

Medidays Zürich 2011

## Vorhofflimmern: Abklärung und Management



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5. September 2011






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## Lernziele

- Epidemiologie des Vorhofflimmerns
- Klinik von Patienten mit Vorhofflimmern
- Pathophysiologie des Vorhofflimmerns
- Katheterablation des Vorhofflimmerns
- Indikationen für Katheterablation
- Aktuelle Guidelines für die Therapie des Vorhofflimmerns
- Indikationen für Dronedaron

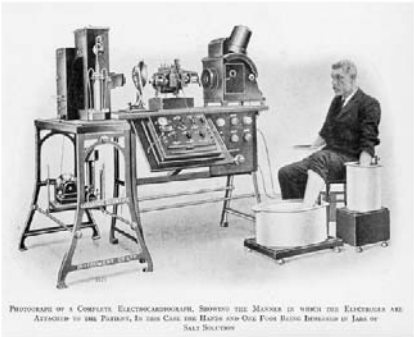
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## Willem Einthoven and Sir Thomas Lewis



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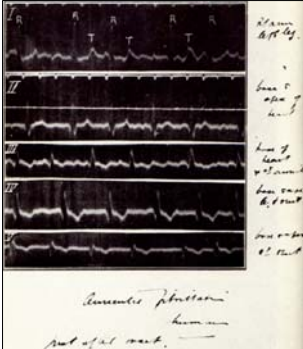
## The first ECG in 1903 Willem Einthoven (Leiden/NL)



PHOTOGRAPH OF A COMPLETE ELECTROCARDIOGRAM, SHOWING THE MANNER IN WHICH THE ELECTRODES ARE ATTACHED TO THE PATIENT, IN THIS CASE THE HEAD AND ONE FOOT BEING EMPLOYED IN PLACE OF THE OTHERS.

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## First ECG Documentation of „Auricular“ Fibrillation

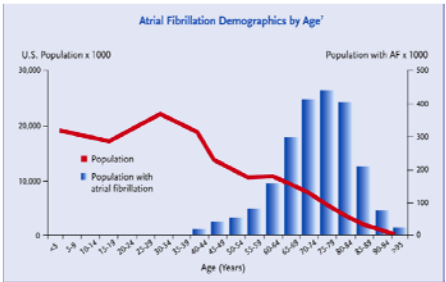


"Dear Professor Einthoven,  
By this post I am sending you  
some curves, experimental and  
clinical.  
Please treat the curves I send  
as if they were your own."  
Sir Thomas Lewis,  
London, January 30, 1910

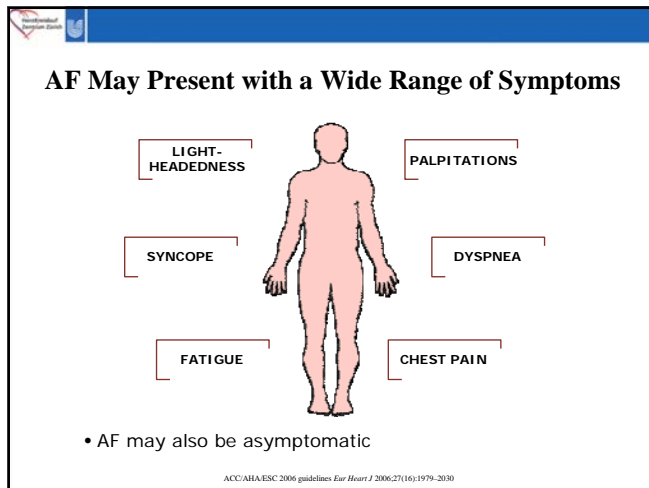
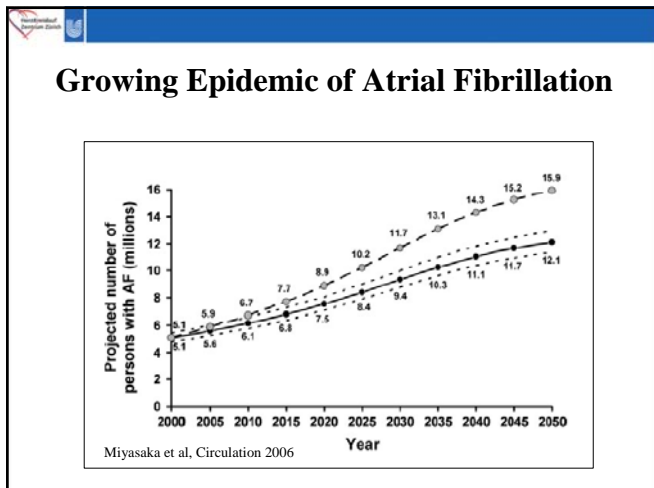
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## Atrial Fibrillation

### Increased prevalence in the elderly



Feinberg WM, Blackshear JL, Laupacis A. Arch Intern Med. 1995;155:469-473



### AF is an Independent Risk Factor for Stroke

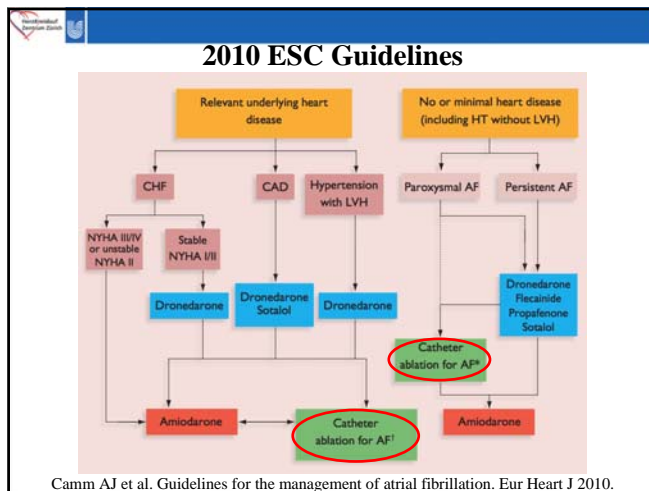
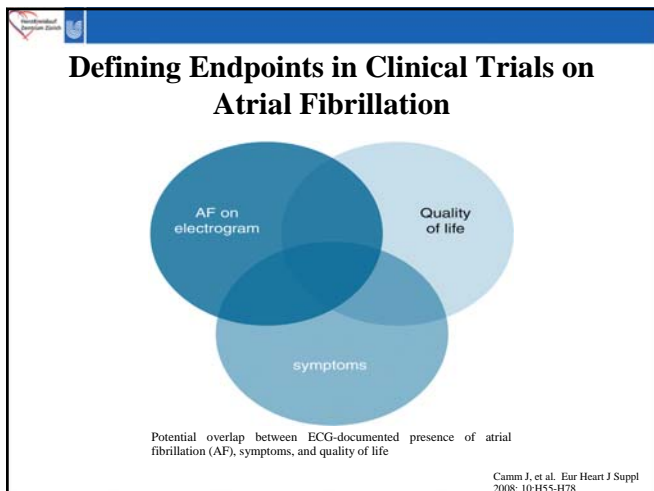
- AF patients have a near **5-fold** increased risk of stroke<sup>1</sup>
- 1 in every 6 strokes occurs in a patient with AF<sup>2</sup>
- Ischemic stroke associated with AF is typically **more severe** than stroke due to other etiologies<sup>3</sup>
- Stroke risk persists even in asymptomatic AF<sup>4</sup>

Affected portion of the brain  
Embolus blocks blood flow to part of the brain  
Internal carotid artery  
Common carotid artery  
Atrial Fibrillation in the left atrium  
Thrombus (clot)  
Aorta  
Heart

1. Wolf et al. Stroke 1991;22:983-988
2. Fuster V et al. Circulation 2006;114:e257-e354
3. Dahl DA et al. Neuroepidemiology 2003;22:118-123
4. Page RL et al. Circulation 2003;107:1141-1145

### Traditional treatment goals in AF

<b>Thromboembolism prevention</b>	Partially addressed by anticoagulants and/or antiplatelets - underused
<b>Rate control</b>	Adequate rate control defined as achievement of arbitrary heart rate target at rest and exercise
<b>Rhythm control</b>	AADs ( or ablation) efficacy defined as "freedom from AF"



### 1998 Haïssaguerre et al. NEJM

SPONTANEOUS INITIATION OF ATRIAL FIBRILLATION BY ECTOPIC BEATS ORIGINATING IN THE PULMONARY VEINS

- Mapping of 45 patients with paroxysmal AF
- AF originating in 94% in pulmonary veins
- Response to local radiofrequency ablation

Haïssaguerre et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. N Engl J Med. 1998; 339: 659-66.

### Pulmonary Vein = Trigger

Extrasystole in PV → Initiation of atrial fibrillation

Haïssaguerre et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. N Engl J Med. 1998; 339: 659-66.

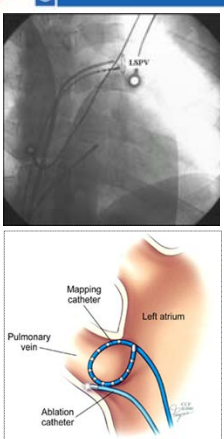
### Electrical Isolation of Pulmonary Veins by RF Ablation

Haïssaguerre et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. N Engl J Med. 1998; 339: 659-66.

### Steerable Ablation Catheter (uni-/bi-directional)

### Circular Mapping Catheter

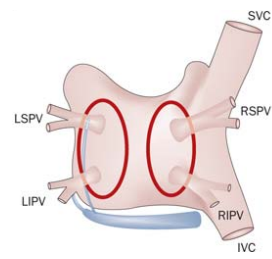
### Procedural Endpoint: Pulmonary Vein Isolation



	A Before Ablation	B After Ablation
I		
V <sub>1</sub>		
Abl <sub>1</sub>		
L <sub>1,2</sub>		
L <sub>1,3</sub>		
L <sub>1,4</sub>		
L <sub>1,5</sub>		
L <sub>1,6</sub>		
L <sub>1,7</sub>		
L <sub>1,8</sub>		
L <sub>1,9</sub>		
L <sub>1,10</sub>		
L <sub>1,11</sub>		
CS <sub>1</sub>		
CS <sub>2</sub>		
STM		

300 msec

### Pulmonary Vein Isolation: Cornerstone of AF Ablation

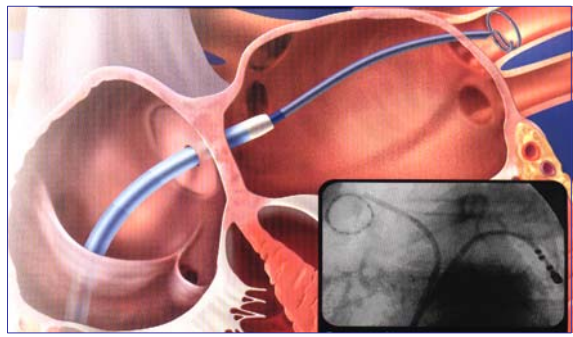


- Point-by-point RF lesions
- Encircling 2 left and 2 right PVs
- Irrigated RF ablation catheter
- Circular mapping catheter
- 3-dimensional mapping system
- Integration of pre-acquired MRI/CT image of left atrium/PVs

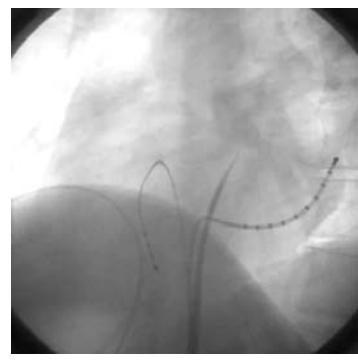
Calkins H et al. HRS/EHRA/ECAS expert consensus statement on catheter ablation and surgical ablation of atrial fibrillation. Heart Rhythm 2007.

### Transseptale Punktion

„Tor“ zum linken Vorhof und den Lungenvenen

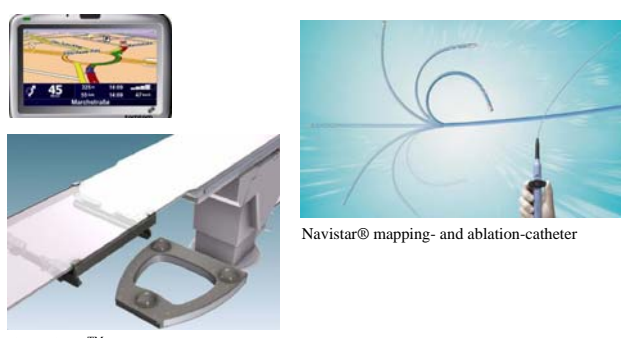


### Transseptale Punktion



### Mapping System CARTO™

„GPS navigation within the heart“

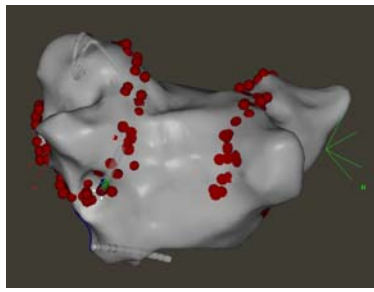


Navistar® mapping- and ablation-catheter

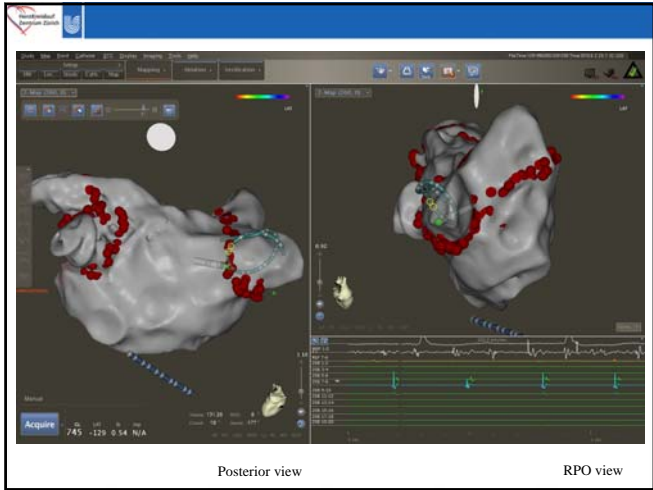
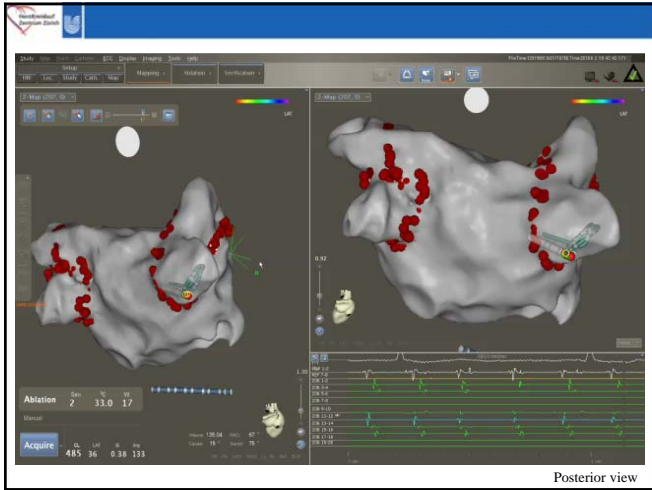
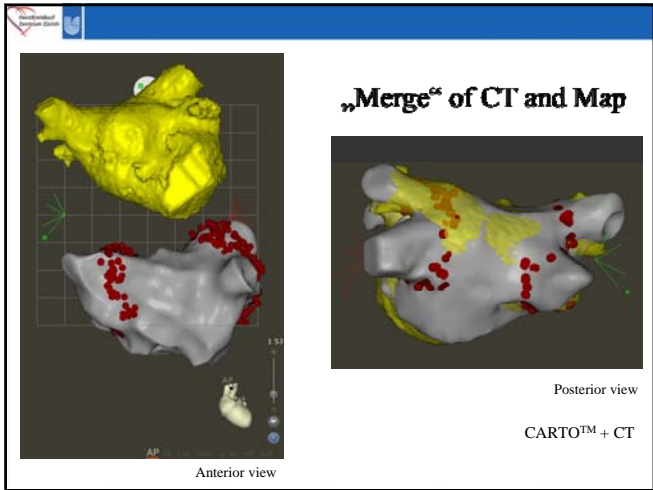
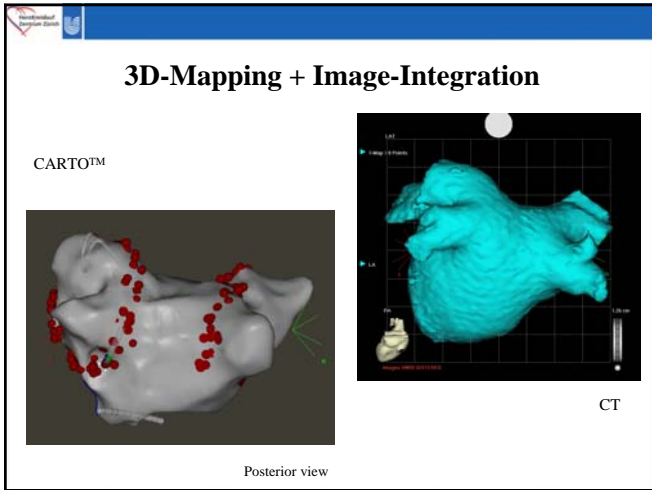
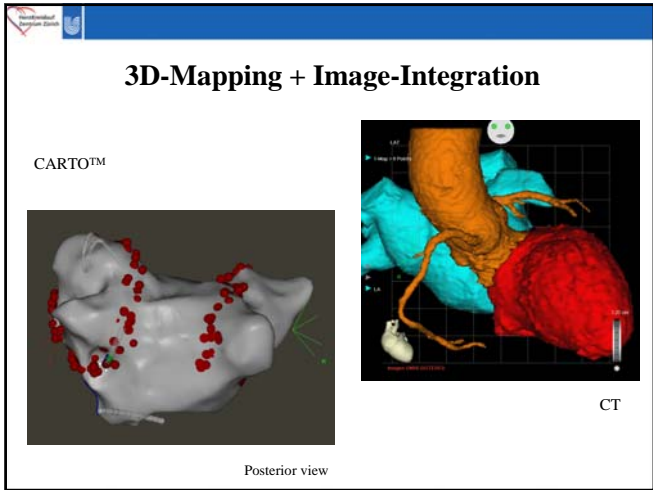
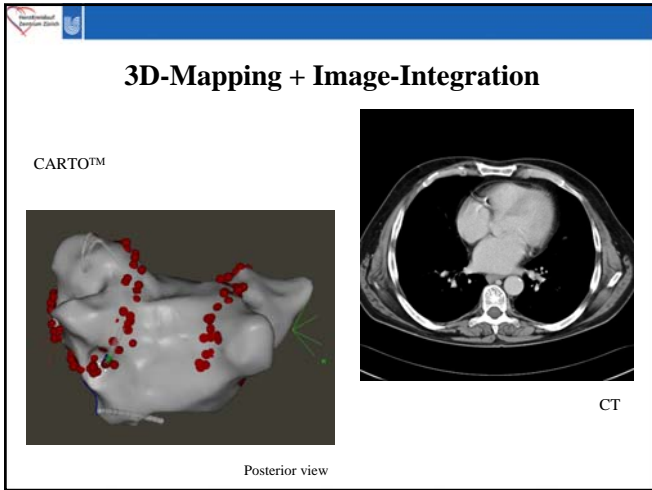
CARTO XP™

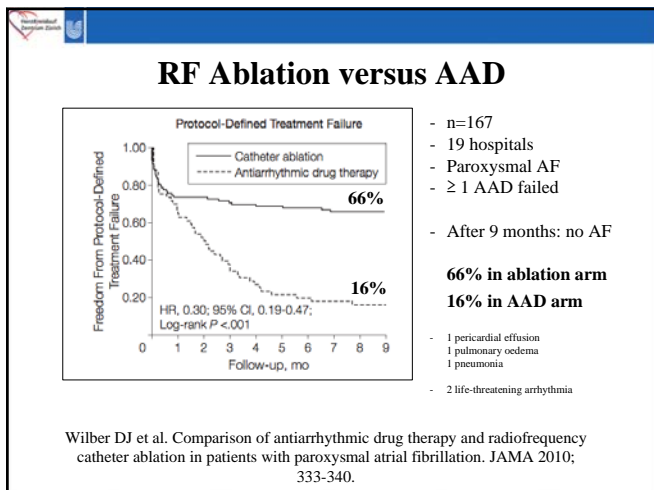
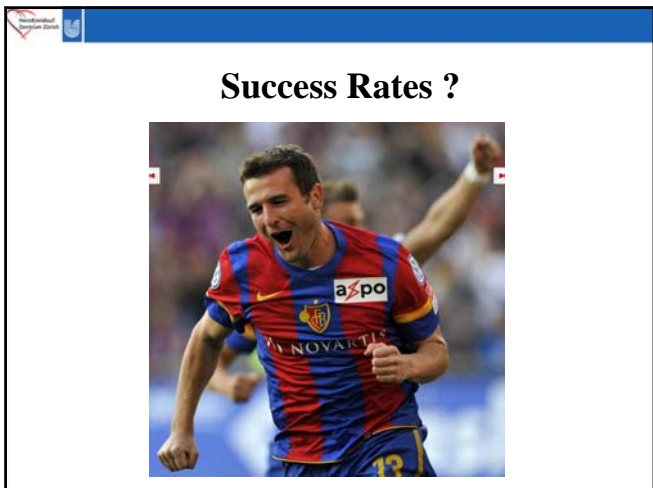
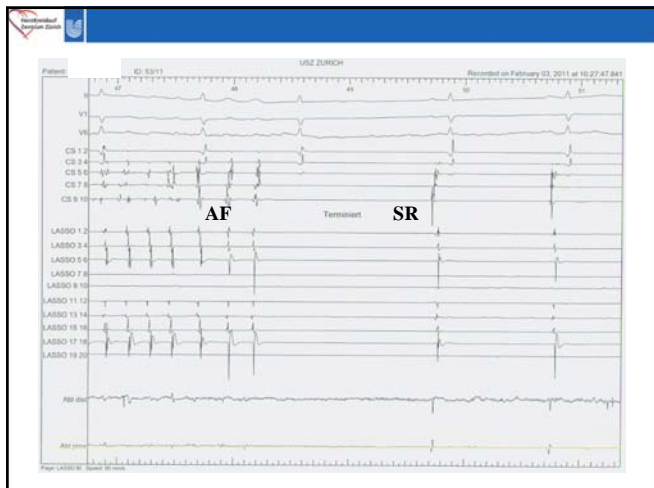
### Electro-Anatomical 3D-Mapping

CARTO™



Posterior view

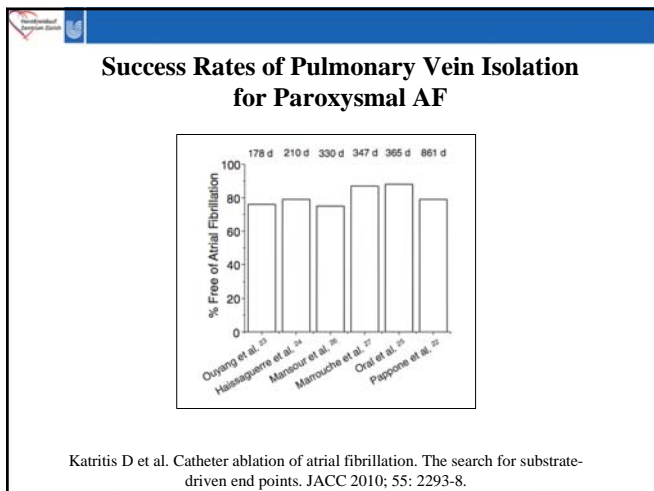




### Quality of Life Assessment from Baseline to 3 Months

Scale	Catheter Ablation		Antiarrhythmic Drug Therapy		Mean Difference Between Groups (95% CI)	P Value
	No. of Patients	Mean Change (95% CI)	No. of Patients	Mean Change (95% CI)		
SF-36 mental	90	6.5 (5.9 to 11.1)	36	1.6 (-1.1 to 4.3)	6.9 (2.8 to 11.2)	<.001
SF-36 physical	90	6.5 (5.2 to 8.6)	39	0.4 (-1.7 to 2.6)	6.6 (3.6 to 9.4)	<.001
Symptom frequency	82	-11.1 (-12.9 to -9.3)	29	0.7 (-2.4 to 3.9)	-11.8 (-15.4 to -8.3)	<.001
Symptom severity	65	-9.4 (-10.9 to -7.9)	23	0.0 (-3.3 to 3.4)	-9.4 (-12.6 to -6.3)	<.001

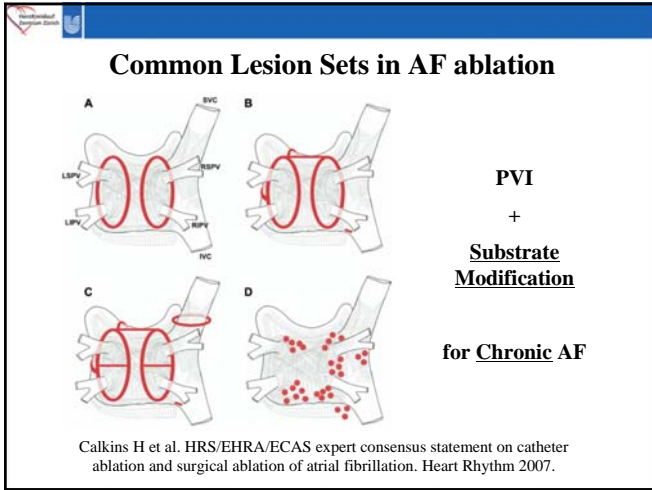
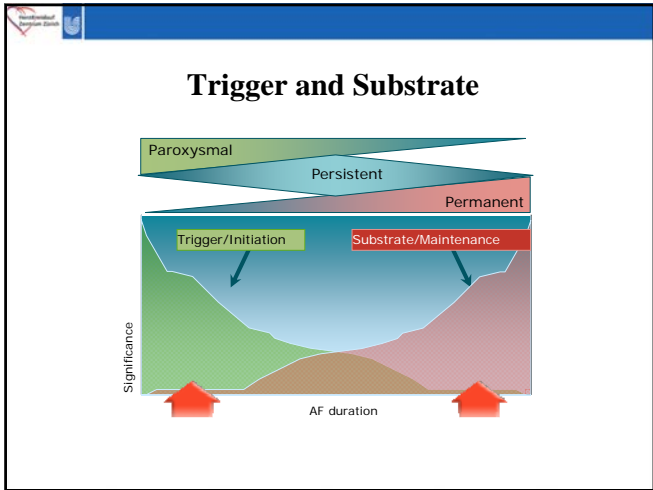
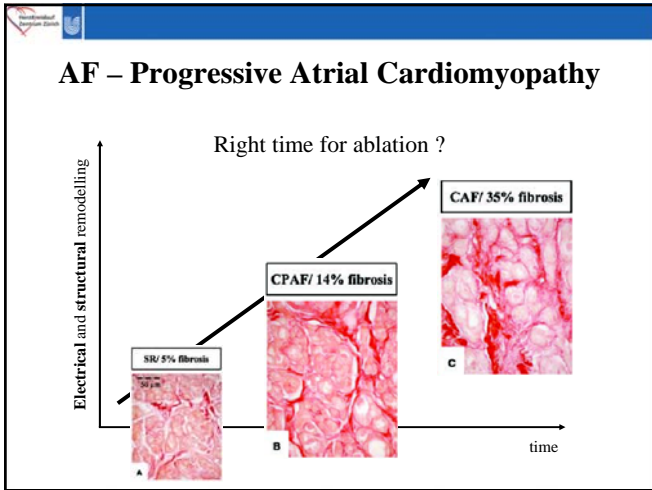
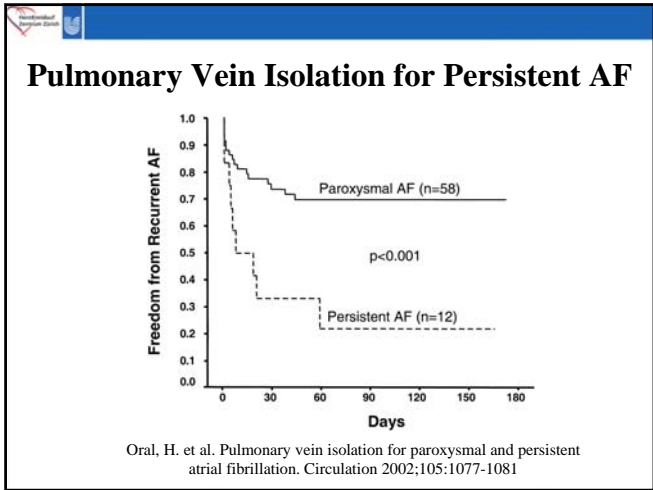
Wilber DJ et al. Comparison of antiarrhythmic drug therapy and radiofrequency catheter ablation in patients with paroxysmal atrial fibrillation. JAMA 2010; 333-340.



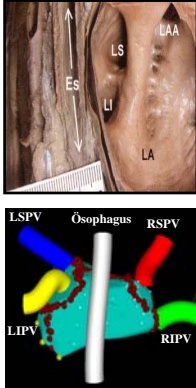
- ### Success Rates ?
- Patient selection
    - **Type of AF** (paroxysmal, persistent, or long-lasting persistent)
    - Comorbidities (obesity, sleep apnea)
  - Ablation strategy
  - Definition of success
 

HRS consensus: „freedom of symptomatic or asymptomatic AF, atrial tachycardia, or atrial flutter lasting  $\geq 30$ s one year following AF ablation“
  - Duration of rhythm monitoring
  - Duration of F/U
  - Small randomized clinical data from highly experienced centers

## Success Rates of Ablation in Patients with Chronic AF ?



### Risks of AF Catheter Ablation

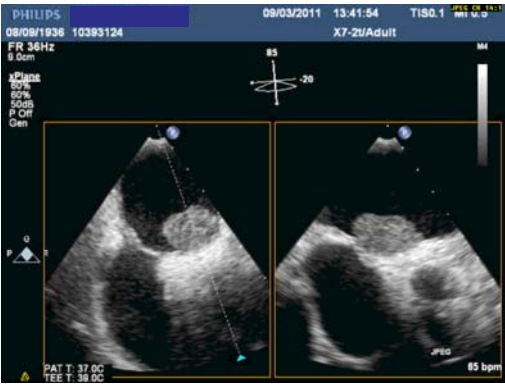


- Pericardial tamponade (1-2%)**  
Percutaneous drainage
- Thromboembolism (1%)**  
TEE beforehand, anticoagulation during and after procedure
- Pulmonary vein stenosis (<1%)**  
Avoidance of ablation inside of PV
- Atrio-esophageal fistula (<1:10.000)**  
Esophageal monitoring during procedure, energy reduction, antacids
- Vascular access complication**
- Left-atrial flutter (Pro-arrhythmia)**  
Redo procedure

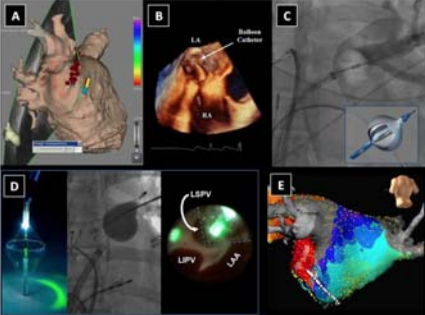
→ Total = 2-4 %

Bertaglia et al., Heart Rhythm 2007

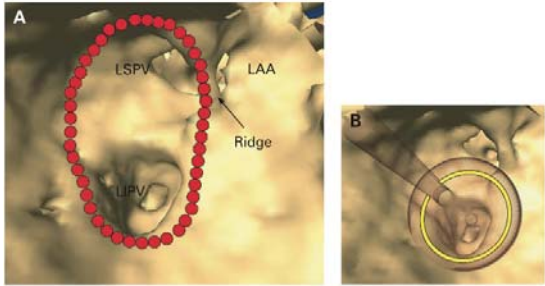
### TEE vor Ablation



### Technical Advancements



- Energy sources
- Application
- Mapping
- Remote catheter control
- and much more

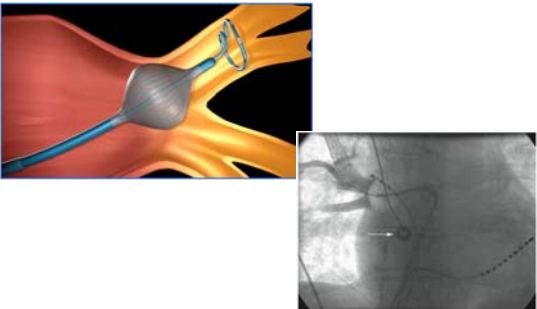


**A** Point-by-point ablation

**B** Single-shot ablation by balloon shaped catheter

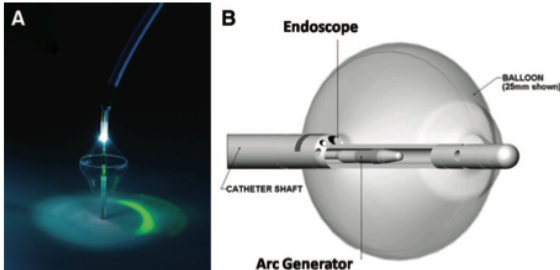
Ernst S. The future of atrial fibrillation ablation: new technologies and indications. Heart. 2009; 95(2):158-63.

### Cryoballoon Catheter



Arctic Front® (Medtronic CryoCath LP Ltd.)

### Laser Energy



**A**

**B** Endoscope, BALLOON (25mm shown), CATHETER SHAFT, Arc Generator

Reddy VY et al. Visually-guided balloon catheter ablation of atrial fibrillation: experimental feasibility and first-in-human multicenter clinical outcome. Circulation 2009; 120:12-20.

## Catheter Contact Measurement

**SENSORS** receive transmitter coils location signal and micro-movements of the spring.

**PRECISION SPRING** allows small amount of electrode deflection.

**Ring Spacing:** 1-7-2

**TRANSMITTER** coil in the 30 sends location reference signal.

## Good candidates for AF ablation ?

## AF Ablation in the Elderly

### Ablation of atrial fibrillation after the retirement age: considerations on safety and outcome

Laurent M. Haegeli · Firat Duru · Evan E. Lockwood · Thomas F. Lüscher · Laurence D. Sterns · Paul G. Novak · Richard A. Leather

**Abstract**  
*Background* Although the incidence of atrial fibrillation (AF) progressively increases with age, the vast majority of AF ablation is done in middle-aged patients. We evaluated the feasibility and safety of catheter ablation in patients older than 65 years of age with paroxysmal and persistent AF.  
*Methods* Out of a total of 230 consecutive AF ablation procedures, 45 patients were older than 65 years of age and underwent 51 procedures. The ablation strategy consisted of wide-area circumferential lines around both ipsilateral pulmonary veins using a three-dimensional mapping system.  
*Results* The mean age was 69±3.5 years (35 males). The mean duration for AF was 8.7±6.5 years. Thirty-nine had paroxysmal and six persistent AF despite use of 1.38±0.77 antiarrhythmic drugs. All patients had a structurally normal heart. Eleven had systemic hypertension. Mean procedure time was 187±33 min. Acute procedural success rate with abolition of all pulmonary vein potentials was achieved in all patients. Pericardial tamponade requiring percutaneous drainage occurred in one (1.9%) patient. There were no cardioembolic events. Among the 43 patients whose clinical outcome was assessed at 6 months, 34 (79%) had a significant reduction (>90%) of the total symptomatic AF

**Table 3** Procedural statistics

	n=53
Average procedure time (minutes)	187±33
Fluoroscopy time (minutes)	43±12
Major complications	
Thromboembolic event and stroke	None
Pericardial tamponade	1 (1.9%)
Vascular access complications	None

ACT activated clotting time, IU international units

J Intern Card Electrophysiol  
 DOI 10.1007/s10840-010-9490-8

## Indications for Catheter Ablation of AF

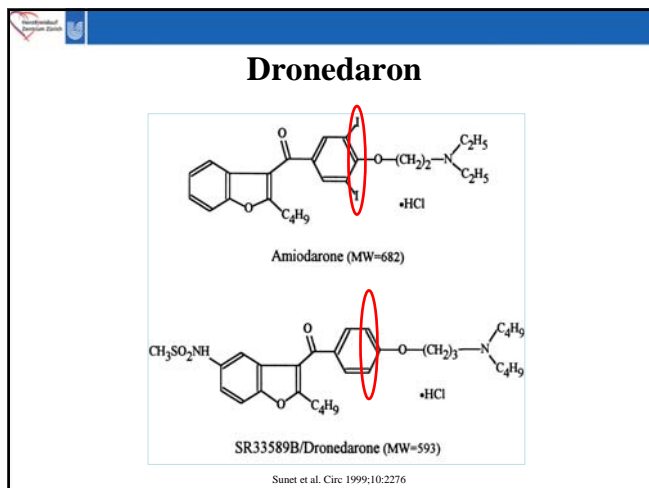
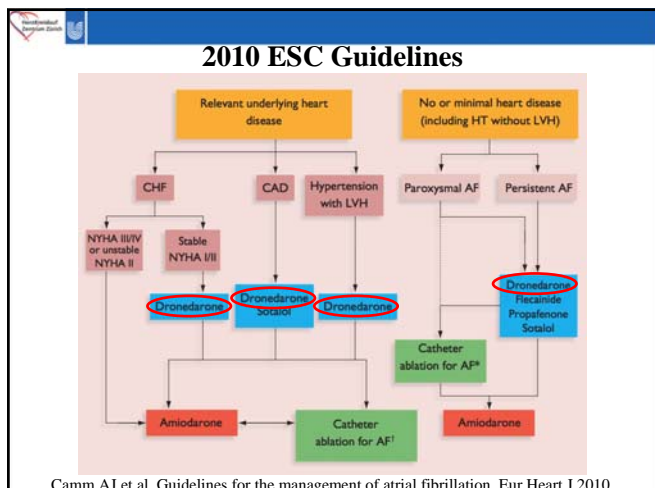
- **Symptomatic** patients with paroxysmal and persistent atrial fibrillation !

## Indications for Catheter Ablation of AF

- **Symptomatic** patients with paroxysmal and persistent atrial fibrillation !
- After **one** antiarrhythmic drug failure
- **No** indications are:
  - asymptomatic patients with AF
  - patient wish to discontinue anticoagulation

## AF Ablation Therapy

- **Success rates** for paroxysmal atrial fibrillation are **70-90%** (with 1-2 procedures)
- Major complications occur in 2-3 %

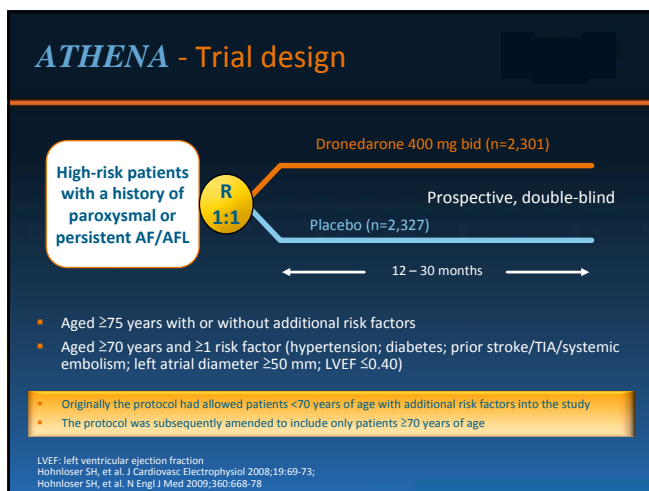


### Similar molecules display important pharmacological differences

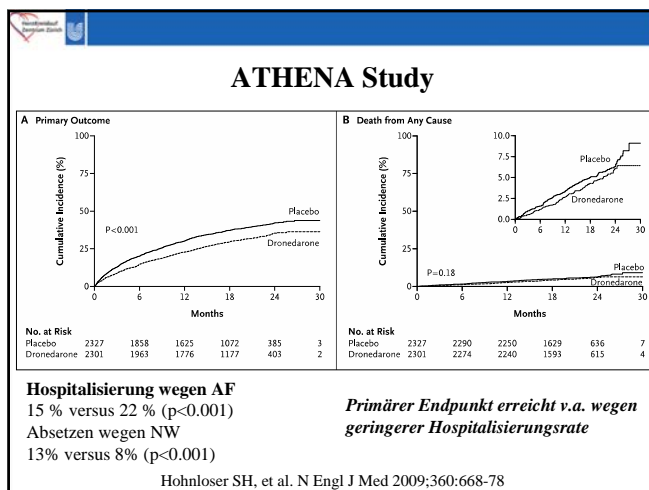
Dronedaron	Amiodaron
Inhibit multiple K <sup>+</sup> channels	
Inhibit Na <sup>+</sup> and Ca <sup>2+</sup> channels	
Exert anti-adrenergic effects	
Low proarrhythmic profile	
No significant effect on LV function	Iodine
No iodine	Higher lipophilicity with long half life (28-180 days) and tissue accumulation
Short half-life (25-30 hours) and no tissue accumulation	Coronary vasodilation highly dependent on NO
Coronary vasodilation refractory to inhibition of NO synthase pathway	Lesser anti-hypertensive effect
Greater anti-hypertensive effect	

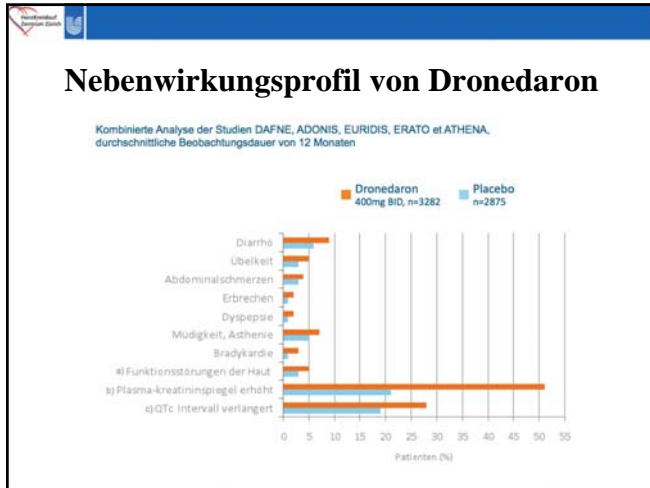
Gautier P, et al. J Cardiovasc Pharmacol. 2003;41(2):191-202.  
Diggelri SA, Hancock JC. Expert Opin Invest Drugs 2004;13:415-426.  
Kathofer et al. Cardiovasc Drug Rev 2005;25(1):23-30.  
Guarinos P, et al. European Journal of Pharmacology 2004;496:119-127.  
Le Heuzey JP, et al. J Cardiovasc Electrophysiol. 2000;11:6-16.

NO=Nitric oxide  
LV=Left ventricular  
BP=Blood pressure



- ### ATHENA - Study endpoints
- Primary endpoint**
    - Combined endpoint of CV hospitalisation and all-cause death
  - Secondary endpoints**
    - Death from any cause
    - CV death
    - Hospitalisation for CV reasons
  - Safety endpoint**
    - Incidence of treatment-emergent adverse events (TEAEs) including all AEs, serious AEs, and AEs leading to study drug discontinuation
- Hohnloser SH, et al. J Cardiovasc Electrophysiol 2008;19:69-73;  
Hohnloser SH, et al. N Engl J Med 2009;360:668-78





- ### Dronedaron
- Erstes Antiarrhythmikum mit „Mortalitätsreduktion“
  - **Kein Ersatz für Amiodaron bei NYHA IV oder dekompensierter Herzinsuffizienz (< 4 Wochen vorher)**
  - Rhythmuskontrolle deutlich **schlechter** als Amiodaron
  - **Besseres NW-Profil als Amiodaron**
  - Cave Lebertoxizität (regelmässige Laborkontrollen !)
  - **Gute Frequenzkontrolle**

### Paradigmen-Wechsel


“Früher”	“Aktuell”
▪ Rate <b>versus</b> rhythm	▪ Rate <b>and</b> rhythm
▪ AF recurrence=failure	▪ AF recurrence only important if <b>symptomatic</b> and severe
▪ MD chooses Rx	▪ MD <b>and</b> patient enter into a therapeutic contract
▪ Focus: ECG	▪ Focus: <b>patient</b>

### Integratives Patienten-Management

aus RHYTHM control

S + DISE





### **Literaturangabe**

- Camm AJ et al. Guidelines for the management of atrial fibrillation. The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology. European Heart Journal (2010) 31, 2369-29