



# **The Role of Ablation in the Management of Atrial Fibrillation**

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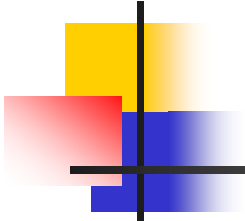

**Paul A. Levine, M.D., FACC**

**Vice President, Medical Services**

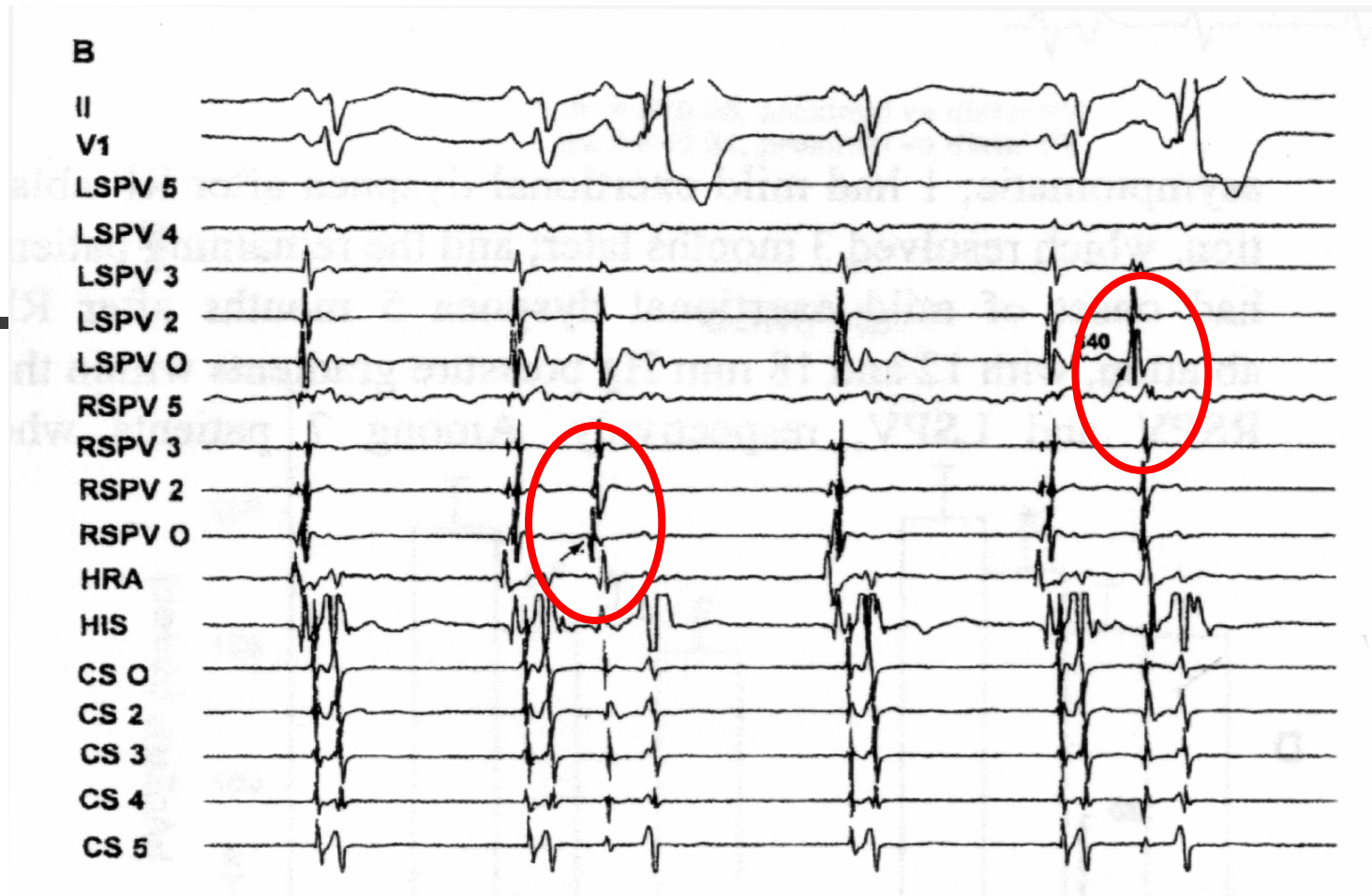
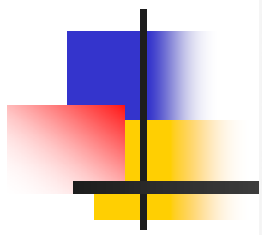
**St. Jude Medical CRMD**

**Clinical Professor of Medicine**

**Loma Linda University School of Medicine**

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- **Title slide for presentation on Pacemaker Diagnostics, a comparison of the various diagnostic features available from multiple different manufacturers. This series will NOT present absolutely every possible iteration and feature of every device as this is simply not feasible but it will provide an overview of the major features and capabilities of the larger manufacturers. Where possible, I have attempted to use recent printouts from the current devices but this will quickly become outdated.**
  - **These slides were all obtained from patients whom I have cared for. The commentary reflects the author's understanding of the various capabilities of these systems. Any inaccuracies are mine alone. These printouts are provided as a service to individuals with an interest in this field simply to increase an awareness of the various diagnostic capabilities that presently exist. Some of the commentary reflect my personal experience with the various diagnostic feature and counters. It is rare that a single diagnostic is adequate for the patient. Each has its own strengths and weaknesses - each tend to compliment the others and are best used in conjunction with one another to facilitate an understanding of the behavior of the pacing system in each patient.**
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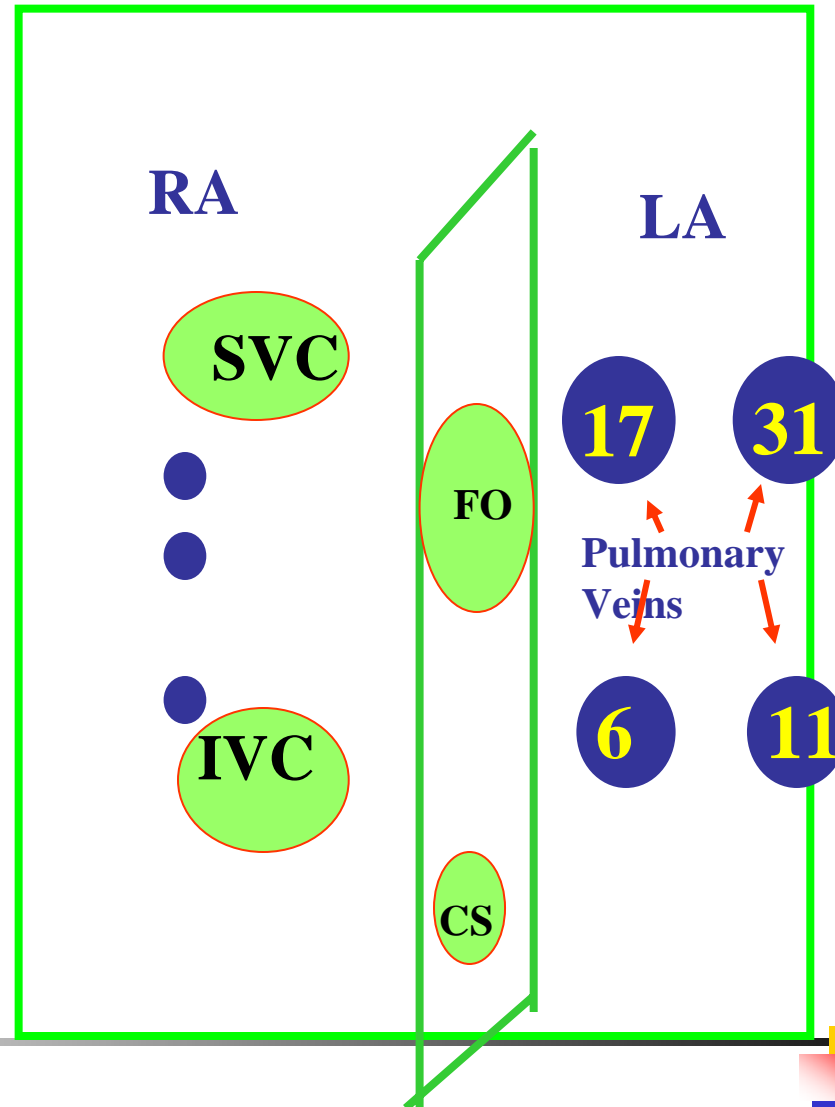
# The Role Focal Ablation in the Management of Atrial Fibrillation



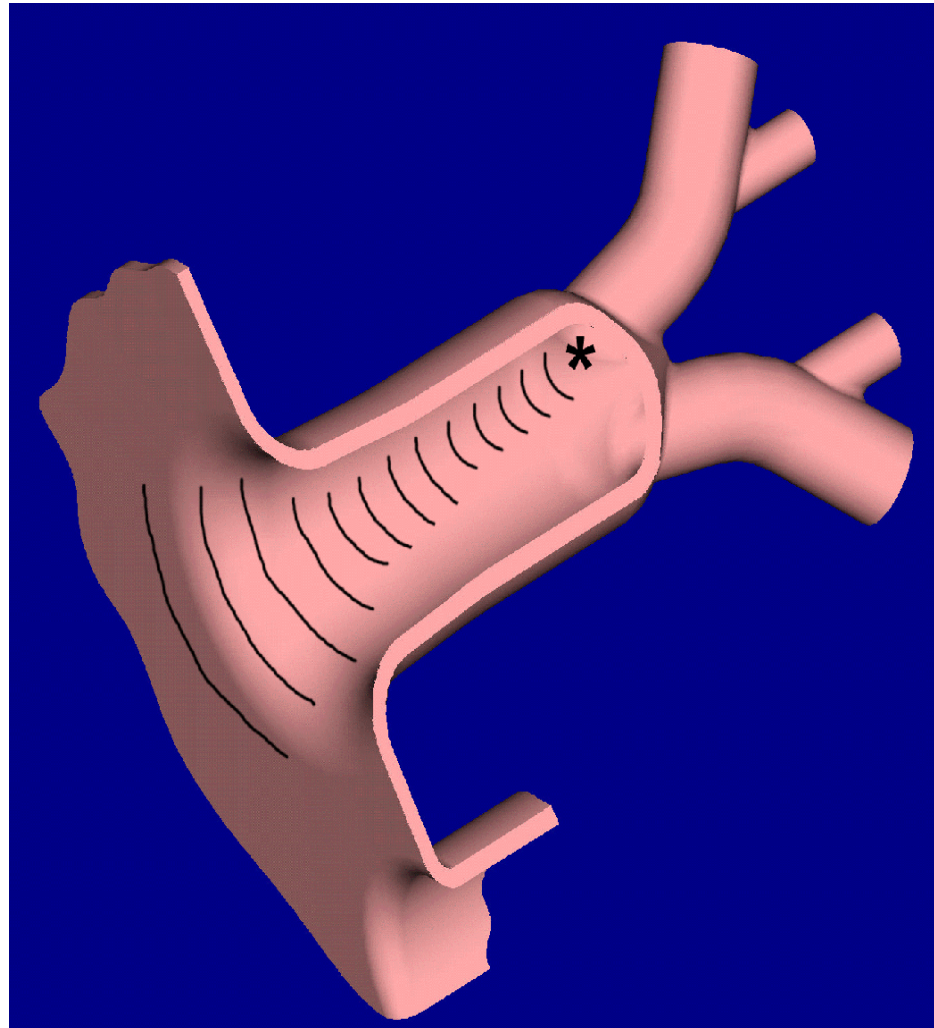
S.A.Chen, CIRC 1999; 100: 1879-1886

# Focal Origin of Atrial Fibrillation

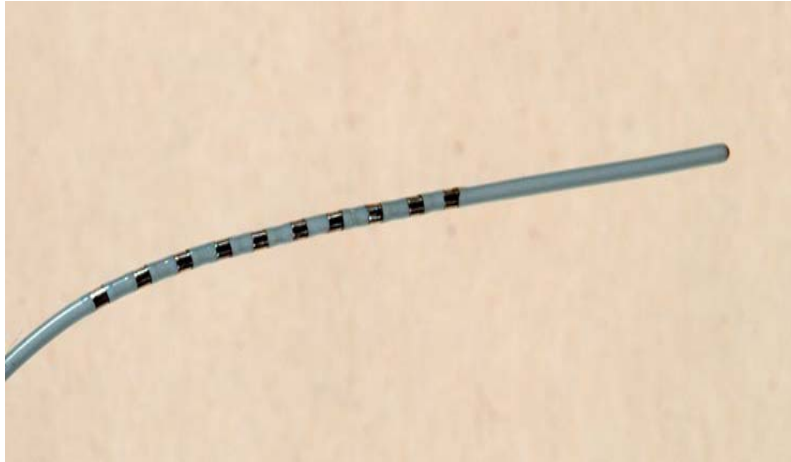
- Title: Spontaneous initiation of Atrial Fibrillation by Ectopic Beats Originating in the PV's
- 94% of atrial triggers in PVs (45 pts)
- Conclusions:
  - The pulmonary veins are an important source of ectopic beats, initiating frequent paroxysms of AF.
  - These foci respond to treatment with RF ablation.



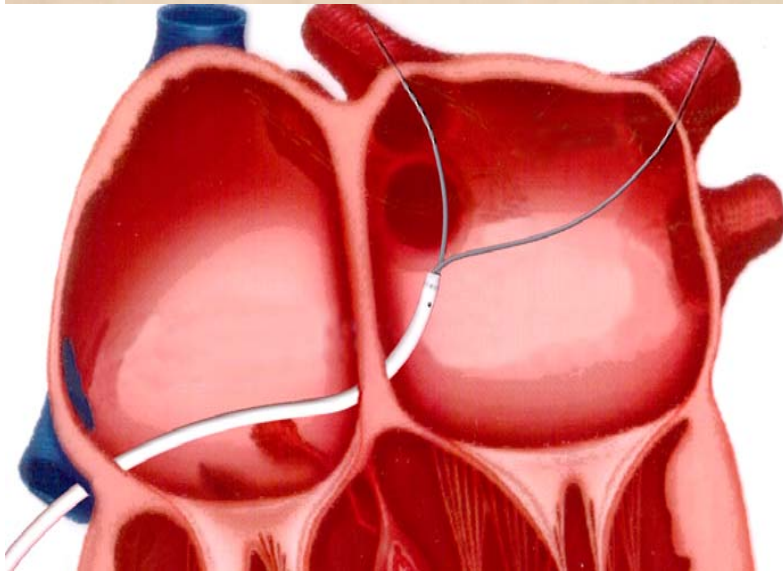
# Focal Trigger within Pulmonary Vein



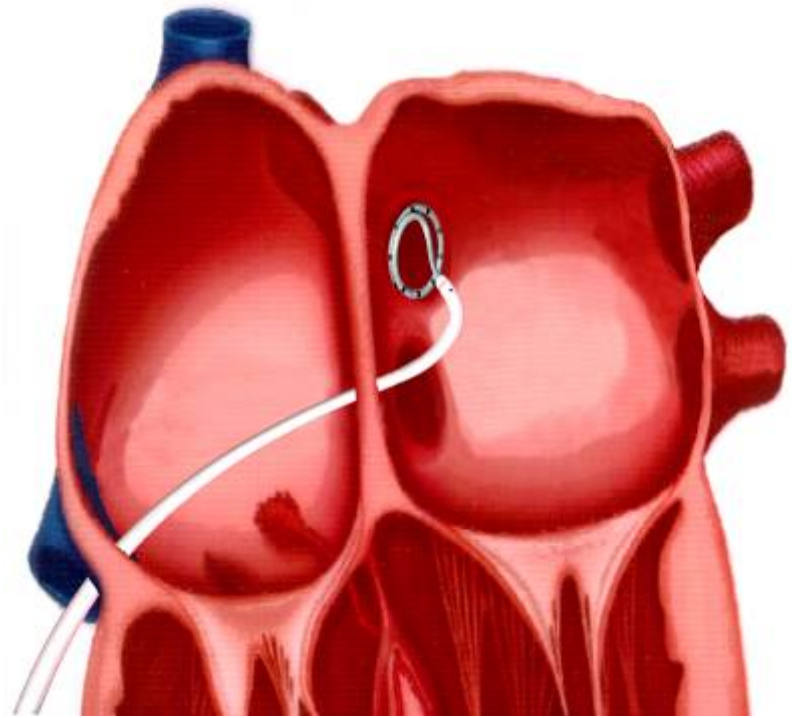
# Mapping of atrial ectopic foci



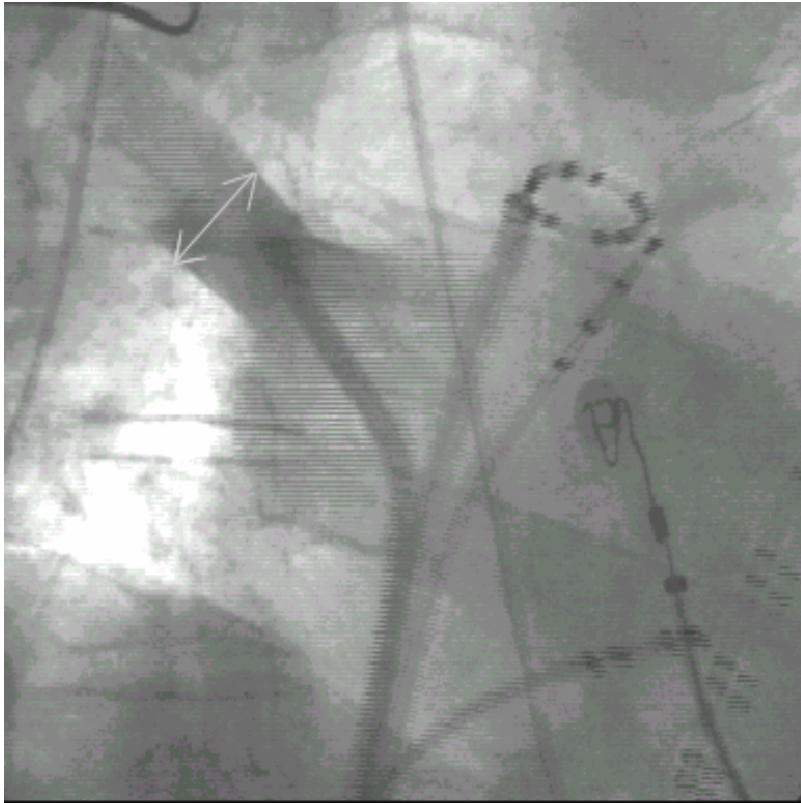
- Detailed mapping required into each pulmonary vein.
- Many patients have multiple foci



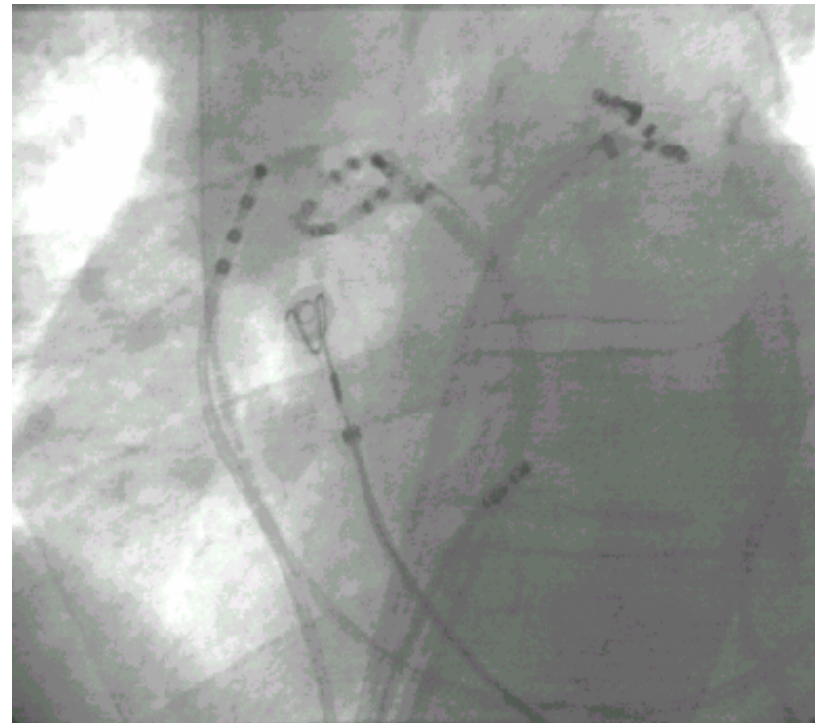
# Supreme Spiral SC™ Catheter



# Supreme Spiral SC™ Catheter

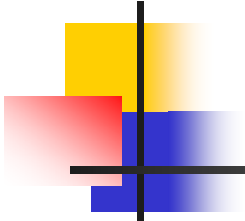


**Measure the size of the PV using contrast radiography**



**The appropriate catheter is selected to encircle the PV os**





# Focal Ablation - Clinical Studies

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	<u>Haissaguerre</u>	<u>Chen</u>	<u>Lesh</u>
<b>Definition of success</b>	No AF or APB $\geq$ 8 days without drugs	No AF or APB at end proc.	All targeted Triggers elim.
<b>Success Rate</b>	84% patients 100% after 4 sessions	100% foci	Not given
<b>Mean F/U</b>	8 months	6 months	14 months
<b>Recurrence Rate</b>	38%	19% symptomatic 15% asymptomatic	67% no drug 54% w/ drug
<b>Pulm Vein Stenosis</b>	20 %	10 %	8 %

Haissaguerre M, Circulation 2000; 101: 14098-1417

Chen SA, Circulation 1999; 100: 1879-1886

Gerstenfeld EP, Lesh M, J Cardiovasc EP, 2001; 12: 900-908





# Focal Ablation

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- **Atrial ectopic foci can be identified in many patients with PAF**
- **These may be amenable to ablation effectively curing or at least delaying development of chronic atrial fibrillation**
- **Long term data regarding safety and efficacy are pending**
  - **Pulmonary vein stenosis**
  - **Gaps in ablation lines & new arrhythmias**





# **Challenge of Pulmonary Vein Ablation**

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- **Difficult to map - time consuming**
- **Pulmonary vein stenosis**
- **Endothelial injury with thrombosis and embolism**
- **Predisposition to other arrhythmias associated with ablation scars**
- **Progression of disease with other foci developing**



# The Role of AV Nodal Ablation in the Management of Atrial Fibrillation



**AV nodal ablation**

courtesy of Dr. Chris Fellows



# AV Nodal Ablation

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- **Indications**

- **Poor control of ventricular rate**
- **Persistent ventricular rates > 90 bpm**
- **Compromised LV function (EF < 40%)**

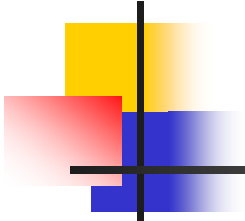
- **Objectives**

- **Improved hemodynamics**
- **Reduction in symptoms and improved QOL**

- **Adverse Consequences**

- **Induction of complete heart block**
- 





# Long-term follow-up of AV Node Ablation

- N = 50; Ablation successful in 47
- Mean follow-up 17 months
- Projected cost per year

	<u>Before</u>	<u>After</u>
Drug Cost	\$ 250	\$ 60
Hospitalization	\$ 8,500	\$ 3,500

- Net savings over 10 years with AV nodal ablation \$ 30,000 (including cost of device)

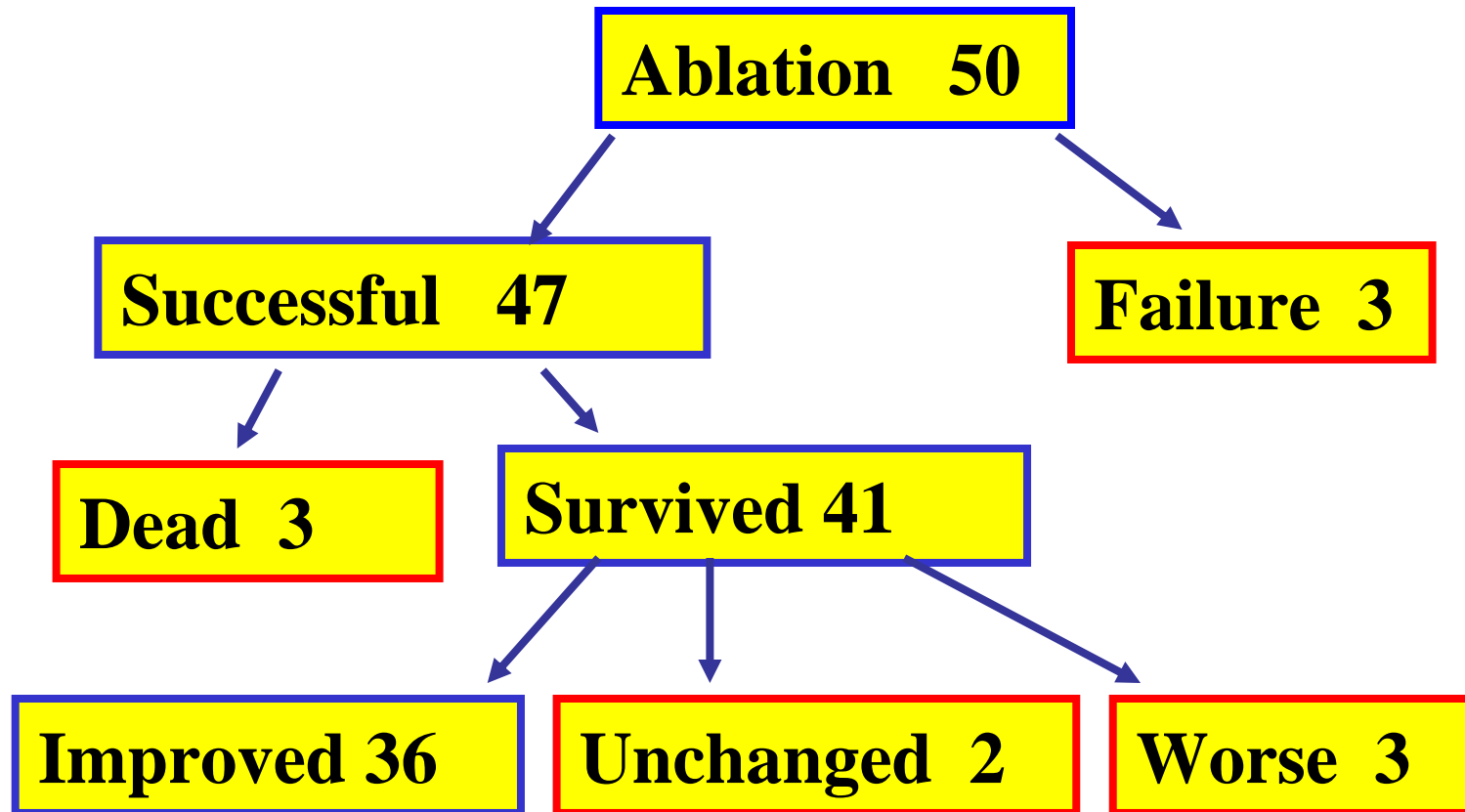
Jensen SM, PACE 1995; 18: 1609-1614

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Study done in Sweden



# Long-term follow-up of AV Node Ablation



Jensen SM, PACE 1995; 18: 1609-1614



# AV Nodal Ablation

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- **N = 64, medically refractory paroxysmal or chronic AF (mean 3.7 drugs per patient)**
- **Resolution of Symptoms post-ablation**
  - **Severe palpitations 100% improved**
  - **Dyspnea 75% improved**
  - **Chest pain 95% improved**
  - **Fatigue 83% improved**
- **NO benefit 12%**

Kim SG, Angiology 1997; 48: 933-938

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# AV Nodal Ablation

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## NYHA Functional Classification

	<u>Pre-Ablation</u>	<u>Post-Ablation (20 months)</u>
<b>I</b>	<b>4</b>	<b>26</b>
<b>II</b>	<b>8</b>	<b>26</b>
<b>III</b>	<b>47</b>	<b>12</b>
<b>IV</b>	<b>5</b>	<b>0</b>

Kim SG, Angiology 1997; 48: 933-938





# **AV Nodal Ablation vs Modification**

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- **N = 60**
- **Prospective randomized trial of medically refractory chronic or paroxysmal atrial fibrillation**
- **F/U at 1 month and 6 months**
  - **QOL**
  - **Cardiac performance using Echo-Doppler and Radionuclide angiography**

**Lee SH, et al, JACC, 1998; 31: 637-644**

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# AV Nodal Ablation vs Modification

	<b>Ablation</b>		<b>Modification</b>	
	<b><u>Pre-Ab</u></b>	<b><u>6 mo.</u></b>	<b><u>Pre-Ab</u></b>	<b><u>6 mo.</u></b>
<b>Gen'l QOL</b>	<b>3.2</b>	<b>1.0</b>	<b>3.1</b>	<b>1.7</b>
<b>Freq. Sx.</b>	<b>2.2</b>	<b>0.7</b>	<b>2.3</b>	<b>1.4</b>
<b>ADL</b>	<b>7.7</b>	<b>5.9</b>	<b>7.6</b>	<b>6.1</b>
<b>Hosp/yr</b>	<b>2.4</b>	<b>0.2</b>	<b>2.5</b>	<b>0.4</b>
<b>ER visit/yr</b>	<b>3.0</b>	<b>0.3</b>	<b>2.9</b>	<b>0.3</b>
<b>AA Drugs</b>	<b>4.7</b>	<b>0.3</b>	<b>4.5</b>	<b>0.4</b>

**Presumed difference due to continued irregular rhythm**



# **Ablation vs Pharmacologic Rx**

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- **N = 43; Prospective Randomized Trial**
- **Enrollment criteria**
  - **Recurrent AF > 1 year with @ least 3 episodes in past 6 months**
  - **Severe symptoms; Age > 50 years**
- **End points**
  - **Quality of Life**
  - **Level of symptoms during first 6 months**



# Ablate/Pace vs Pharmacologic Rx

	<u>Enrollment</u>		<u>6 Months</u>		<u>% Reduction</u>
	A/P	Drugs	A/P	Drugs	
<b>N</b>	<b>(22)</b>	<b>(21)</b>	<b>(22)</b>	<b>(18)</b>	
<b>QOL</b>	<b>50</b>	<b>50</b>	<b>20</b>	<b>43</b>	<b>-53%*</b>
<b>Palp.</b>	<b>7.5</b>	<b>7.2</b>	<b>1.5</b>	<b>5.1</b>	<b>-71%*</b>
<b>DOE</b>	<b>5.8</b>	<b>6.7</b>	<b>3.7</b>	<b>5.8</b>	<b>-36%**</b>
<b>Rest dyspnea</b>					
	<b>3.8</b>	<b>2.0</b>	<b>0.8</b>	<b>1.8</b>	<b>-56% ns</b>
<b>Exer Intol.</b>	<b>7.0</b>	<b>6.5</b>	<b>3.7</b>	<b>6.8</b>	<b>-46%*</b>
<b>Fatigue</b>	<b>4.6</b>	<b>3.8</b>	<b>2.1</b>	<b>4.3</b>	<b>-51%**</b>

Brignole M, Circ 1997; 96: 2617-2624





## **Ablate and Pace for Atrial Fibrillation with NORMAL LV Function**

- **N = 12**
- **Afib with poorly controlled ventricular response BUT normal LV function (EF 47%)**
- **At 3 months post-ablation, 10 of 12 deteriorated with EF falling to 43% and decreased quality of life**

Szil-Torok T, Europace 2002; 4: 61-66





# **Device Therapy for Paroxysmal Atrial Fibrillation**

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- **Atrial fibrillation is a complex arrhythmia with multiple mechanisms and disease substrates**
- **Optimal therapy is likely to consist of a hybrid of drugs and devices (both stimulation and ablation) to stabilize the atrium and delay the onset of persistent or chronic atrial fibrillation**
- **The underlying disease substrate at the cellular level is likely to progress eventuating in chronic atrial fibrillation**







# **Management of Other Organized Atrial Tachycardias**

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# Options

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- **Prevention from occurring**
- **Treatment after they have occurred**
  - **Anti-tachycardia pacing**
  - **Shock**

**Patients commonly have both paroxysmal atrial fibrillation and other organized atrial tachycardias**

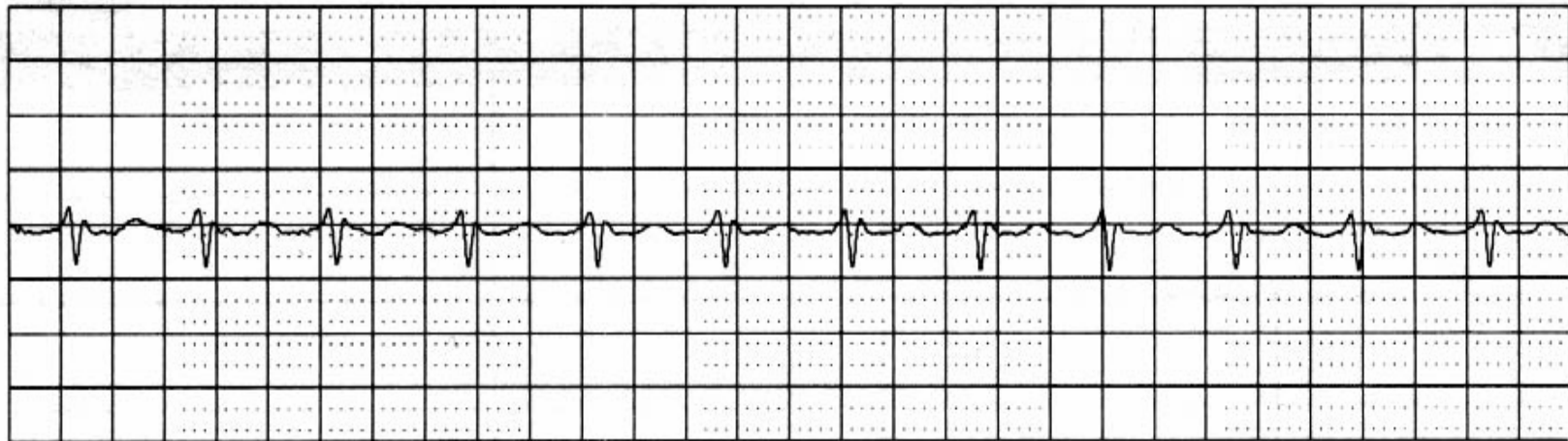
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# Example of Organized Atrial Tachycardia from ADOPT-A study

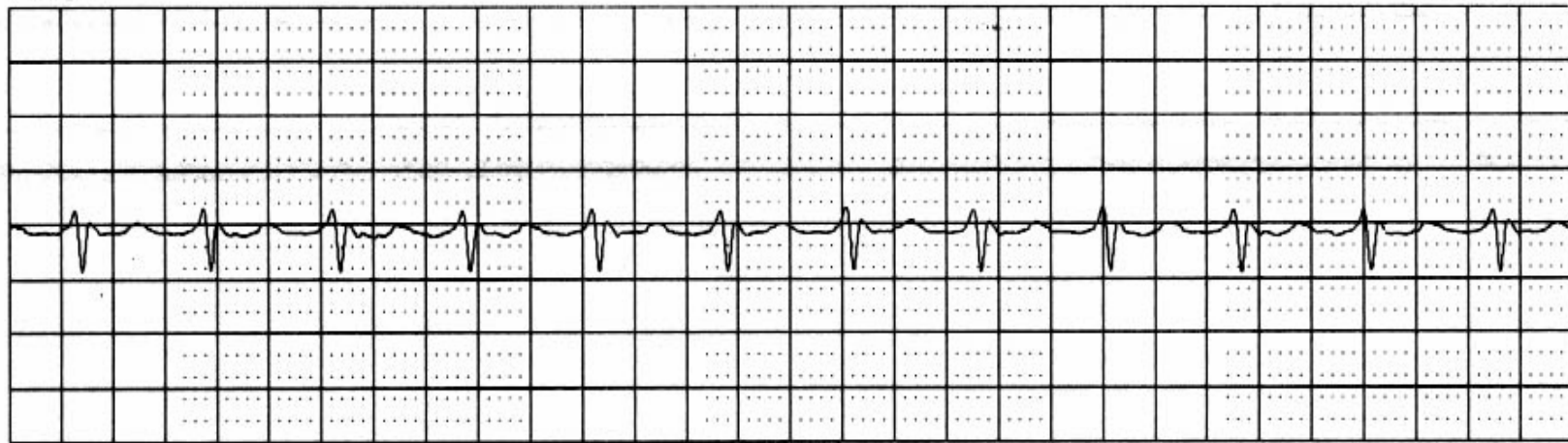
**Strip 1**

10 mm/mV

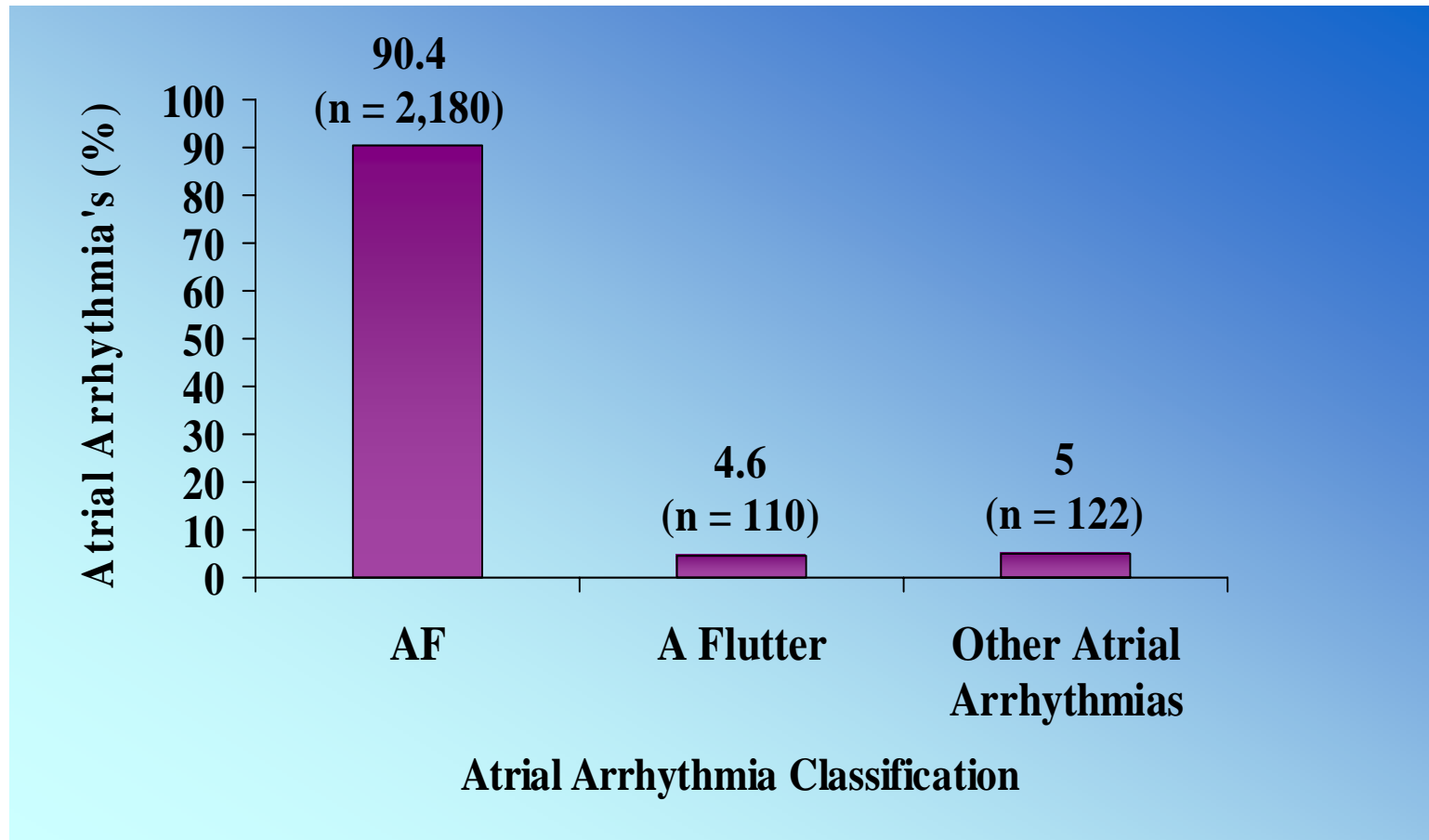


**Strip 2**

10 mm/mV

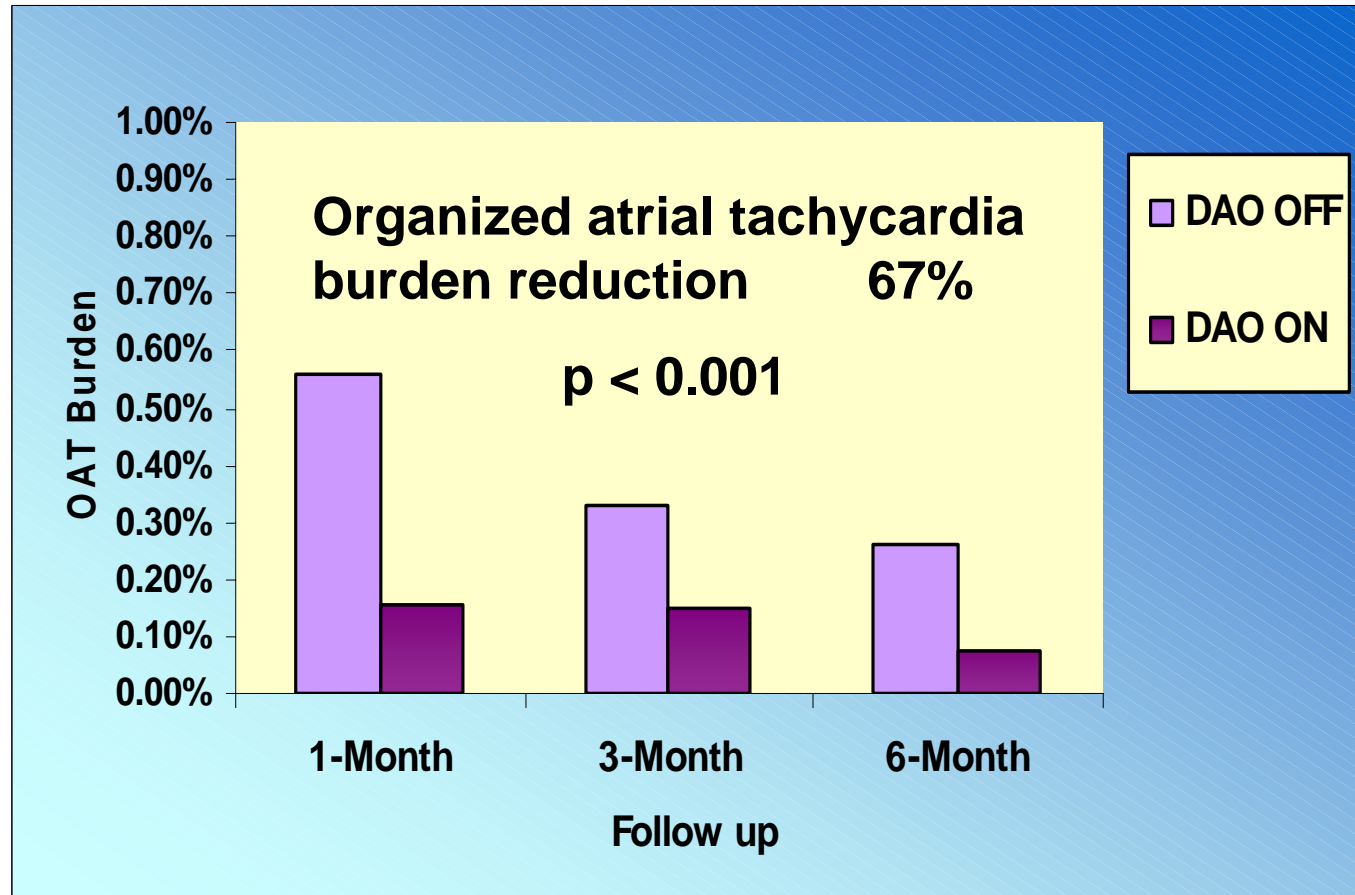


# Distribution of arrhythmias in ADOPT study



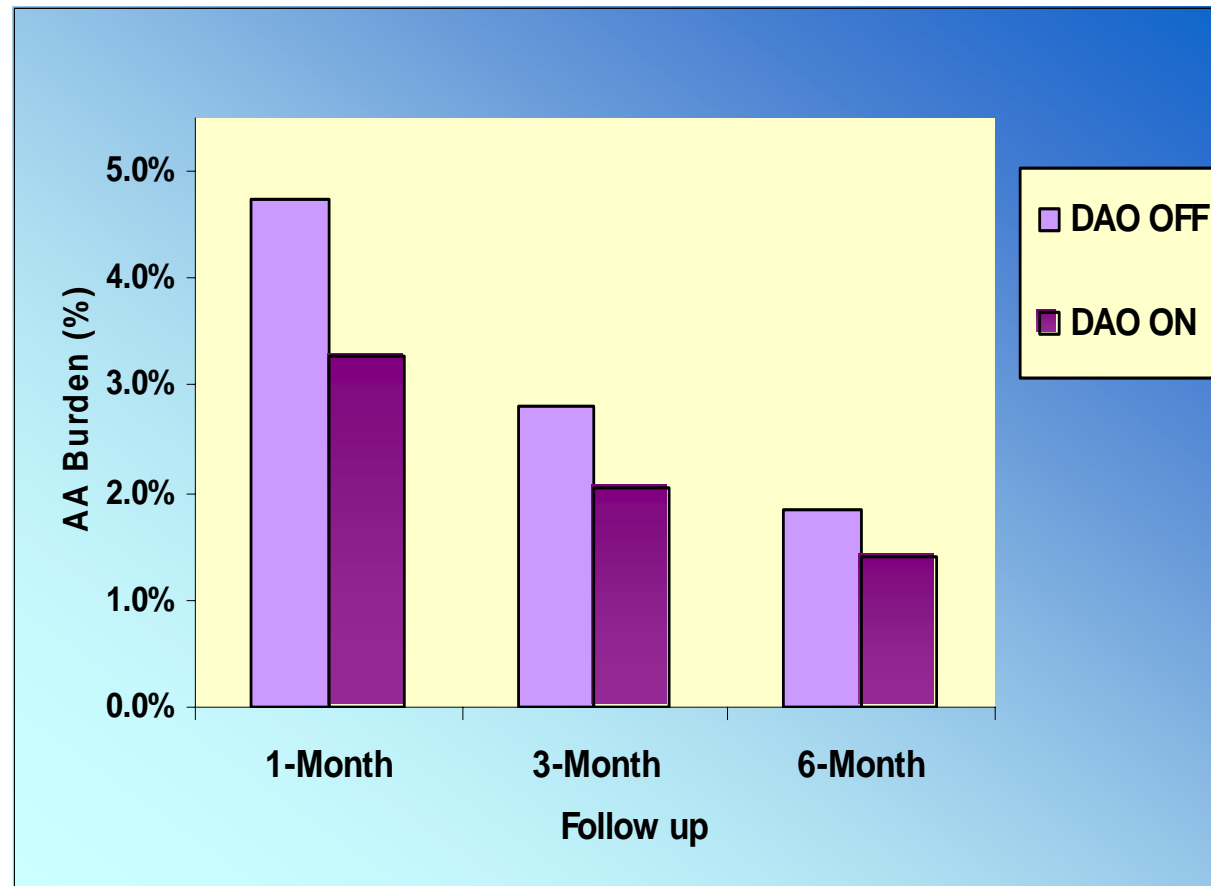
Carlson MD, et al, (abstract) *Circulation* 2001;104 (suppl):II-383.

# Impact of Atrial Overdrive algorithm on Organized Atrial Tachycardias



Carlson MD, et al, (abstract) Circulation 2001;104 (suppl):II-383.

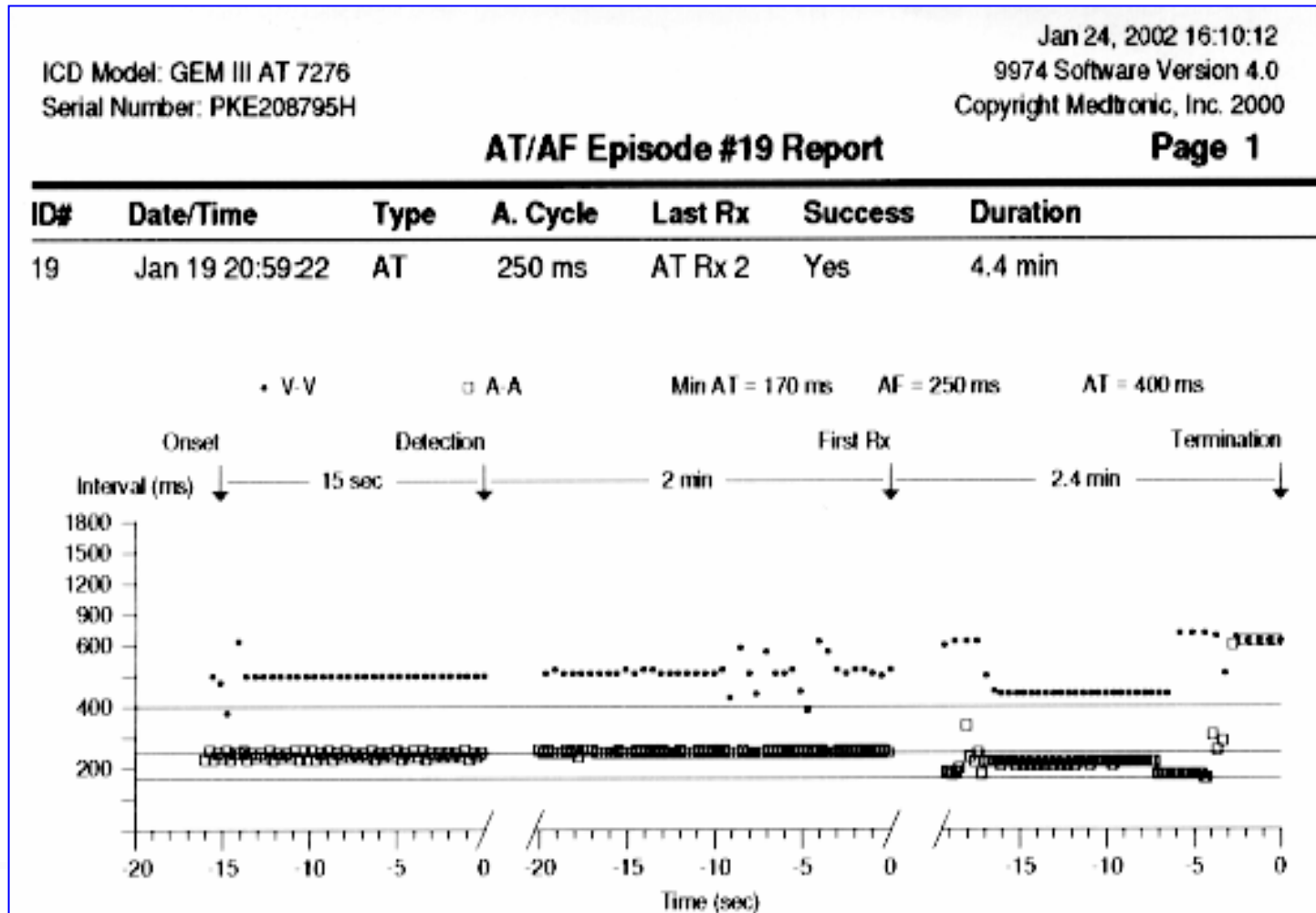
# Cumulative Benefit of AF Suppression™ on all atrial tachyarrhythmias



Carlson MD, et al, (abstract) *Circulation* 2001;104 (suppl):II-383.

# Treatment of Atrial Tachycardia

Longer interval = slower rate





# Hypothesis

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**Independent of the method of arrhythmia termination, pacing at a higher rate for a period of time after termination will prevent Immediate or Early Recurrence of Atrial Arrhythmia (ERAF, IRAF)**

**Medtronic included a Post-Mode Switch Overdrive Pacing algorithm in AT500 (PMOP)**

**Prospective nonrandomized trial involving 43 patients**

**Effect of PMOP on recurrence of atrial tachycardia following successful termination of tachycardia by ATP**

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**Israel CW, Circulation 2001; 104: II-345**





## **AT500 - PMOP**

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**PMOP at 80 ppm for 10 minutes was ineffective in preventing the recurrence of atrial tachycardia within 60 seconds of successful ATP**

**40% increased incidence of recurrence of atrial tachycardia when PMOP was enabled compared to when it was disabled ( $p = 0.0006$ )**

**Israel CW, Circulation 2001; 104: II-345**

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# **ATP for Atrial Fibrillation**

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**Automatic 50 Hz Burst for termination of atrial fibrillation**

**Medtronic Gem III AT n = 120**

**Endpoint: restoration of sinus or atrial paced rhythm within 5 seconds of termination of 50 Hz burst**

**Analysis based on manual analysis of pmkr diagnostics: Marker Chains and Stored EGMs**

**Results: 2.4% success rate**

**51% of stored EGMs discarded as invalid**



**Acmon Blue**  
*Santa Clarita, CA*  
*31 March 2002*