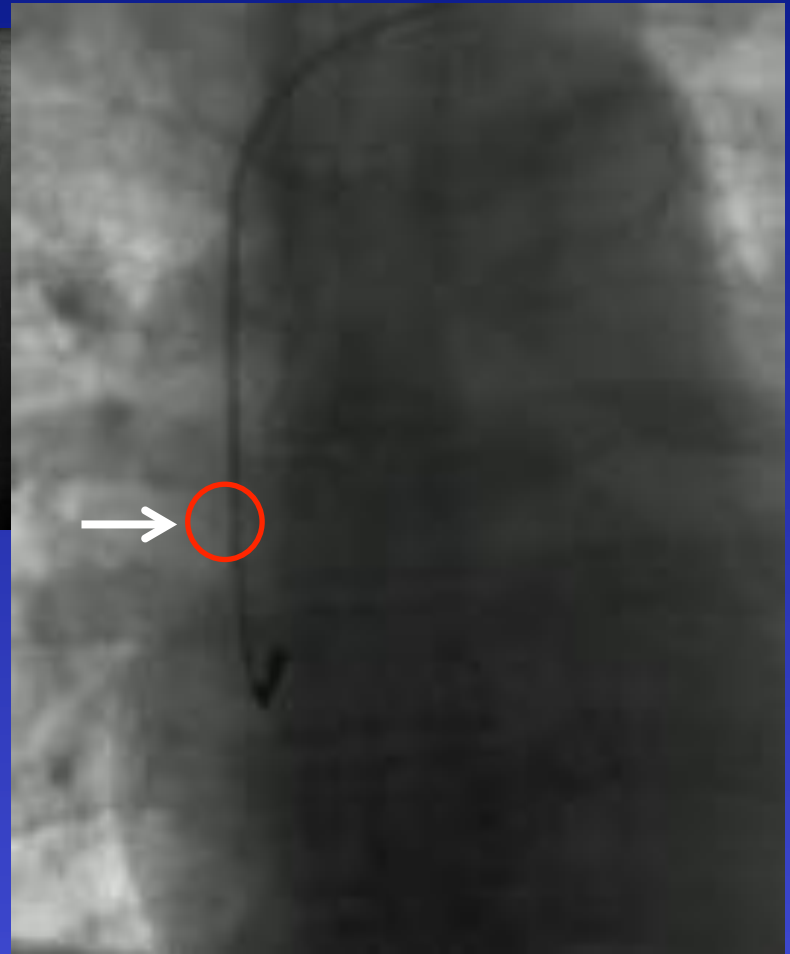
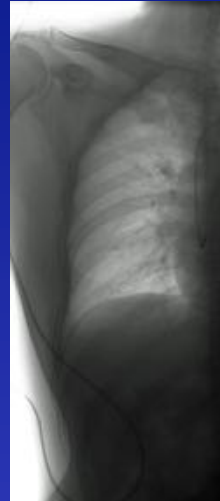
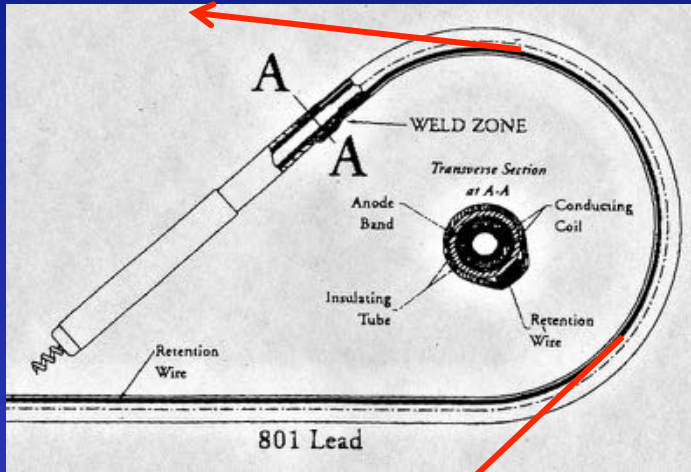


SVC rupture

Perforation due to retention wire of ACCUFIX J lead

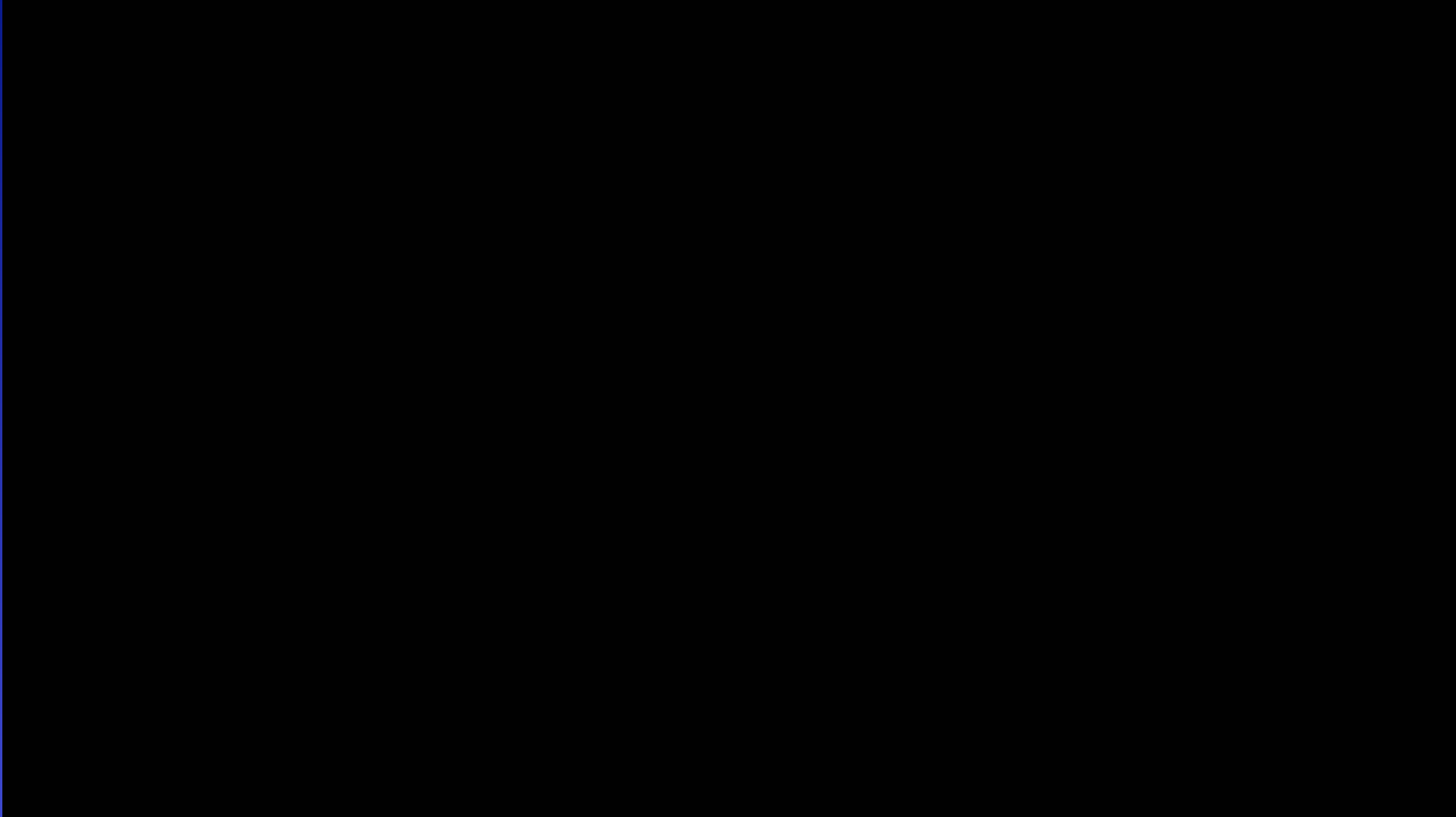


(5m13s)



SVC rupture

▪ Perforation due to retention wire of ACCUFIX J lead



Surgical Needs for Complications of Implanting Devices:

(3) pocket related

Hematoma



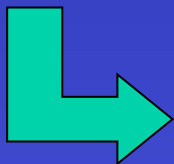
Hematoma

Incidence of device implantation–related noninfectious complications (over 12 months)

	All, n (%)	Requiring Reintervention, n (%)
Hematoma	328 (5.34)	26 (0.42)
Lead dislodgment	112 (1.82)	102 (1.66)
Pacing threshold elevation	59 (0.96)	1 (0.01)
Impending erosion	34 (0.55)	31 (0.50)
Erosion	15 (0.24)	15 (0.24)
Overall	548 (8.93)	175 (2.85)

- 175 pts (31.9%) required a reintervention (new procedure)
- 101 pts (18.4%) required early (before hospital discharge) reinterventions

Klug, et al.; for the PEOPLE Study Group: *Circulation*. 2007;116:1349-1355.

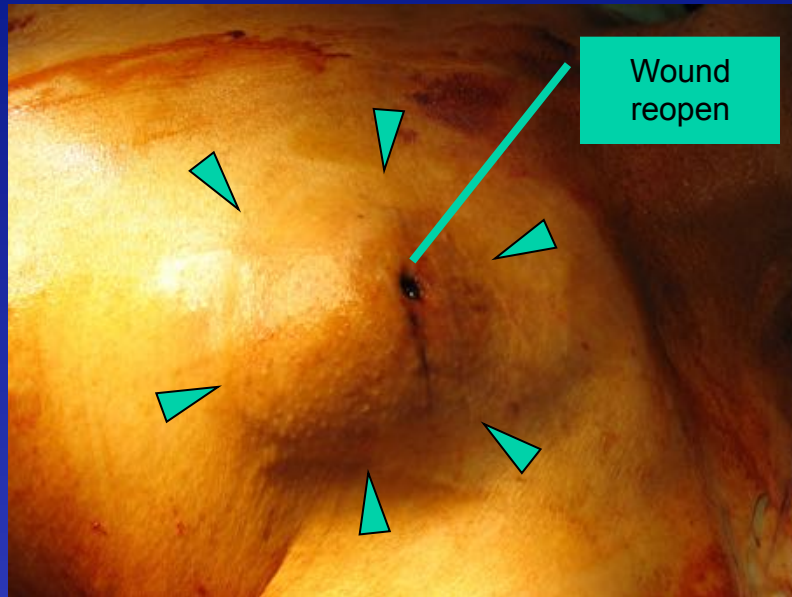


Hematoma is a “nest” of pocket infection!



Hematoma: Case

Ten days after implantation with anticoagulation therapy (antiplatelet agent and warfarin)



Continuous progression of hematoma sometimes reopen the wound!



We need a **complete removal** of hematoma and **washing away** the remained clot form inside of the pocket to avoid infectious complication.



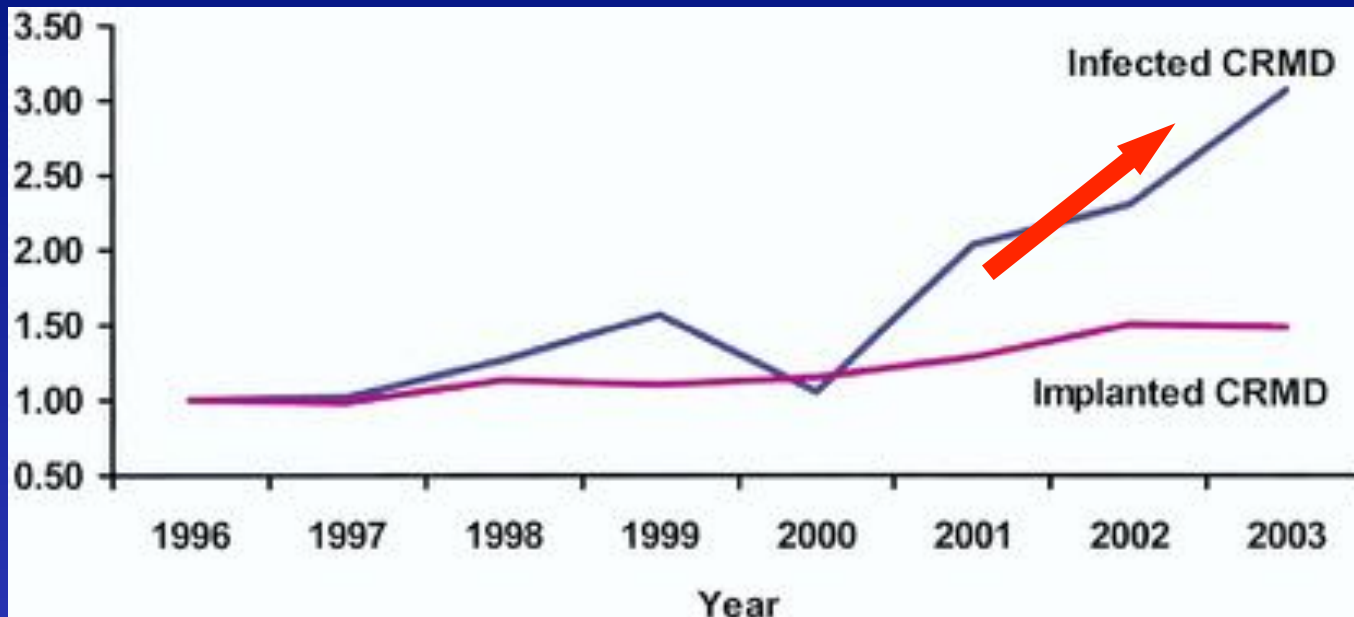
Surgical Needs for Complications of Implanting Devices:

(4) infection

Management of complex case



Infectious Complications of Implanting Devices



Proportional increase in the number of cardiac rhythm management devices implanted and those **infected by the year** of hospitalization.

(normalized to the number of devices implanted and infected in the year 1996, respectively)

Note the dramatic increase in device infections compared with device implantations, particularly after the year 2000.

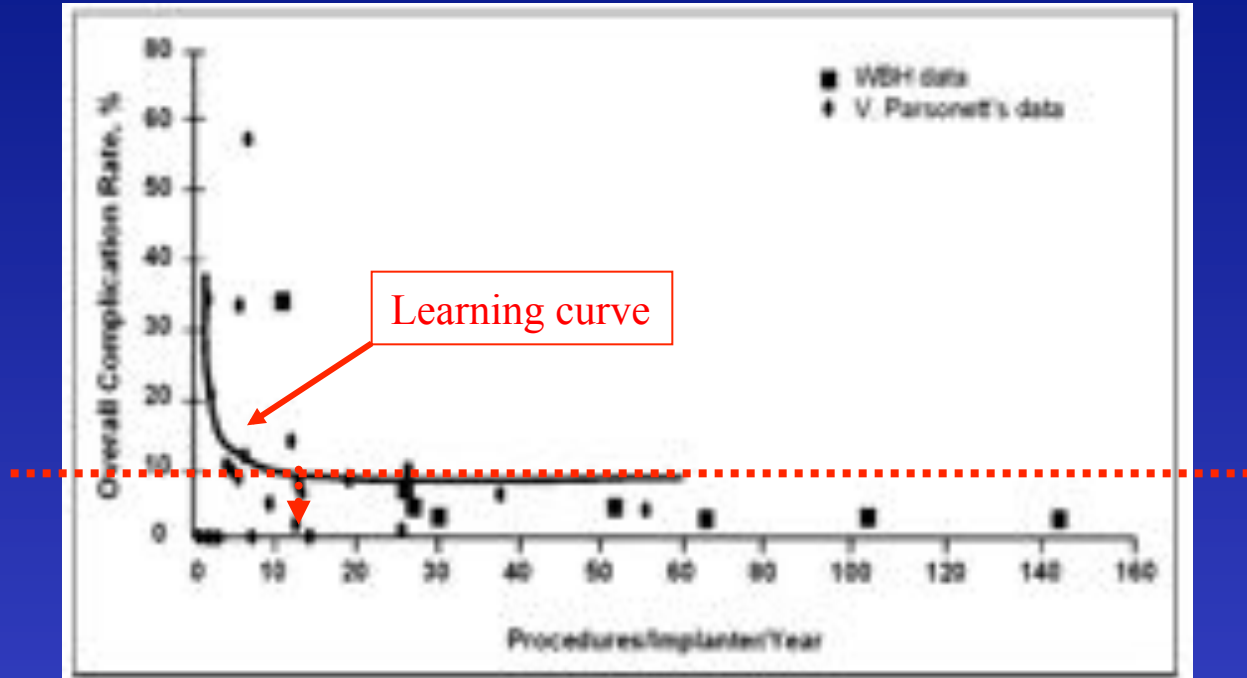
Voigt A, et al.: *J Am Coll Cardiol.* 2006;48:590–591.

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Infectious Complications of Implanting Devices

The relation between operator activity and the occurrence of complications (pacemaker)



Data collected from Parsonnet et al. are compared with William Beaumont Hospital data. A striking overlap is noted. Adapted with permission from Parsonnet et al.

Tobin K, et al.: *Am J Card* 2000, 85:774–776.

Parsonnet V, et al.: *J Am Coll Cardiol* 1989;13:917–921.

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Infectious complication: Case

Case: 68 y.o male

Diagnosis: pAf (for more than 35 years)

post VVI PM implantation due to SSS (at 61 y.o.)

via right subclavian vein (initial procedure)

additional lead (due to lead fracture)

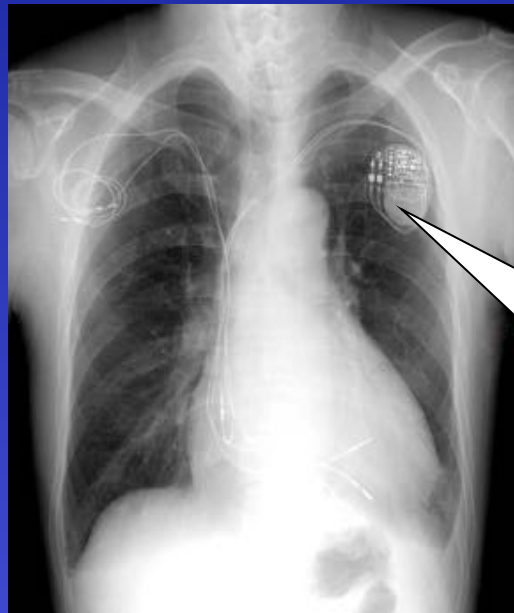
& generator exchange (second procedure)

Congestive heart failure (heart rate dependent)

Af ablation (by catheter)

+

PM reimplantation
(DDD upgrade)



New PM was implanted on the left precordial because of obstruction of right subclavian vein



Infectious complication: Case

6 POD: Sudden VF (due to coronary spasm)



Required CPR (heart massage) and PCPS



Dislodgement of RV lead
Need re-fixation (35 days after initial implant)

2 weeks after
re-fixation
procedure



Notified infection
and sepsis (MRSA)



Consulted to cardiac surgeon

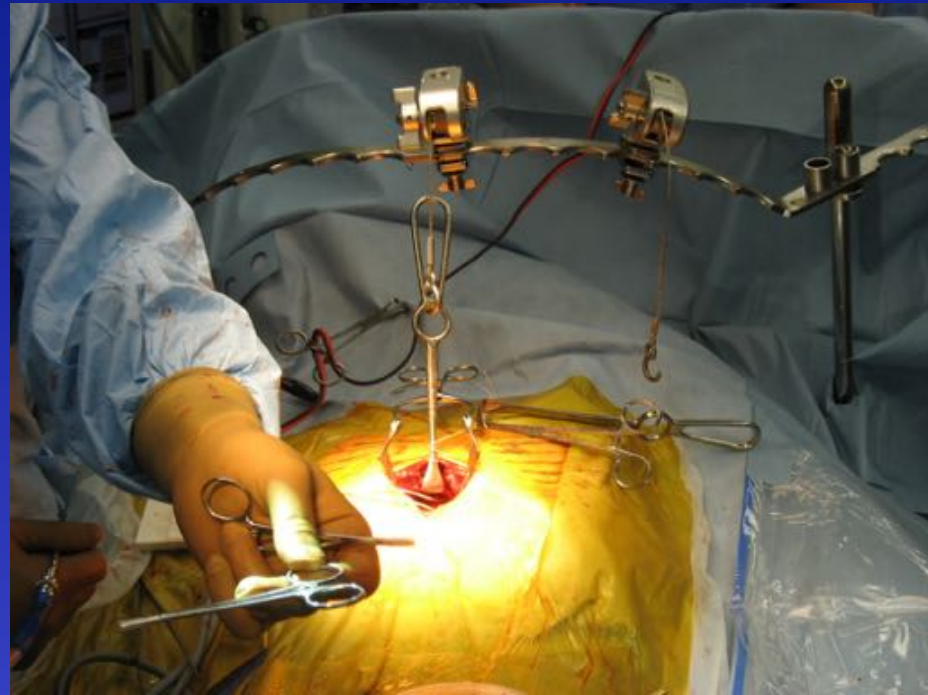
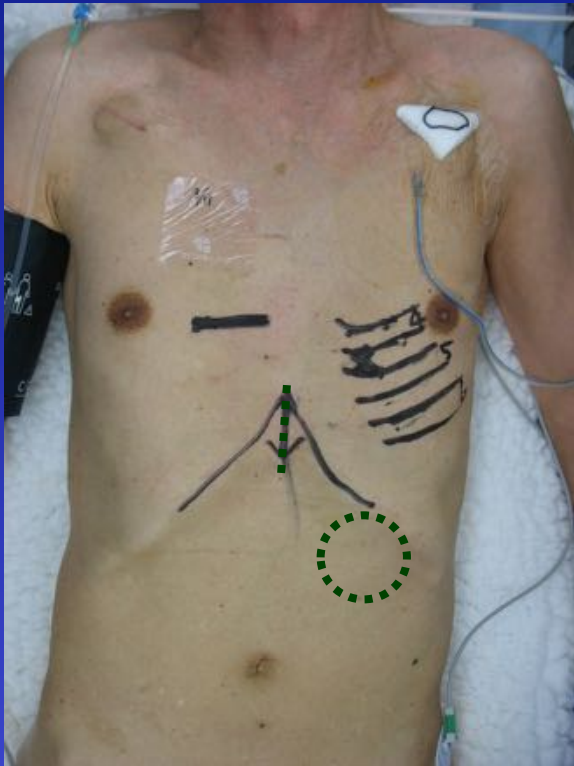
-**Less invasive procedure** was requested because of his poor condition
-**Simultaneous procedure** of system extraction and re-implantation was required because he depended on the pacing



Infectious complication: Case

Endoscopic video-assisted subxiphoidal approach

3 weeks after re-fixsation (after sufficient treatment of antibiotics)



Show VTR
(endoscopic view)



Infectious complication: Case

Endoscopic video-assisted subxiphoidal (EVAS) approach



Infectious complication: Case



Endoscopic video-assisted subxiphoidal approach (EVAS)

Merit:

- No need of sternotomy
- No need of separate ventilation
- No need of chest drain
- Small incision and Less pain

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Demerit:

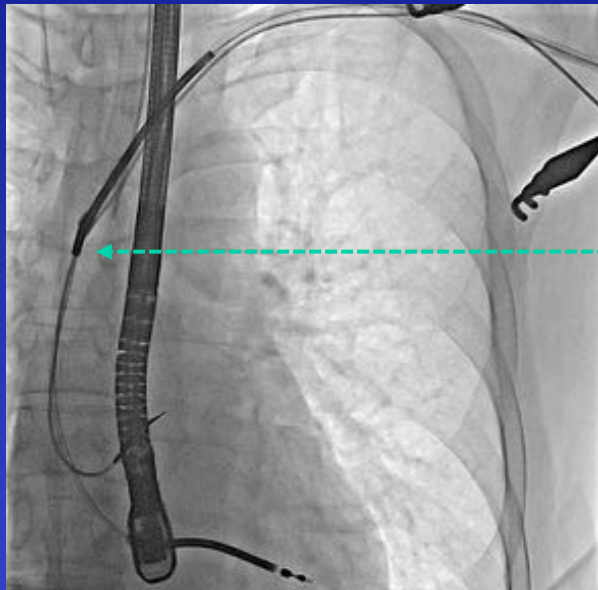
- Need general anesthesia

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Infectious complication: Hybrid lead extraction

A case with large vegetation (>2 cm)



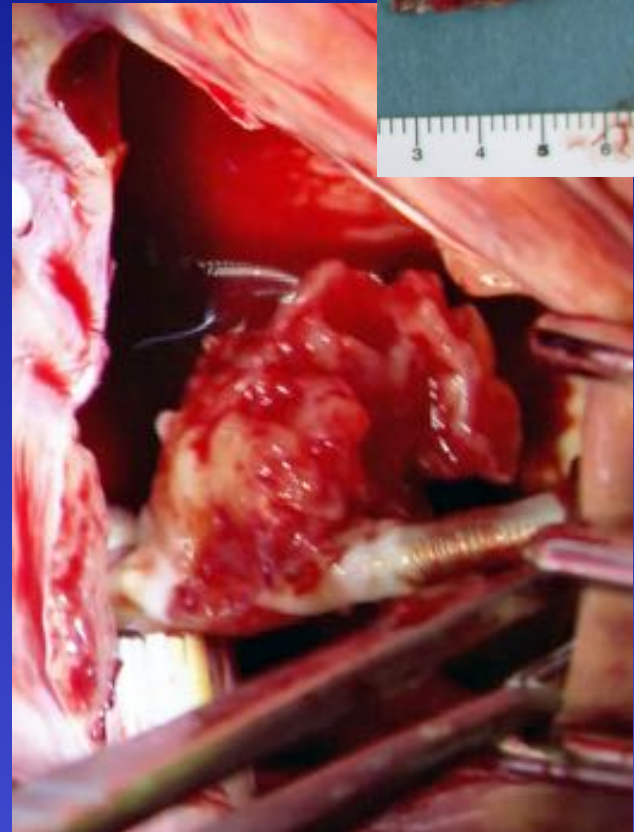
with laser sheath



Distal edge
of SVC coil



with open surgery



The “key” for Surgical management of complications

Managing surgical complications related to the implantation of pacemakers and ICDs should include:

- (1) awareness of potential complications,
- (2) a meticulous approach to the implantation procedure to avoid complications,
- (3) approach to diagnosis
- (4) specific therapy

Stephen Pavia and Bruce Wilkoff: *Current Opinion in Cardiology* 2001, 16:66–71



Do we need a surgeon?

in the field of device implantation.

Yes, we do!

But, surgeons should understand EP devices well.





Miyajima: a world heritage



Peace memorial: a world heritage

Thank you for your attention.

