

Le défibrillateur entièrement sous cutanée a pris toute sa place dans la panoplie contre la mort subite



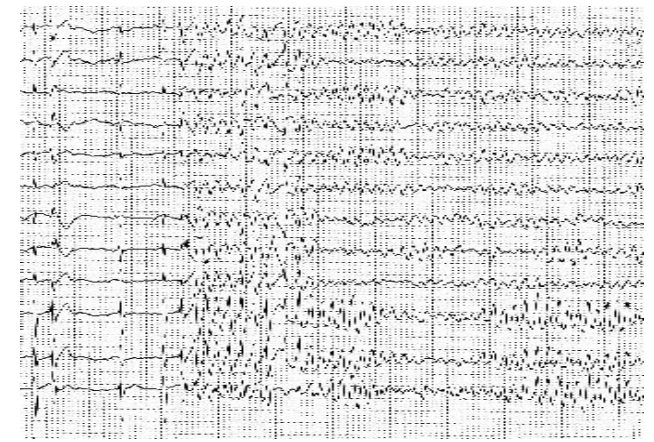
**Dr Xavier Waintaub**

Cardiologie Rythmologie  
Pitié Salpêtrière Paris



# Mr B. 25 ans

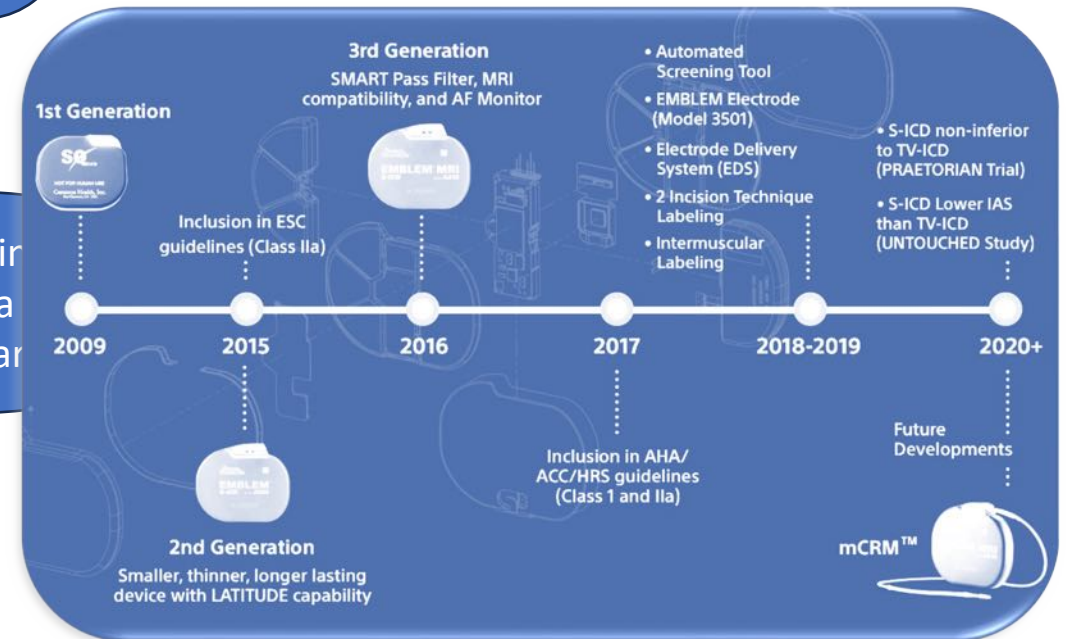
2009 Mort subite récupéré sur FV idiopathique



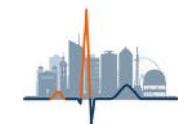
Je vais vous implanter un défibrillateur



C'est le Dr Wain qui vous suivra mon départ



HÔPITAUX UNIVERSITAIRES  
PITIÉ SALPÊTRIÈRE  
CHARLES FOIX

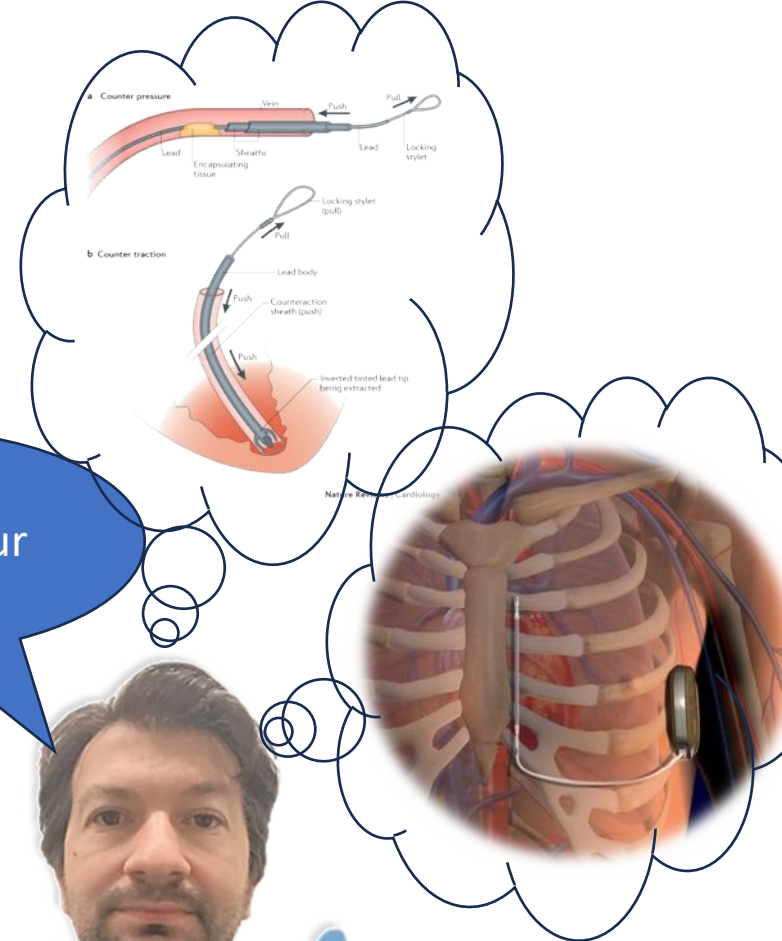
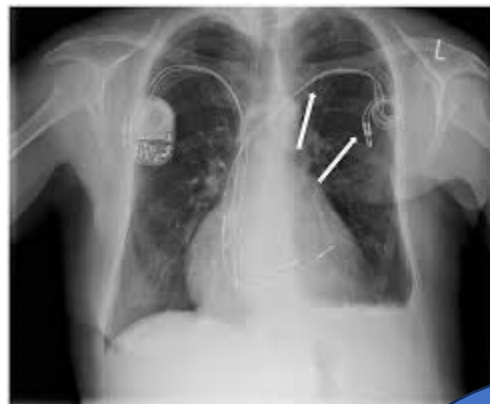


2009 Défibrillateur VVI endocavitaire

2016 Mars Changement de défibrillateur

2016 Avril choc inapproprié sur fracture de sonde  
Réintervention ajout sonde de défibrillation

2017 Extériorisation de boîtier de DAI



Dr W. je sens mon boîtier qui sort de sa loge !

On a une solution pour vous





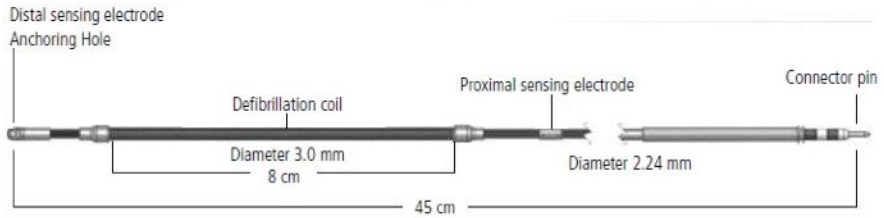
Un défibrillateur sous cutanée

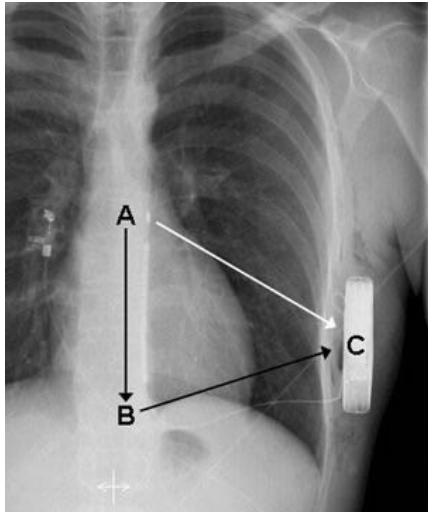


Un défibrillateur sous quoi !!



Thickness	12.7 mm
Volume	59.5 cc
Weight	130 gram
Longevity	7.3 years
Remote monitoring	LATITUDE



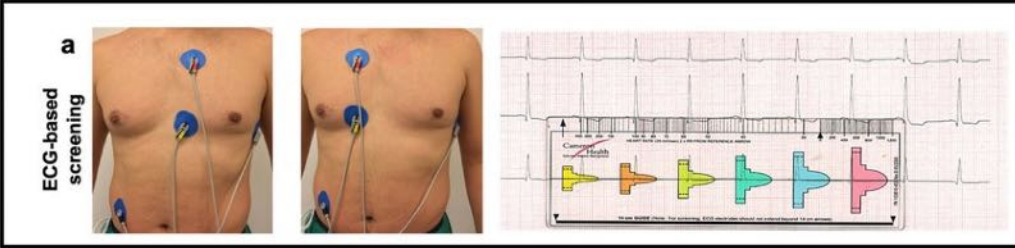


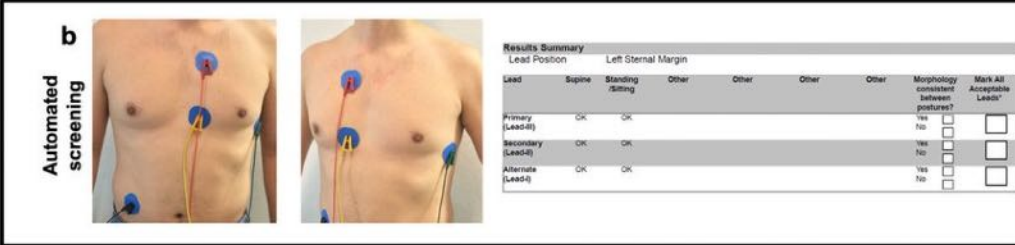
### Discordance between QRS and T



The positive area of the QRS complex is smaller than the negative area. Thus the QRS complex is net negative. The T-wave, on the other hand, is positive.

Left parasternal      Right parasternal      Result

**a** 

**b** 

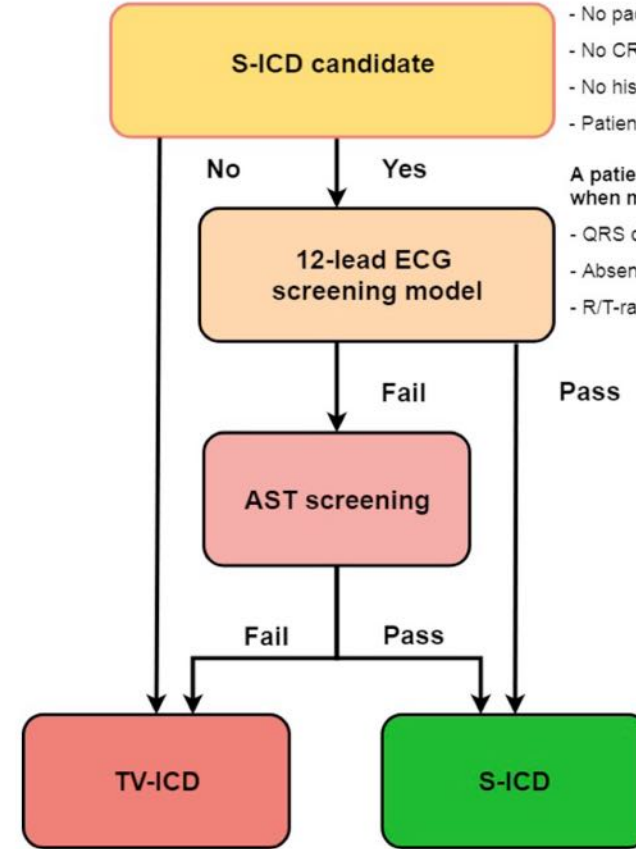
Results Summary		Left Sternal Margin				Morphology consistent between positions?	Mark All Acceptable Leads*
Lead	Lead Position	Spine	Standing	Other	Other		
Primary (Lead II)	OK	OK	OK			Yes <input type="checkbox"/>	<input type="checkbox"/>
Secondary (Lead III)	OK	OK	OK			Yes <input type="checkbox"/>	<input type="checkbox"/>
Alternate (Lead I)	OK	OK	OK			Yes <input type="checkbox"/>	<input type="checkbox"/>
						No <input type="checkbox"/>	<input type="checkbox"/>

A patient is a S-ICD candidate when meeting all the following criteria:

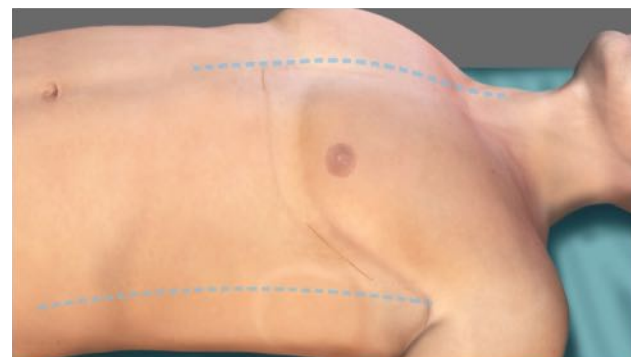
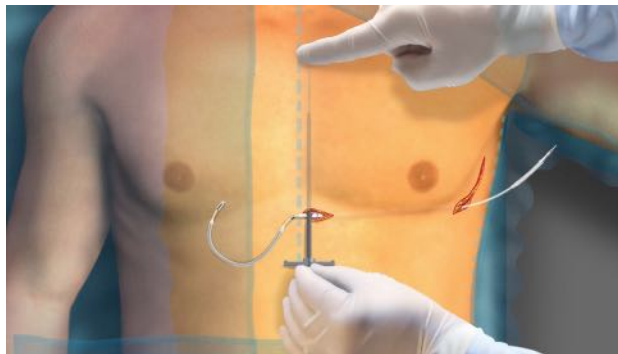
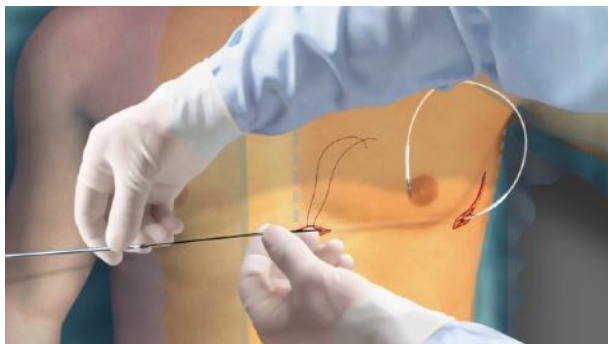
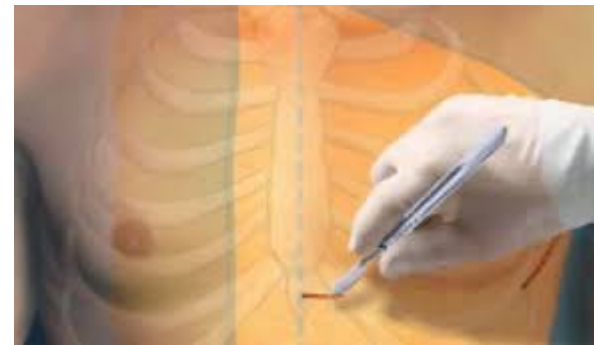
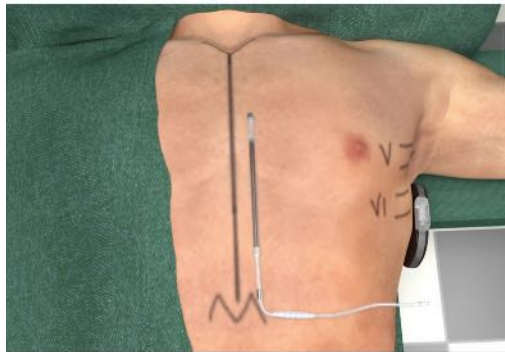
- No pacing indication
- No CRT indication
- No history of monomorphic VT
- Patients preference for S-ICD

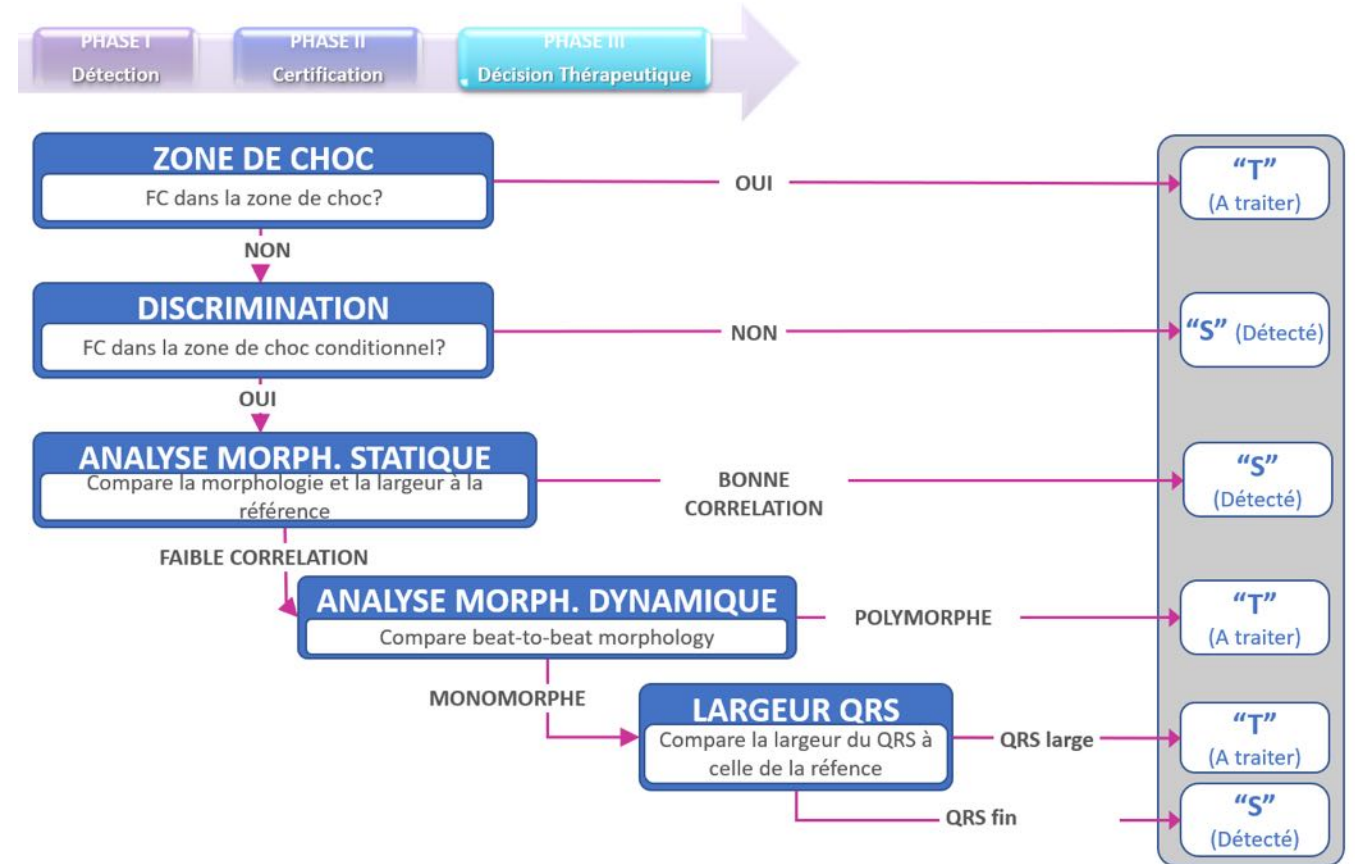
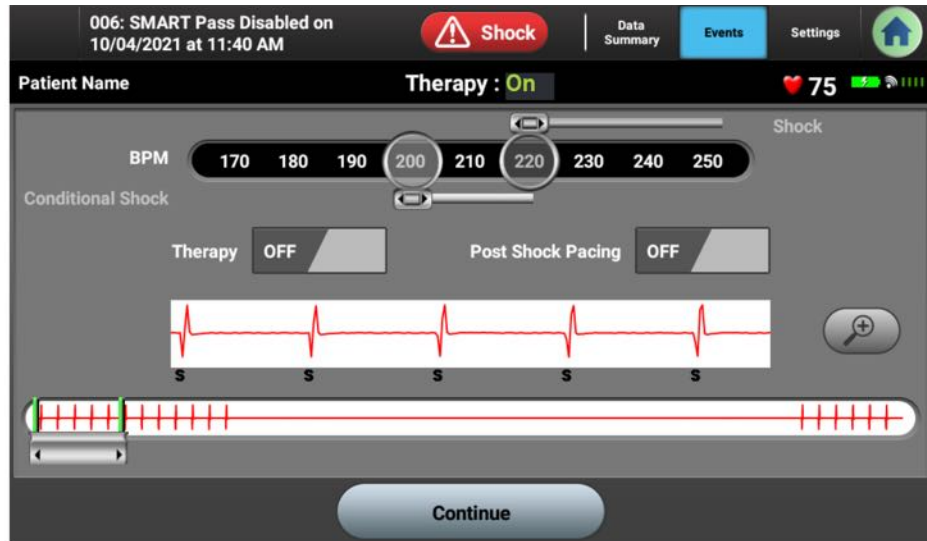
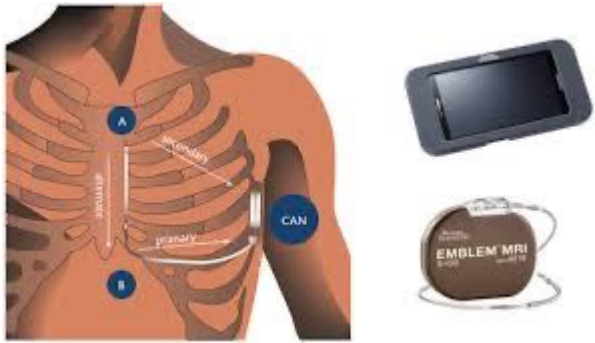
A patient will pass the 12-lead ECG screening when meeting all the following criteria:

- QRS duration  $\leq 130$  ms
- Absence of QRS/T-wave discordance in lead II
- R/T-ratio  $\geq 3.5$  in lead II



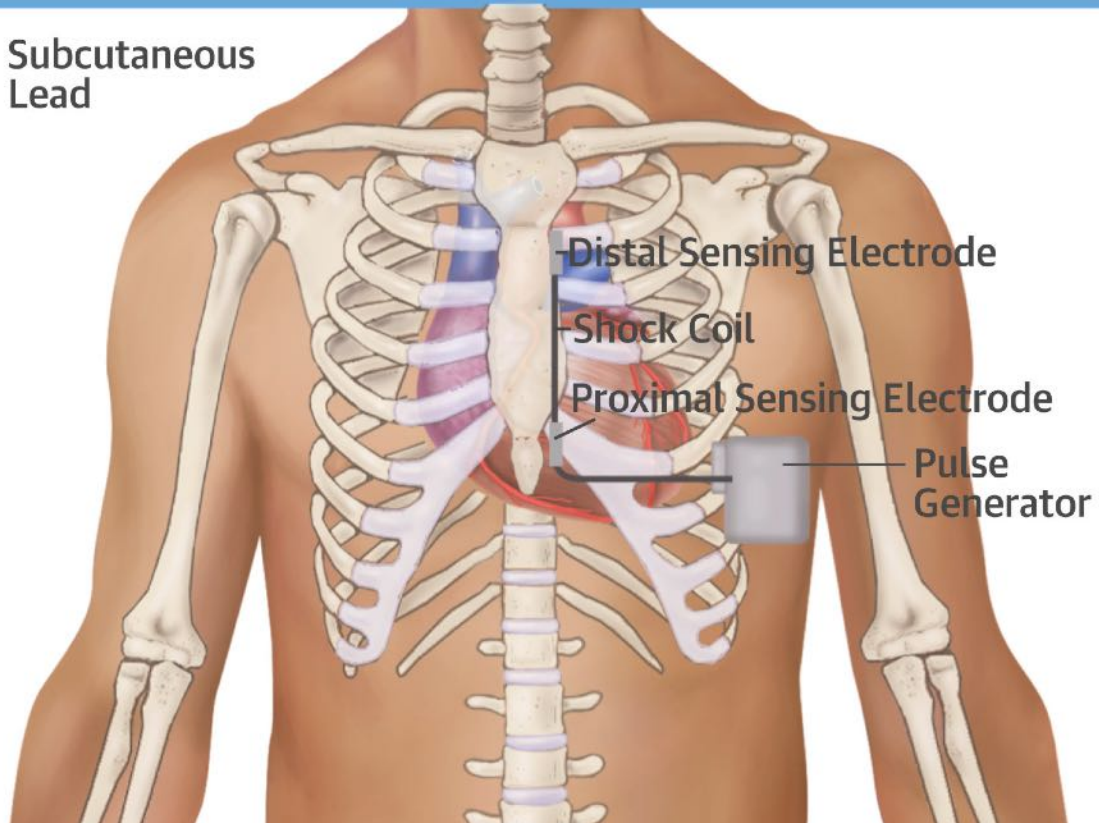
3% à 8% des patients ne sont pas éligibles au S ICD  
13% à 16% pour les porteurs de cardiopathies congénitales ou de CMH.



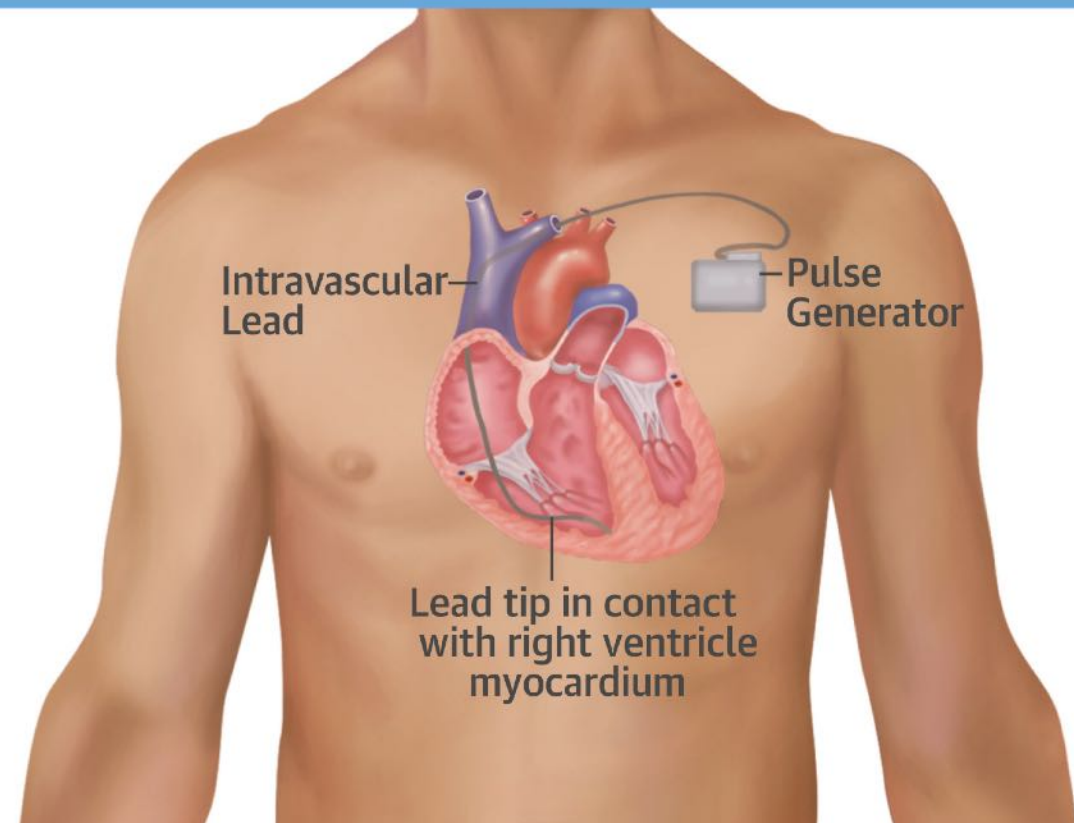


## S-ICD

Subcutaneous  
Lead

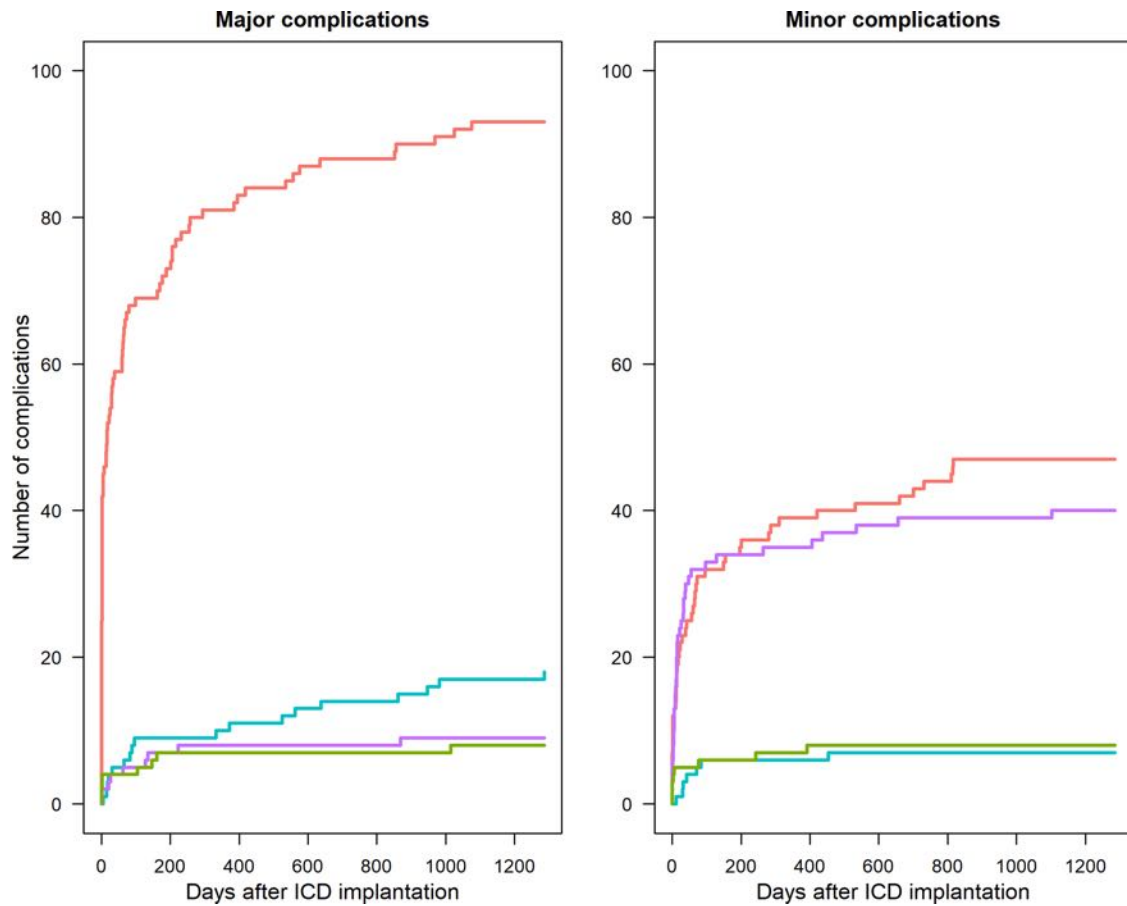


## Transvenous ICD

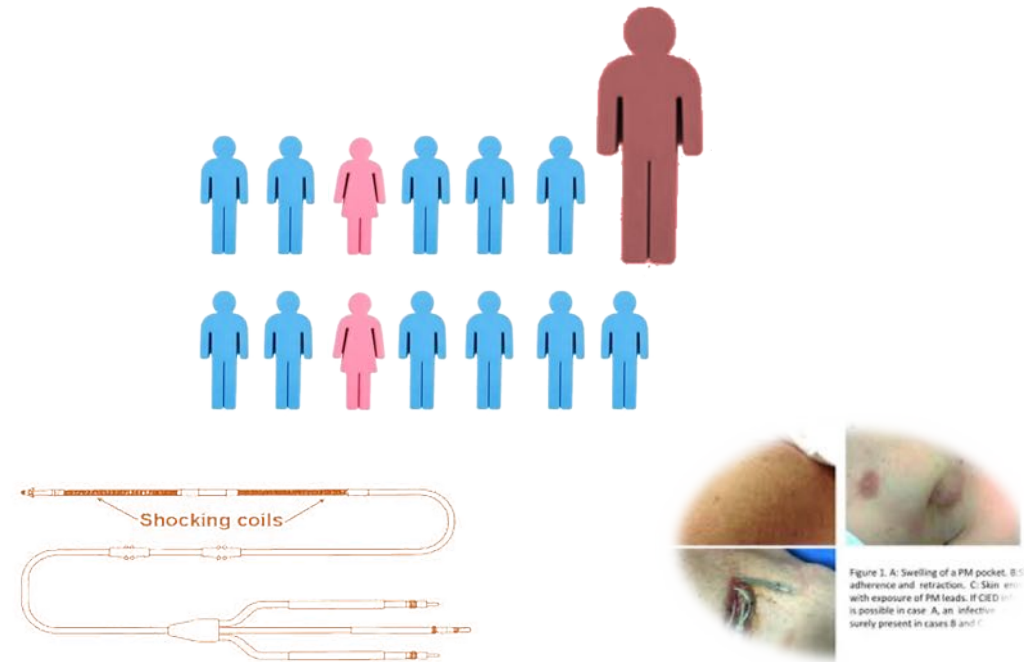




# Moins de complications ?

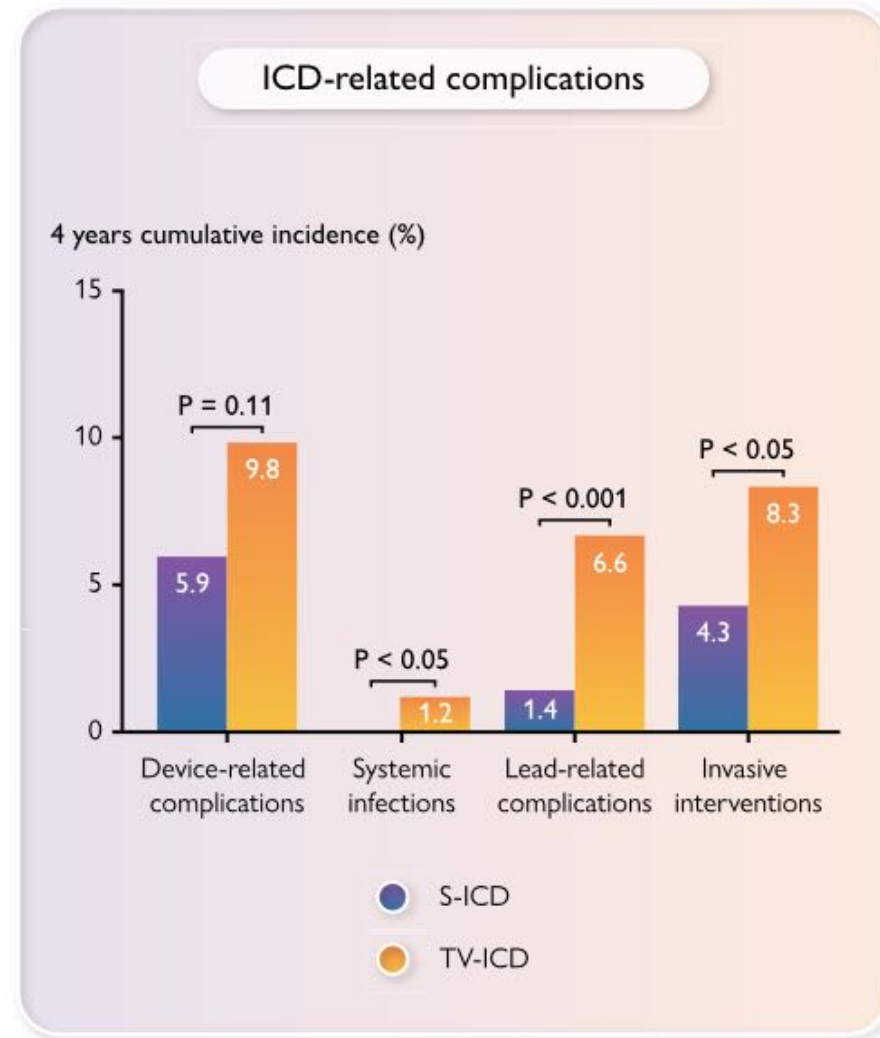
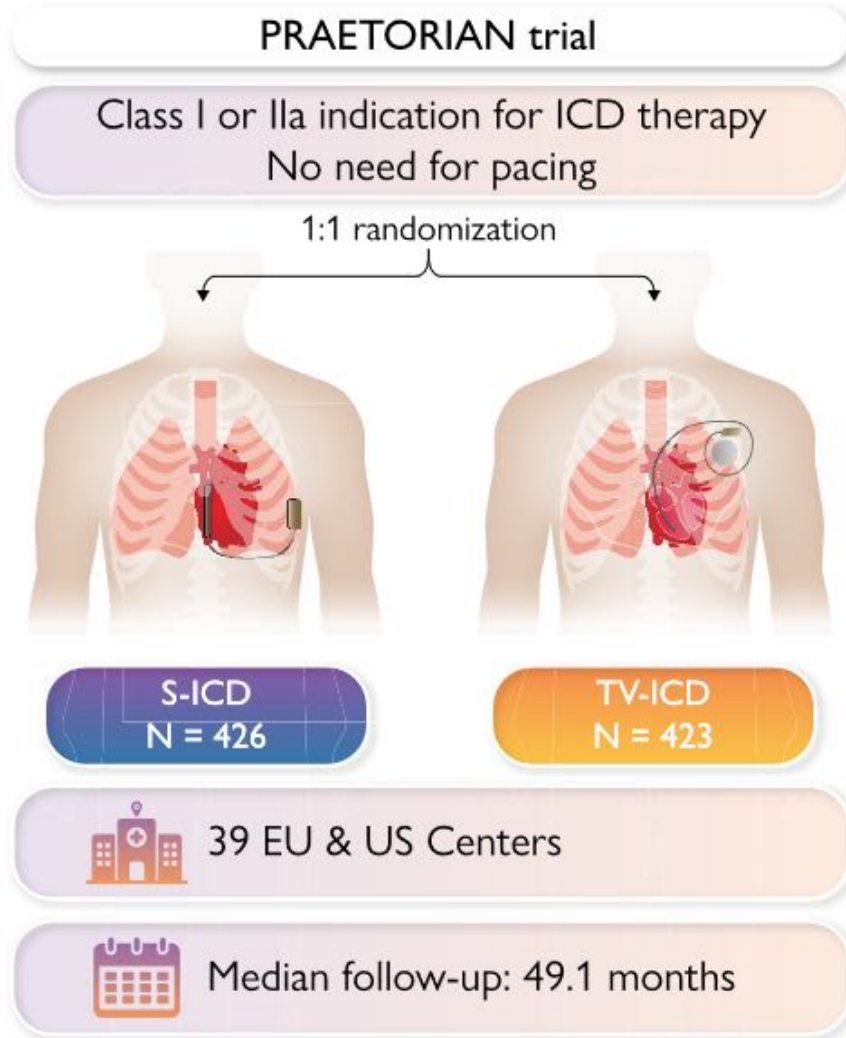


Suivi sur 2,2 années de 1442 patients avec dai tv  
 13,5% de complications  
 4,6% de thérapie inappropriée  
 1 patient sur 13 avec une complication grave



Marit van Barreveld. Journal of the American Heart Association. Dutch Outcome in Implantable Cardioverter-Defibrillator Therapy: Implantable Cardioverter-Defibrillator-Related Complications in a Contemporary Primary Prevention Cohort, Volume: 10, Issue: 7, DOI: (10.1161/JAHA.120.018063)

# Moins de complications ?



Knops et Al. Eur Heart J 2022 Dec 14;43(47):4872-4883

# Thérapies inappropriées ?

## S-ICD Studies



Subcutaneous ICD

13,1%

8,1%

4,8%

4,3%

2,4%

IDE Study  
2013<sup>2</sup>

Effortless  
Registry  
2017<sup>3</sup>

PRAETORIAN  
(Enrolled 2011-  
2016)<sup>4</sup>

SMART Pass  
Study  
2018<sup>5</sup>

UNTOUCHED  
(Gen 3)  
2020<sup>1</sup>

## TV-ICD Studies



Transvenous ICD

4,1%

4,8%

5,0%

PRAETORIAN  
TV-ICD<sup>4</sup>

ADVANCE III  
(30/40)<sup>6</sup>

MADIT-RIT  
(DR ICD)<sup>7</sup>

# Effacité des chocs ?

## S-ICD Conversion Rates

**UNTOUCHED<sup>8</sup>**  
N = 1,111  
(Enrolled 2015 - 2018)

92.2%

98.4%

**PAS 1 Year<sup>14</sup>**  
N = 1,637  
(Enrolled 2013 - 2015)

91.3%

100%

**EFFORTLESS 3 Year<sup>10</sup>**  
N = 985  
(Enrolled 2009 - 2013)

88.5%

97.4%

**IDE<sup>9</sup>**  
N = 321  
(Enrolled 2009)

92.1%

100%

■ First Shock ■ Final Shock

## TV-ICD Conversion Rates<sup>15-19</sup>

**SIMPLE Study – Testing Group:**  
First shock: 88.5%, Final shock: 97.4%

**SIMPLE Study - No Testing Group :**  
First shock: 92.0%, Final shock: 98.2%

**SCD-HeFT:** First shock: 83.0%

**PainFree Rx II:** First shock: 87.0%

**MADIT-CRT:** First Shock: 89.8% - 92.3%

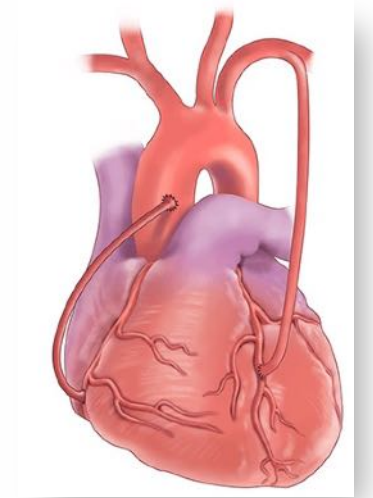
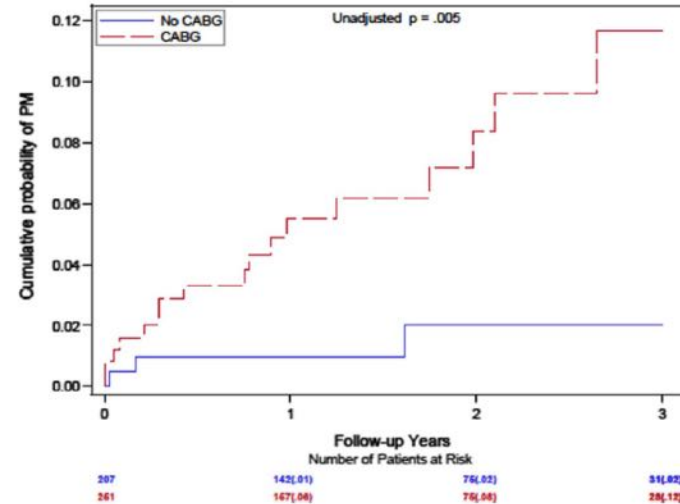
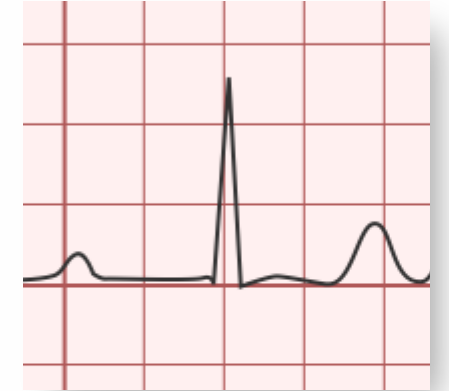
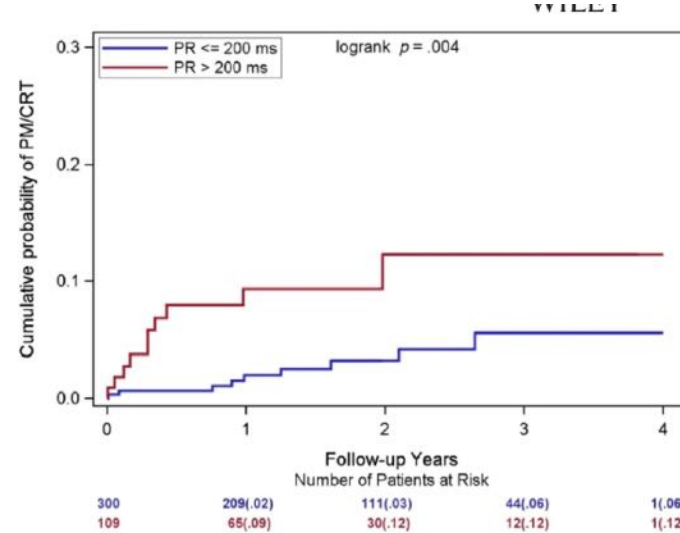
**LESS Study:** Final Shock: 97.3%

# Une perte de chance ? Pas de sondes pas de stimulation ?

Etude dérivée de MADIT II

Nombre de patients dans le groupe contrôle qui vont nécessiter une stimulation cardiaque sur 20 mois de suivi

- 24 sur 458 patients (5.2%) vont être implantés d'un stimulateur ou d'un système de resynchronisation



Kutyifa V et al. Ann Noninvasive Electrocardiol 2020;25:e12744.

# Une perte de chance ?

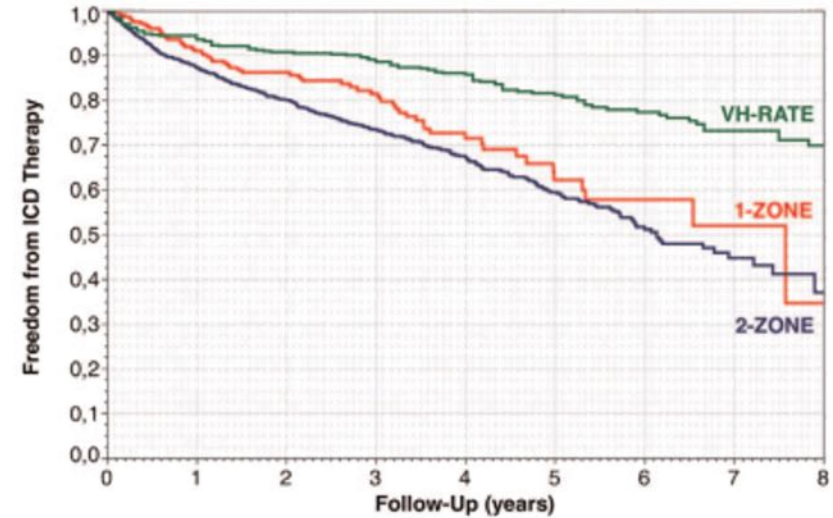
## Pas de sondes pas de stimulation antitachycardique ?

Very high rate programming in primary prevention patients with reduced ejection fraction implanted with a defibrillator: Results from a large multicenter controlled study

Nicolas Clementy, MD,<sup>\*</sup> Farid Challal, MD,<sup>\*</sup> Eloi Marijon, MD, PhD,<sup>†</sup> Serge Boveda, MD,<sup>‡</sup> Pascal Defaye, MD,<sup>§</sup> Christophe Leclercq, MD, PhD,<sup>||</sup> Jean-Claude Deharo, MD, PhD,<sup>¶</sup> Nicolas Sadoul, MD, PhD,<sup>#</sup> Didier Klug, MD, PhD,<sup>\*\*</sup> Olivier Piot, MD,<sup>††</sup> Daniel Gras, MD,<sup>‡‡</sup> Pierre Bordachar, MD, PhD,<sup>§§</sup> Vincent Algalarrondo, MD, PhD,<sup>|||</sup> Laurent Fauchier, MD, PhD,<sup>•</sup> Dominique Babuty, MD, PhD<sup>•</sup>;DAI-PP Investigators

**Table 1** ICD programming at baseline in the VH-RATE group and the DAI-PP subgroups

Variable	VH-RATE group (n = 500)	1-Zone group (n = 300)	2-Zone group (n = 1200)
Monitoring	LR: 170 ± 0.6 beats/min	LR: 172 ± 10 beats/min	LR: 160 ± 9 beats/min
VT	—	—	LR: 177 ± 7 beats/min NID: 20 ± 6 ATP: 9 ± 3 Shocks: Yes Discrimination: On Timers: Off
VF	LR: 221 ± 1.0 beats/min NID: 13 ± 4	LR: 200 ± 0.2 beats/min NID: 16 ± 3	LR: 222 ± 7 beats/min NID: 16 ± 6



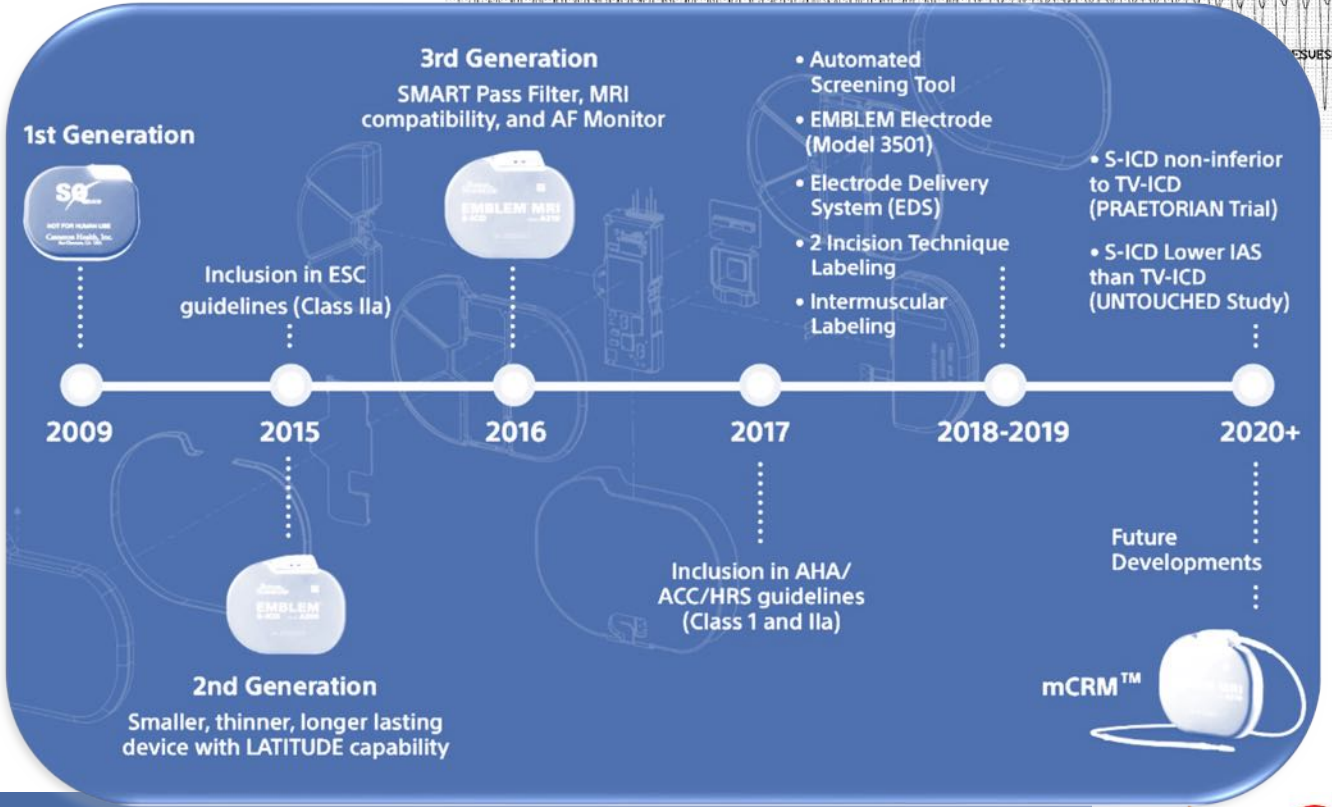
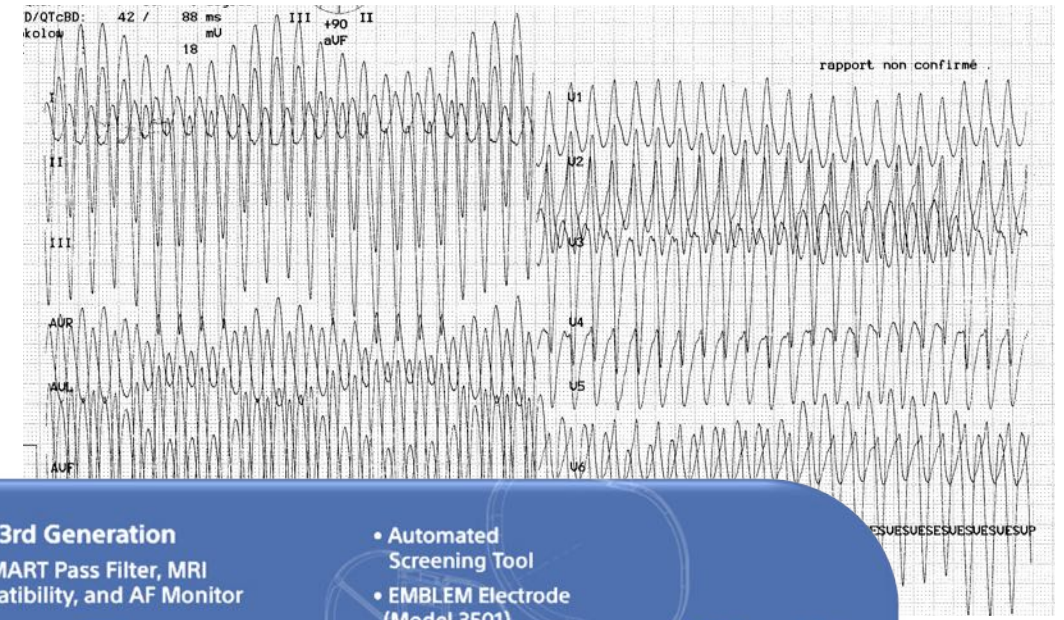
	500	451	397	364	319	216	136	90	51
VH-RATE	500	451	397	364	319	216	136	90	51
1-ZONE	300	208	149	101	62	35	15	9	2
2-ZONE	1,200	909	682	448	275	178	93	36	10

**Figure 1** Event-free curves (with 95% confidence intervals) for ICD therapy (appropriate therapy or inappropriate shock). ICD = implantable cardioverter-defibrillator.

**3 patients (2.6%) experienced symptomatic VT episodes with syncope or presyncope,**

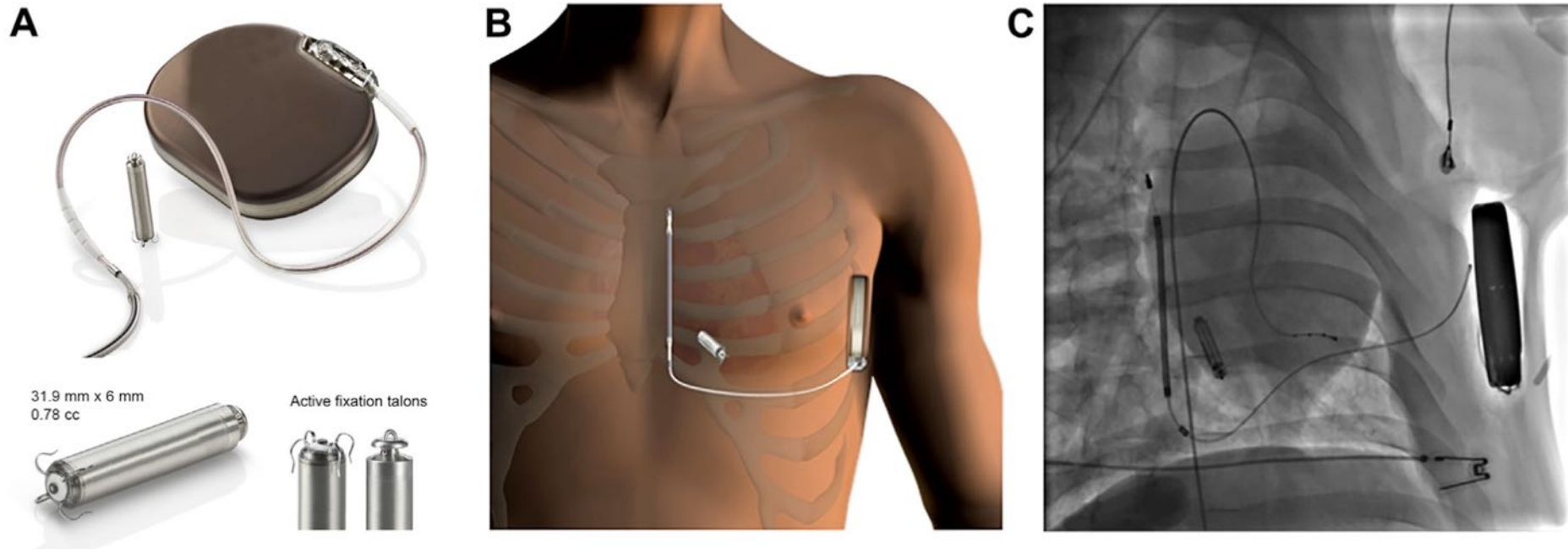
# 2022 Mr B. Jr 17 ans

TV soutenue syncopale sur séquelle de myocardite  
FEVG conservée



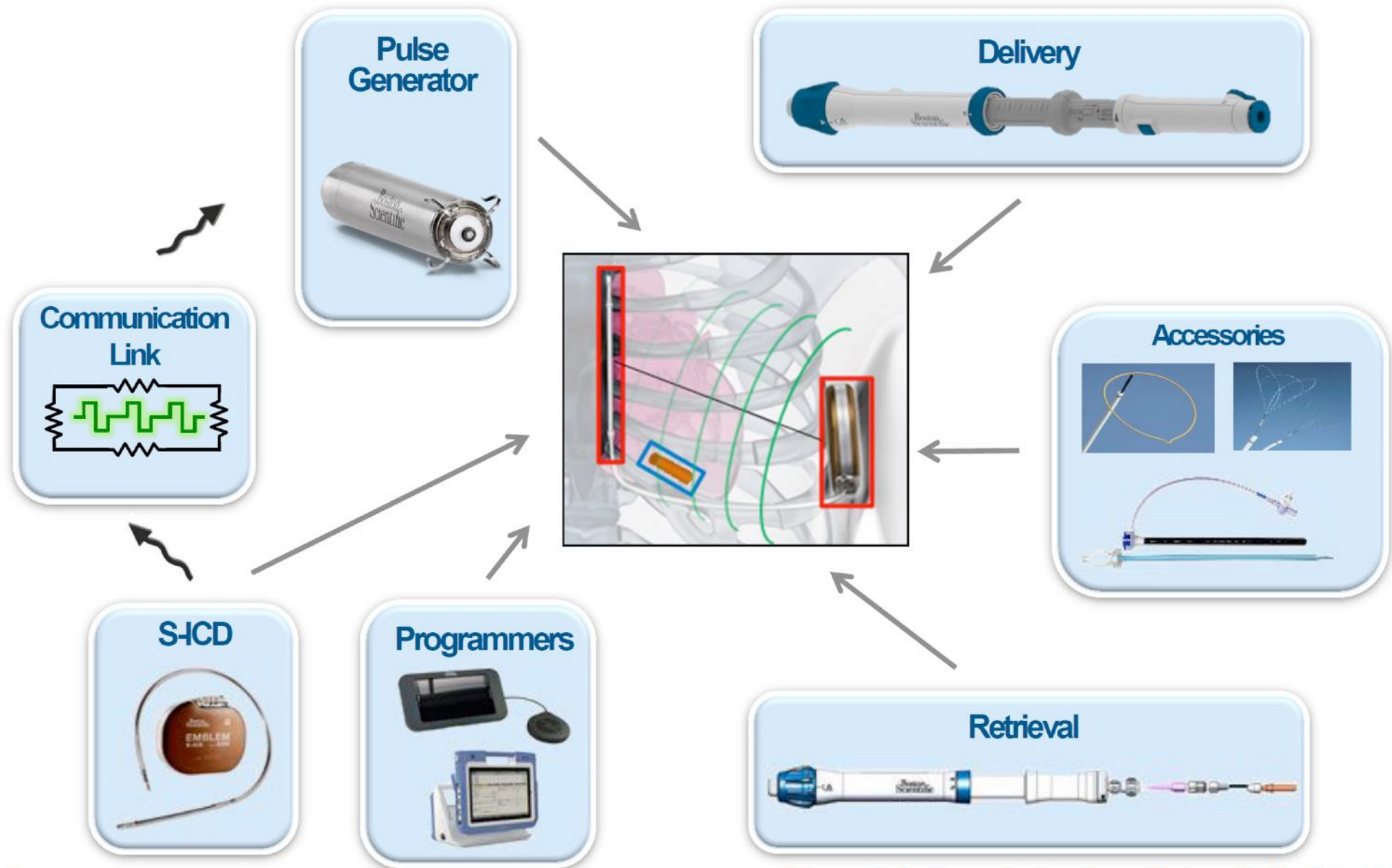
# Bientôt une solution pour délivrer des salves d' ATP ?

**FIGURE 1** Communicating ATP-Enabled LP and S-ICD



*modular cardiac rhythm management system*





*\*Concept device or technology . Not available for sale.*

# 2022 Mr F. 55 ans

CMD ischémique FEVG 30 %  
ECG RS 70 bpm  
séquelle de nécrose antérieure

Traité par  
Aspirine  
Dapaglifosine  
ARNI  
Aldactine  
Bisoprolol

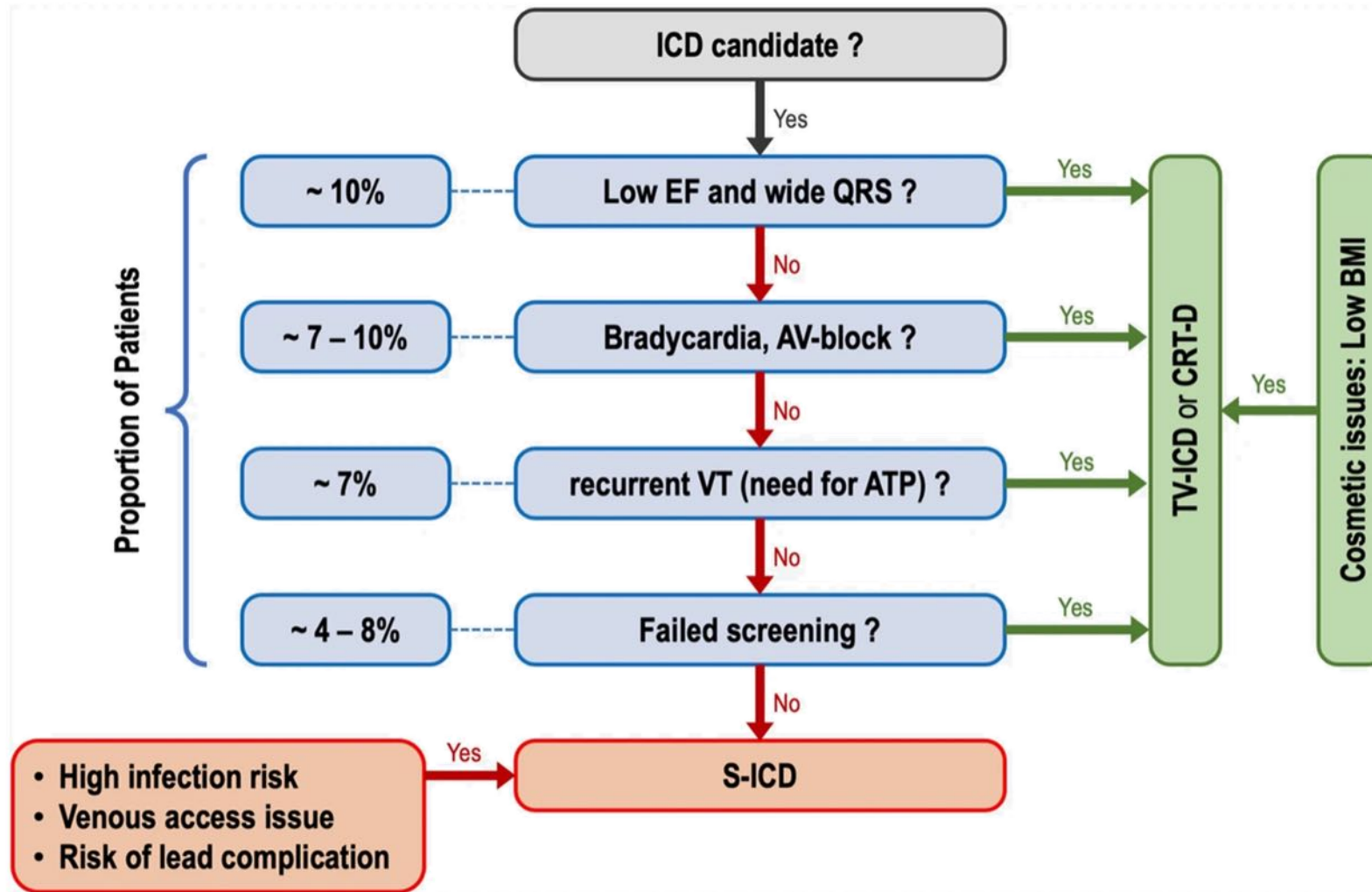


Docteur je vous ai amené mon  
voisin il est pas en forme  
Il peut avoir un defibrillateur  
comme moi ?



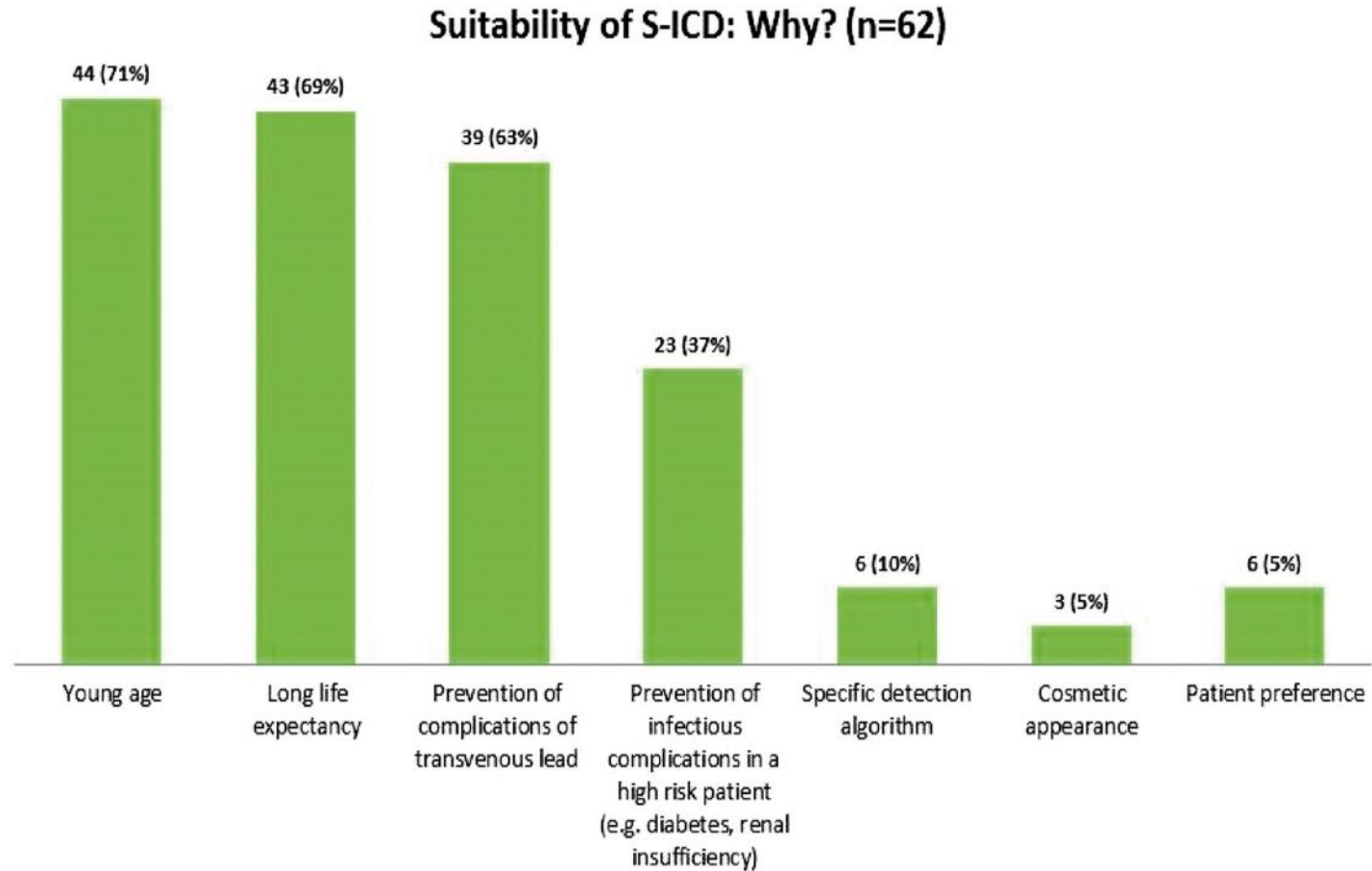
Oui

# La place actuelle du S ICD

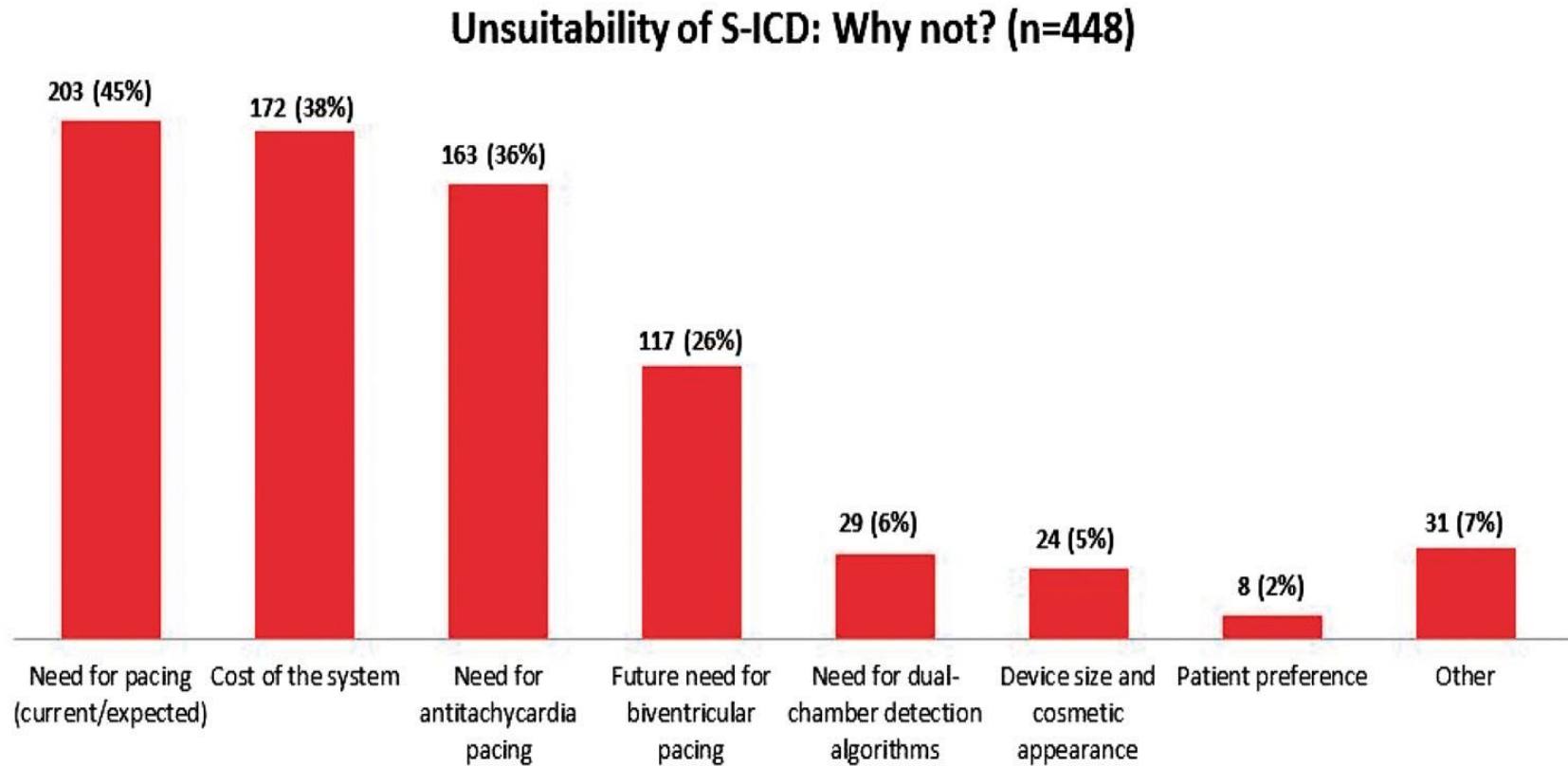




**Figure 3** Factors for preferring an S-ICD over a transvenous ICD (n = 62). Multiple factors were reported per patient.



**Figure 2** Factors for preferring a transvenous ICD over an S-ICD (n = 448). Multiple factors were reported per ...





## Factors Influencing Selection of S-ICD vs. TV-ICD

Favors S-ICD



Favors TV-ICD



- Limited vascular access
  - Venous occlusion
  - Venous anomaly
- Congenital heart disease
  - No venous access to heart
  - Intra-cardiac shunt
- Prior transvenous ICD infection
- Prior bacteremia
- High risk for infection
  - Immunodeficiency
  - Diabetes
  - Renal dysfunction
  - Immunosuppressive therapy
- On hemodialysis
  - High risk for infection
  - Need for venous access
- Young age
  - Need for multiple leads in lifetime
  - Active with increased risk lead failure
- Hypertrophic cardiomyopathy
  - High defibrillation energy requirement with TV-ICD
- Channelopathies
  - Index arrhythmia VT/PMVT
  - Often young patients
- Women
  - Higher risk complications TV leads compared with men
  - Cosmetic appearance/concealed
- Patient preference
- Need for bradycardia pacing
- Need for CRT
- Known need for ATP for frequent MMVT, without planned VT ablation
- Failed ECG screen (high risk inappropriate shocks)

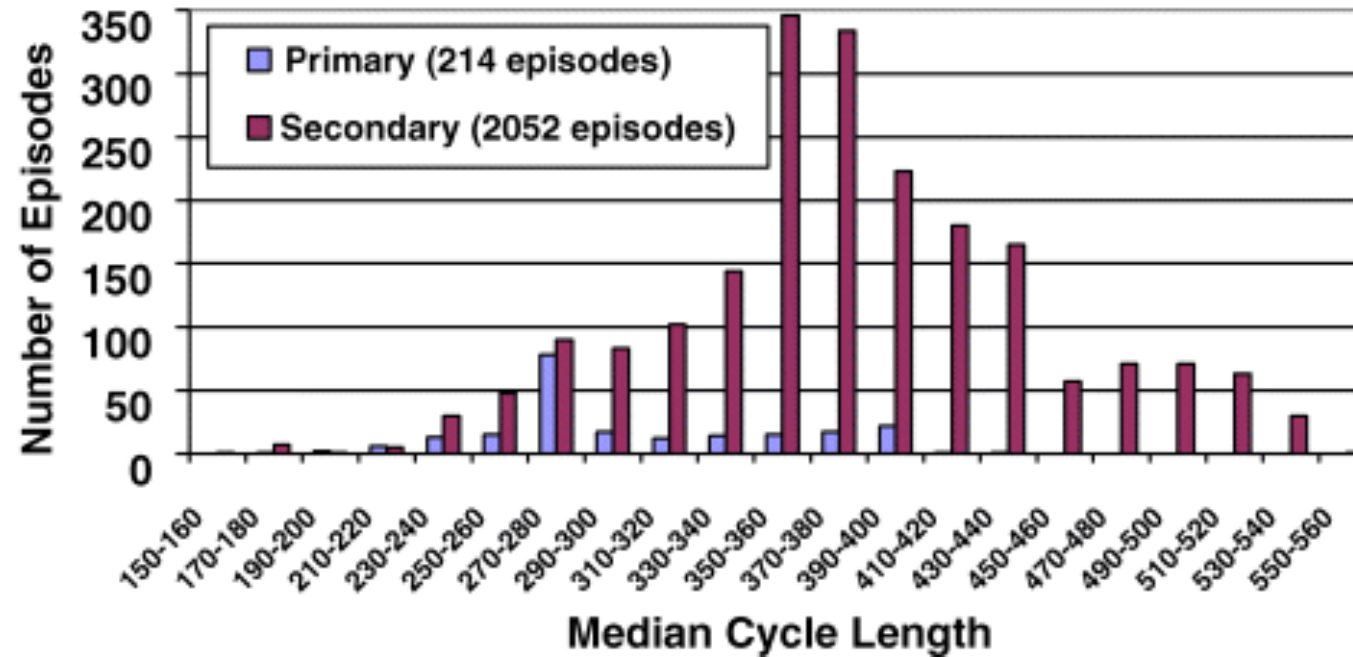
## Conclusion

In a large, real-world cohort of S-ICD recipients, a low overall rate (2.7%; 1.1% per patient-year) of conversion to a TV device was observed at follow-up. Antibradycardia pacing, ATP, or CRT indications were the main reasons for switch to a TV device (63% of patients). A higher BMI ( $.30 \text{ kg/m}^2$ ) and CKD predict all-cause conversion to a TV device. IHD, older age, and CKD were significantly associated with TV device switching because of the development of pacing/CRT indications at follow-up, whereas preserved LVEF was protective against switching. Careful patient selection may help to minimize conversion to a TV device during follow-up



# Cycle des TV détectées sur les DAI en prévention primaire et secondaire

## Appropriately Detected Episodes With VT Detection Enabled



Differences in Tachyarrhythmia Detection and Implantable Cardioverter Defibrillator Therapy by Primary or Secondary Prevention Indication in Cardiac Resynchronization Therapy Patients

Differences in Tachyarrhythmia Detection and Implantable Cardioverter Defibrillator Therapy by Primary or Secondary Prevention Indication in Cardiac Resynchronization Therapy Patients, Volume: 15, Issue: 9, Pages: 1002-1009, First published: 26 August 2004, DOI: (10.1046/j.1540-8167.2004.03625.x)

