



# CASTLE AF study

ORIGINAL ARTICLE

## Catheter Ablation for Atrial Fibrillation with Heart Failure

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Pacing Clin Electrophysiol. 2009 Aug;32(8):987-94. doi: 10.1111/j.1540-8159.2009.02428.x.

## Catheter ablation versus standard conventional treatment in patients with left ventricular dysfunction and atrial fibrillation (CASTLE-AF) - study design.

Marrouche NF<sup>1</sup>, Brachmann J; CASTLE-AF Steering Committee.

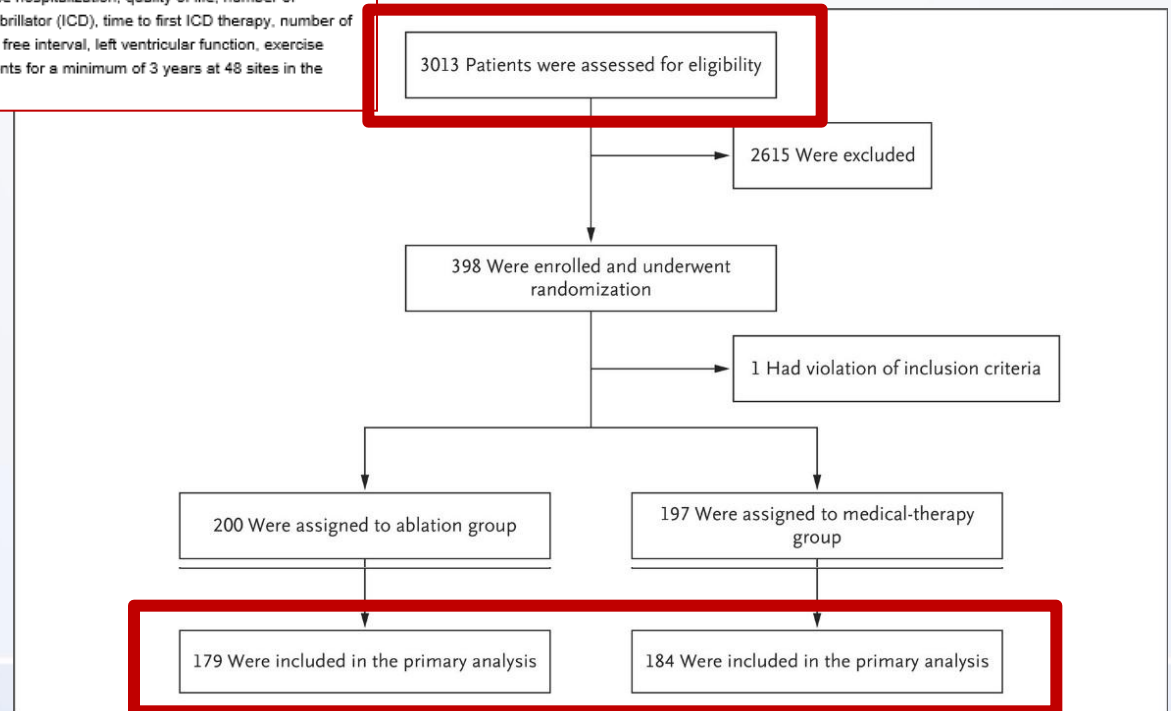
⊕ Collaborators (10)

⊕ Author information

### Abstract

**BACKGROUND:** Electrical isolation of the pulmonary veins by catheter ablation is an emerging treatment modality for the treatment of atrial fibrillation (AF) and is increasingly used in patients with heart failure.

**METHODS:** The catheter ablation versus standard conventional treatment in patients with left ventricular dysfunction and atrial fibrillation trial (CASTLE-AF) is a randomized evaluation of ablative treatment of atrial fibrillation in patients with left ventricular dysfunction. The primary endpoint is the composite of all-cause mortality or worsening of heart failure requiring unplanned hospitalization using a time to first event analysis. Secondary endpoints are all-cause mortality, cardiovascular mortality, cerebrovascular accidents, worsening of heart failure requiring unplanned hospitalization, unplanned hospitalization due to cardiovascular reason, all-cause hospitalization, quality of life, number of therapies (shock and antitachycardia pacing) delivered by the implantable cardioverter-defibrillator (ICD), time to first ICD therapy, number of device-detected ventricular tachycardia and ventricular fibrillation episodes, AF burden, AF free interval, left ventricular function, exercise tolerance, and percentage of right ventricular pacing. CASTLE-AF will randomize 420 patients for a minimum of 3 years at 48 sites in the United States, Europe, Australia, and South America.



- NYHA class II, III, or IV heart failure
- left ventricular ejection fraction (LVEF) of 35% or less
- all the patients were required to have had implantation of a Biotronik-manufactured implantable cardioverter–defibrillator (ICD) device or a cardiac resynchronization therapy defibrillator (CRT-D) with automatic daily remote-monitoring capabilities

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Characteristic	Treatment Type	
	Ablation (N=179)	Medical Therapy (N=184)
Age — yr		
Median	64	64
Range	56–71	56–73.5
Male sex — no. (%)	156 (87)	155 (84)
Body-mass index†		
Median	29.0	29.1
Range	25.9–32.2	25.9–32.3
New York Heart Association class — no./total no. (%)		
I	20/174 (11)	19/179 (11)
II	101/174 (58)	109/179 (61)
III	50/174 (29)	49/179 (27)
IV	3/174 (2)	2/179 (1)
Cause of heart failure — no. (%)‡		
Ischemic	72 (40)	96 (52)
Nonischemic	107 (60)	88 (48)
Type of atrial fibrillation — no. (%)		
Paroxysmal	54 (30)	64 (35)
Persistent	125 (70)	120 (65)
Long-standing persistent (duration >1 year)	51 (28)	55 (30)
Left atrial diameter		
Total no. of patients evaluated	162	172
Median — mm	48.0	49.5
Interquartile range — mm	45.0–54.0	5.0–55.0
Left ventricular ejection fraction		
Total no. of patients evaluated	164	172
Median — %	32.5	31.5
Interquartile range — %	25.0–38.0	27.0–37.0
CRT-D implanted — no. (%)§	48 (27)	52 (28)
ICD implanted — no. (%)§	131 (73)	132 (72)
Dual-chamber	128 (72)	123 (67)
Single-lead device with “floating” atrial sensing dipole	3 (2)	9 (5)
Indication for ICD implantation — no. (%)		
Primary prevention	160 (89)	163 (89)
Secondary prevention	19 (11)	21 (11)
History of amiodarone use — no./total no. (%)¶		
Failure	78/175 (45)	82/176 (47)
Unacceptable side effects	21/175 (12)	24/176 (14)
Nonuse	76/175 (43)	70/176 (40)

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**Table S3. Medications at Baseline and at Last Follow-Up**

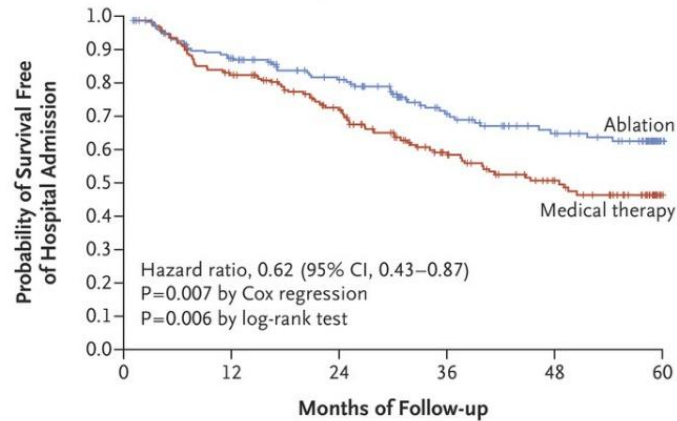
Medication	Treatment of Atrial Fibrillation	
	Ablation group (179 patients)	Pharmacological group (184 patients)
Baseline	n=177	n=180
ACE-inhibitor or ARB – no. (%)	166 (94)	164 (91)
Beta-blocker – no. (%)	165 (93)	171 (95)
Diuretics including spironolactone – no. (%)	165 (93)	167 (93)
Digitalis – no. (%)	31 (18)	56 (31)
Calcium antagonist – no. (%)	16 (9)	13 (7)
Oral anticoagulant – no. (%)	165 (93)	172 (96)
Antiarrhythmic drug (class Ia, Ic, or III) – no. (%)	57 (32)	55 (31)
Amiodarone – no. (%)	55 (31)	46 (26), n=179
Sotalol – no. (%)	1 (1)	2 (1)
Final follow-up*	n=177	n=182
ACE-inhibitor or ARB – no. (%)	155 (88)	154 (85)
Beta-blocker – no. (%)	161 (91)	163 (90)
Diuretics including spironolactone – no. (%)	151 (85)	163 (90)
Digitalis – no. (%)	24 (14)	62 (34)
Calcium antagonist – no. (%)	8 (5)	5 (3)
Oral anticoagulant – no. (%)	159 (90)	164 (90)
Antiarrhythmic drug (class Ia, Ic, or III) – no. (%)	48 (27)	64 (35)
Amiodarone – no. (%)	45 (25)	56 (31)
Sotalol – no. (%)	2 (1)	6 (3)

\*Last follow-up with documented medications.

ACE=angiotensin-converting enzyme; ARB=angiotensin receptor blocker.

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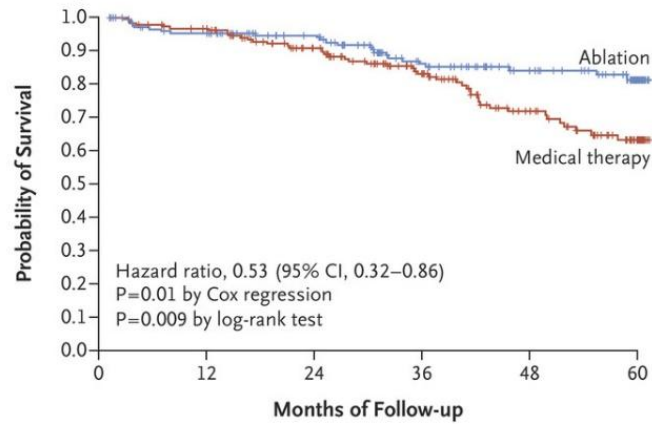
**A** Death or Hospitalization for Worsening Heart Failure



**No. at Risk**

Ablation	179	141	114	76	58	22
Medical therapy	184	145	111	70	48	12

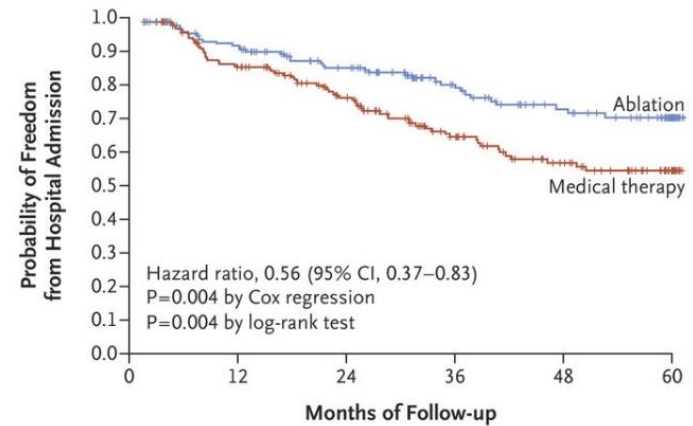
**B** Death from Any Cause



**No. at Risk**

Ablation	179	154	130	94	71	27
Medical therapy	184	168	138	97	63	19

**C** Hospitalization for Worsening Heart Failure

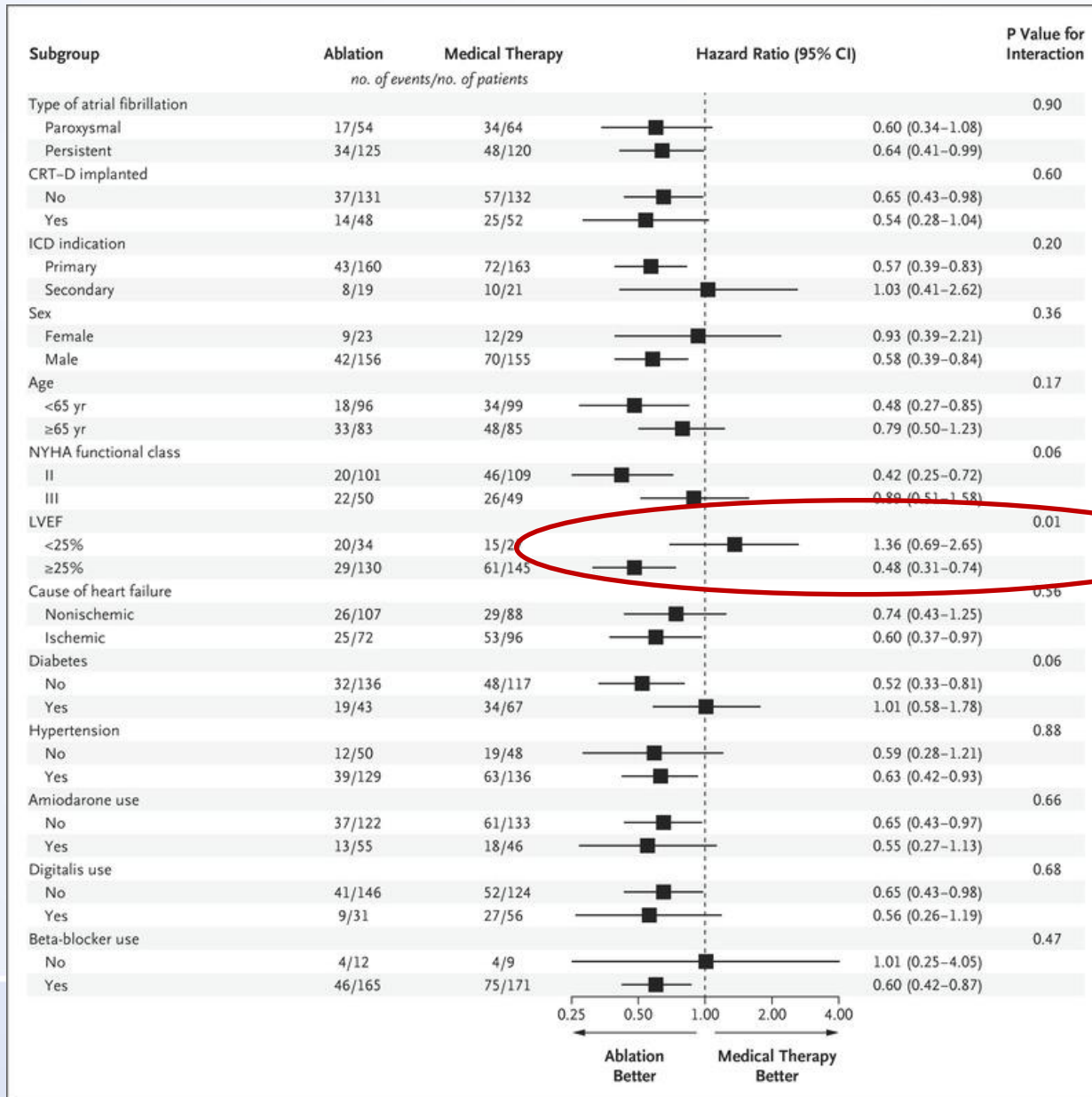


**No. at Risk**

Ablation	179	141	114	76	58	22
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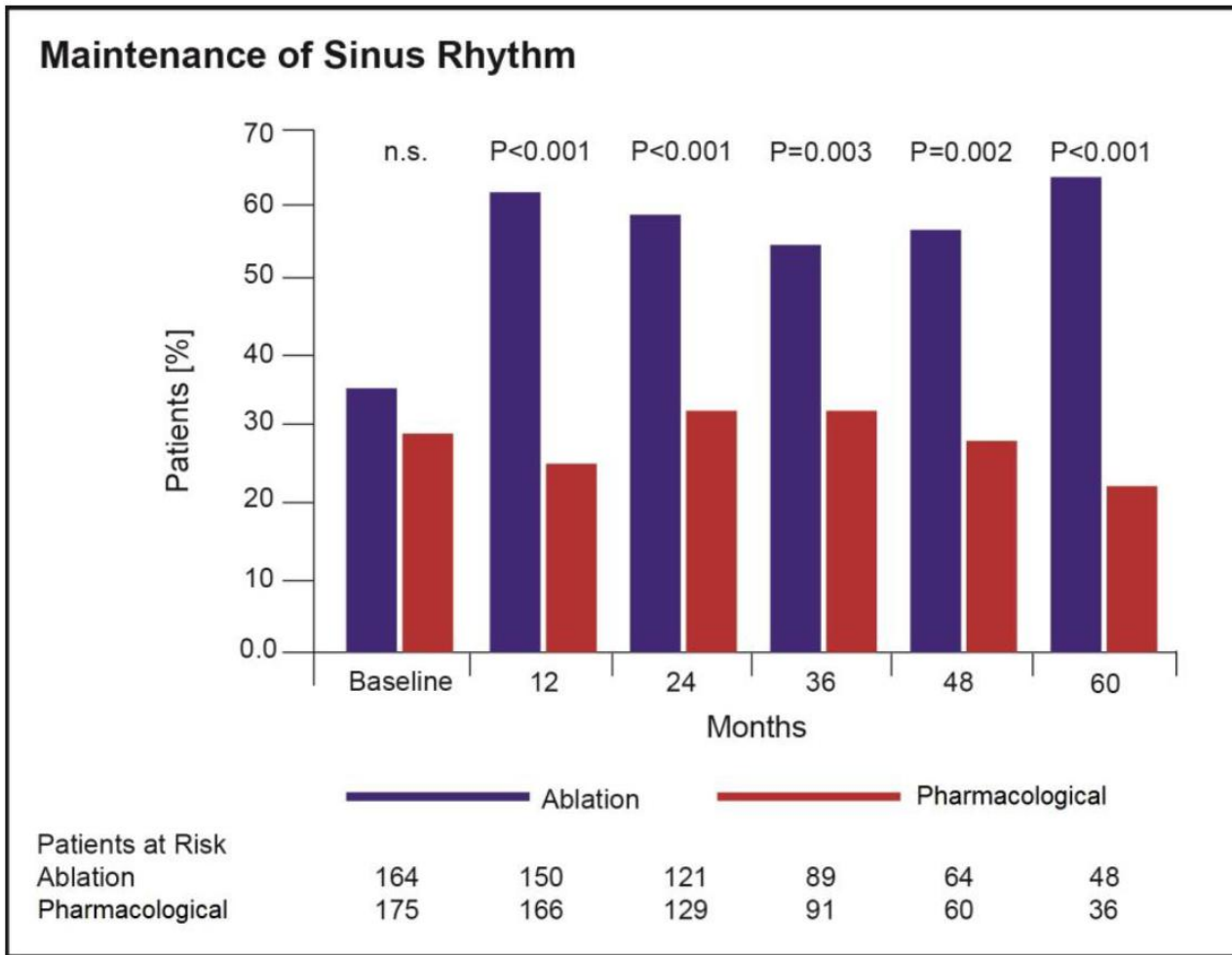


# Hot lines: CASTLE AF study





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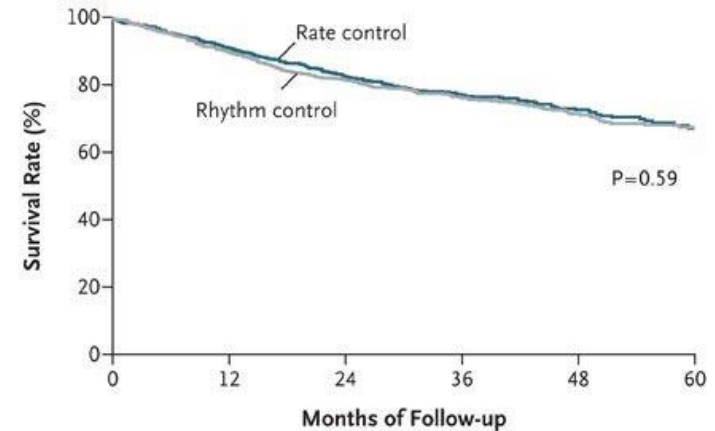
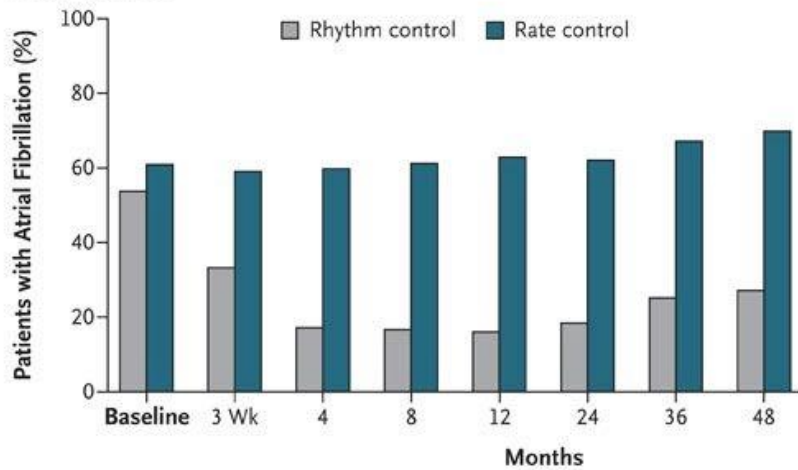


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## Rhythm vs rate control in AF HF pts

A total of 1376 patients were enrolled, mean age 67 y, EF 27%  
 There were also no significant differences favoring either strategy

**A Follow-up Visits**



No. at Risk	0	12	24	36	48	60
Rhythm control	593	514	378	228	82	
Rate control	604	521	381	219	69	

**CASTLE-AF** je prospektivní randomizovaná studie, která u vybraných pacientů se srdečním selháním při dysfunkci levé a s FS prokazuje, že **katetrizační ablace pro FS vede ke snížení mortality a hospitalizací pro SI** v porovnání s konzervativní léčbou



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**Table 2.** Primary and Secondary Clinical End Points.\*

End Point	Ablation (N=179)	Medical Therapy (N=184)	Hazard Ratio (95% CI)	P Value	
				Cox Regression	Log-Rank Test
	<i>number (percent)</i>				
Primary†	51 (28.5)	82 (44.6)	0.62 (0.43–0.87)	0.007	0.006
Secondary					
Death from any cause	24 (13.4)	46 (25.0)	0.53 (0.32–0.86)	0.01	0.009
Heart-failure hospitalization	37 (20.7)	66 (35.9)	0.56 (0.37–0.83)	0.004	0.004
Cardiovascular death	20 (11.2)	41 (22.3)	0.49 (0.29–0.84)	0.009	0.008
Cardiovascular hospitalization	64 (35.8)	89 (48.4)	0.72 (0.52–0.99)	0.04	0.04
Hospitalization for any cause	114 (63.7)	122 (66.3)	0.99 (0.77–1.28)	0.96	0.96
Cerebrovascular accident	5 (2.8)	11 (6.0)	0.46 (0.16–1.33)	0.15	0.14

\* All numbers and percentages represent the total numbers of events and raw event rates after a median follow-up of 37.8 months. Deaths and cerebrovascular accidents were evaluated at baseline and 12 weeks after baseline for hospitalizations in the two groups (the “blinking period”). For Kaplan–Meier estimates at 12, 36, and 60 months, see Table S6 in the Supplementary Appendix.

† The primary end point is a composite of death from any cause or hospitalization for worsening heart failure.

## Results-CASTLE AF

### AF Burden Derived from Memory of Implanted Devices



CARMA

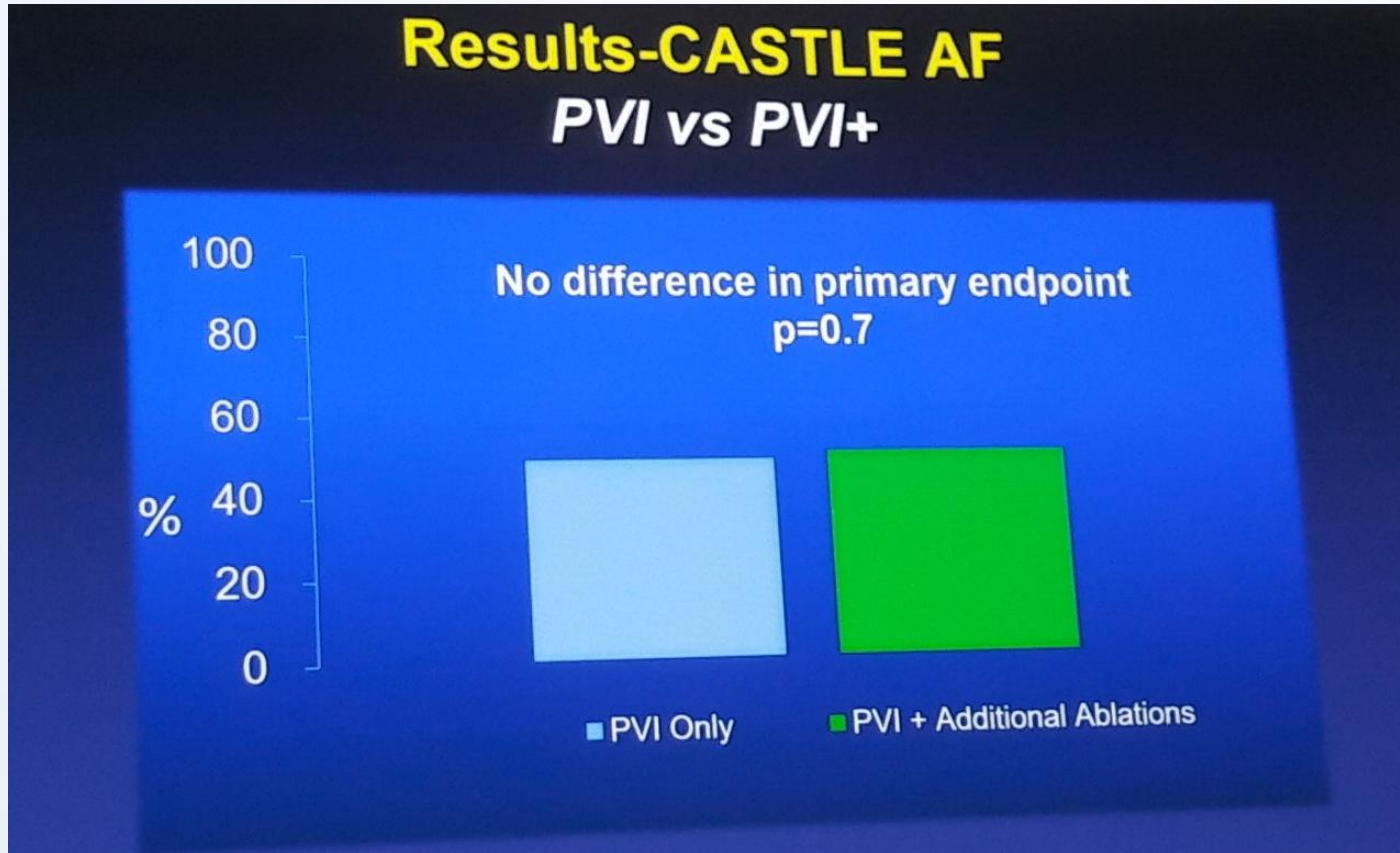
Biosense Webster.

Johnson & Johnson INSTITUTE



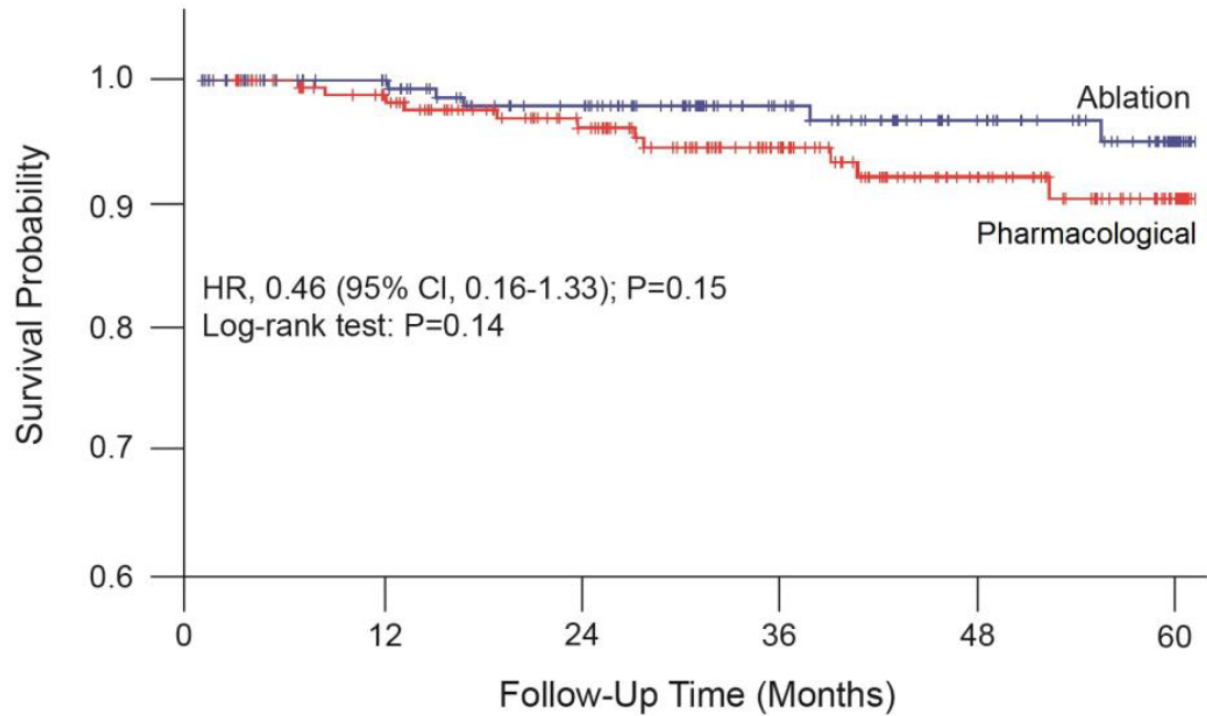


## Typ ablace: PVI či komplexnější výkon



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## Cerebrovascular Accident



### Patients at Risk

Ablation	179	153	127	91	68	24
Pharmacological	184	165	135	95	60	18