

Bradykardi o pacemakers – lite teoretisk bakgrund

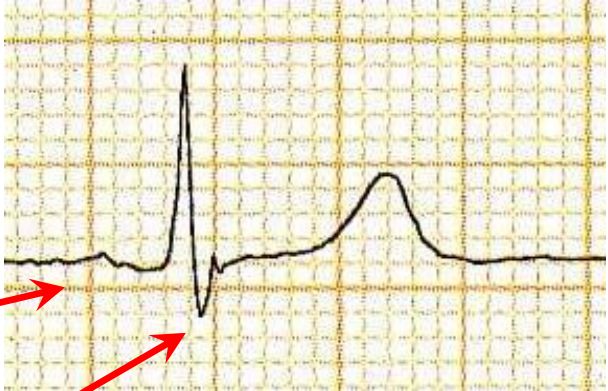
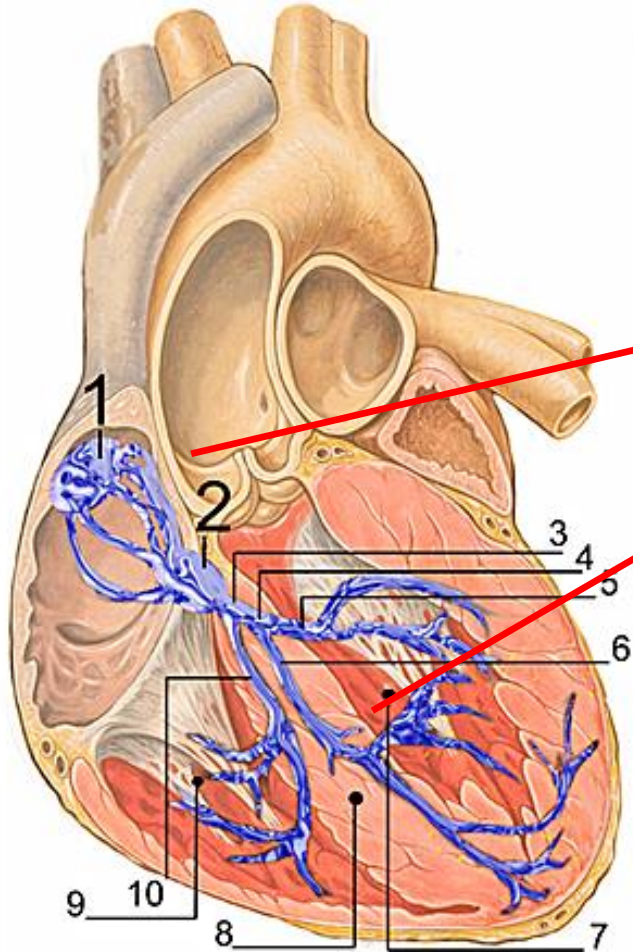
Anneli Svensson

Spec läk arytmisektionen

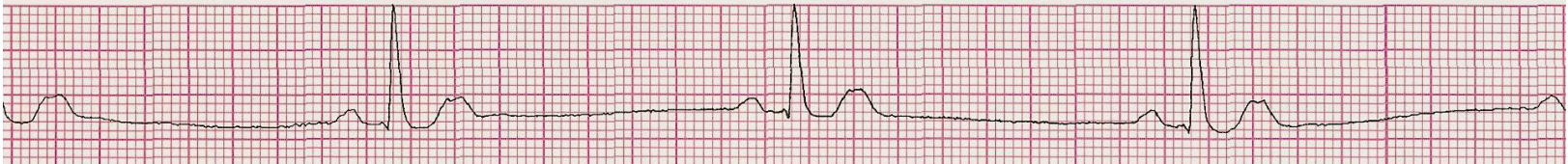
ansvarig Kardiogenetikmottagningen

Studierektor kardiologi

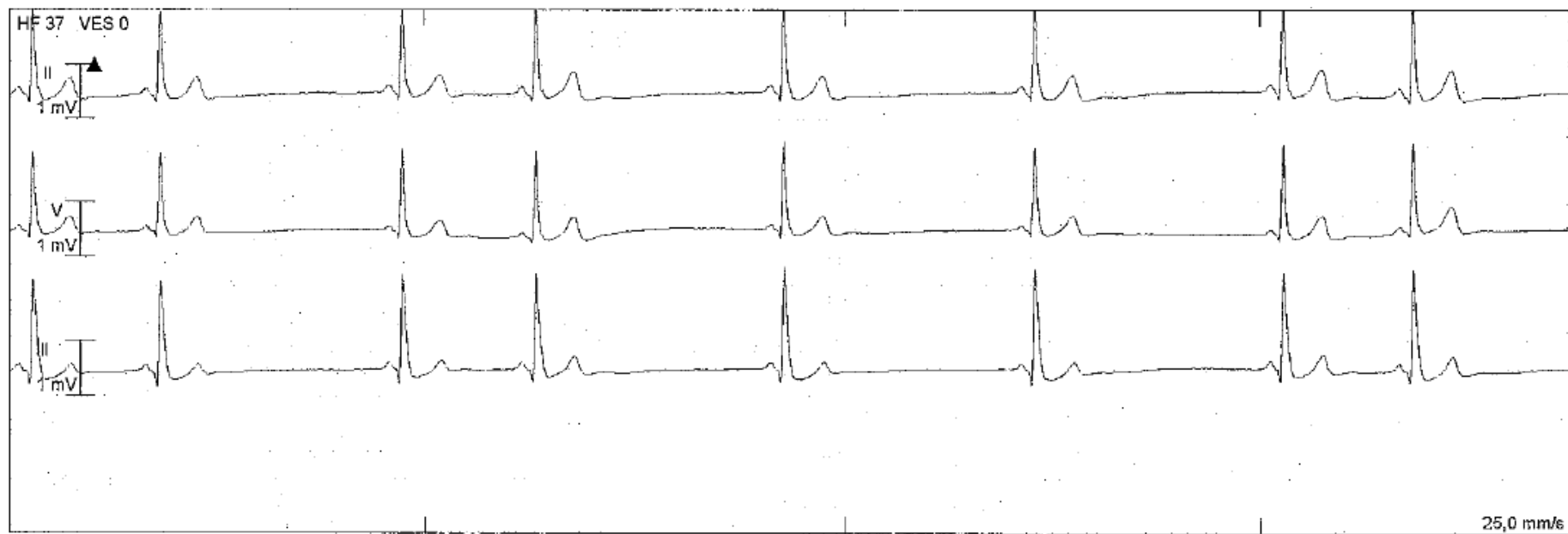
Normala retledningssystemet



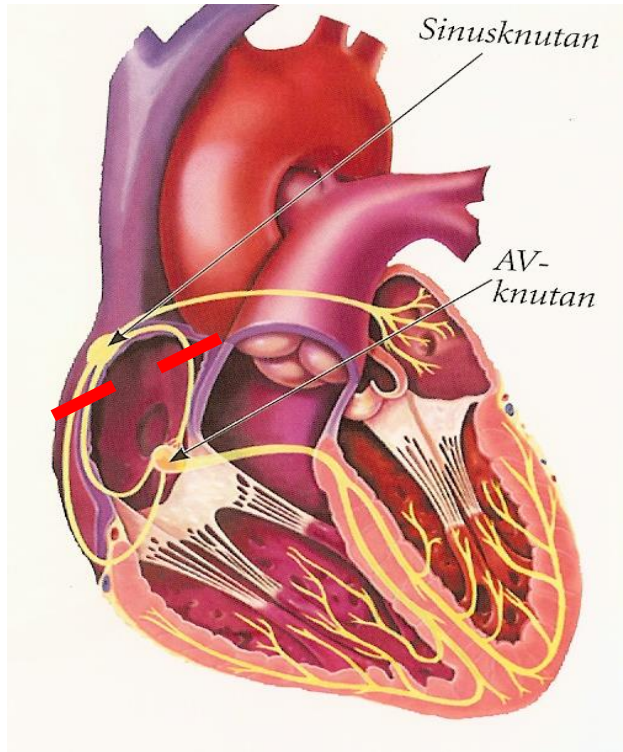
Sinusrytm



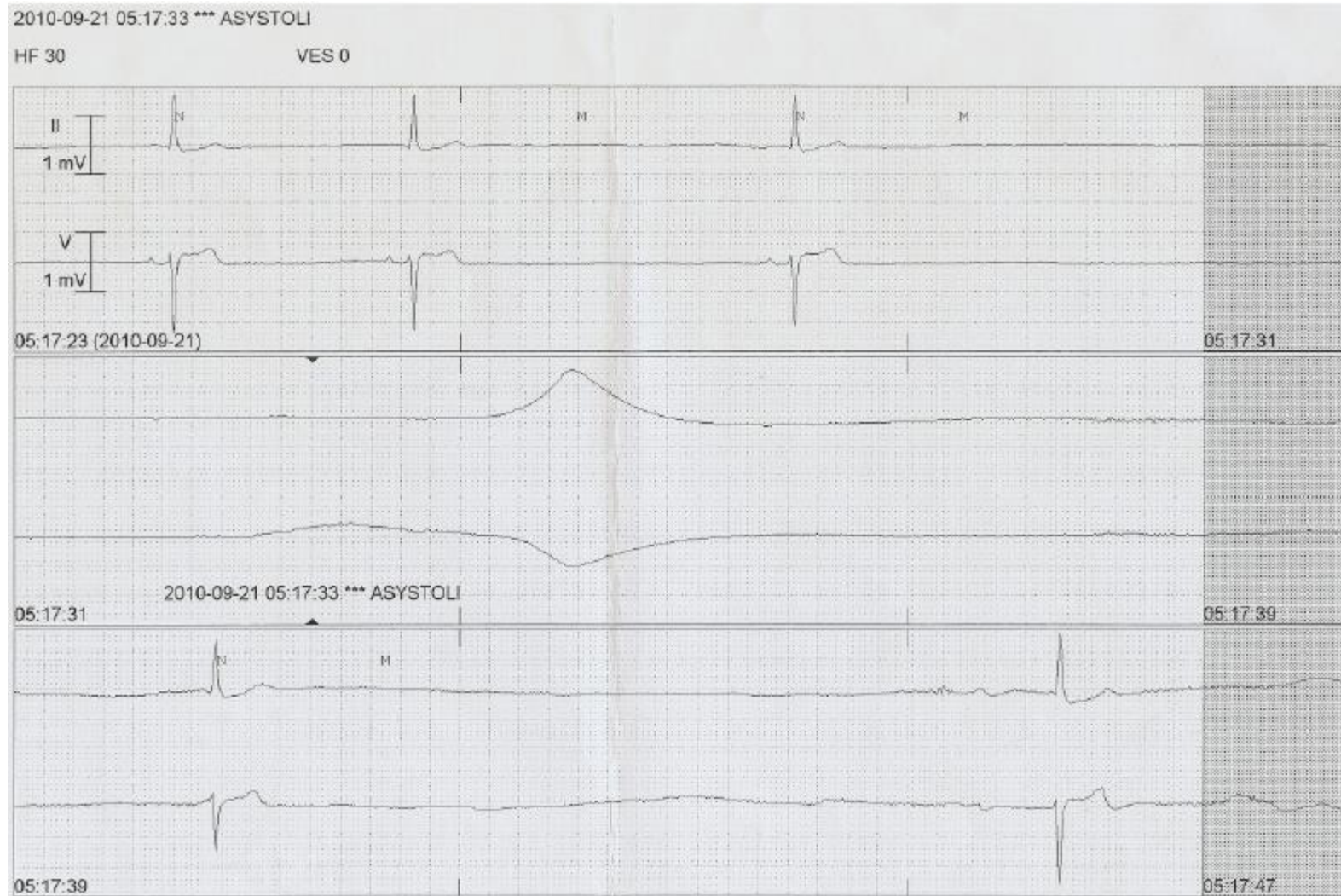
Detta är...?



SA-block typ II

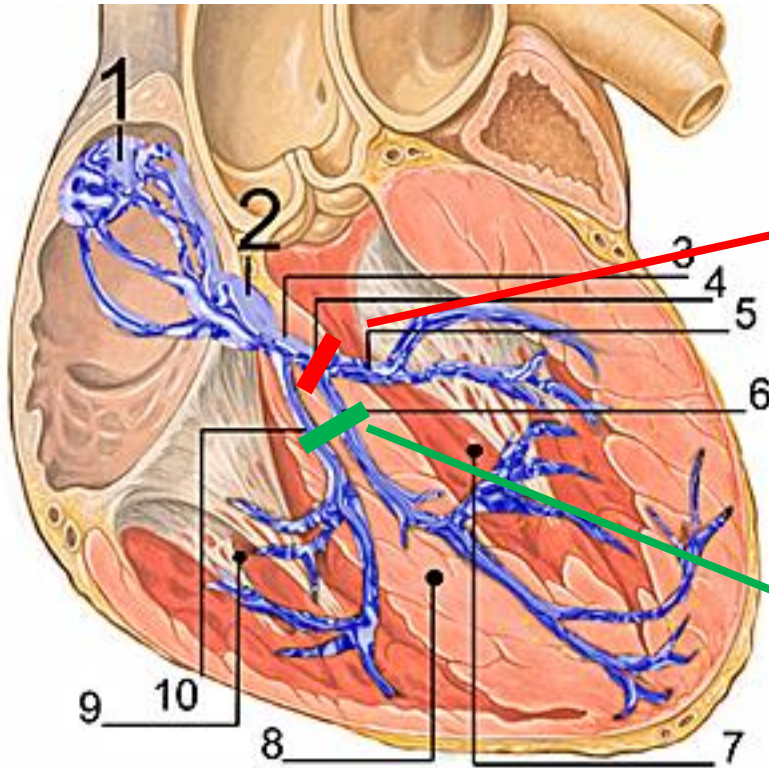


Detta är...?



Detta är...?

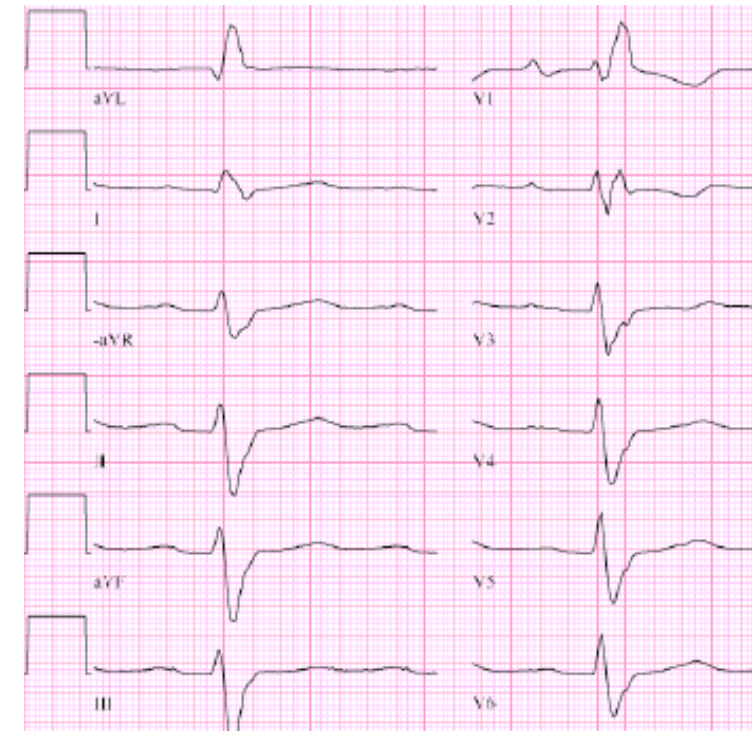
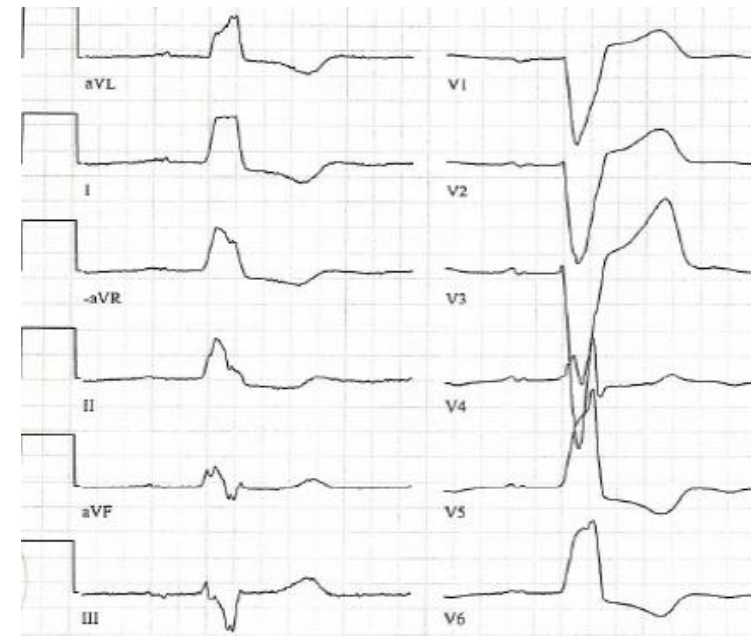




LBBB

RBBB
+ LAH

Skänkelblock





2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

The Task Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA).

European Heart Journal

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Volume 36, Issue 41
1 November 2015

Article Contents

Abbreviations and acronyms

1. Preamble
2. Introduction
3. Definitions, epidemiology and future perspectives for the

GUIDELINES

2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: The Task Force for the Management of Patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death of the European Society of Cardiology (ESC)

Endorsed by: Association for European Paediatric and Congenital Cardiology (AEPC) 

Silvia G. Priori ✉, Carina Blomström-Lundqvist ✉, Andrea Mazzanti, Nico Blom, Martin Borggrefe, John Camm, Perry Mark Elliott, Donna Fitzsimons, Robert Hatala, Gerhard Hindricks ... Show more

Guideline
S

Pacemakernomenklatur

NBG kod

A



hjärtrum som
stimuleras

B



hjärtrum som sensas

C



Hur pacemaker reagerar
på avkänd aktivitet

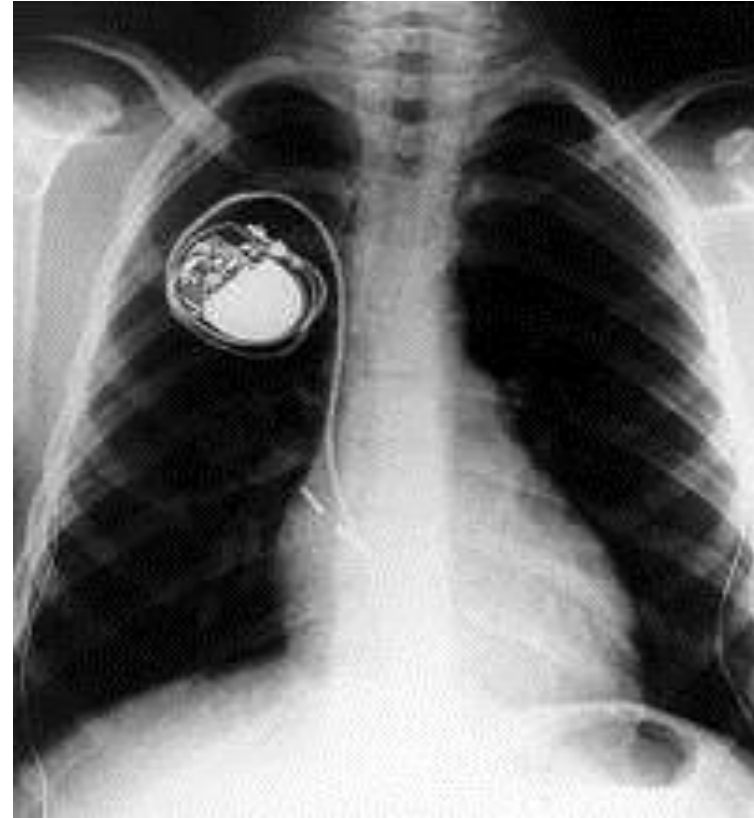
NBG kod

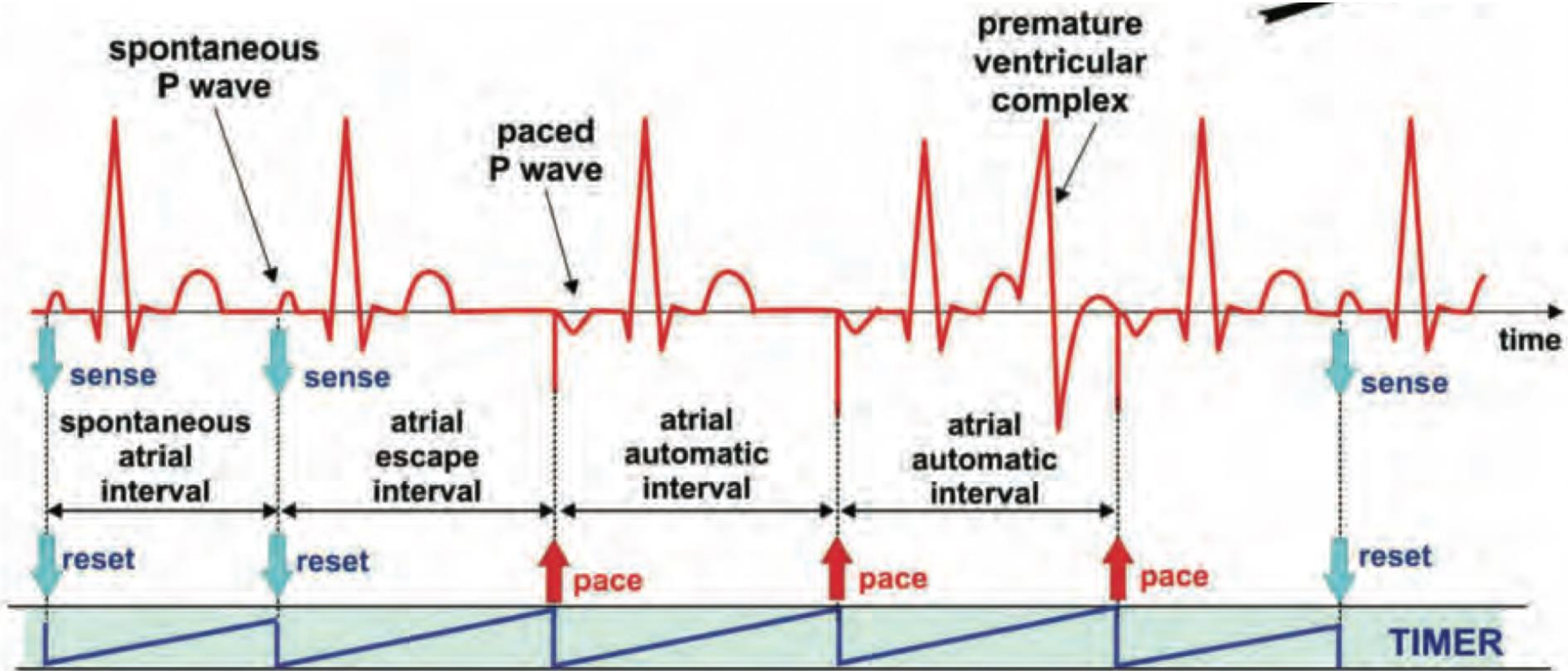
I	II	III	IV	V
Vilket hjärtrum stimuleras?	Var sensas?	Reaktion efter sensing	Rate Modulation	Multisite Pacing
O= None A= Atrium V= Ventricle D= Dual (A+V)	O= None A= Atrium V= Ventricle D= Dual (A+V)	O= None T= Triggered I= Inhibited D= Dual (T+I)	O= None R= Rate Modulation	O= None A= Atrium V= Ventricle D= Dual (A+V)
S= Single (A or V)	S= Single (A or V)			

AAI

Pacing och avkänning i förmak

Egen förmaksrytm inhiberar
pacemakersystemet

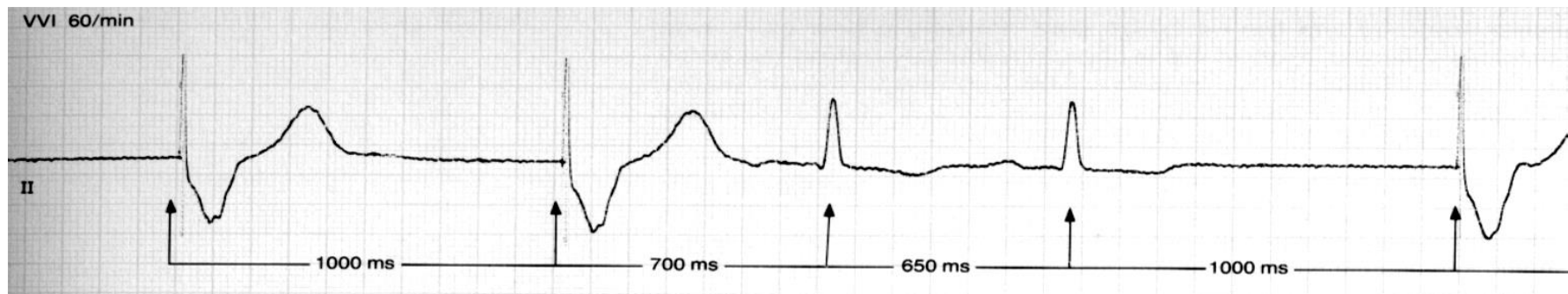
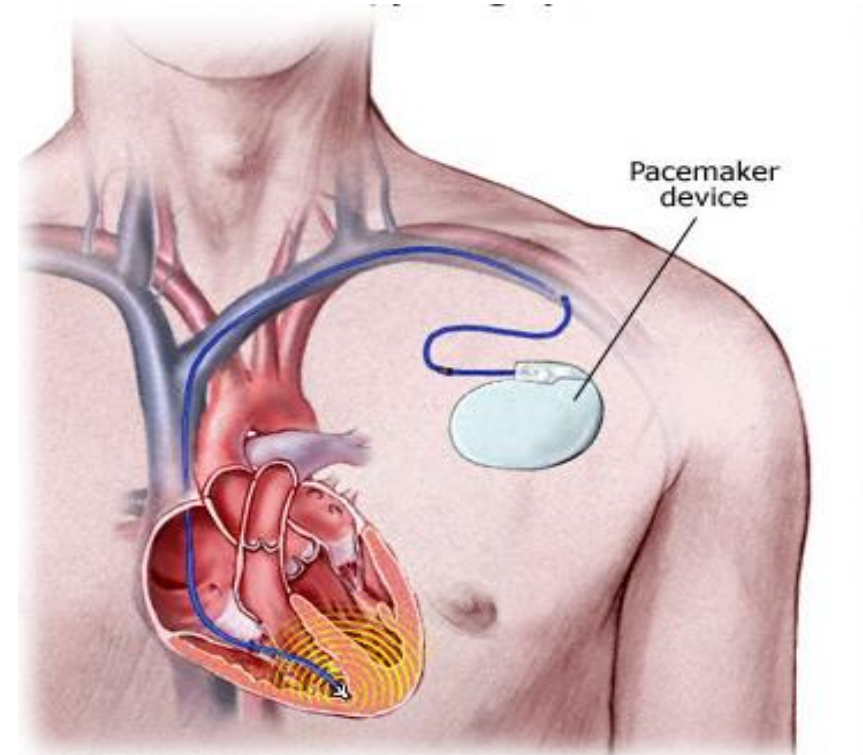


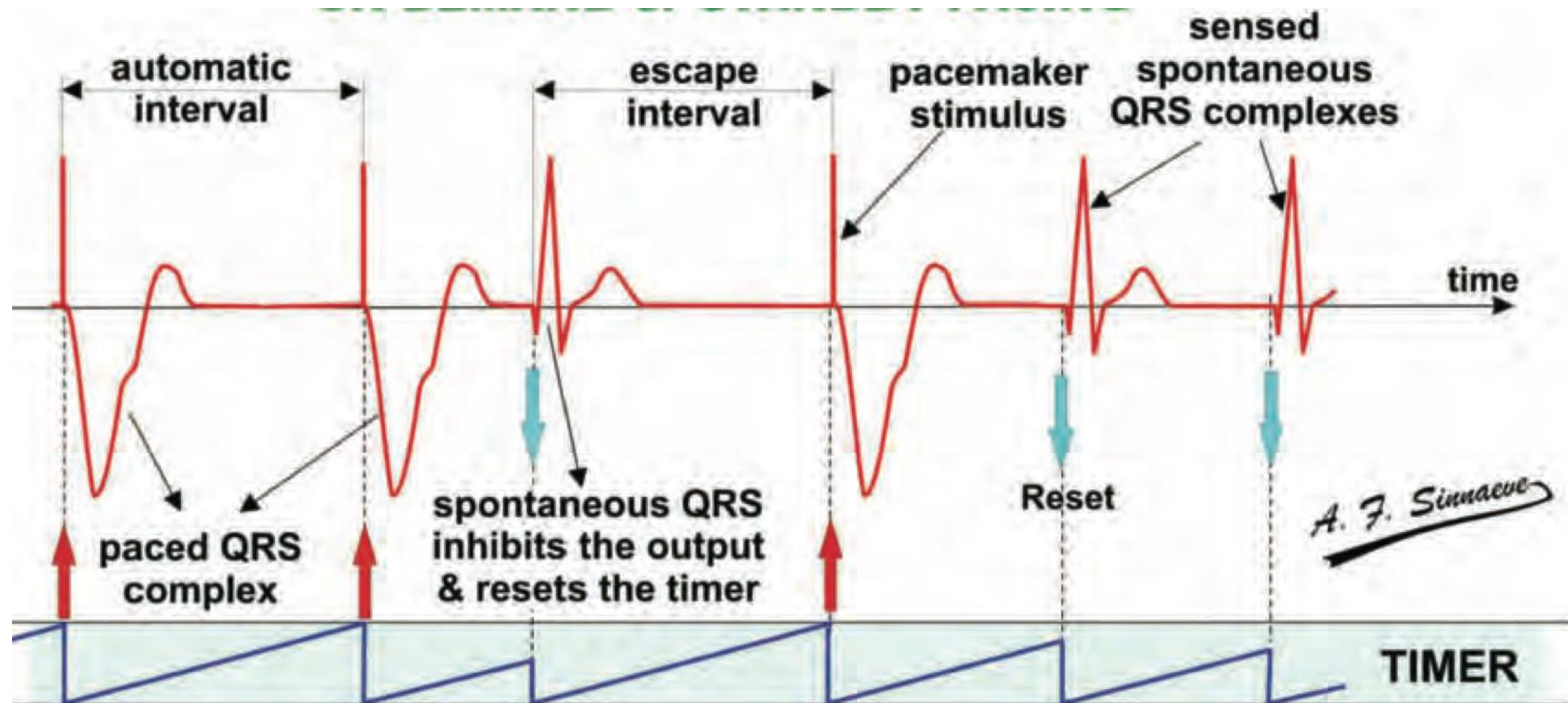


VVI

Pacing och avkänning i
kammaren

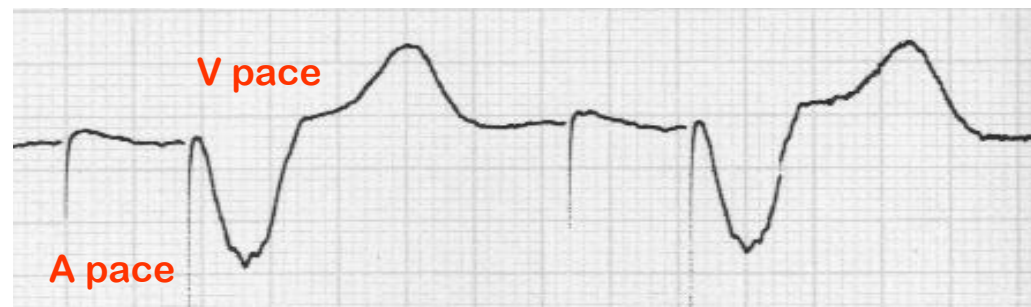
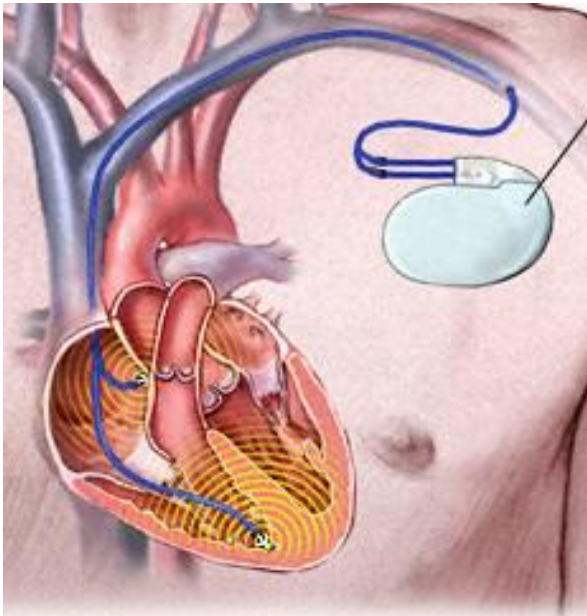
Egen kammarrytm inhiberar
pacemakersystemet



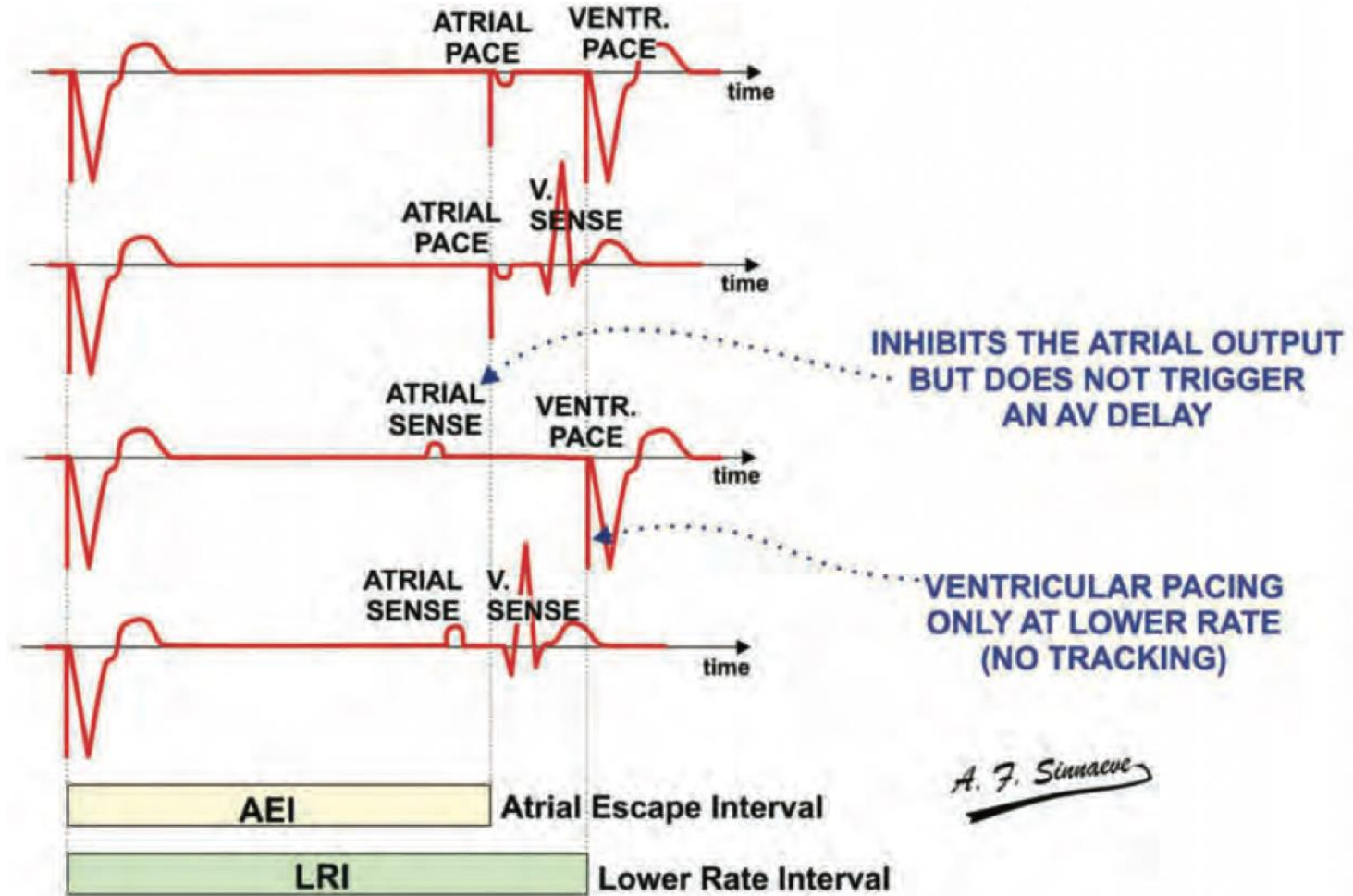


DDD

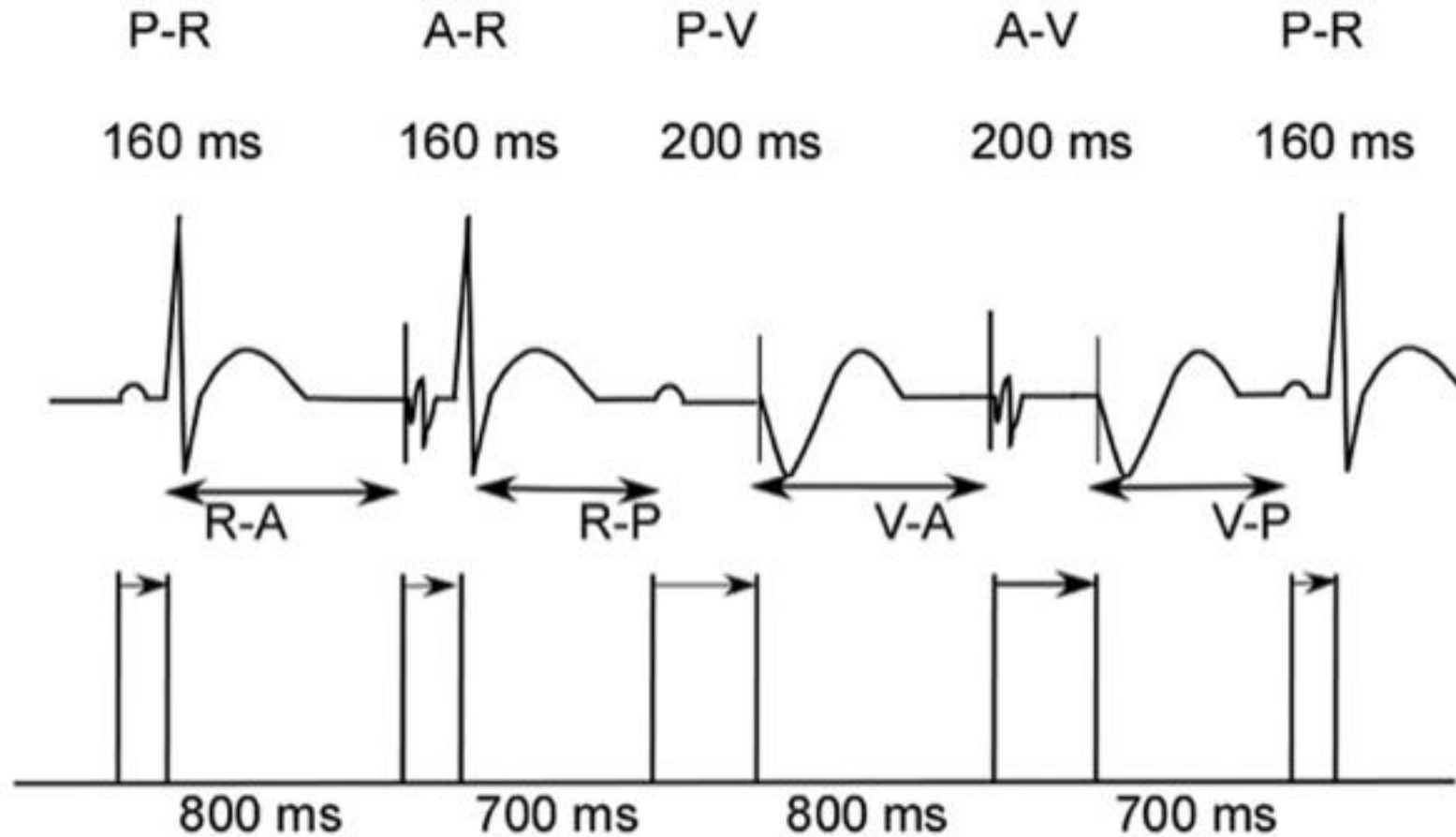
Pacing och avkänning i både förmak och kammare
Egenrytm inhiberar pacemakersystemet



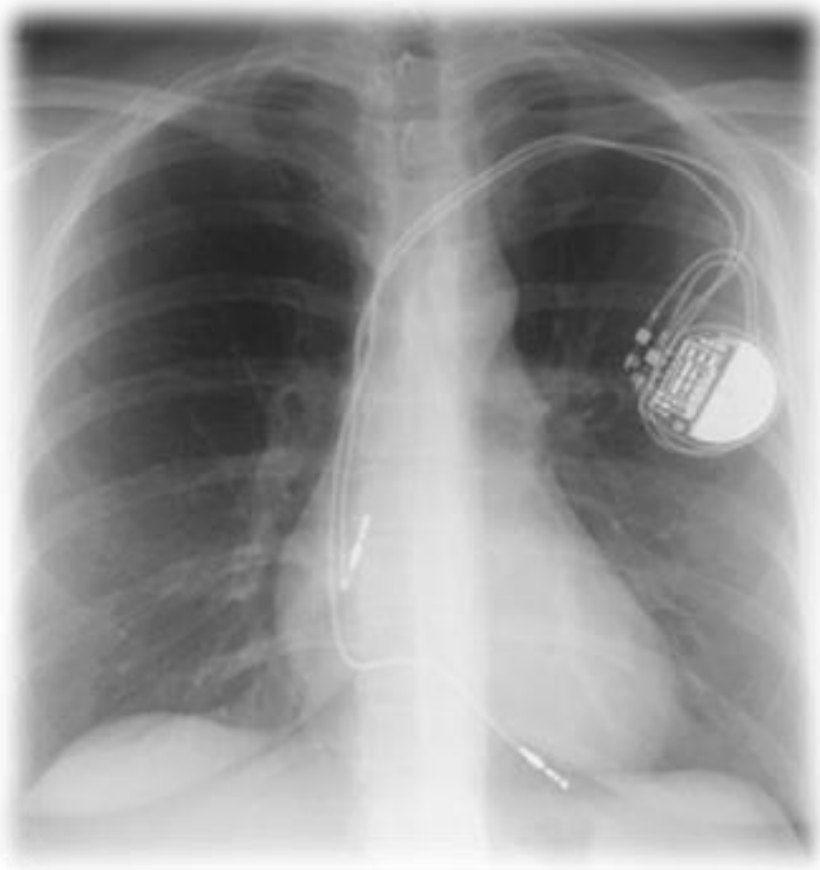
DDI



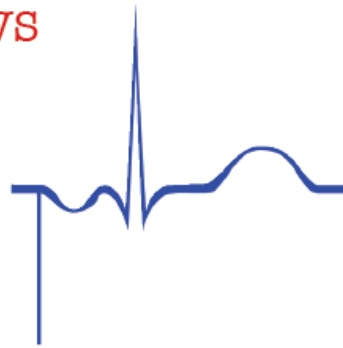
Många olika intervall att hålla reda på



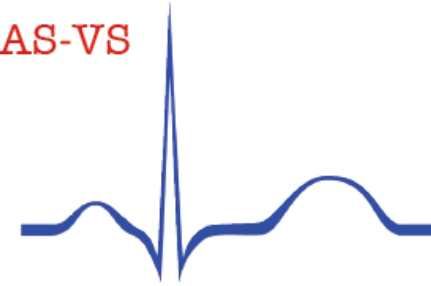
Möjliga kombinationer



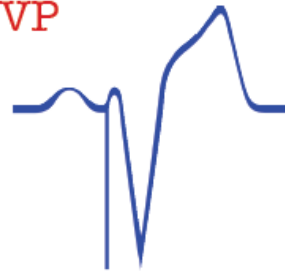
AP-VS



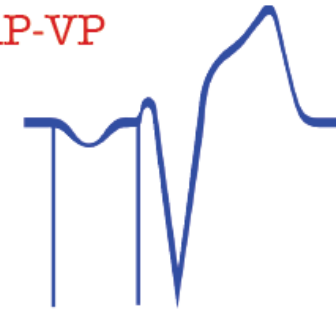
AS-VS



AS-VP



AP-VP



Sensitivitet = känslighet

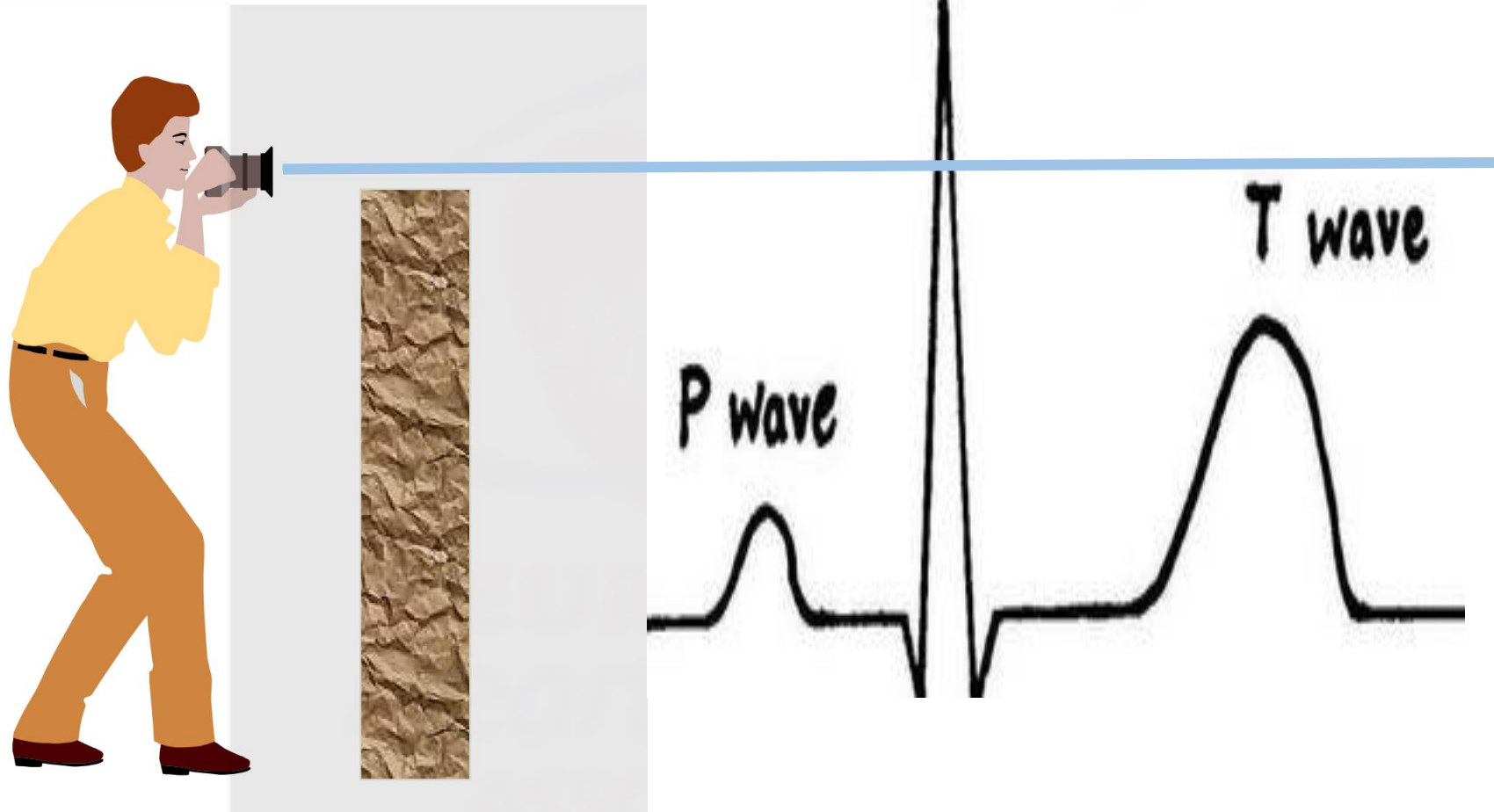


Bild: Linus Sonesson

Högt sensitivetsvärde: stora signaler ses, risk för undersense

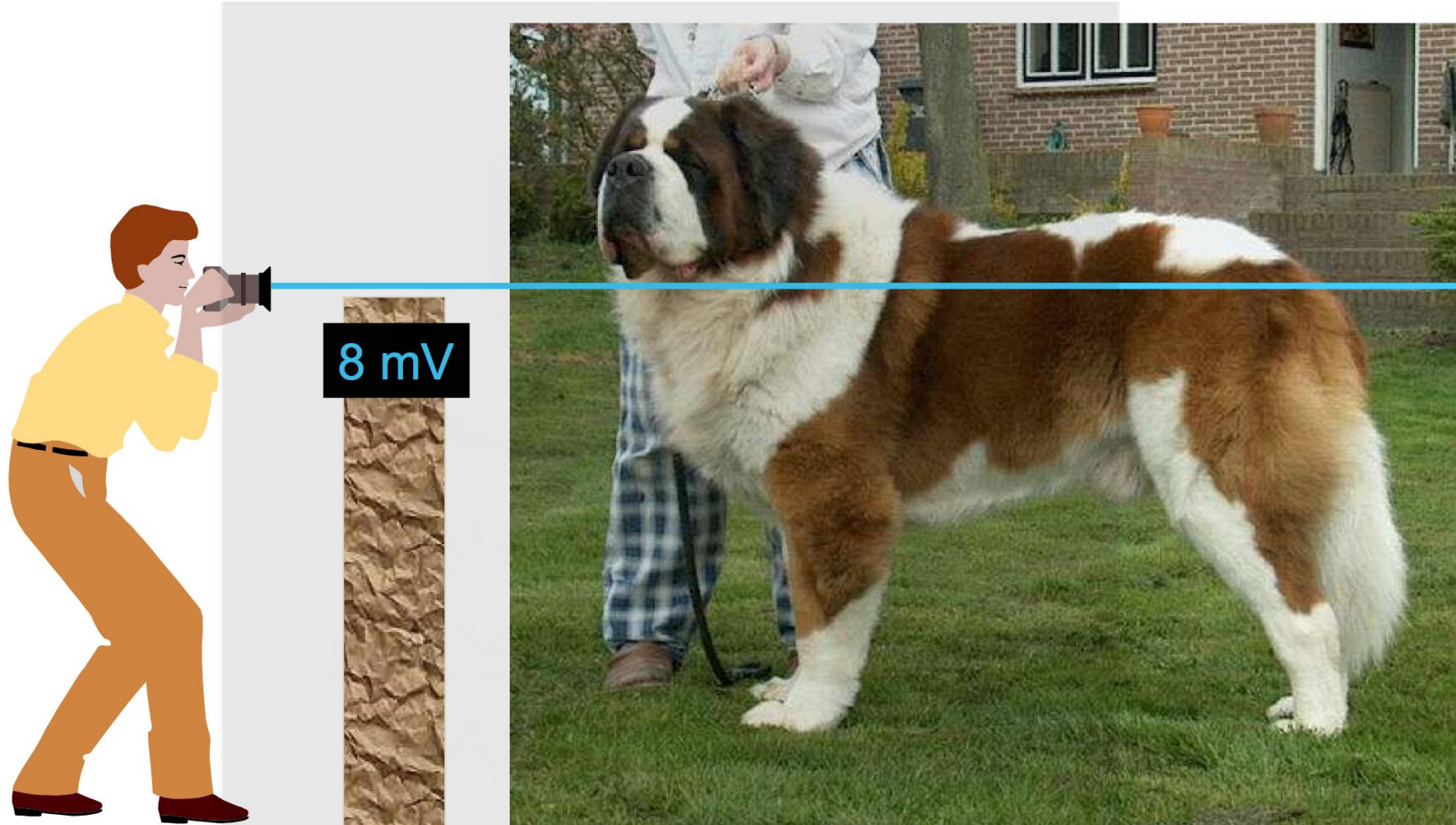
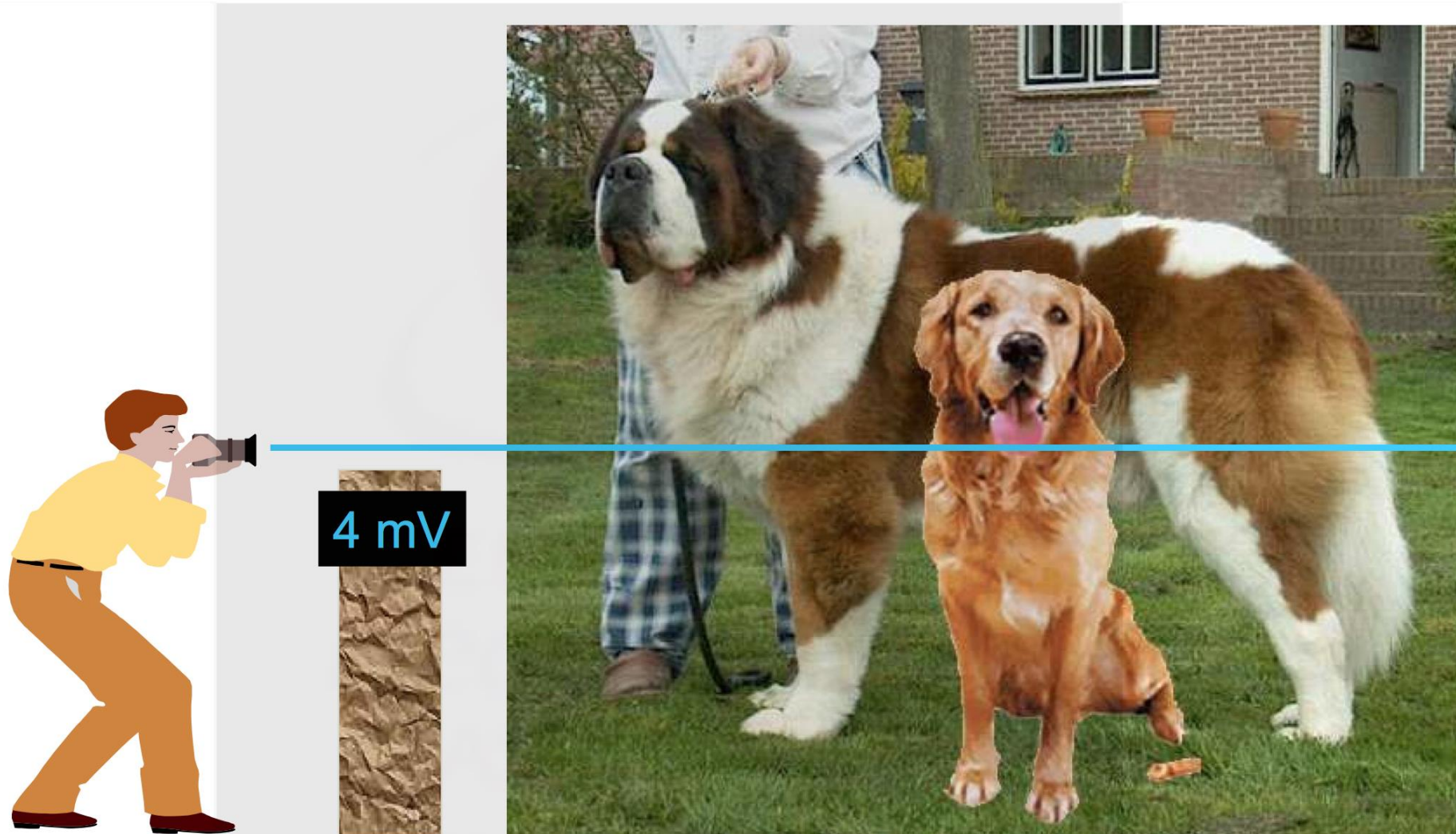


Bild: Linus Sonesson

Lägre sensitivitetvärde: även mindre signaler ses



Ännu lägre sensitivetsvärde: risk för oversense

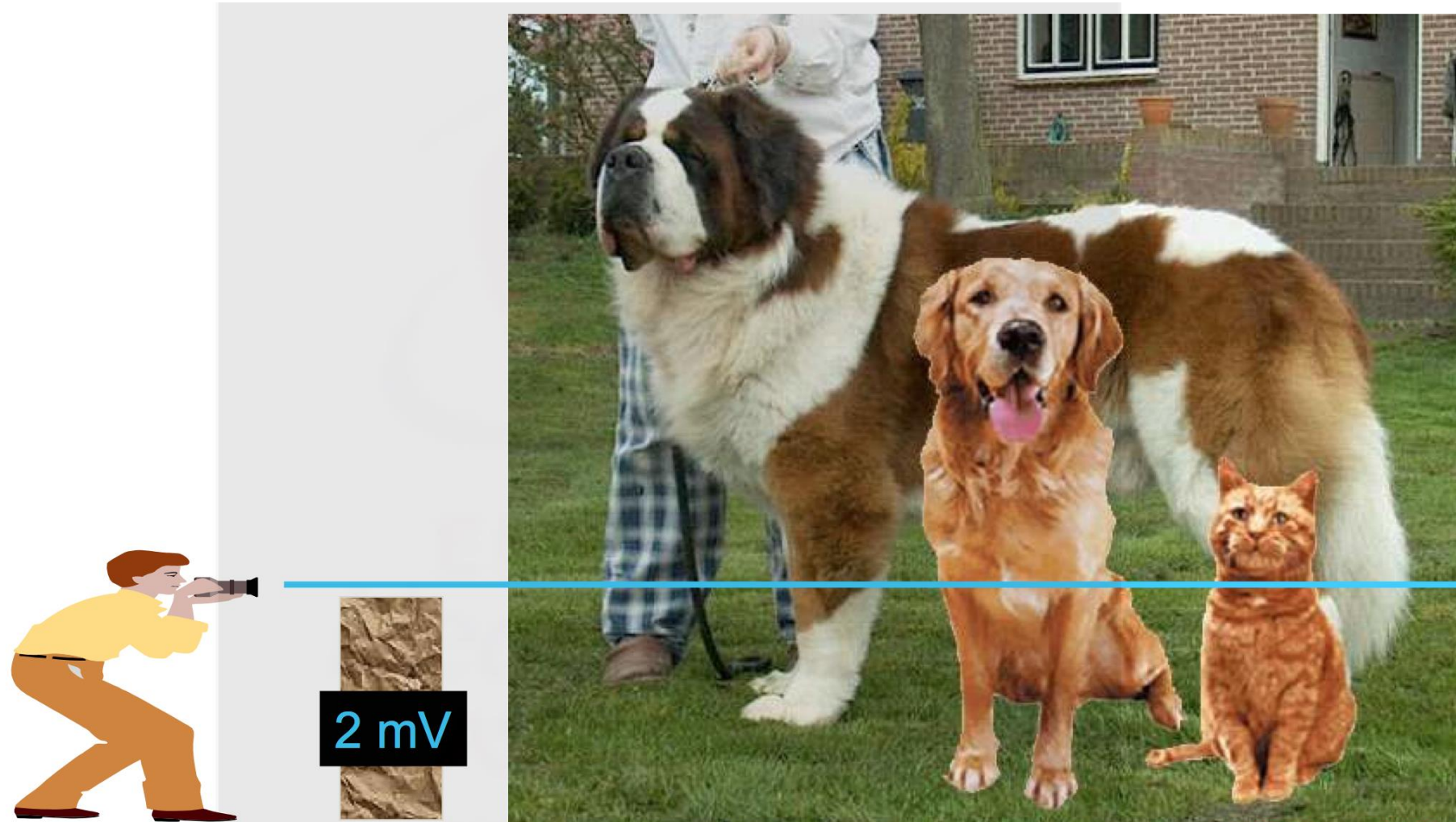
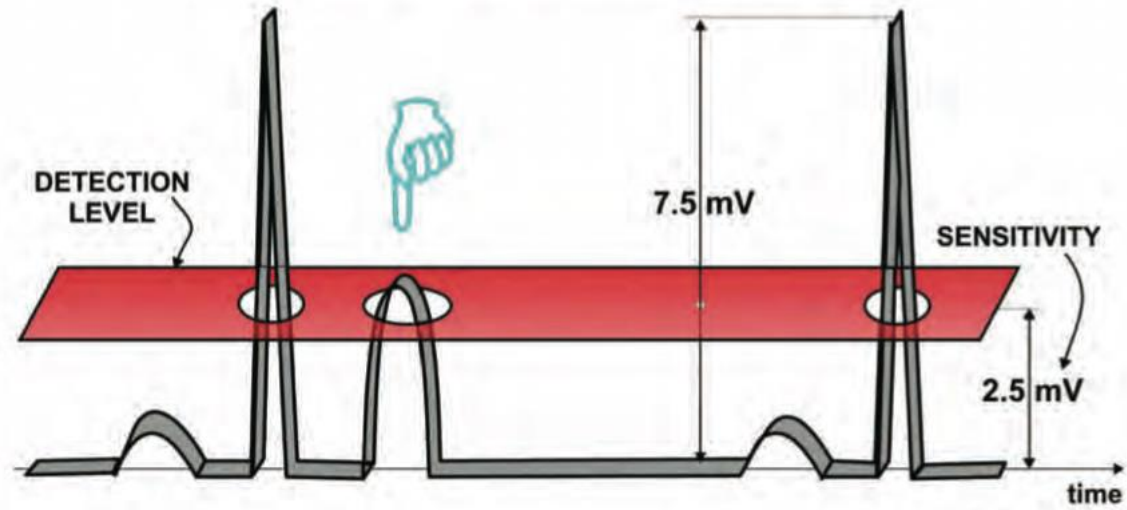
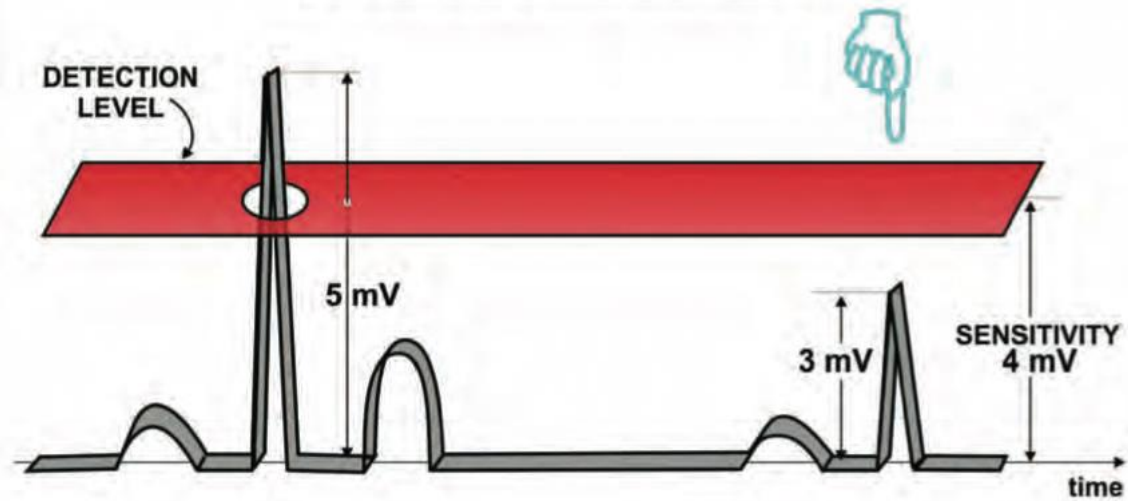


Bild: Linus Sonesson

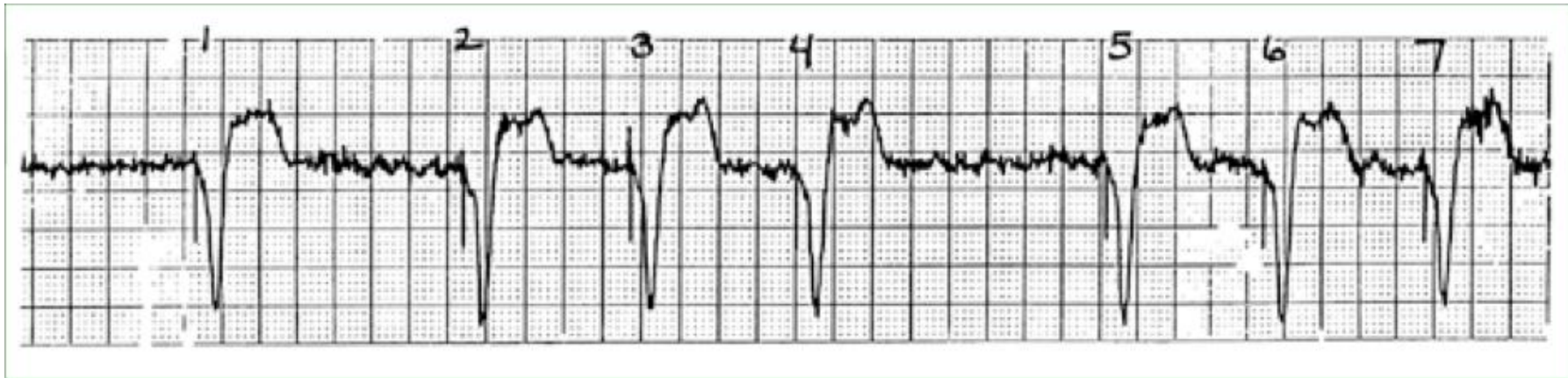
OVERSENSING



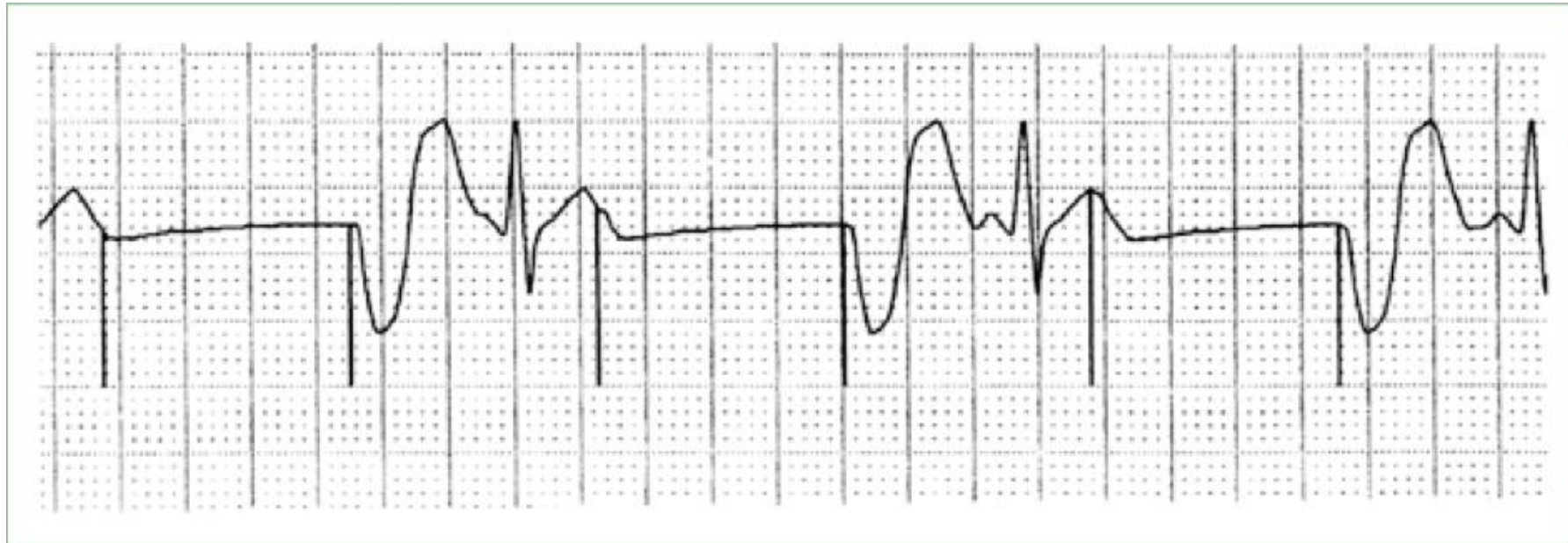
UNDERSENSING



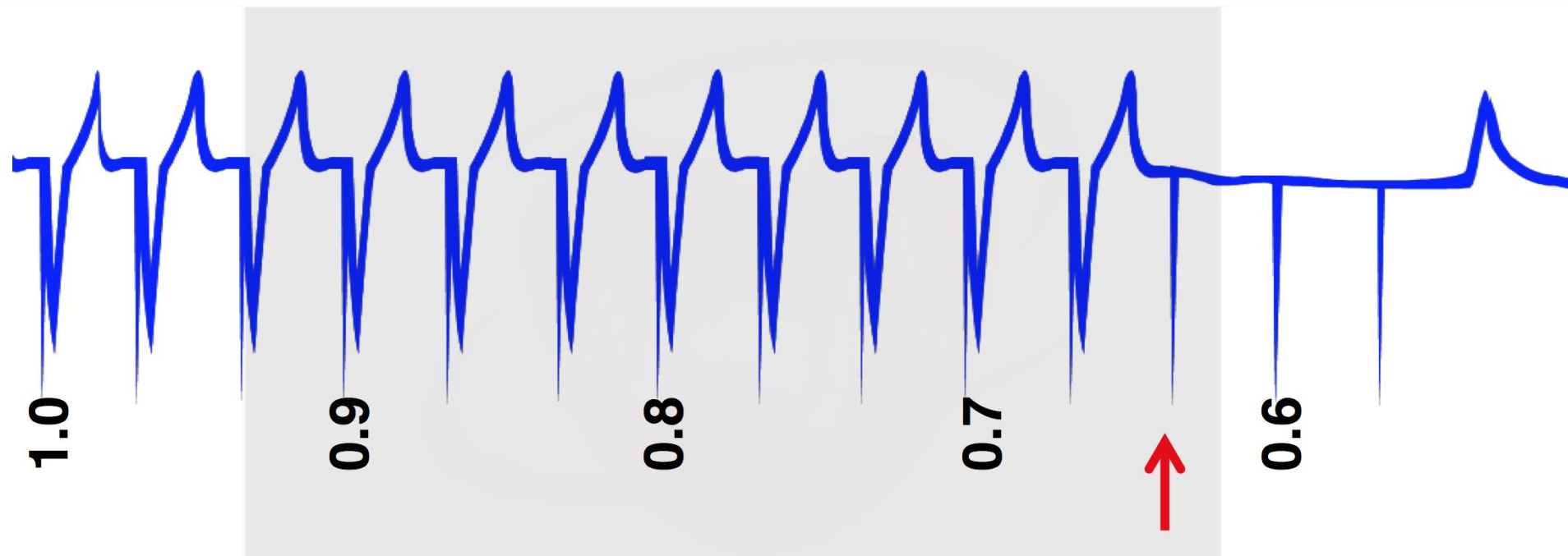
Oversense (VVI mode)



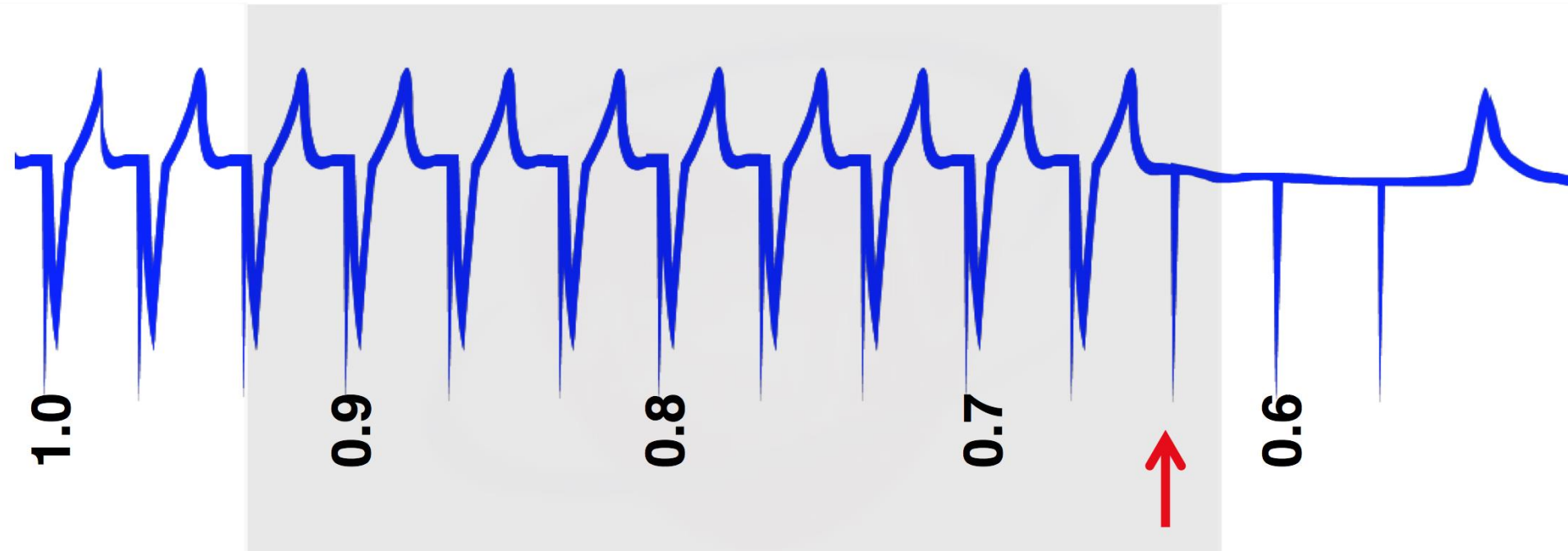
Undersense (VVI mode)



Tröskelvärdestest



Tröskelvärdestest



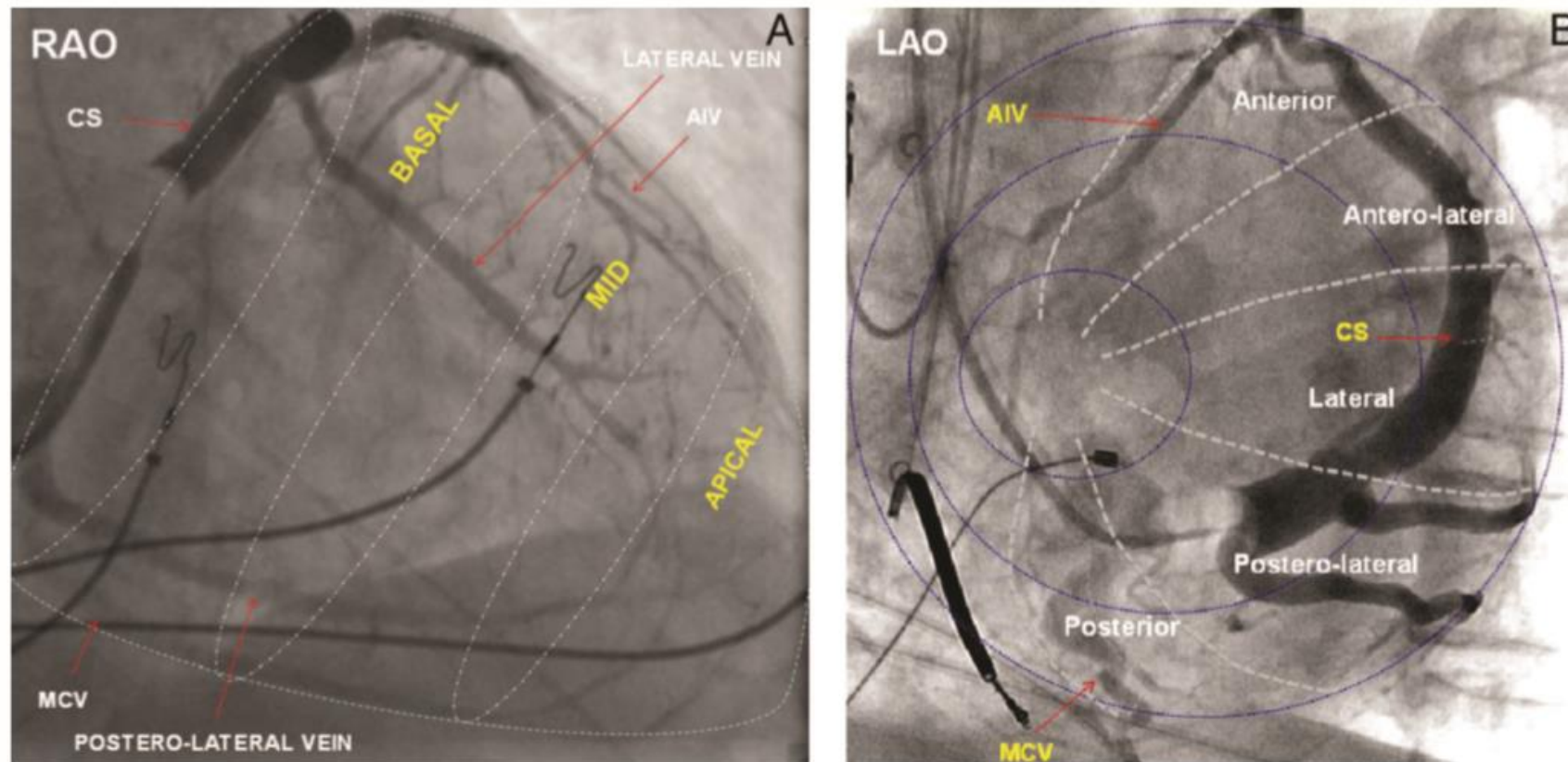
Loss of capture

Tröskelvärde för pacing: 0,8V

Loss of capture



2012 EHRA/HRS expert consensus statement on cardiac resynchronization therapy in heart failure: implant and follow-up recommendations and management



Angiographic views for visualization of coronary venous tree (adapted from Singh *et al.*¹²⁹).

Komplikationer CRT

Totalblock

Arytmier

Dislokation 4-11%

Dissektion CS 3-8%

Tamponad 1-2%

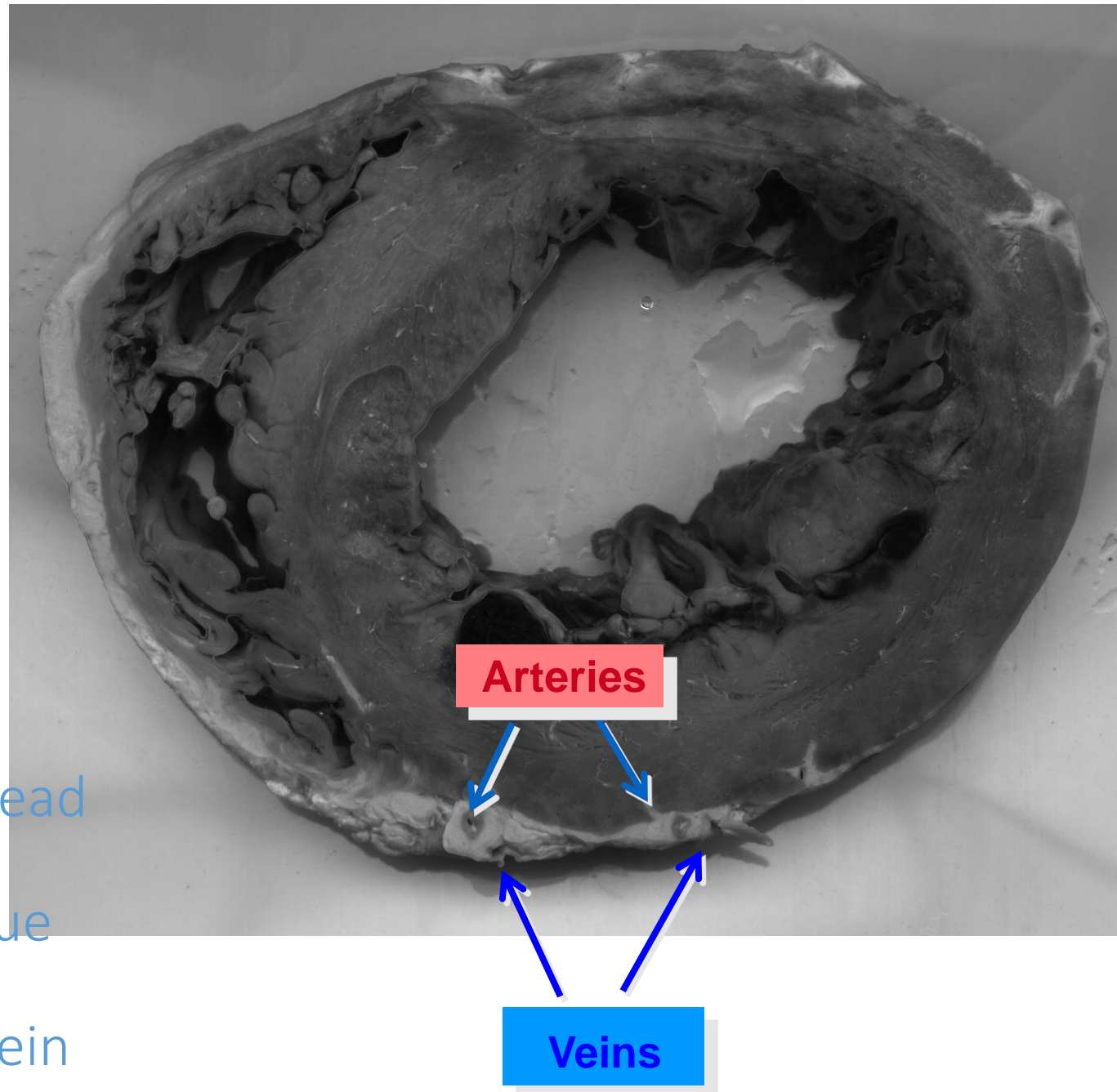
Phrenicusstimulering >10%

Ngt vanligare med infektioner (lång optid)



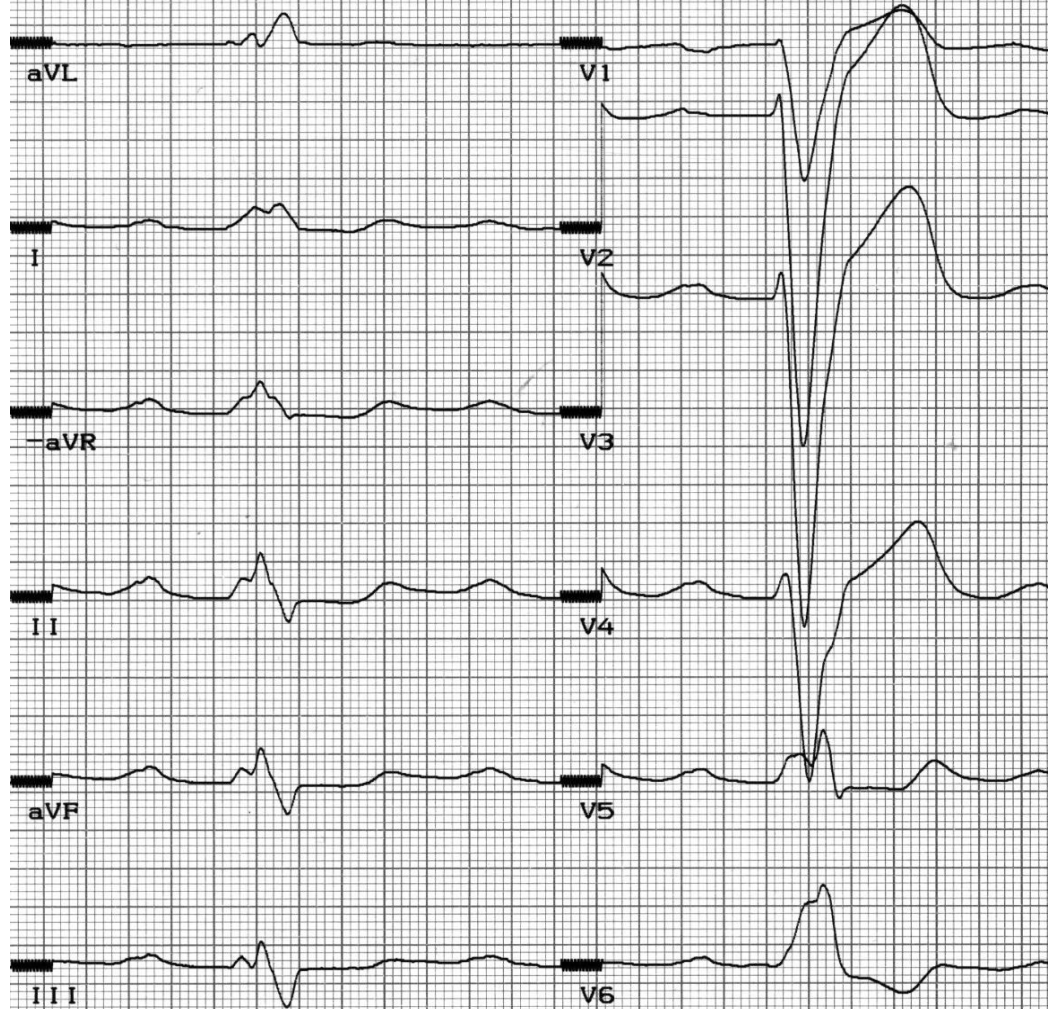
Factors That Can Influence Thresholds

- Relative Size of Vein vs Lead
- Viability of Cardiac Tissue
- Size of Fat Pad Under Vein



Epikardiella elektroder





11-NOV-2002

76år
Man

Beställare: 7



13-NOV-2002 1:

Man

Primärimplantationer ICD/CRT

- | Komplikationsfrekvens | ICD | CRT-D/P |
|-------------------------------|-----|---------|
| • Infektion | 1% | 2-4% |
| • Dislokation | 2 | 3-11 |
| • Pneumothorax | 1 | 1 |
| • CS dissektion /perforation | | 2-5 |
| • Hematom (reop) | 2 | 2 |
| • Ej reop 3-10% | | |
| • Om reop infektionsrisk x 15 | | |
- *Upp till 20% komplikationer vid 5 år efter nyimplantation.*

Riskfaktorer för komplikation

Njurinsufficiens

Diabetes

Steroider/Immunosuppression

Temporär pacing

Hög ålder

Antikoagulantia

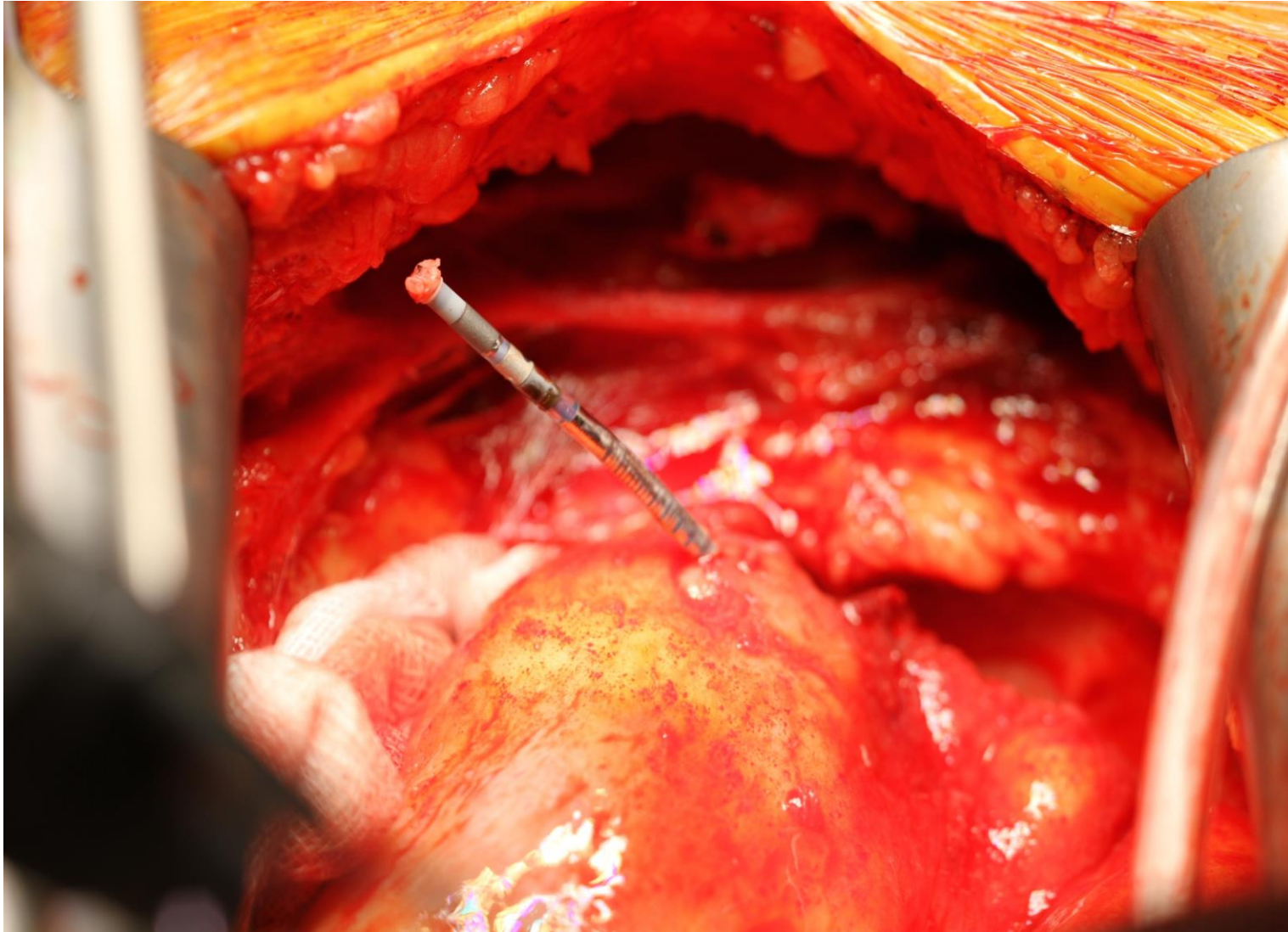
Ovan kirurg

Ingreppets komplexitet

Primärimplantation PM < ICD < CRT < Dosbyten < Uppgraderingar

Alla reoperationer har kraftigt ökad risk!

Ooops...



Antikoagulation vid devicekirurgi

Hur göra med patienter på Warfarin?

NOAK?

Dubbel trombocythämning?

Trippelterapi?

LMWH?

Antikoagulation vid devicekirurgi

”Bridging” med LMWH på högriskpatienter ger mer komplikationer än att fortsätta Waran med terapeutiskt INR.

Trombocythämmare i kombination med LMWH ger extra stor blödningsrisk.

- *Lågriskpatienter – sätt ut Waran tillfälligt, ej LMWH*
- *Högriskpatienter – behåll Waran (ev sätt ut ASA)*

Thal et al. PACE 2010;33:385-388

Ahmed et al. Heart Rhythm 2010;7:745-749

Ghanbari et al. PACE 2010; 33:400-406

Cheng et al. Heart Rhythm 2011;8:536-540

- Antimikrobiell spektrum

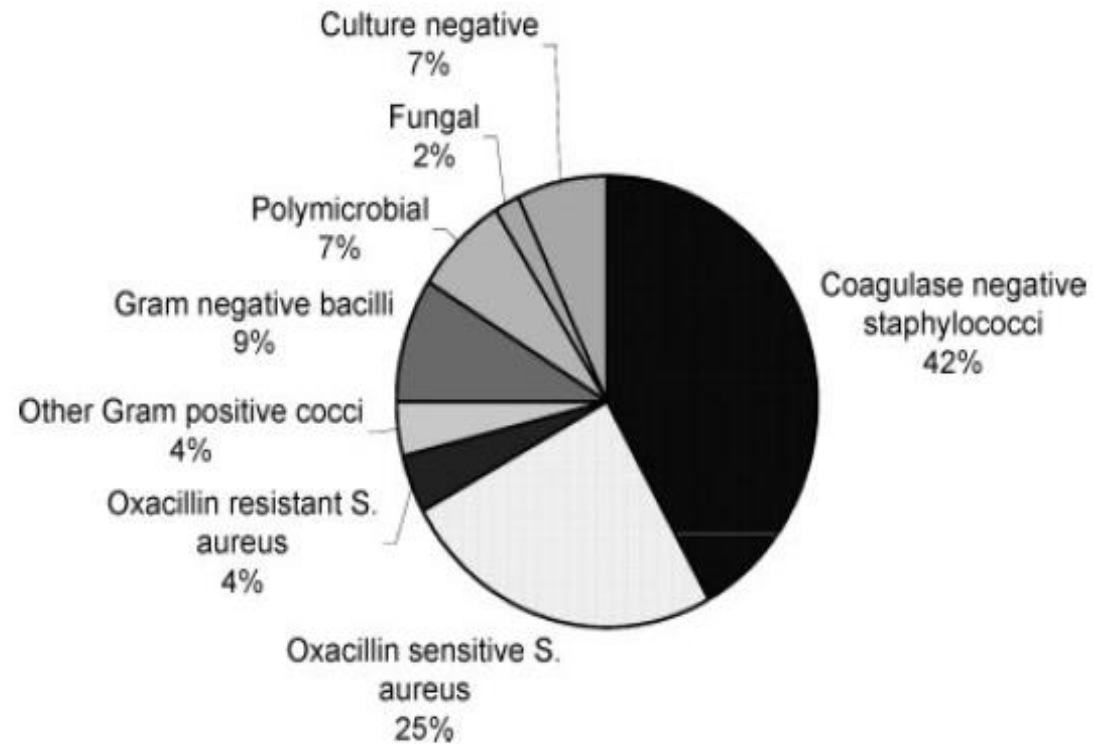


Figure 1. Microbiology of PPM/ICD infections (n=189). From Sohail et al,³⁸ with permission.

Infektioner

- 1-3% kliniska infektioner i samband med devicekirurgi
- 4-6 ggr risk vid sekundära ingrepp jämfört med primärimplantation (ex dosbyte)
- 15 ggr risk vid tidiga reoperationer
- ICD-operationer högre risk än PM
- Extra hög risk vid byte elektrod/uppgradering



Underdiagnostik av infektioner

- Ömhet veckor efter op – misstänk infektion!
- Lågvirulenta dosfickeinfektioner ger oftast ingen feber eller stegring av CRP eller LPK
- Provtagning med pinne ger 30% pos odl
- Vävnadsodling från dosficka ca 70% pos vid klinisk infektion
- Högre sensitivitet vid odling från material i dosfickan (suturer, symuff, connector).

Chua et al. PACE 2005; 28: 1276-1281

Mason et al. PACE 2011; 34: 143-149

- Tack!