

DGK CARDIO UPDATE 2024

16. und 17. Februar

23. und 24. Februar

Supraventrikuläre Rhythmusstörungen

Thorsten Lewalter, München

Interessenkonflikte

Forschungsunterstützung: Boston Scientific, Lifetech, Abbott, Biotronik, Daiichi Synkyo

Vortragstätigkeit und Beratertätigkeit: Medtronic, St. Jude, Biotronik, Boston Scientific, Cardiofocus, Bayer, Osypka, Boehringer, Daiichi Sankyo, BMS, Pfizer, Novartis, Atricure, Toray, Abbott, Lifetech

SUPRAVENTRIKULÄRE RHYTHMUSSTÖRUNGEN

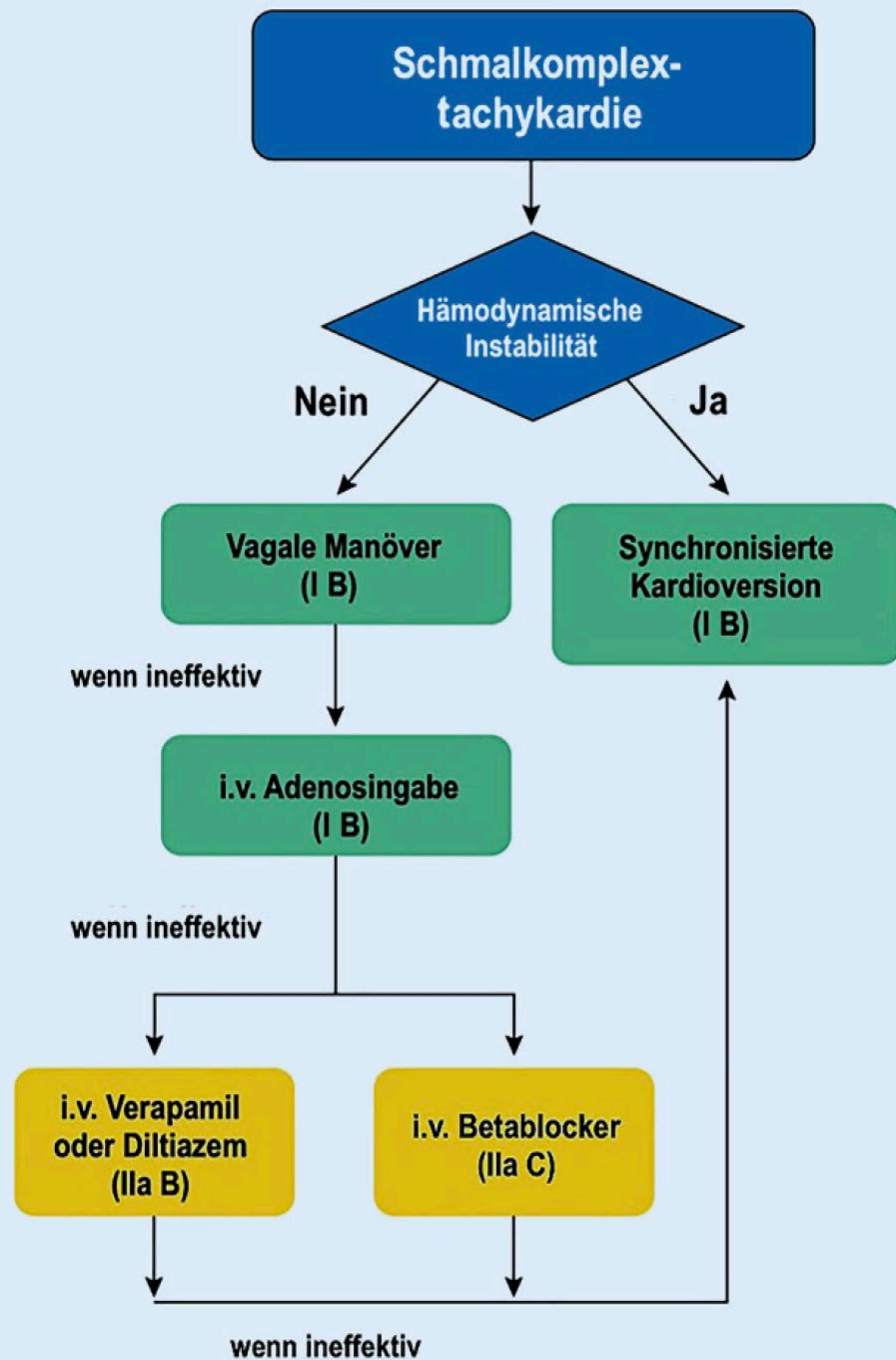
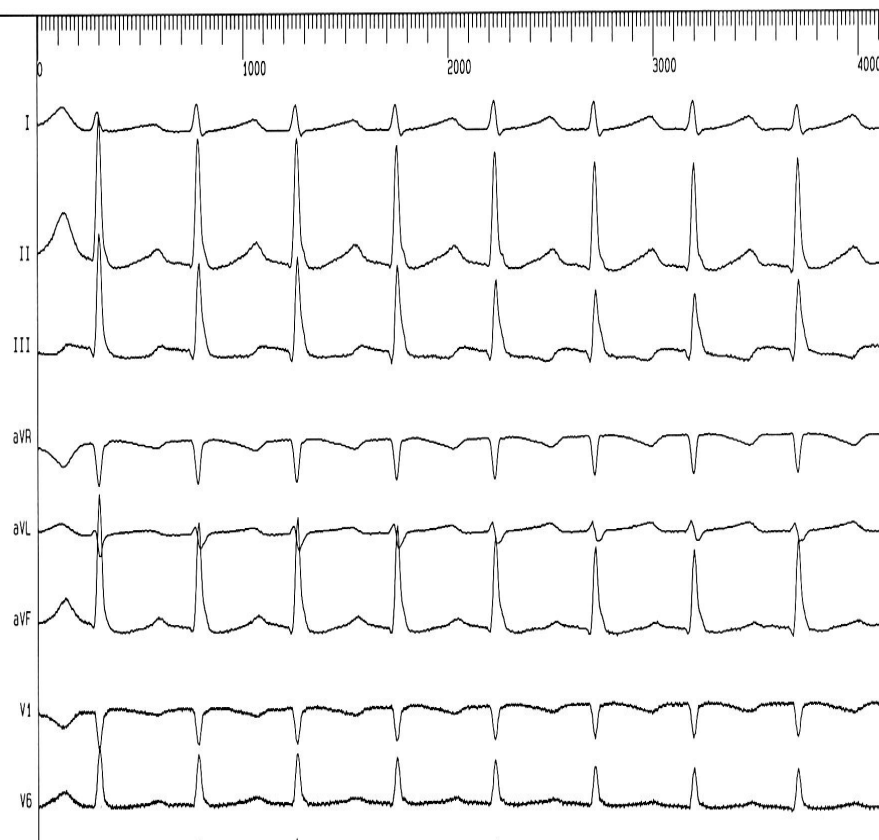
1 Akuttherapie - Herzrhythmusstörungen

- Mechanische Terminierung SVT: Valsalva und Variationen
- Bradykardie und “Torsades de pointes” Tachykardie

2019 ESC Guidelines for the management of patients with supraventricular tachycardia

The Task Force for the management of patients with supraventricular tachycardia of the European Society of Cardiology (ESC)

Developed in collaboration with the Association for European Paediatric and Congenital Cardiology (AEPC)



Vagale Manöver/Etripamil

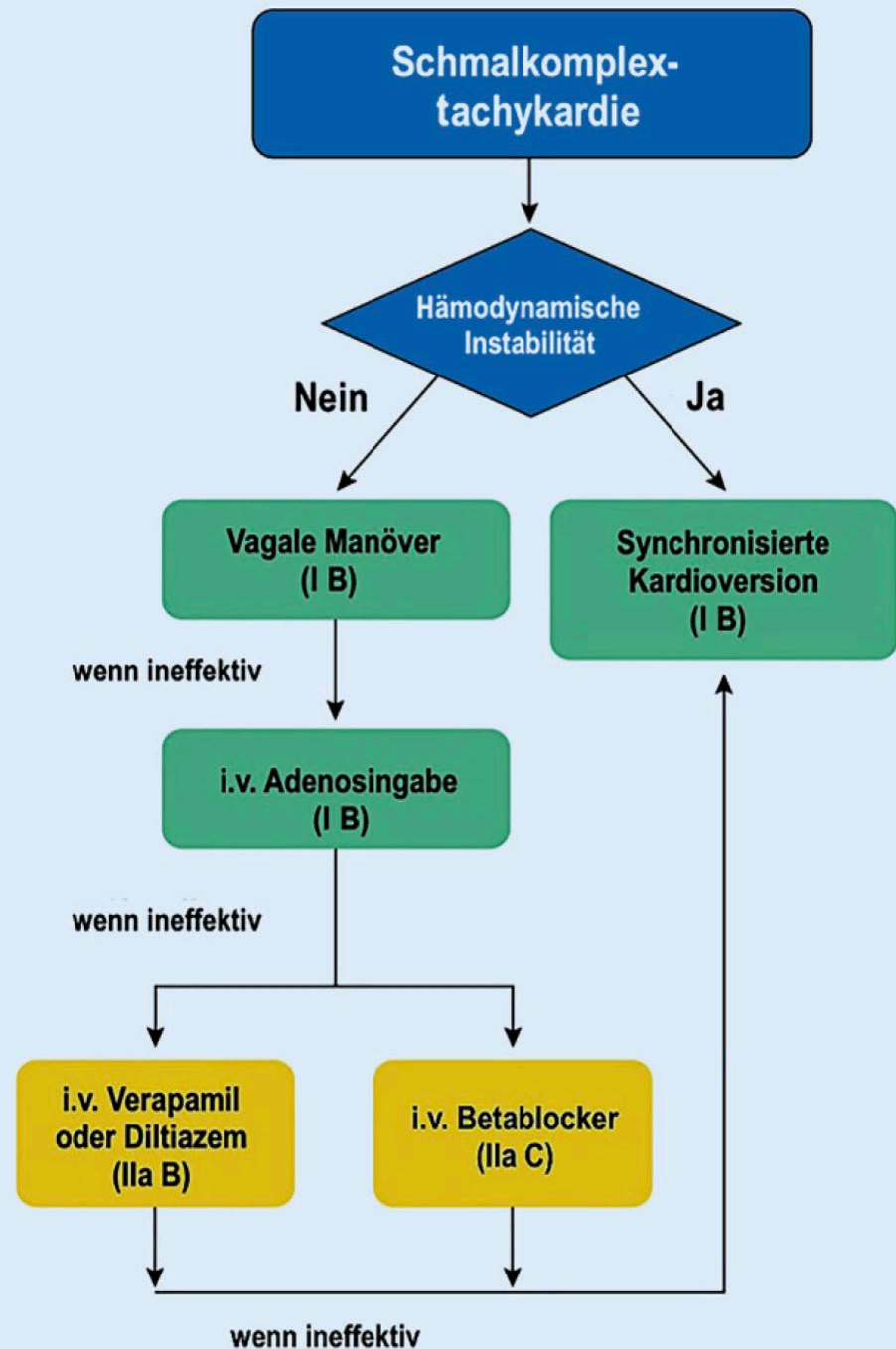
Mod. Valsalva Manöver (MVM)

- im Liegen, kräft. Pressen im Bauchraum
- mind. 12-15 sec, anschl Beinhochnahme



„reverse Valsalva Manöver“

- im Sitzen kräftiges Einatmen gegen geschl. Atemwege



Vagale Manöver/Etripamil

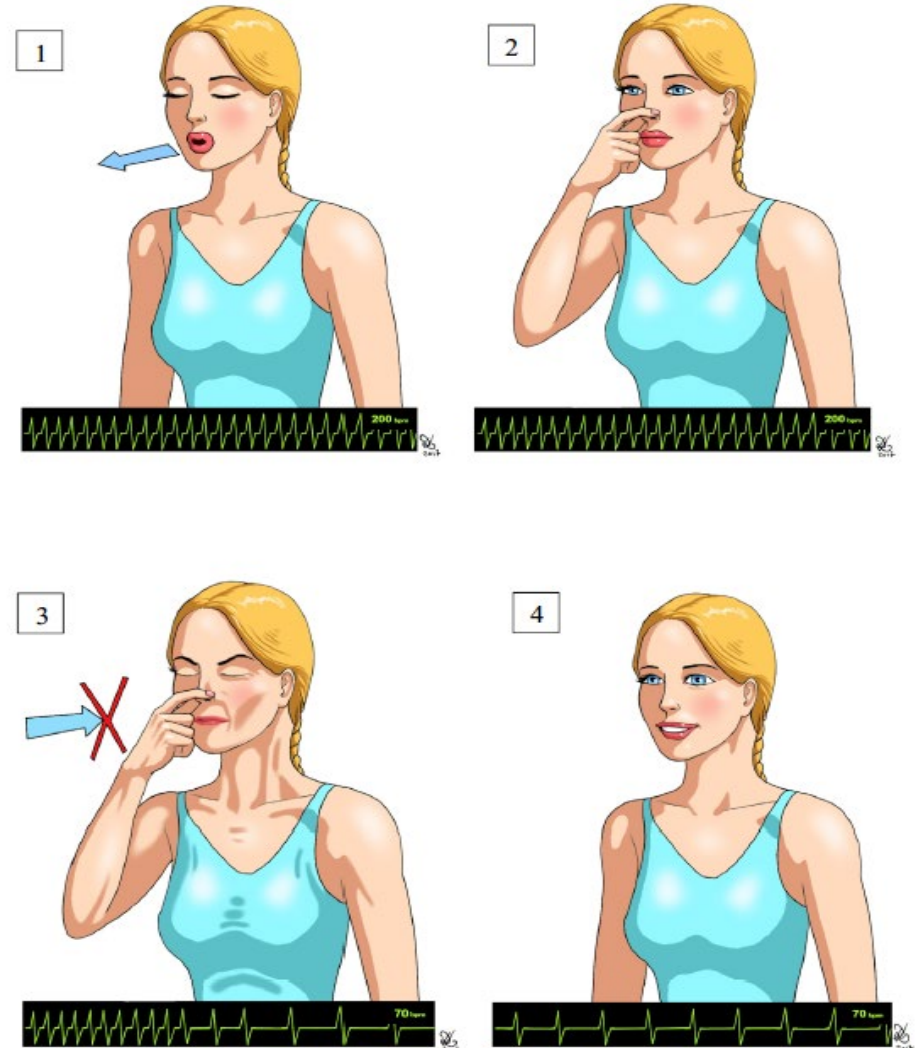
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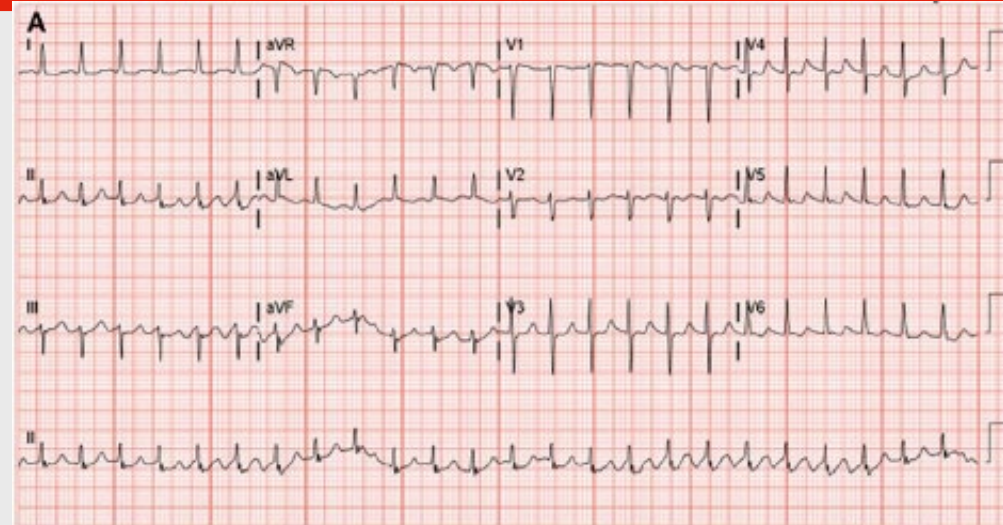
- im Sitzen kräftiges Einatmen gegen geschl. Atemwege



Atrioventricular Nodal Reentry Tachycardia in Pregnancy: „I have ice for you“

Abou et al. EHJ Case Reports 2023

- ➔ 37-jährige Schwangere, anhaltende AVNRT
- ➔ Hypotonie, Luftnot, Brustschmerz
- ➔ ineff. MVM und CSM
- ➔ Verweigerung medik. Maßnahmen



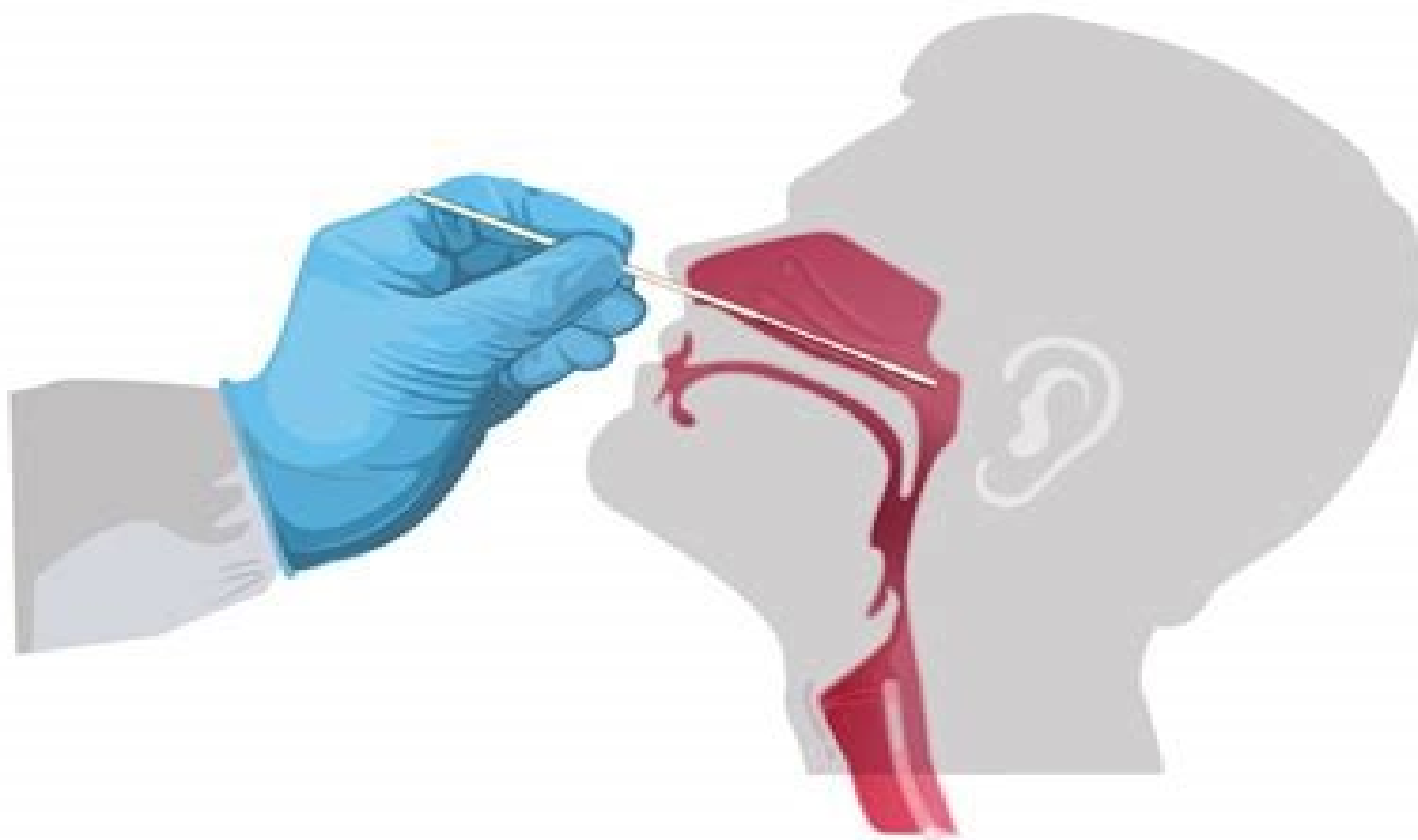
Termination of paroxysmal supraventricular tachycardia by intranasal swab insertion

Am J Emerg Med. 2023 Oct:

Edmond A. Hooker, M.D. DrPH^{a,b,*}, Jeremy S. Liebman, MD^b

^a Xavier University, Cincinnati, OH, United States of America

^b US Acute Care Solutions, Cincinnati, OH, United States of America



“Etripamil Nasal Spray for Conversion of Repeated Spontaneous Episodes of Paroxysmal Supraventricular Tachycardia During Long-Term Follow-Up: Results From the NODE-302 Study“

Ip et al. AHMJ 2023

First Nasal Spray Successfully Treats Supraventricular Tachycardia

HRS late-breaking study has potential to change the way patients are treated

Results of a ground-breaking clinical trial demonstrate the effectiveness of a novel, fast-acting nasal spray therapy called Etripamil to stop a common rapid heart rate condition known as paroxysmal supraventricular tachycardia (PSVT). The multicenter, randomized trial enrolled 104 patients from more than 35 centers across the U.S. and Canada, and the results were presented at Heart Rhythm 2017, the Heart Rhythm Society's 38th Annual Scientific Sessions.

PSVT results in more than 50,000 U.S. hospital visits every year. In order to restore normal heart rhythm, patients are often treated with adenosine,



Created by Lyatharico / Freepik.com

169 Pat. mit PSVT



nach erfolglosem VSM:
Etripamil-Nasenspray



Konversion in SR innerhalb
von 30 min: 60.2%

Vagale Manöver/Etripamil

Mod. Valsalva Manöver (MVM)

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- mind. 12-15 sec, anschl Beinhochnahme



„reverse Valsalva Manöver“

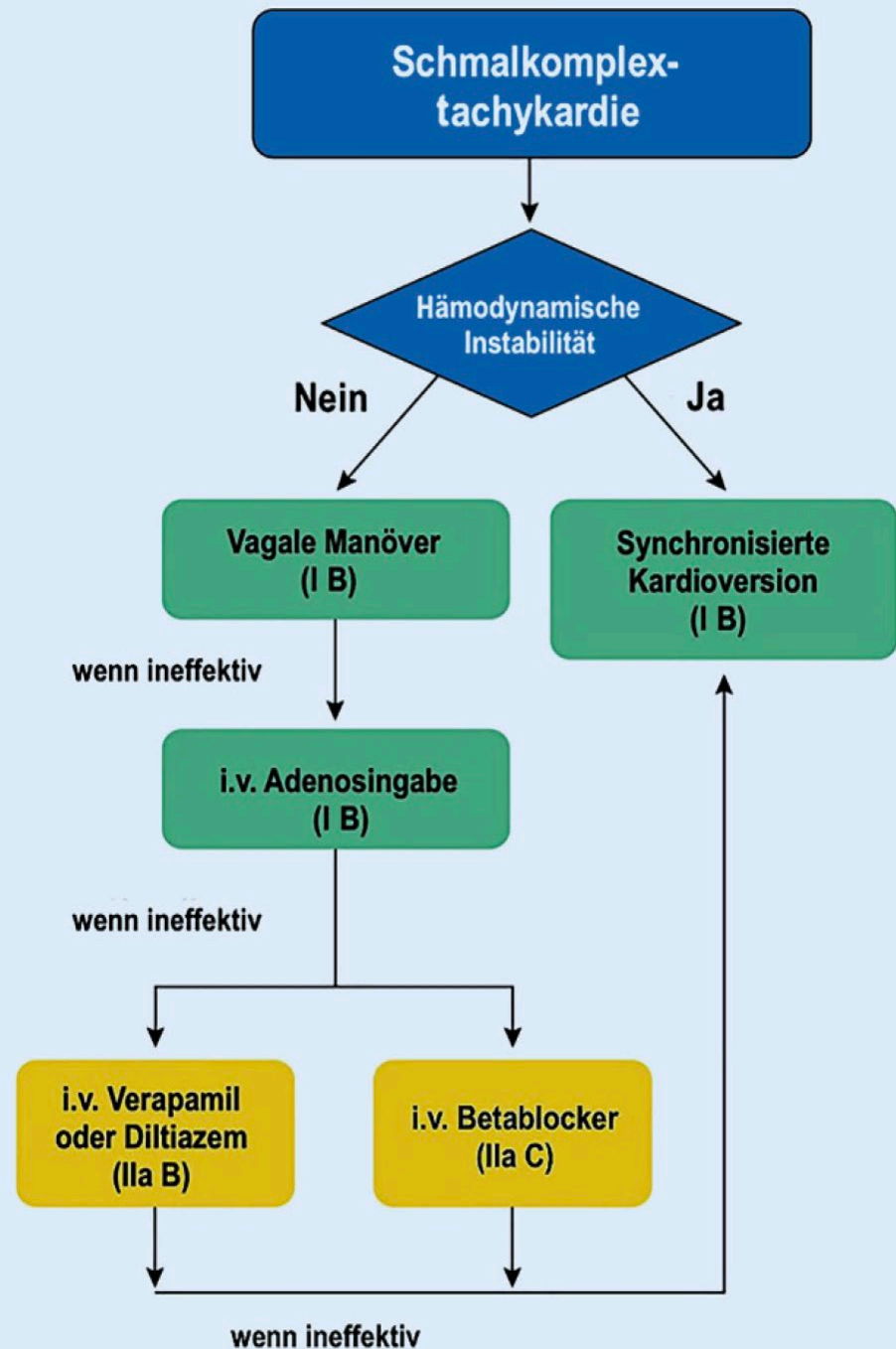
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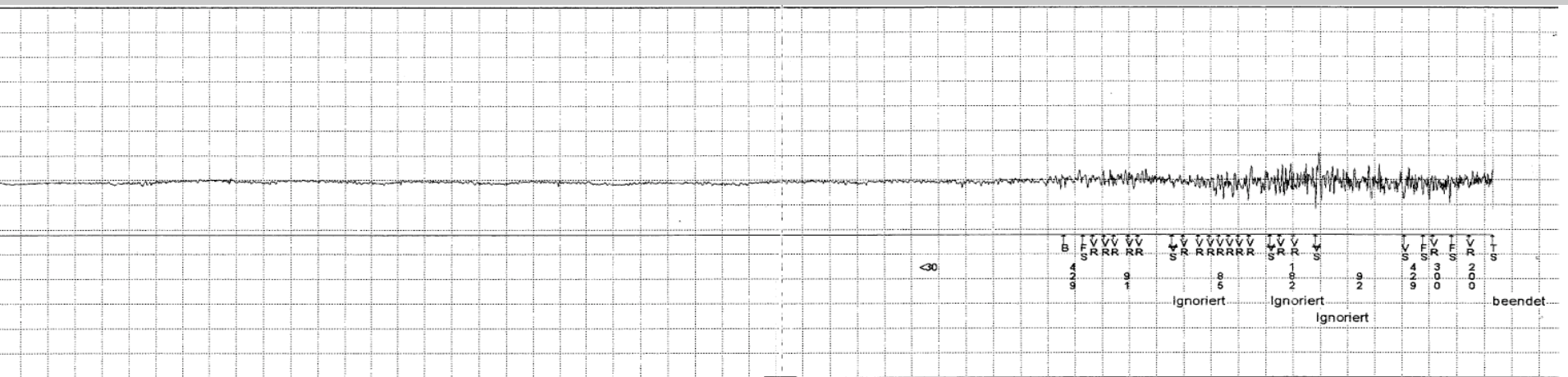
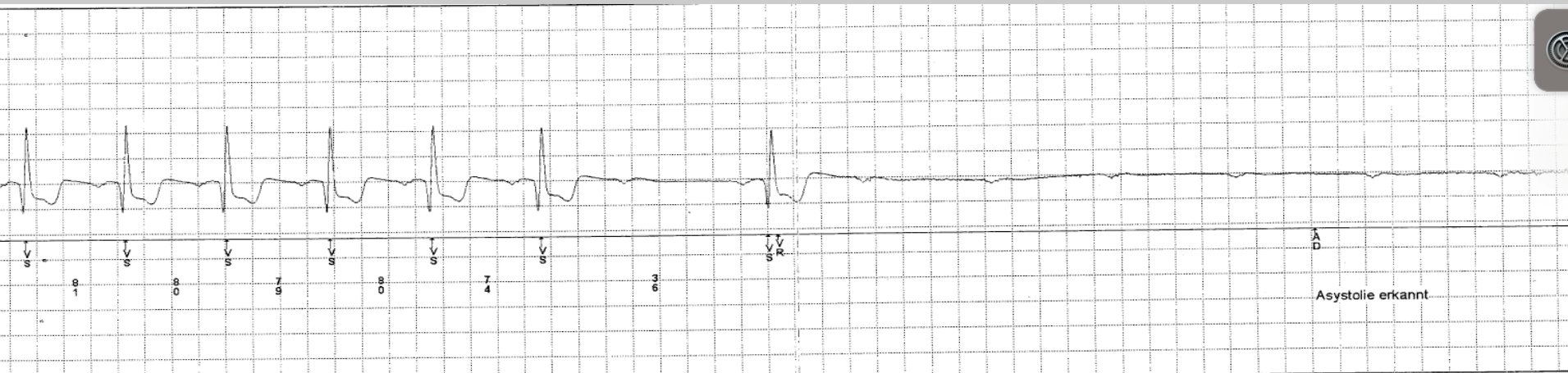
Eiswassergesichtsbad
(z.B. Schwangerschaft)
Reizung Nasen-Rachenraum
(„nasal swab“)



Etripamil Nasenspray



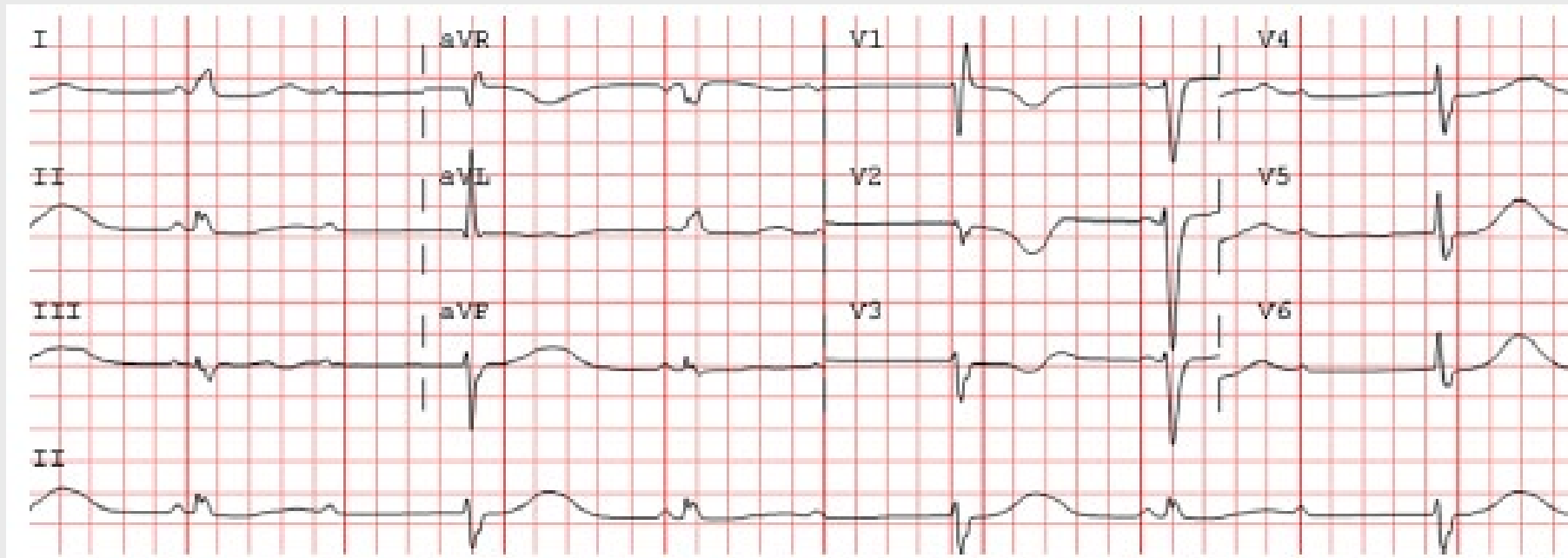
Bradykardie – „Mode of Death“



„Bradycardia-Induced Torsades de Pointes in Atrioventricular Block“

Bhatta et al. Cureus 2023

86 J. Frau, Synkope, ER

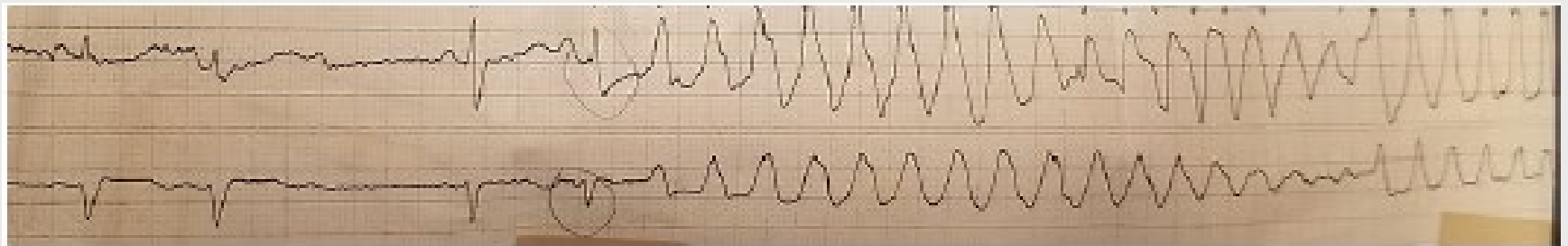


32/min

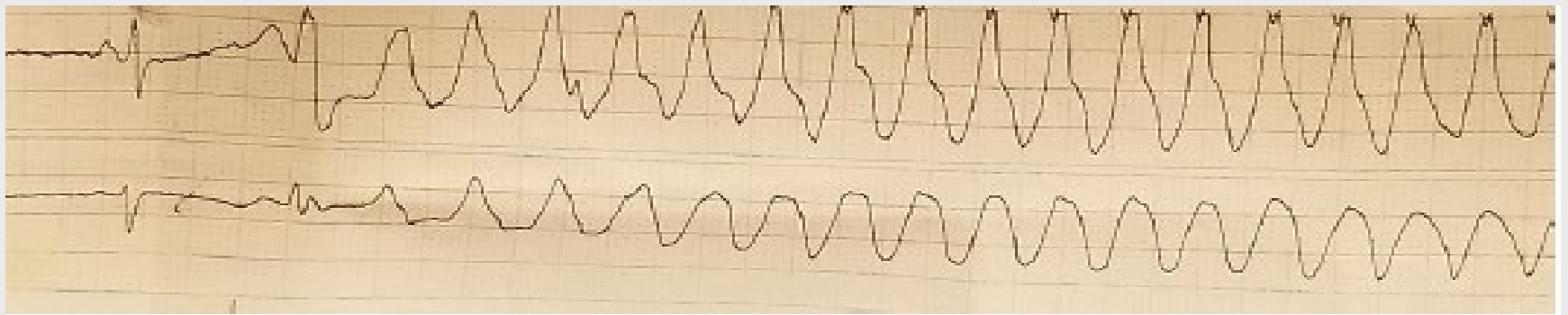
„Bradycardia-Induced Torsades de Pointes in Atrioventricular Block“

Bhatta et al. Cureus 2023

„warten auf die Schrittmacherimplantation“

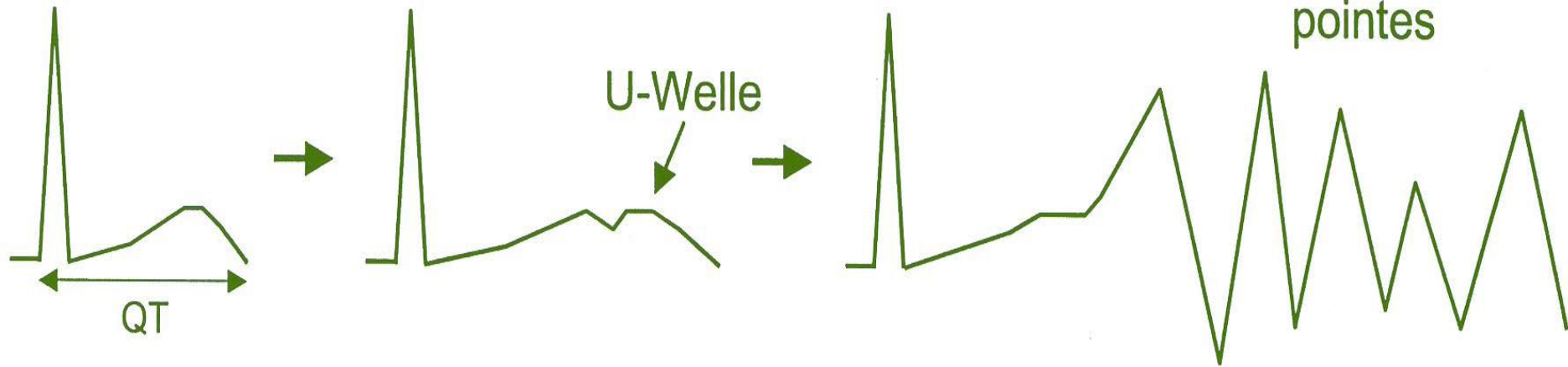


„Terminierung mit iv Magnesium“

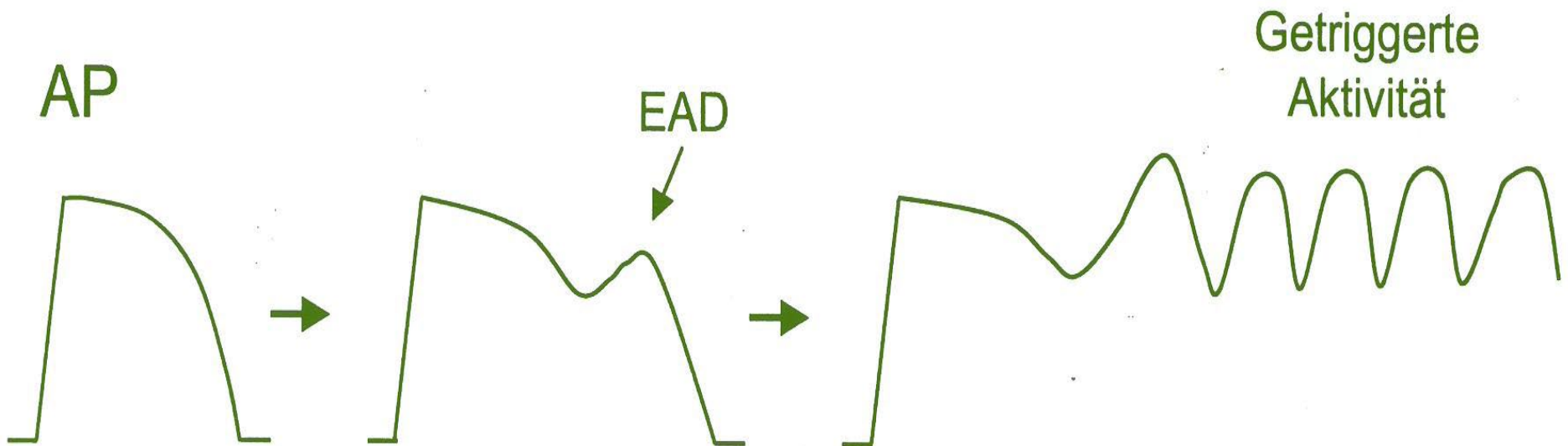


„Monomorphe VT mit CPR“

EKG



AP



„Prevalence and Clinical Characteristics of Patients with Torsades de Pointes Complicating Acquired Atrioventricular Block“

Bun et al., JCM 2023

100 Pat. höhergr. AV-Block; 17 Pat. mit Tdp-Tachykardie

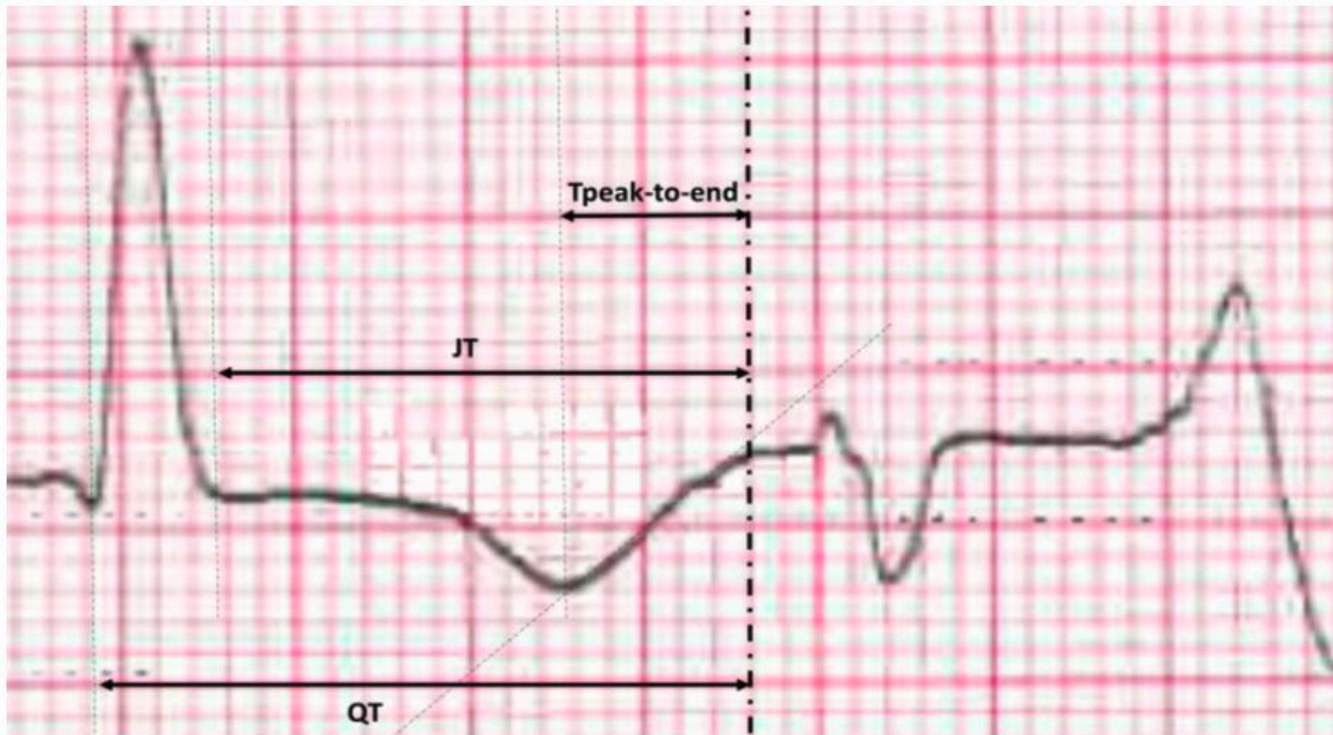


Figure 1. Method of manual measurement for QT, JT, and Tpeak-to-end intervals at the moment of most severe bradycardia.

Frequenzkorrigiertes QT-Intervall (QTc)

Erstbeschreiber	Formel	Bemerkungen
Bazett (37)	$QTc = \frac{QT - \text{Dauer}}{\sqrt{RR - \text{Abstand (s)}}}$	bei Frequenzen < 60/min wird unterkorrigiert, bei > 60/min überkorrigiert; die mathematisch richtige Einheit ist $s^{1/2}$, vielfach findet sich auch die Angabe in $ms^{1/2}$; häufig werden vereinfachend s oder ms verwendet

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gemessene QT-Dauer: 400 ms = 0,4 sec

100/min = RR-Abstand von 600 msec = 0,6 sec: Wurzel 0,6 = 0,8

$QTc = 0,4/0,71 \text{ s} = 0,5 \text{ sec}$ oder 500 msec

Frequenzkorrigiertes QT-Intervall (QTc)

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Fridericia (38)	$QTc = \frac{QT - \text{Dauer}}{\sqrt[3]{RR - \text{Abstand (s)}}}$	

„Prevalence and Clinical Characteristics of Patients with Torsades de Pointes Complicating Acquired Atrioventricular Block“

Bun et al., JCM 2023

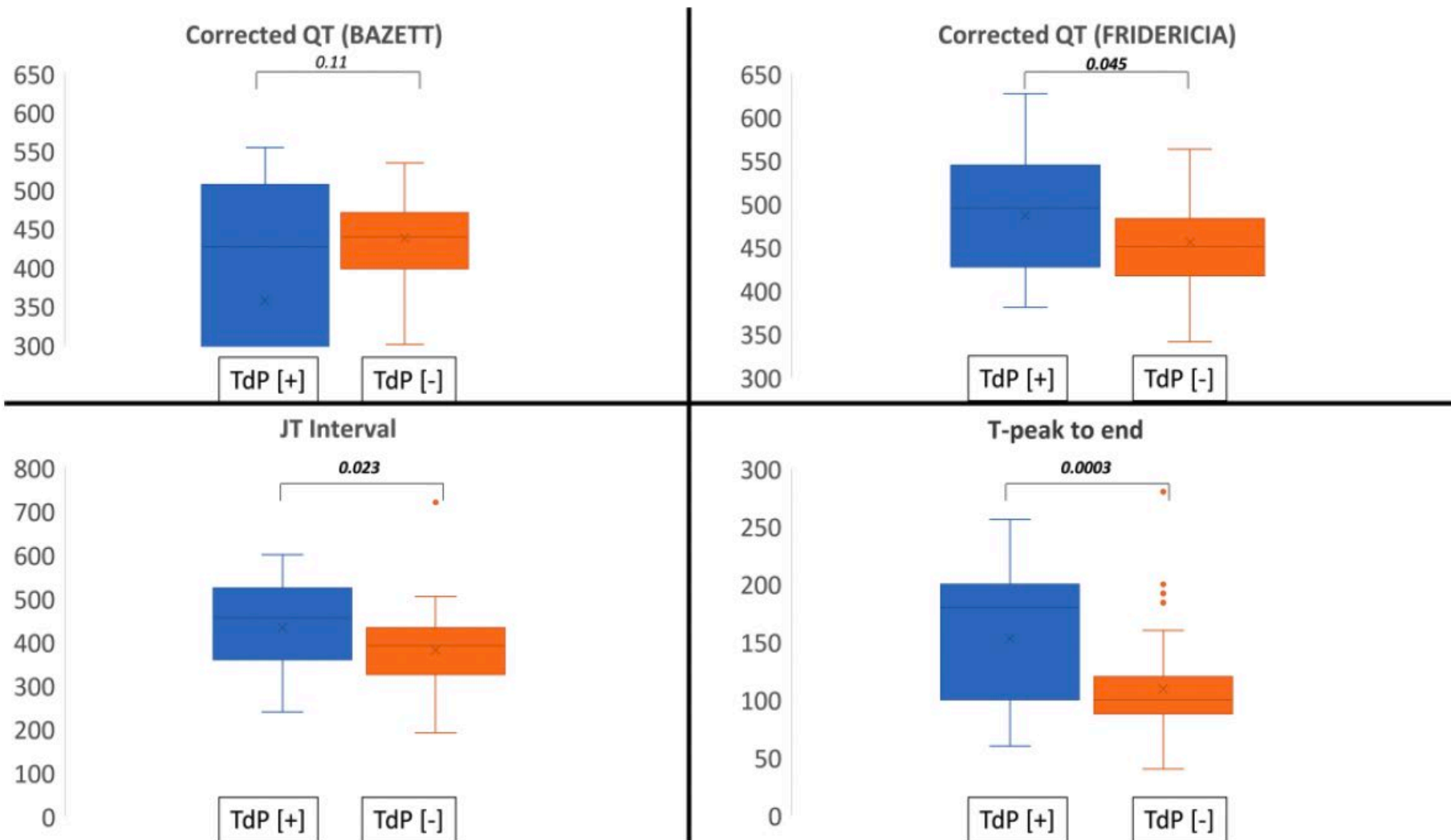
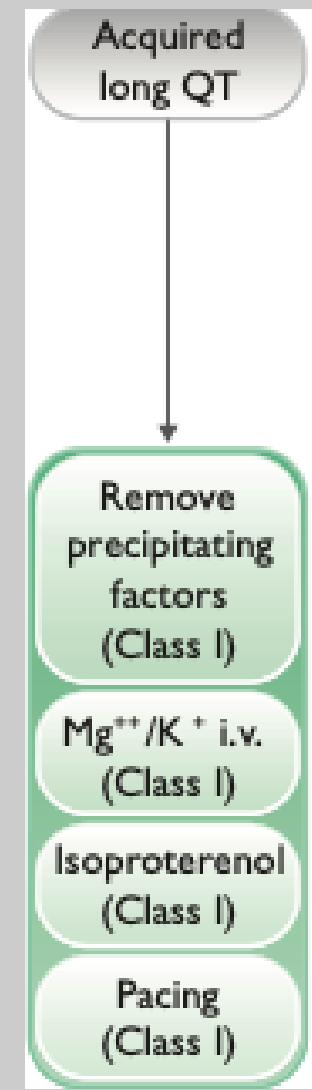
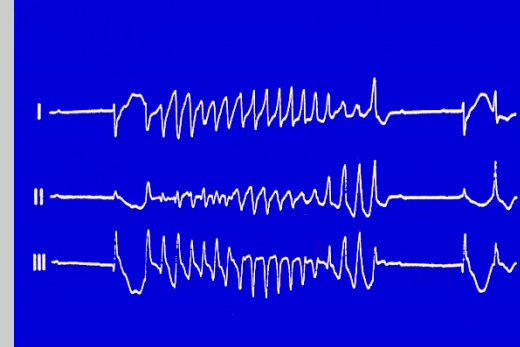


Table 3. Summary of published studies of ECG parameters in TdP patients during AVB.

Author	Design Number of TdP [+)/TdP [–]	Parameter	TdP [+]	TdP [–]
Strasberg B, 1986 [22]	Retrospective 9 vs. 12	QTc (ms)	510 ± 60 *	400 ± 40
Moroe K, 1988 [23]	Retrospective 6 vs. 9	QTc (ms)	580 ± 112 *	459 ± 37
Kurita T, 1992 [24]	Retrospective 6 vs. 8	QTc (ms)	585 ± 45 *	476 ± 58
Subbiah, 2010 [5]	Retrospective 11 vs. 33	QTc (ms)	440 ± 93 *	376 ± 40
		Tpeak-to-end (ms)	147 ± 25 *	94 ± 25
Cho MS, 2015 [9]	Retrospective 20 vs. 80	QT (ms)	716.4 ± 98.9 *	523.2 ± 91.3
		Tpeak-to-end (ms)	334.2 ± 59.1 *	144 ± 73.7
		Tpe/QT	0.49 ± 0.09 *	0.27 ± 0.11
Chorin, 2017 [4]	Retrospective and prospective 47 vs. 203	QTc (ms)	564 ± 81 *	422 ± 62
Our series, 2023	Prospective 17 vs. 83	QTc _{FR} (ms)	486 ± 70 *	456 ± 53
		Tpeak-to-end (ms)	160 ± 57 *	106 ± 35
		Tpe/QT	0.29 ± 0.08 *	0.21 ± 0.06
		JTc (ms)	437 ± 89 *	375 ± 71

* Variables are statistically significant in comparison with TdP [–] group.



Dessertenne's Tachycardia

- one form of polymorphic VT -



torsade de pointe

torsades de pointe

torsades des pointe

torsades des pointes

torsade des pointe

torsade des pointes

torsade de pointes

torsades de pointes

after AJ Camm, NASPE 1996

Zusammenfassung / Diskussion

- Akuttherapie -

1. SVT-Terminierung - Stufenschema

2. Bradykardie – „Tdp“ Gefahr!

- Risikomarker QT-Dauer: Monitoring!
- passagerer PM
- zeitnahe PM Implantation!
- spezifische Behandlung „Tdp“: Mg++, HF!

SUPRAVENTRIKULÄRE RHYTHMUSSTÖRUNGEN

1 Akuttherapie - Herzrhythmusstörungen

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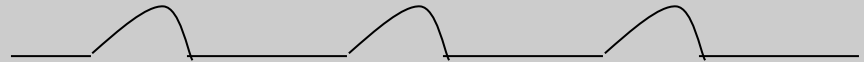
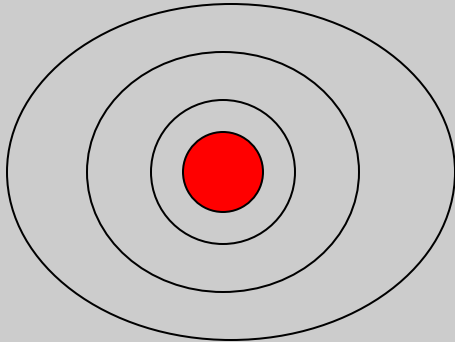
2 Atriale Tachyarrhythmien

- Ektopie atriale Tachykardie
- Vorhofflimmern
 - Epidemiologie, Prognose, Pathogenese und Diagnostik

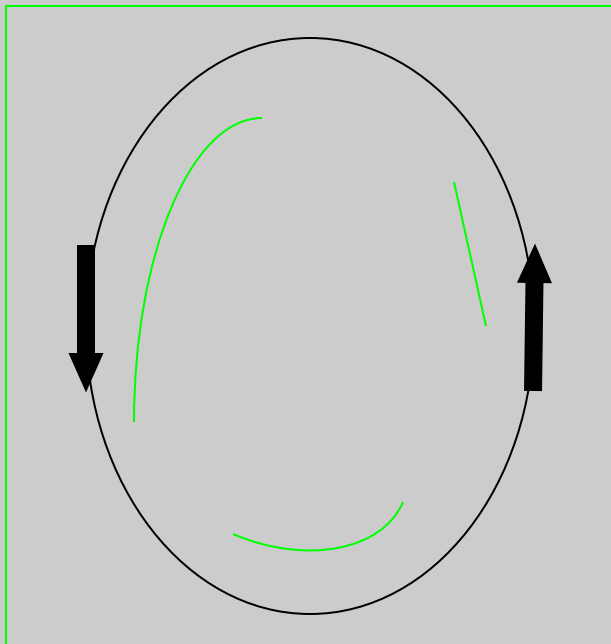
Tachykardiemechanismen – Anatomische Dimension

Fokale Arrhythmie

(u.a. Reentry, gest. Automatie)

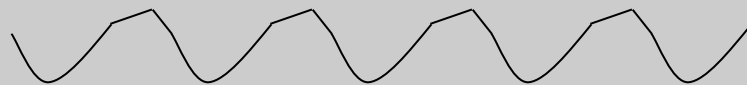


„Atriale Tachykardie“
(P-wave atrial tachycardia)



Makro-Reentry

(Kreiserregung)



„Vorhofflattern“
(F-wave atrial tachycardia)

Atrial Tachycardias (ATs) With Complex Atrial Activation Patterns (n = 126)

57 P-wave ATs (45%)



23 Macro-re-entrant ATs (40%)
26 Localized-re-entrant ATs (46%)
8 Focal ATs (14%)

69 F-wave ATs (55%)

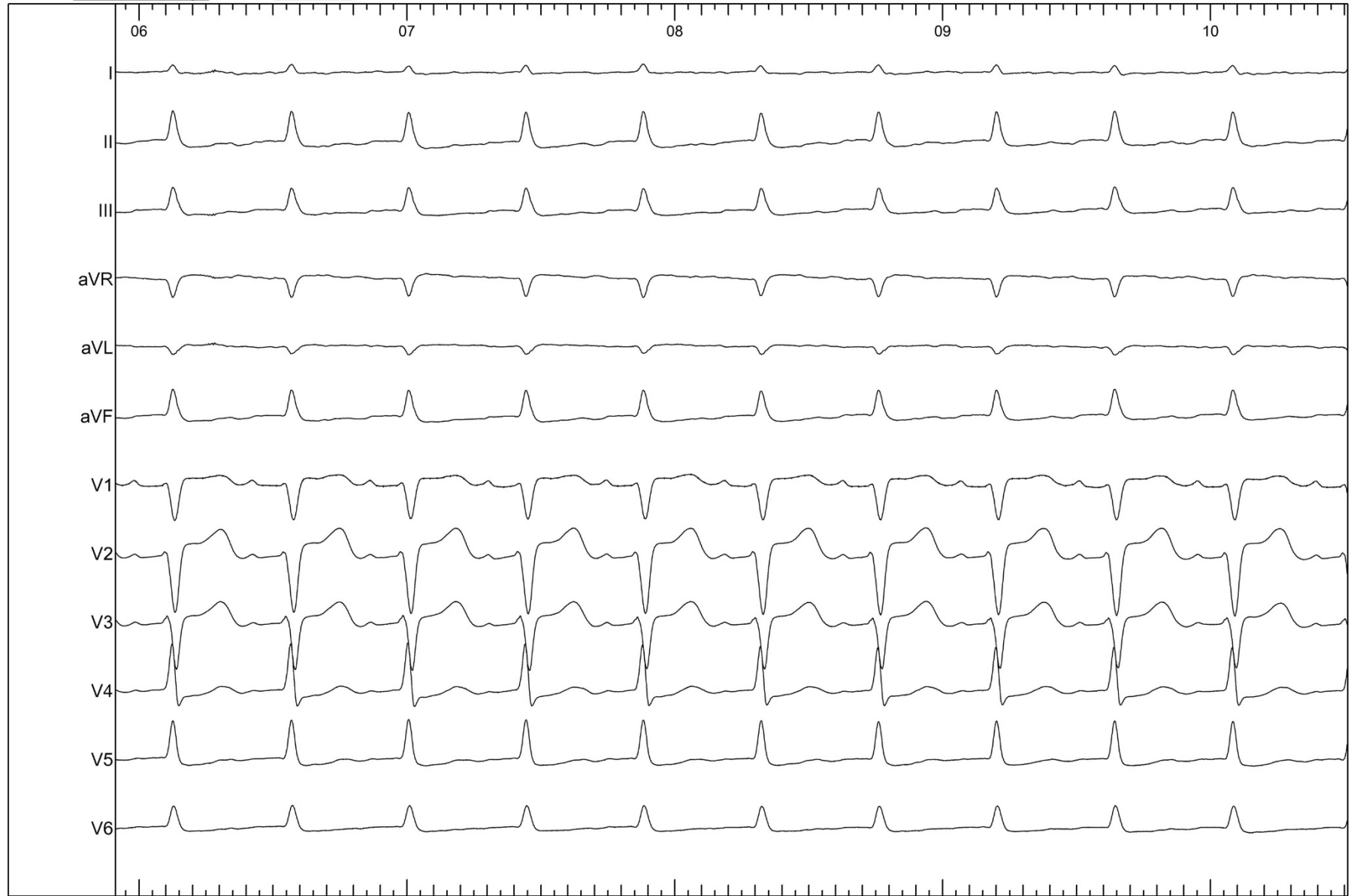


46 Macro-re-entrant ATs (67%)
21 Localized-re-entrant ATs (30%)
2 Focal ATs (3%)

Patient:

ID:

Recorded on November 19, 2019 at 9:59:32.088



Live Review

2 LA Flutt...



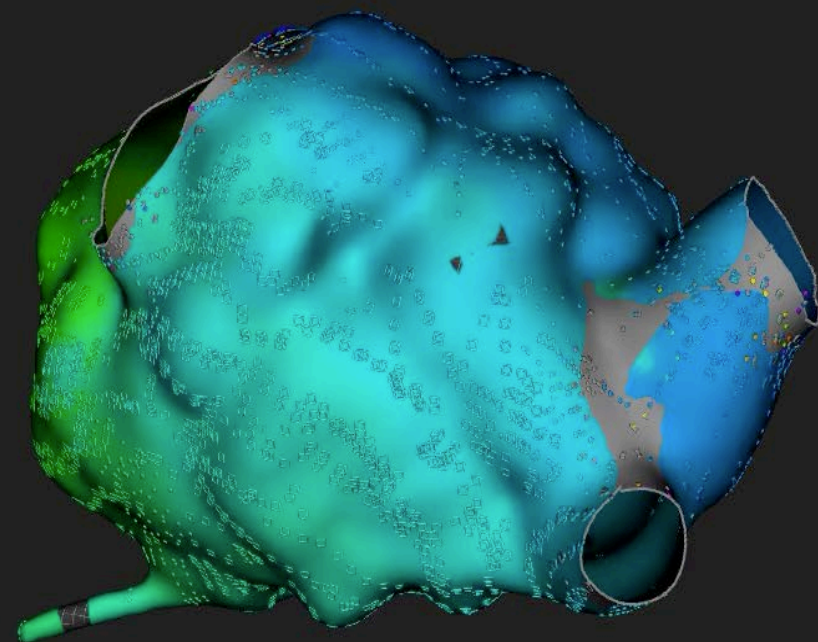
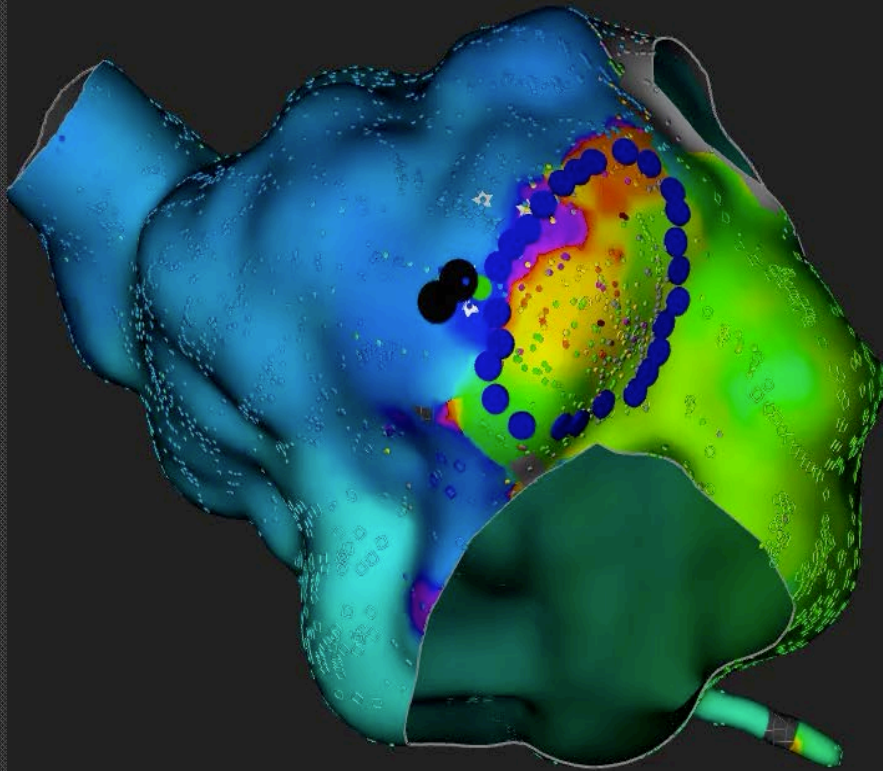
B.Time
LUMI

Live Review

2 LA Flutt...



B.Time
LUMI



Auto
*
INF
SUP
RL
LL
RAO
LAO
PA
AP



Catheter Tagging

Orion

Tag

- LAA-Occluder
- Target
- 1.4

33:56 Beats: 1040 Volume: 186.85 cc EGMs: 8229

Orion
Start

Auto
*
INF
SUP
RL
LL
RAO
LAO
PA
AP



Time: 33:56 Beats: 1040 Volume: 186.85 cc EGMs: 8229

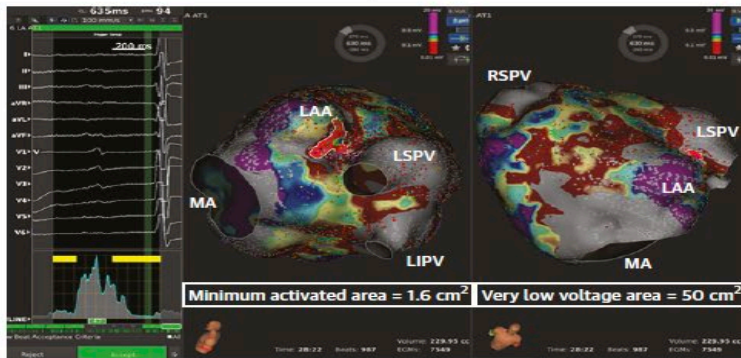
MFI
ABL
Orion

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57 P-wave ATs (45%)



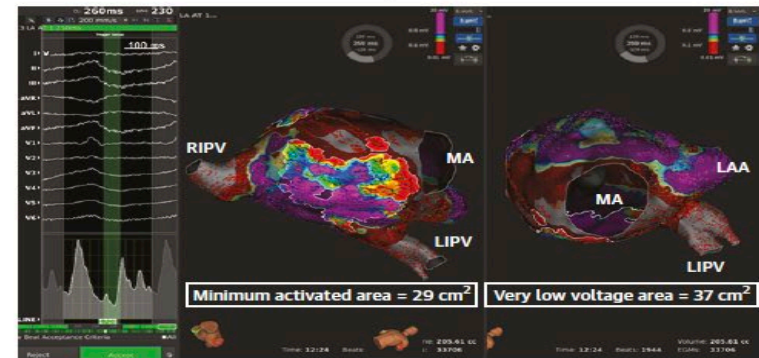
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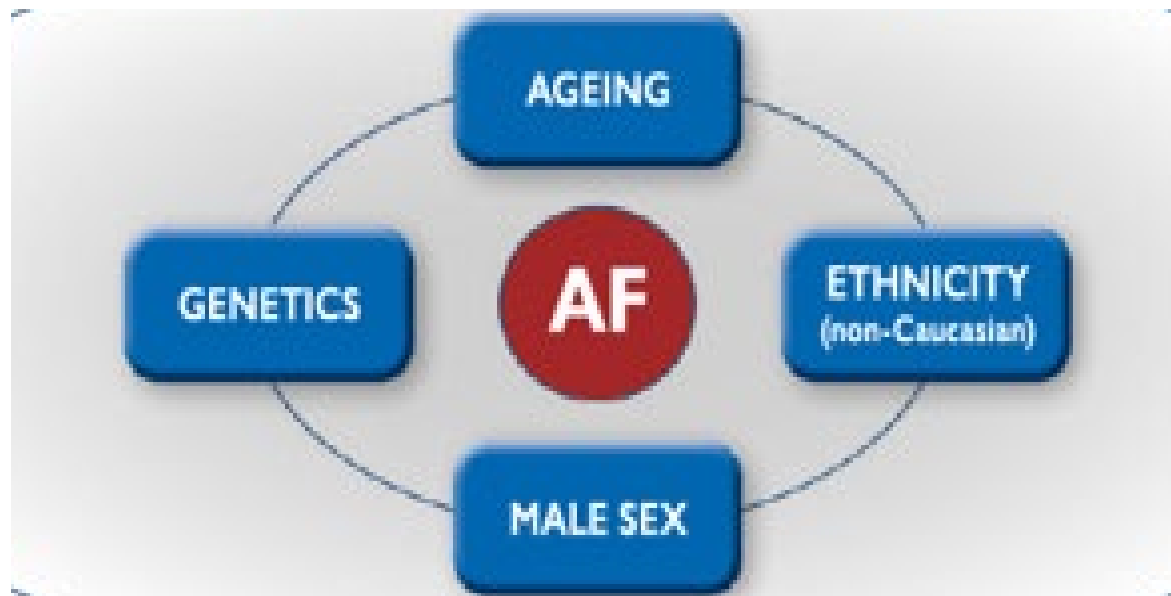


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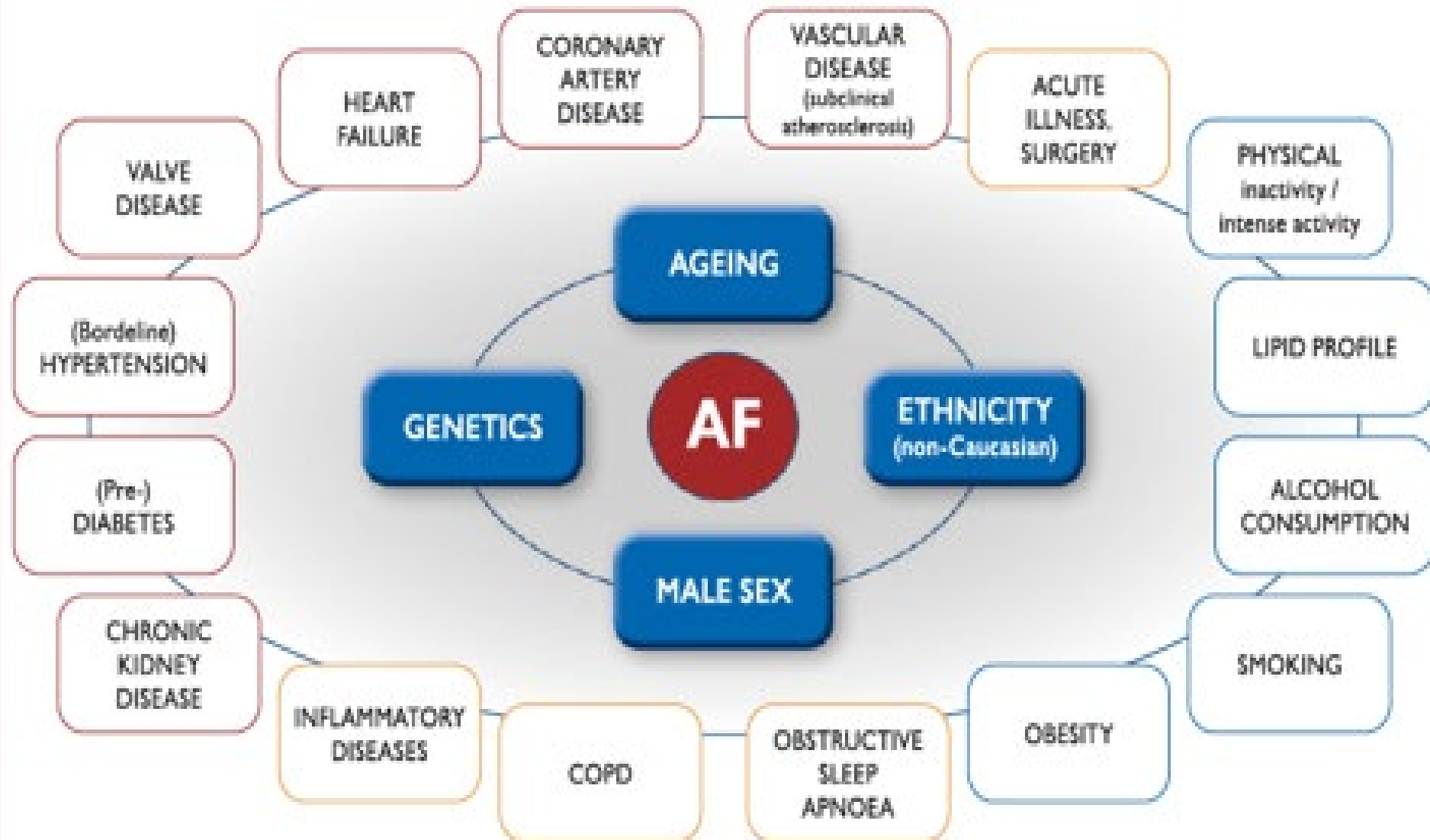


Large ← **Very low voltage area** → Small
 Small ← **Minimum activated area throughout the AT cycle** → Large

Vorhofflimmern – Auslösende Faktoren



Vorhofflimmern – Auslösende Faktoren



“Critical illness associated new onset atrial fibrillation: subsequent atrial fibrillation diagnoses and other adverse outcomes“

Lancini et al., Europace 2023

7030 Pat. auf Intensivstation; 509303 h EKG-Monitoring



309 Pat. mit „critical illness new onset atrial fibrillation“ (CI-NOAF)



235 lebend aus dem Krankenhaus entlassen



75 Pat. (31.9%) mit erneutem AF (median FU 413 Tage)

(CHA₂DS₂-VASC 3.1±1.6)

“Critical illness associated new onset atrial fibrillation: subsequent atrial fibrillation diagnoses and other adverse outcomes“

Lancini et al. Europace 2023

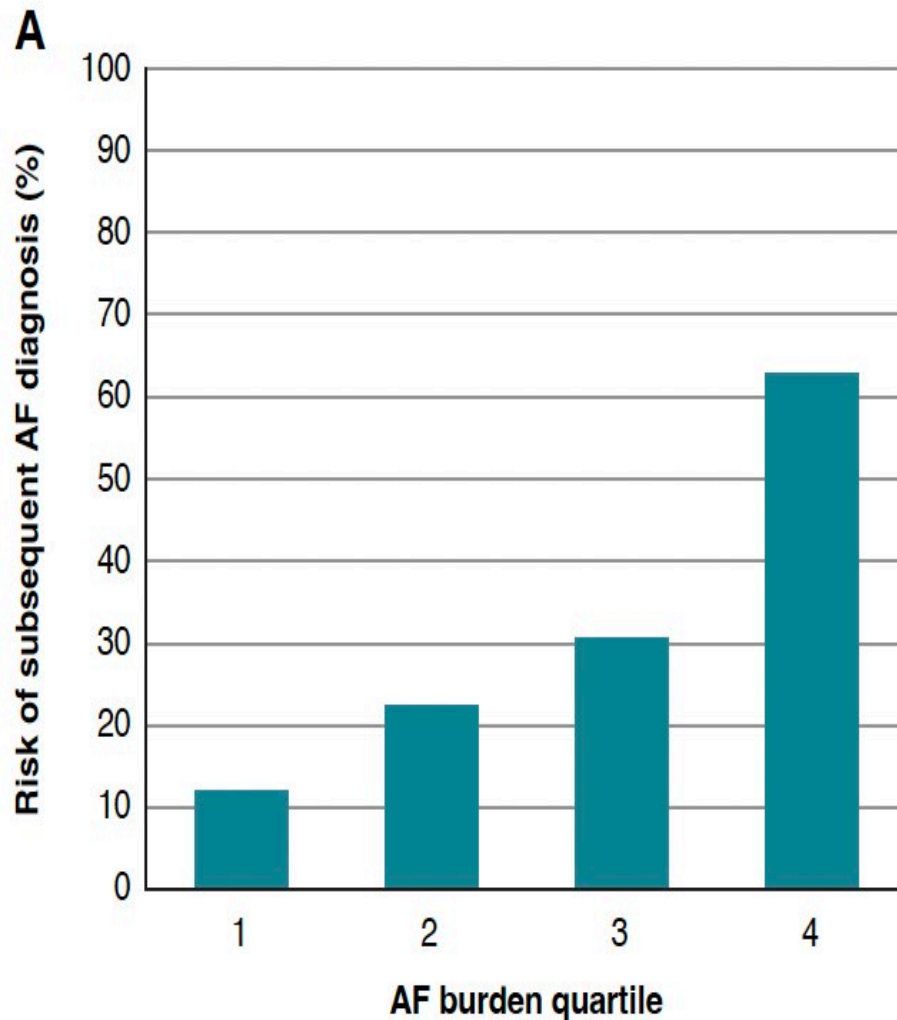


Table 3 Multivariable binary logistic regression of factors associated with subsequent AF diagnosis.

Parameter	Odds ratio (95% CI)	P-value
AF burden	15.03 (2.76–81.70)	0.002
Left atrial area (cm ²)	1.12 (1.03–1.23)	0.010
Creatinine (μmol/L)	1.00 (0.99–1.01)	0.093
Body mass index (kg/m ²)	1.05 (0.99–1.12)	0.109
CHA ₂ DS ₂ VASc score	1.32 (0.90–1.93)	0.163
Coronary artery disease	0.61 (0.16–2.30)	0.469
Renal replacement therapy	1.67 (0.38–7.37)	0.500
Diabetes	0.73 (0.22–2.39)	0.598
Chronic kidney disease	1.42 (0.28–7.32)	0.674
SAPS2 score	1.00 (0.96–1.03)	0.838
LV ejection fraction (%)	1.00 (0.98–1.04)	0.906
Peripheral vascular disease	1.00 (0.20–5.07)	0.995

SAPS2 = simplified acute physiology score 2, LV = left ventricular.

“Critical illness associated new onset atrial fibrillation: subsequent atrial fibrillation diagnoses and other adverse outcomes“

Lancini et al., Europace 2023

INCREASING ATRIOPATHY AND ATRIAL SUBSTRATE

Normal LA size

Low CI-NOAF risk
and burden

Low long term
AF risk

Mild/moderate
LA enlargement

Moderate CI-NOAF
risk and burden

Moderate long term
AF risk

Severe LA
enlargement

High CI-NOAF risk
and burden

High long term
AF risk

CI-NOAF:

- ca. 1/3 der Pat. hat AF im weiteren Verlauf
- AF-Last und LA-Größe sind unabhängige Prädiktoren für erneutes AF
- 63% der Pat. mit >25% „AF burden“ auf ICU haben auch im Verlauf AF

PHILIP

08/02/19

BF 56Hz
12cm

2D
71%
K 50
M Aus
Allg



09:19:44 TIS0.9 MFO.6

S7-2omni/Kard Allg

S3

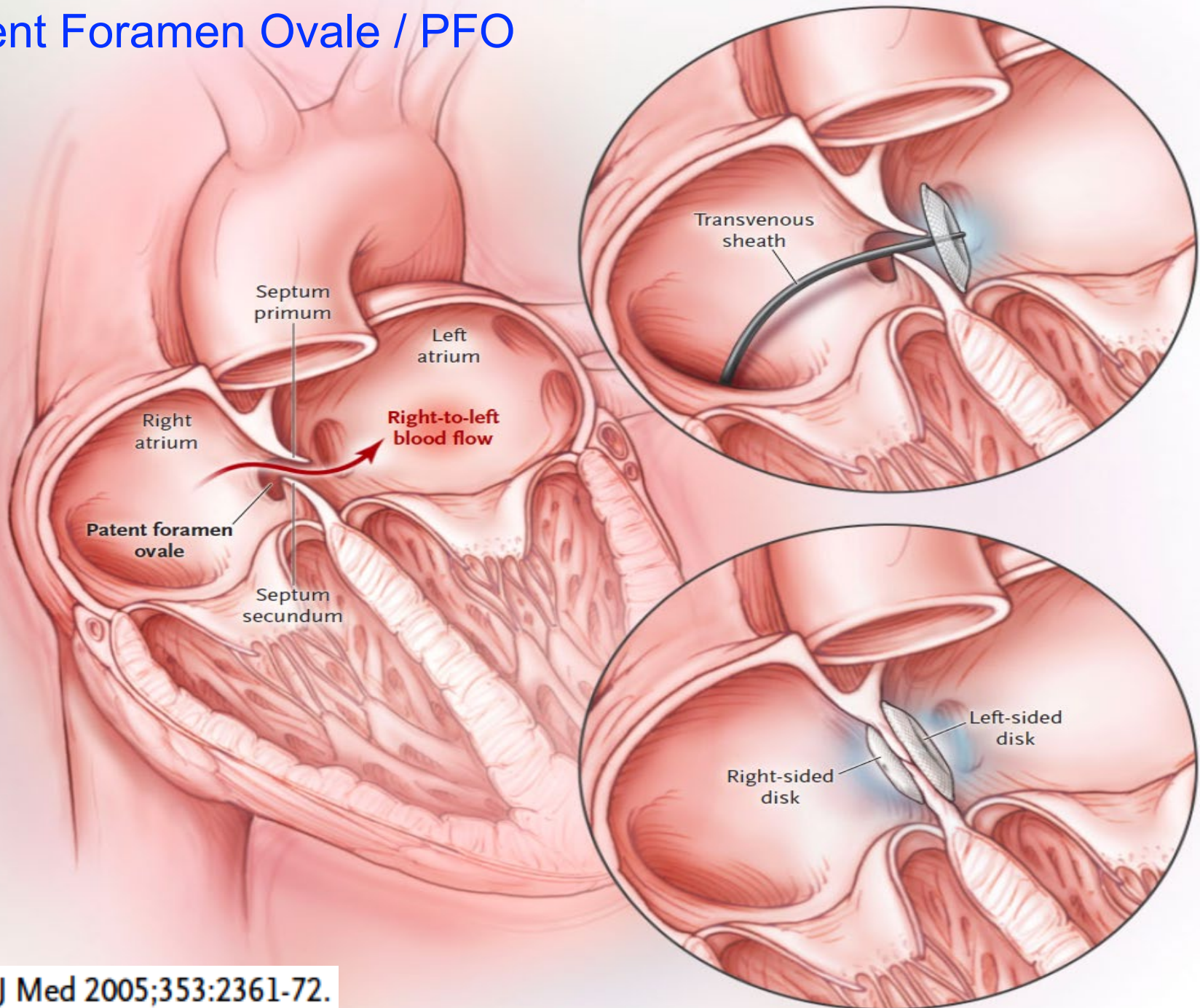
TEE: Bubble-test mit Valsalva



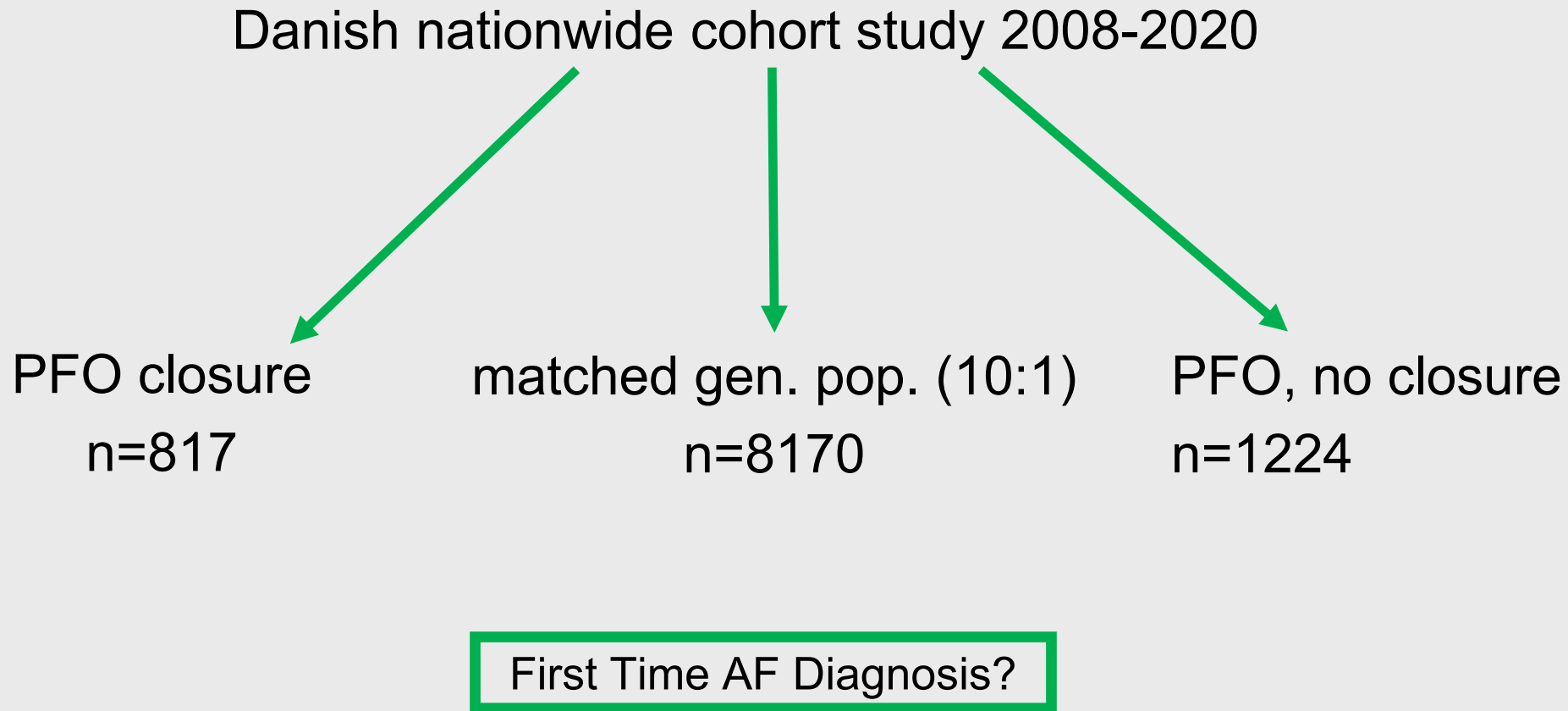
JPEG

87 /min

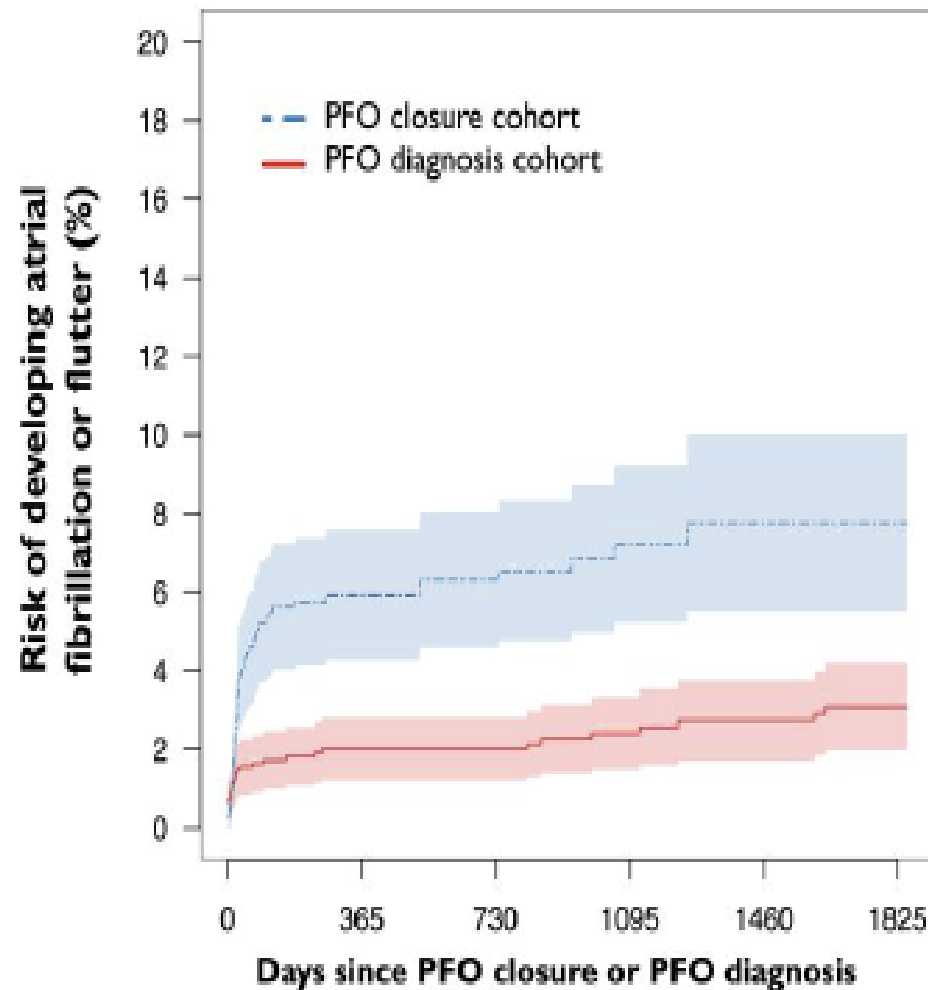
Patent Foramen Ovale / PFO



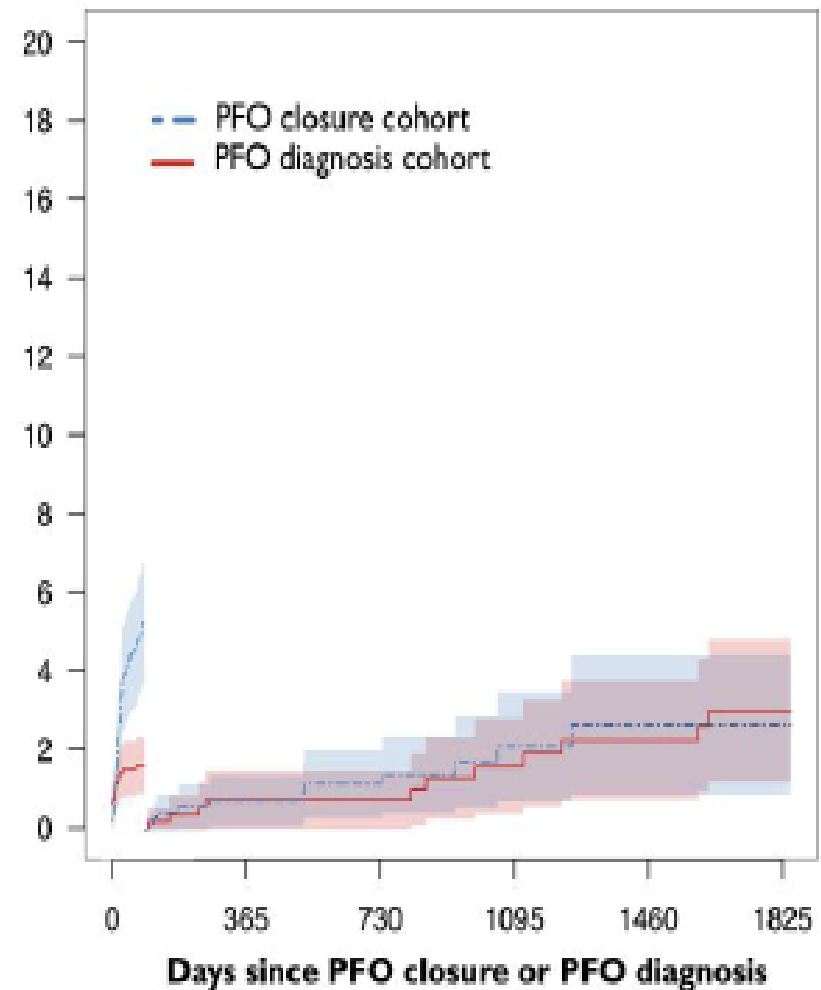
“Long-term risk of atrial fibrillation or flutter after transcatheter patent foramen ovale closure: a nationwide Danish study”
Skibsted et al. EHJ 2023



A Overall



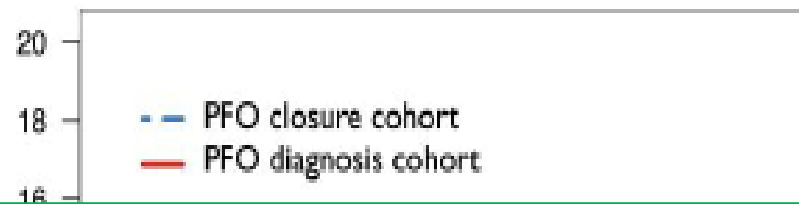
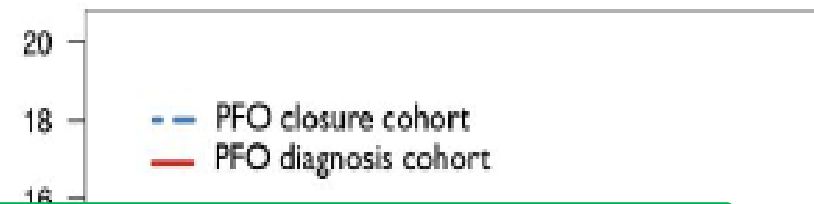
B Before and after 3 months



No. at risk

PFO closure cohort	817	580	397	236	115	79
PFO diagnosis cohort	1224	368	275	212	182	150

817	580	397	236	115	79
1224	368	275	212	182	150

A Overall**B Before and after 3 months**

Conclusions

Patent foramen ovale closure was not associated with any substantial increased long-term risk of developing AF beyond the well-known procedure-related short-term risk of AF.

0 365 730 1095 1460 1825
Days since PFO closure or PFO diagnosis

0 365 730 1095 1460 1825
Days since PFO closure or PFO diagnosis

No. at risk

PFO closure cohort	817	580	397	236	115	79	817	580	397	236	115	79
PFO diagnosis cohort	1224	368	275	212	182	150	1224	368	275	212	182	150

“Atrial pacing minimization in sinus node dysfunction and risk of incident atrial fibrillation: a randomized trial”

Kronborg et al. EHJ 2023

DANPACE II

Patients with sinus node disease



N = 539

N = 269

DDD-40

N = 270

DDDR-60

24 months

**Atrial fibrillation (AF)
> 6 minutes**



DANPACE II

Patients with sinus node disease



N = 539

N = 269

DDD-40

N = 270

DDDR-60

24 months

Atrial fibrillation (AF)
> 6 minutes



Median % atrial pacing

DDD-40

1%

versus

49%

DDDR-60

P < 0.001

DANPACE II

Patients with sinus node disease



N = 539

N = 269

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DDDR-60

24 months

Atrial fibrillation (AF)
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Median % atrial pacing

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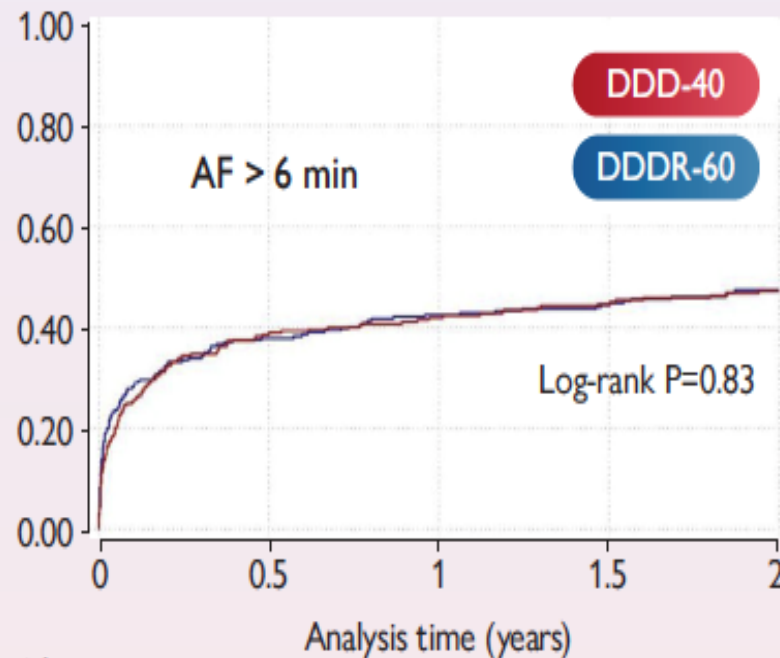
versus

49%

DDDR-60

P < 0.001

Cumulative event rate



Patients at risk

DDD-40	269	161	150	139	124
DDDR-60	270	159	145	140	126

Reduced atrial pacing did not reduce the incidence of AF

DANPACE II

Patients with sinus node disease



N = 539

N = 269

DDD-40

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DDDR-60

24 months

Atrial fibrillation (AF)
> 6 minutes



Median % atrial pacing

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1%

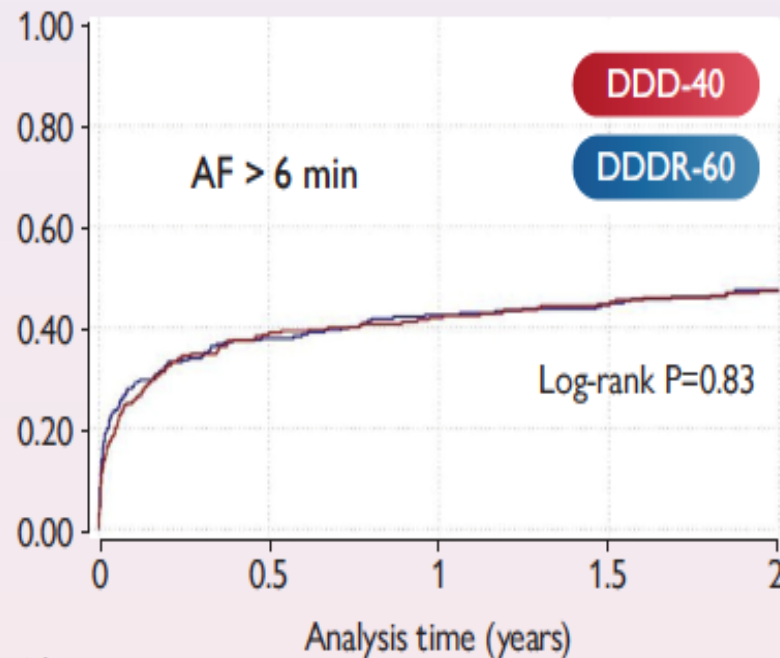
versus

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Cumulative event rate



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DDD-40	269	161	150	139	124
DDDR-60	270	159	145	140	126

Reduced atrial pacing did not reduce the incidence of AF

DDD-40

↑ Crossovers

↑ Syncope/near-syncope

→ Quality of life

→ Exercise quality

Zusammenfassung / Diskussion

- Risikofaktoren Vorhofflimmern -

1. **CI-NOAF** („critical illness new onset atrial fibrillation“)
 - ca. 30% mit AF-Rezidiv innerhalb von ca. 1 Jahr (smart watch Monitoring bei OAC-Terminierung?)
 - erh. Risiko bei dil. LA und initial hohem „AF-burden“

Zusammenfassung / Diskussion

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Zusammenfassung / Diskussion

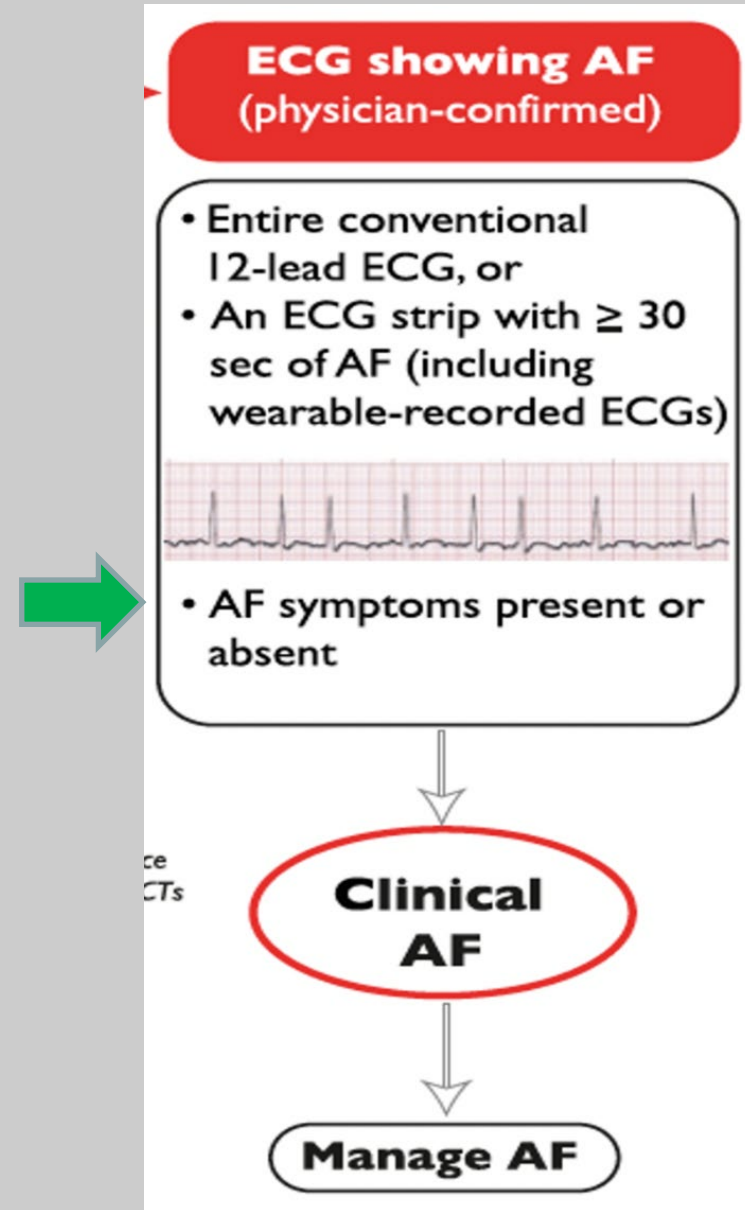
- Risikofaktoren Vorhofflimmern -

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2. **PFO-Occluder:** pass. postproz. AF; kein Nachweis eines dauerhaften mech. induz. AF
3. **Sinusknotensyndrom und Atr. Pacing**
 - höhere atr. Stimulationsrate erhöht nicht AF-Inzidenz
 - mehr Synkopen/Schwindel unter niedriger atr. Stim. (DDD 40)

AF-related OUTCOMES

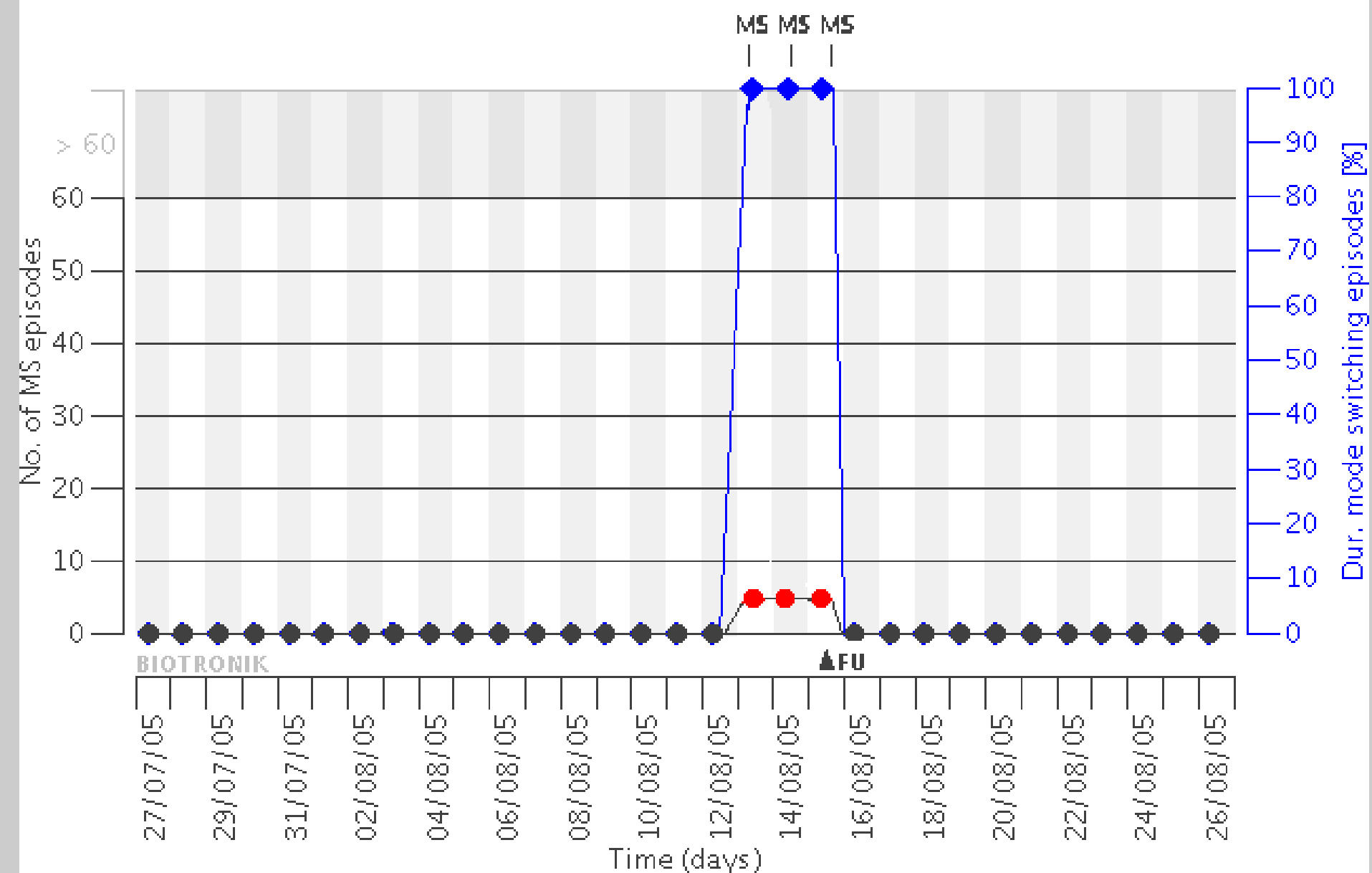
AF-Related Outcome	Frequency in AF	Mechanism(s)
Death 	1.5 - 3.5 fold increase	Excess mortality related to: • HF, comorbidities • Stroke
Stroke 	20-30% of all ischaemic strokes, 10% of cryptogenic strokes	• Cardioembolic, or • Related to comorbid vascular atheroma
LV dysfunction / Heart failure 	In 20-30% of AF patients	• Excessive ventricular rate • Irregular ventricular contractions • A primary underlying cause of AF
Cognitive decline / Vascular dementia 	HR 1.4 / 1.6 (irrespective of stroke history)	• Brain white matter lesions, inflammation, • Hypoperfusion, • Micro-embolism
Depression 	Depression in 16-20% (even suicidal ideation)	• Severe symptoms and decreased QoL • Drug side effects
Impaired quality of life 	>60% of patients	• Related to AF burden, comorbidities, psychological functioning and medication • Distressed personality type
Hospitalizations 	10-40% annual hospitalization rate	• AF management, related to HF, MI or AF related symptoms • Treatment-associated complications

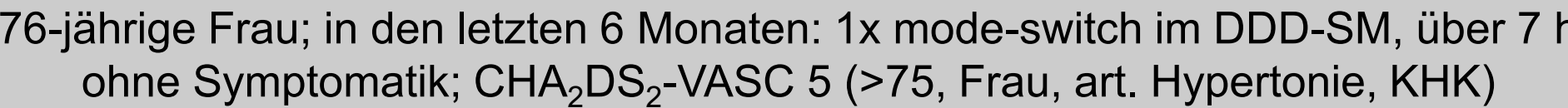
Vorhofflimmern



Mode switching episodes

● No. of mode switching episodes / 24h ◆ Duration of mode switching episodes / 24h [%]





“Apixaban for Stroke Prevention in Subclinical Atrial Fibrillation”

Healy et al. NEJM 2023

4012 Pat. (SM/ICD), 76.8 ± 7.6 J., $\text{CHA}_2\text{DS}_2\text{-VASc}$ 3.9 ± 1.1



Subclinical „device-detected“ AF: 6 min bis max. 24 h

NOAC-Apixaban

FU 3.5 ± 1.8 J.

ASS 81 mg/T.

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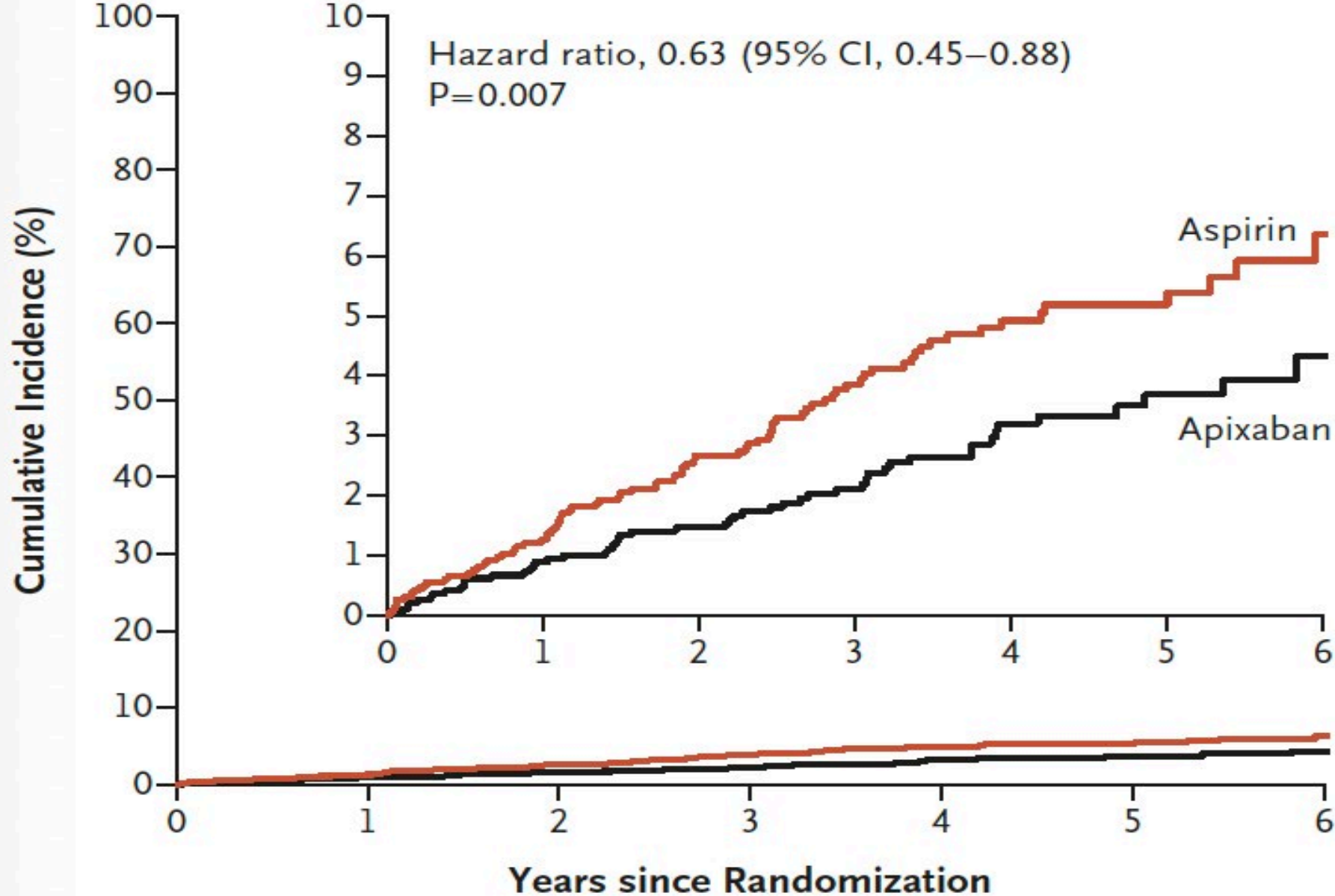


55 Pat.

Primärer Endpunkt:
Schlaganfall und syst. Embolie



86 Pat.



No. at Risk

Aspirin	1997	1777	1539	1120	780	468	200
Apixaban	2015	1786	1558	1157	820	474	214

“Apixaban for Stroke Prevention in Subclinical Atrial Fibrillation”

Healy et al. NEJM 2023

„on-treatment“-Analyse
„major bleeding“:

Apixaban	86 1.71%/Pat.-J.	ASS	47 0.94%/Pat.-J.
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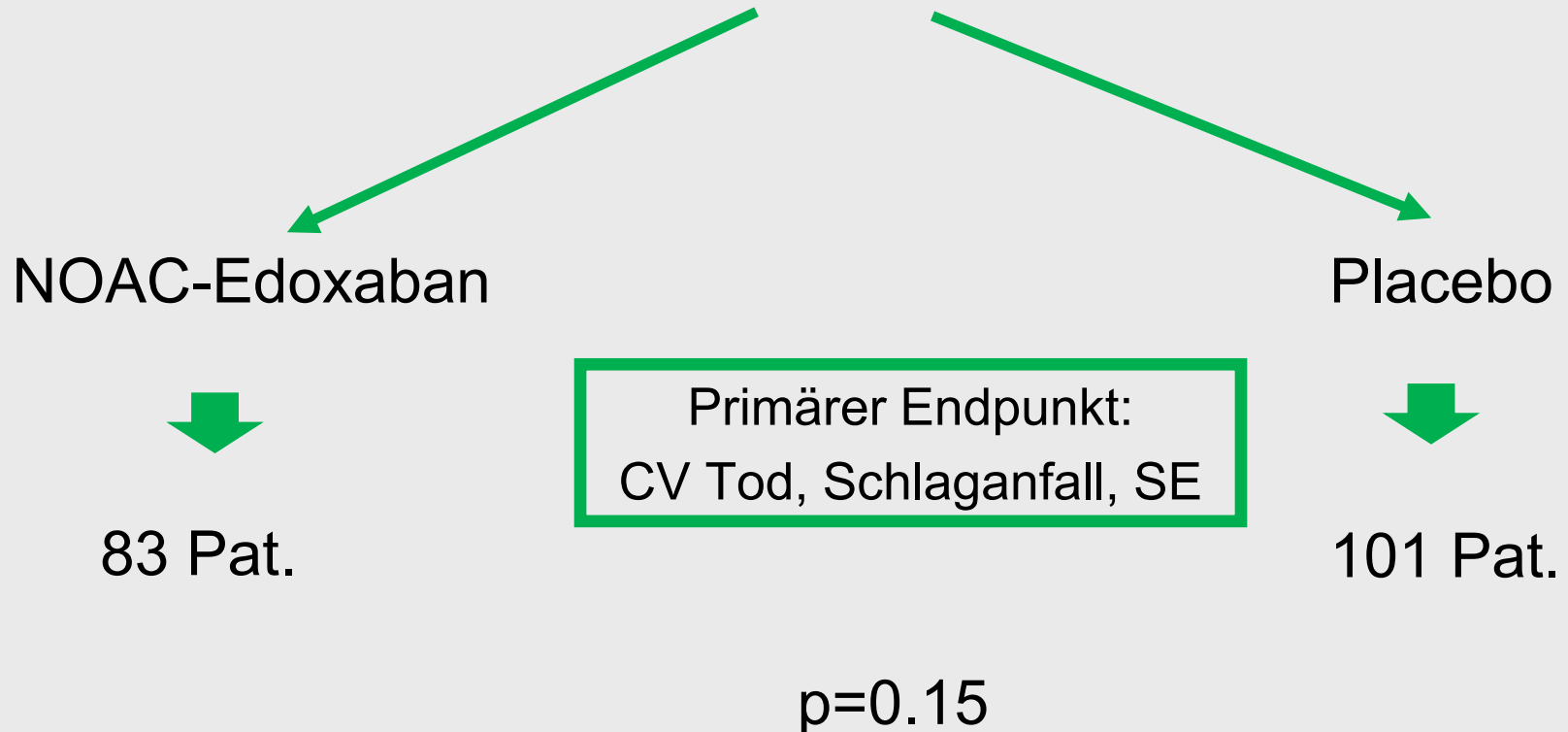
HR 1.80; 95% CI, 1.26 to 2.57;
P = 0.001

	Apixaban		ASS	
Fatal bleeding	5	0.10	8	0.16
Symptomatic intracranial hemorrhage	12	0.24	15	0.30
Gastrointestinal bleeding	45	0.89	20	0.40
Transfusion performed	26	0.51	18	0.36

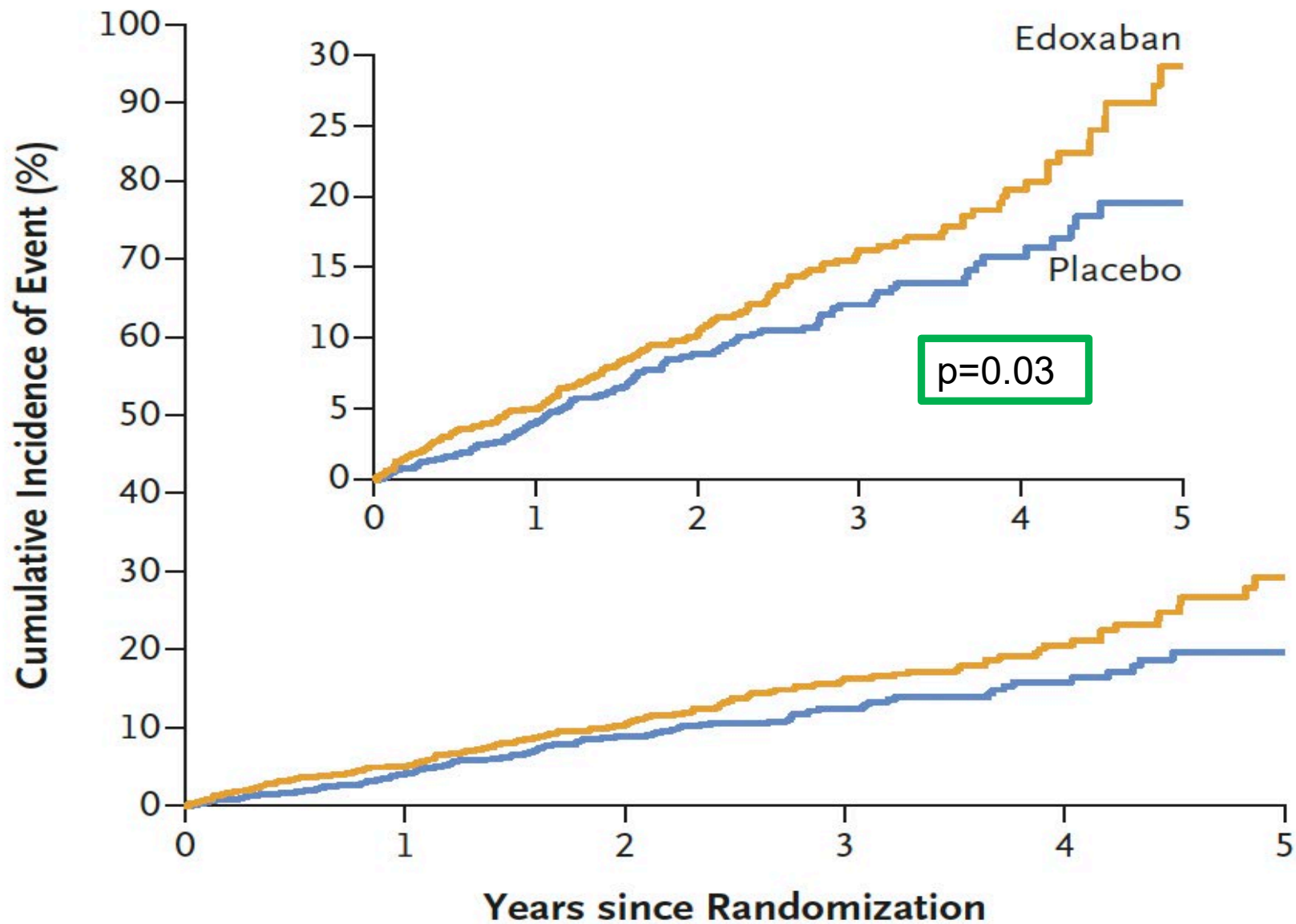
“Anticoagulation with Edoxaban in Patients with Atrial High-Rate Episodes”

Kirchhof et al. NEJM 2023

2536 Pat. (SM/ICD), 78 J., median CHA2DS2-VASc 4.0
median AHRE Dauer: 2.8 h



B Major Bleeding or Death from Any Cause



No. at Risk (no. of events)

Edoxaban	1270 (57)	866 (41)	551 (30)	324 (11)	145 (10)	44
Placebo	1266 (42)	829 (36)	538 (17)	332 (9)	138 (5)	49

“Anticoagulation with Edoxaban in Patients with long Atrial High-Rate Episodes ≥ 24 h”

Becher et al. EHJ 2024

Anticoagulation in patients with long Atrial High-Rate Episodes (AHRE) ≥ 24 hours

A subanalysis of the Non-vitamin K antagonist Oral anticoagulation in patients with Atrial High rate episodes (NOAH-AFNET 6) trial



259/2389 patients with device-detected AHRE ≥ 24 hours
(78 years old, 37% women, median CHA₂DS₂-VASC score 4)

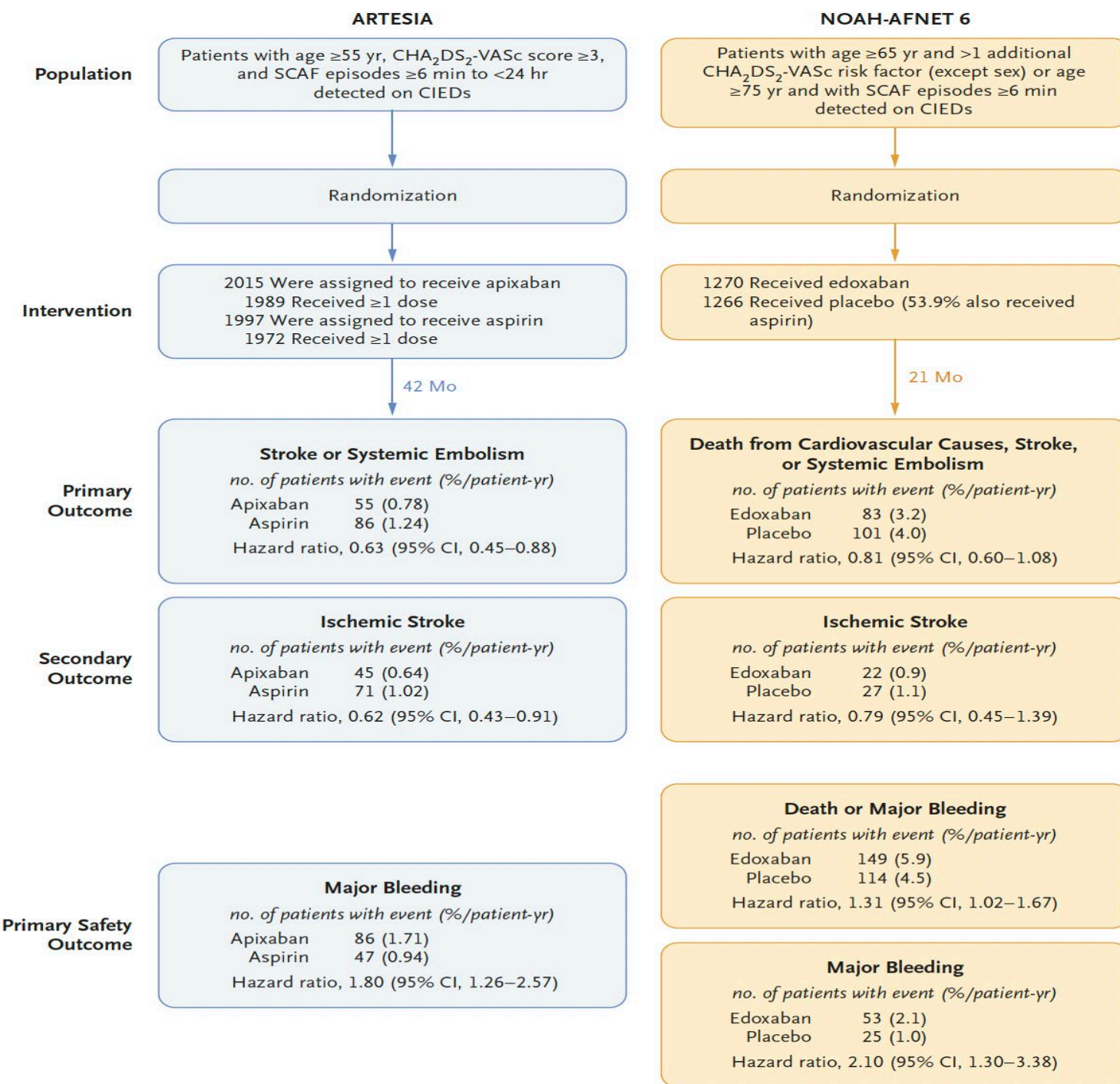


AHRE reviewed by Corelab

Ischemic Stroke Rate by AHRE Duration and Treatment*

AHRE < 24 hours events/N (%/patient-years)			AHRE ≥ 24 hours events/N (%/patient-years)		
Anticoagulation	Placebo	HR (95% CI)	Anticoagulation	Placebo	HR (95% CI)
20/1062 (0.90)	21/1068 (0.96)	0.92 (0.50, 1.70)	2/132 (0.95)	2/127 (0.97)	1.03 (0.14, 7.32)

*p-interaction=0.89



*“What Lies beneath the Surface
— Treatment of Subclinical Atrial Fibrillation”*
Svennberg et al. NEJM 2023

“Direct Oral Anticoagulants for Stroke Prevention in Patients with Device-Detected Atrial Fibrillation: A Study-Level Meta-Analysis of the NOAH-AFNET 6 and ARTESiA Trials”

McIntyre et al. Circulation 2024

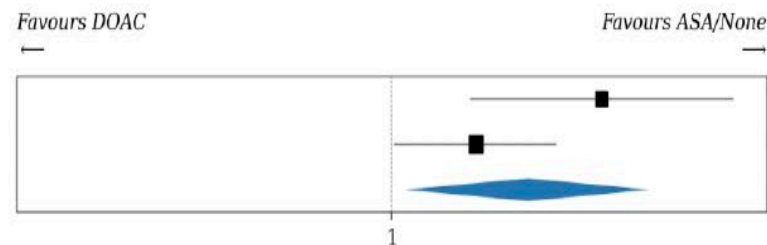
Major Bleeding

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	53/1,270	(4.2%)	25/1,266	(2.0%)	41.1%	2.11 [1.32, 3.38]
ARTESiA	106/2,015	(5.3%)	78/1,997	(3.9%)	58.9%	1.35 [1.01, 1.79]
Pooled Estimate	159/3,285	(4.8%)	103/3,263	(3.2%)	I²: 61%	1.62 [1.05, 2.5]

Mantel-Haenszel, DerSimonian-Laird
Random Effects

$p=0.03$, $z=2.18$
 $\tau^2=0.06$

RR: Risk Ratio
CI: Confidence Interval



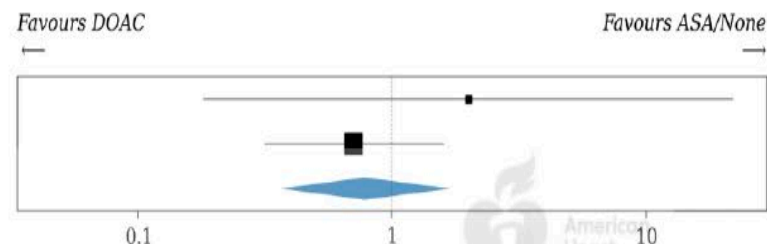
Fatal Bleeding

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	2/1,270	(0.2%)	1/1,266	(0.1%)	10.2%	1.99 [0.18, 21.96]
ARTESiA	10/2,015	(0.5%)	14/1,997	(0.7%)	89.8%	0.71 [0.32, 1.59]
Pooled Estimate	12/3,285	(0.4%)	15/3,263	(0.5%)	I²: 0%	0.79 [0.37, 1.69]

Mantel-Haenszel, DerSimonian-Laird
Random Effects

$p=0.34$, $z=0.61$
 $\tau^2=0.00$

RR: Risk Ratio
CI: Confidence Interval



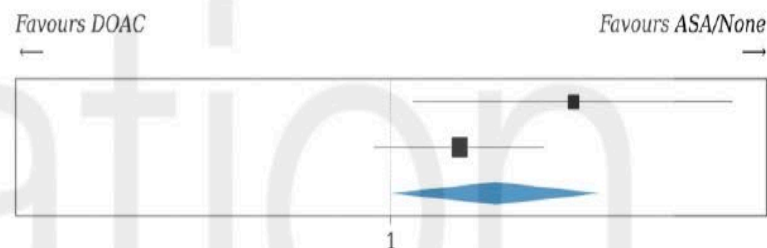
All-cause Mortality or Major Bleeding

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	149/1,270	(11.7%)	114/1,266	(9.0%)	31.9%	1.3 [1.03, 1.64]
ARTESiA	431/2,015	(21.4%)	387/1,997	(19.4%)	68.1%	1.1 [0.98, 1.25]
Pooled Estimate	580/3,285	(17.7%)	501/3,263	(15.4%)	I²: 35%	1.16 [1.0, 1.35]

Mantel-Haenszel, DerSimonian-Laird
Random Effects

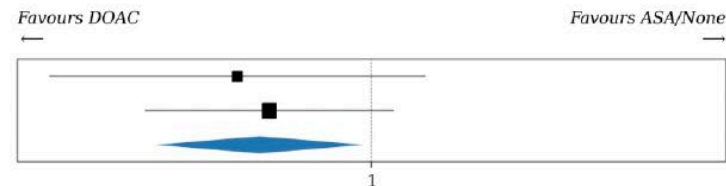
$p=0.05$, $z=1.96$
 $\tau^2=0.00$

RR: Risk Ratio
CI: Confidence Interval



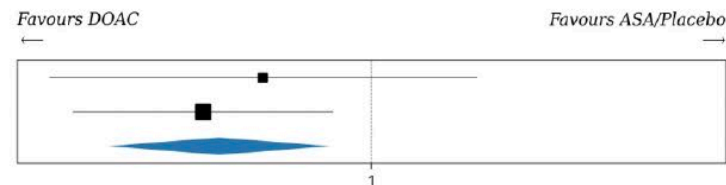
Composite of All-cause Stroke, Peripheral Arterial Embolism, Myocardial Infarction, Pulmonary Embolism or Cardiovascular Death

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	83/1,270	(6.5%)	101/1,266	(8.0%)	30.4%	0.82 [0.62, 1.08]
ARTESiA	189/2,015	(9.4%)	218/1,997	(10.9%)	69.6%	0.86 [0.71, 1.03]
Pooled Estimate	272/3,285	(8.3%)	319/3,263	(9.8%)	I²: 0%	0.85 [0.73, 0.99]
Mantel-Haenszel, DerSimonian-Laird Random Effects		p=0.03, z=2.11 τ ² =0.00		RR: Risk Ratio CI: Confidence Interval		



All-cause Stroke

Study	DOAC	(%)	ASA/Placebo	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	22/1,270	(1.7%)	29/1,266	(2.3%)	27.1%	0.76 [0.44, 1.31]
ARTESiA	55/2,015	(2.7%)	84/1,997	(4.2%)	72.9%	0.65 [0.46, 0.91]
Pooled Estimate	77/3,285	(2.3%)	113/3,263	(3.5%)	I²: 0%	0.68 [0.51, 0.9]
Mantel-Haenszel, DerSimonian-Laird Random Effects		p=0.01, z=2.68 τ ² =0.00		RR: Risk Ratio CI: Confidence Interval		



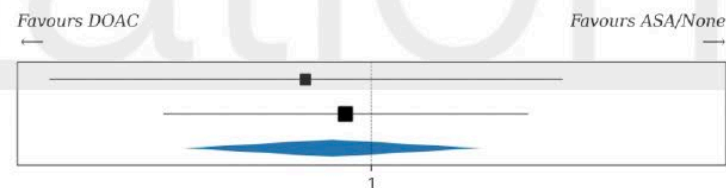
All-cause Stroke or Systemic Embolism

Study	DOAC	(%)	ASA/Placebo	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	23/1,270	(1.8%)	33/1,266	(2.6%)	28.5%	0.69 [0.41, 1.18]
ARTESiA	55/2,015	(2.7%)	86/1,997	(4.3%)	71.5%	0.63 [0.45, 0.88]
Pooled Estimate	78/3,285	(2.4%)	119/3,263	(3.6%)	I²: 0%	0.65 [0.49, 0.86]
Mantel-Haenszel, DerSimonian-Laird Random Effects		p=0.00, z=2.99 τ ² =0.00		RR: Risk Ratio CI: Confidence Interval		



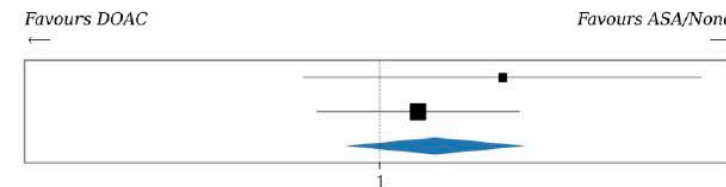
Cardiovascular Death

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	52/1,270	(4.1%)	57/1,266	(4.5%)	33.6%	0.91 [0.63, 1.31]
ARTESiA	105/2,015	(5.2%)	108/1,997	(5.4%)	66.4%	0.96 [0.74, 1.25]
Pooled Estimate	157/3,285	(4.8%)	165/3,263	(5.1%)	I²: 0%	0.95 [0.76, 1.17]
Mantel-Haenszel, DerSimonian-Laird Random Effects		p=0.60, z=0.52 τ ² =0.00		RR: Risk Ratio CI: Confidence Interval		



All-cause Mortality

Study	DOAC	(%)	ASA/None	(%)	Weight	RR [95% CI]
NOAH-AFNET 6	111/1,270	(8.7%)	94/1,266	(7.4%)	20.6%	1.18 [0.9, 1.53]
ARTESiA	362/2,015	(18.0%)	341/1,997	(17.1%)	79.4%	1.05 [0.92, 1.2]
Pooled Estimate	473/3,285	(14.4%)	435/3,263	(13.3%)	I²: 0%	1.08 [0.96, 1.21]
Mantel-Haenszel, DerSimonian-Laird Random Effects		p=0.23, z=1.21 τ ² =0.00		RR: Risk Ratio CI: Confidence Interval		



Zusammenfassung / Diskussion

- Antikoagulation/“Subclinical AF/AHRE -

1. Artesia / NOAH AF-Net:

- red. Schlaganfallrate / vermehrte Blutungen
- Keine klare Empfehlung zur OAC: individuelle Risiko-Nutzenbewertung: Risikoprofil Schlaganfall vs Risiko Blutung

2. Perspektive: „tight monitoring“ / „remote Monitoring“: Schwellenüberschreitung!

SUPRAVENTRIKULÄRE RHYTHMUSSTÖRUNGEN

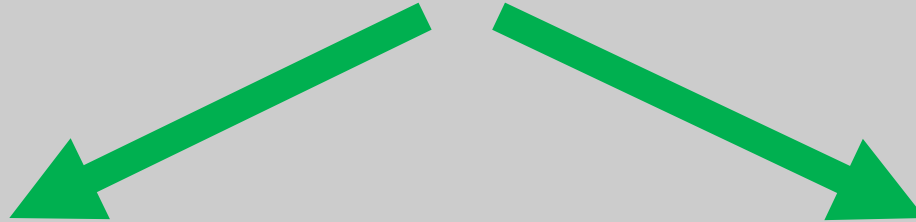
1 Akuttherapie - Herzrhythmusstörungen

- Mechanische Terminierung SVT: Valsalva und Variationen
- Bradykardie und “Torsades de pointes” Tachykardie

2 Atriale Tachyarrhythmien

- Ektopie atriale Tachykardie
- Vorhofflimmern
 - Epidemiologie, Prognose, Pathogenese und Diagnostik
 - Therapie: Differentialtherapie, Rhythmus- oder Frequenzkontrolle
 - Embolie- und Schlaganfallprophylaxe: Orale Antikoagulation und LAA-Okkluder

Vorhofflimmern – Therapie („Rate vs Rhythm Control“)



**„Rate Control“ –
Pseudoregularisierung**

(AVN-Leitungsverz.: u.a. β -Blocker, Digitalis; AVN-Ablation)



Zielfrequenz?

**„Rhythm Control“ –
Sinusrhythmuserhalt**

(Antiarrhythmika; Kardioversion; LA-Ablationsbehandlung)

Outline of rate control therapy



- Lenient rate control
- Heart rate <110 bpm (12 lead ECG)

- Symptoms or deterioration of LV function or CRT (CRT-P or CRT-D)

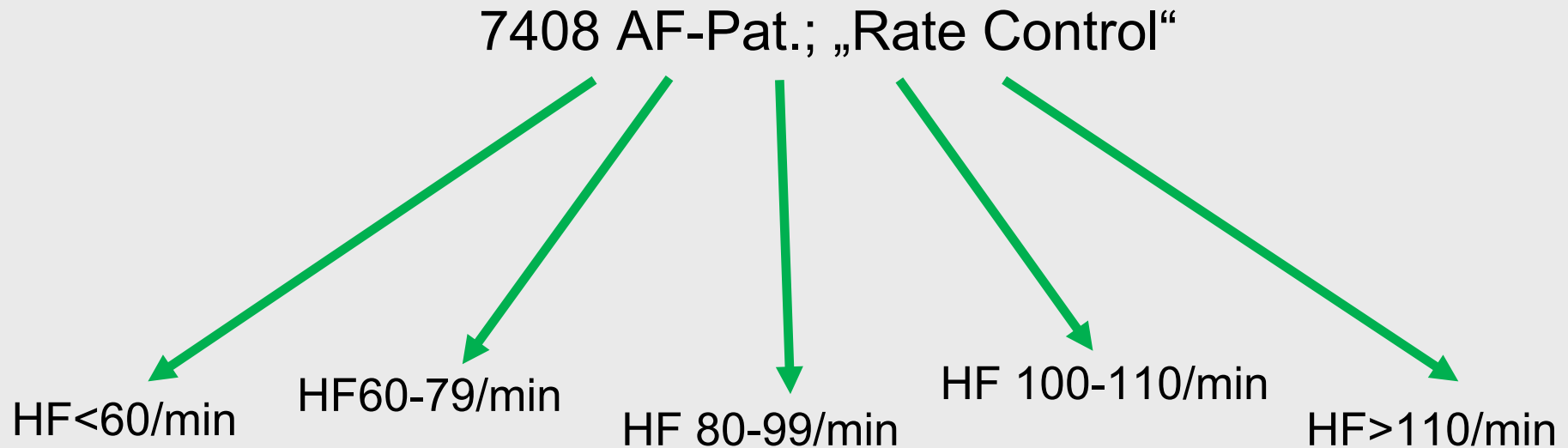


- Lower heart rate: aim heart rate <80 bpm (12 lead ECG)
- Lower heart rate in CRT aimed at continuous biventricular pacing
- Assess heart rate during exercise: gradual increase of heart rate: heart rate <110 bpm at 25% duration of maximal exercise time
- In CRT patients: assess continuous biventricular pacing during exercise
- Perform 24 hour Holter monitoring for safety

Consider rhythm control or atrioventricular node ablation if symptoms or deterioration of LV function / tachycardiomyopathy persist or when continuous biventricular pacing in CRT is not achieved

“Ventricular rate in atrial fibrillation and the risk of heart failure and death“

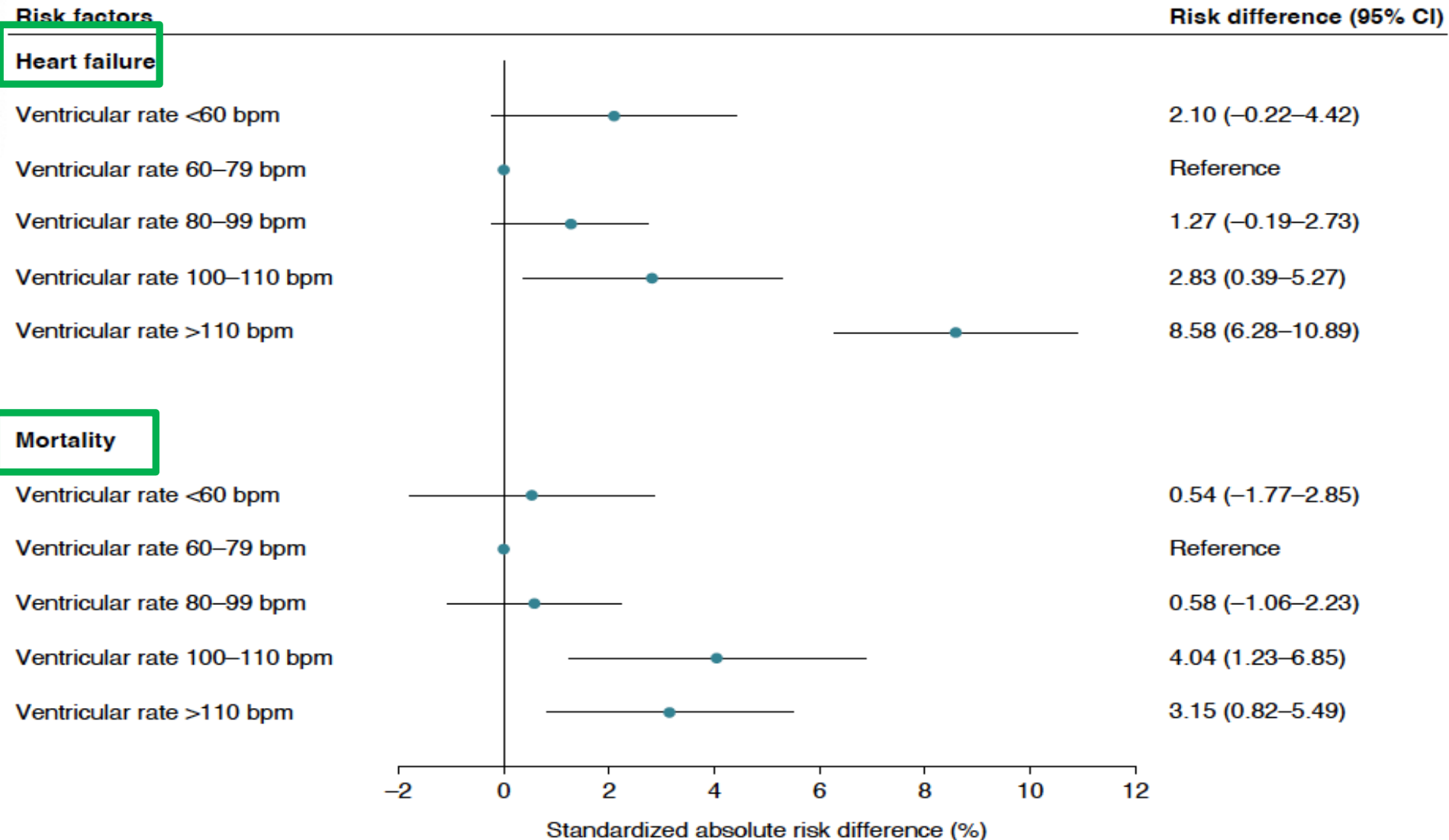
Westergaard et al. Europace 2023



Neu-aufgetretene Herzinsuffizienz und
Mortalität innerhalb eines Jahres?

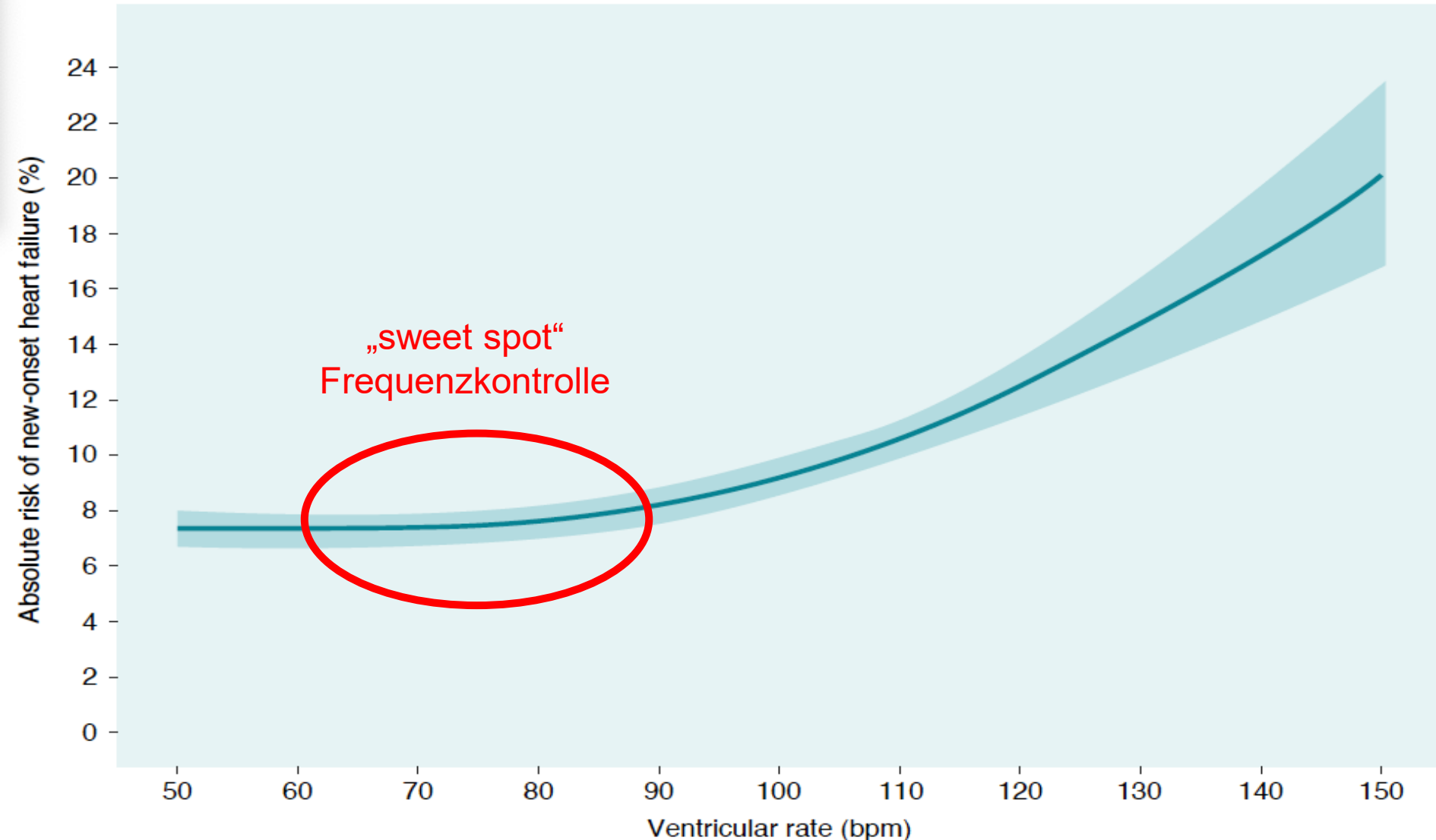
“Ventricular rate in atrial fibrillation and the risk of heart failure and death”

Westergaard et al. Europace 2023



“Ventricular rate in atrial fibrillation and the risk of heart failure and death”

Westergaard et al. Europace 2023



Run baby run ... but not too fast! Rate control management in atrial fibrillation: a claim for personalization

Europace (2023) 25, 1–3

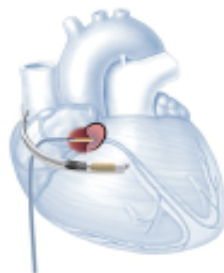
Igor Diemberger ^{1,2*} and Giuseppe Boriani ³

HEART RATE ASSESSMENT



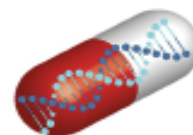
- Device selection
- Integration of other parameters (e.g. activity level)

ABLATE AND PACE



- Patient selection
- CIED complications
- Pacing configuration

PERSONALIZATION OF DRUG TREATMENT



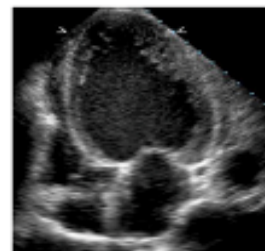
- Prediction of response by clinical profile
- Prediction of response by biomarkers (e.g. BNP)
- Pharmacogenomics

COMBINATION OF DRUG TREATMENT



- Maximize drug dose vs. drug association
- Use of BB and CCB association

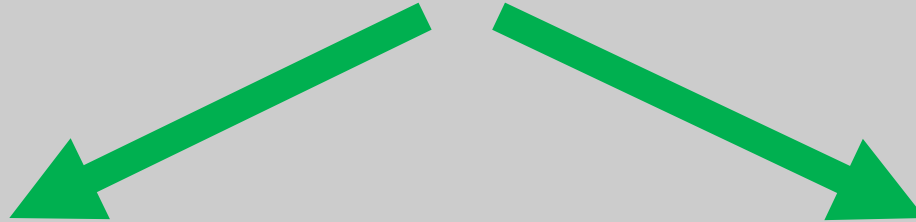
LV DYSFUNCTION/HEART FAILURE PATIENTS



- Possible use of CCB in selected patients
- HR target in specific conditions
- Hybrid therapy (Drug+ CIED)



Vorhofflimmern – Therapie („Rate vs Rhythm Control“)



**„Rate Control“ –
Pseudoregularisierung**

(AVN-Leitungsverz.: u.a. β -Blocker, Digitalis; AVN-Ablation)

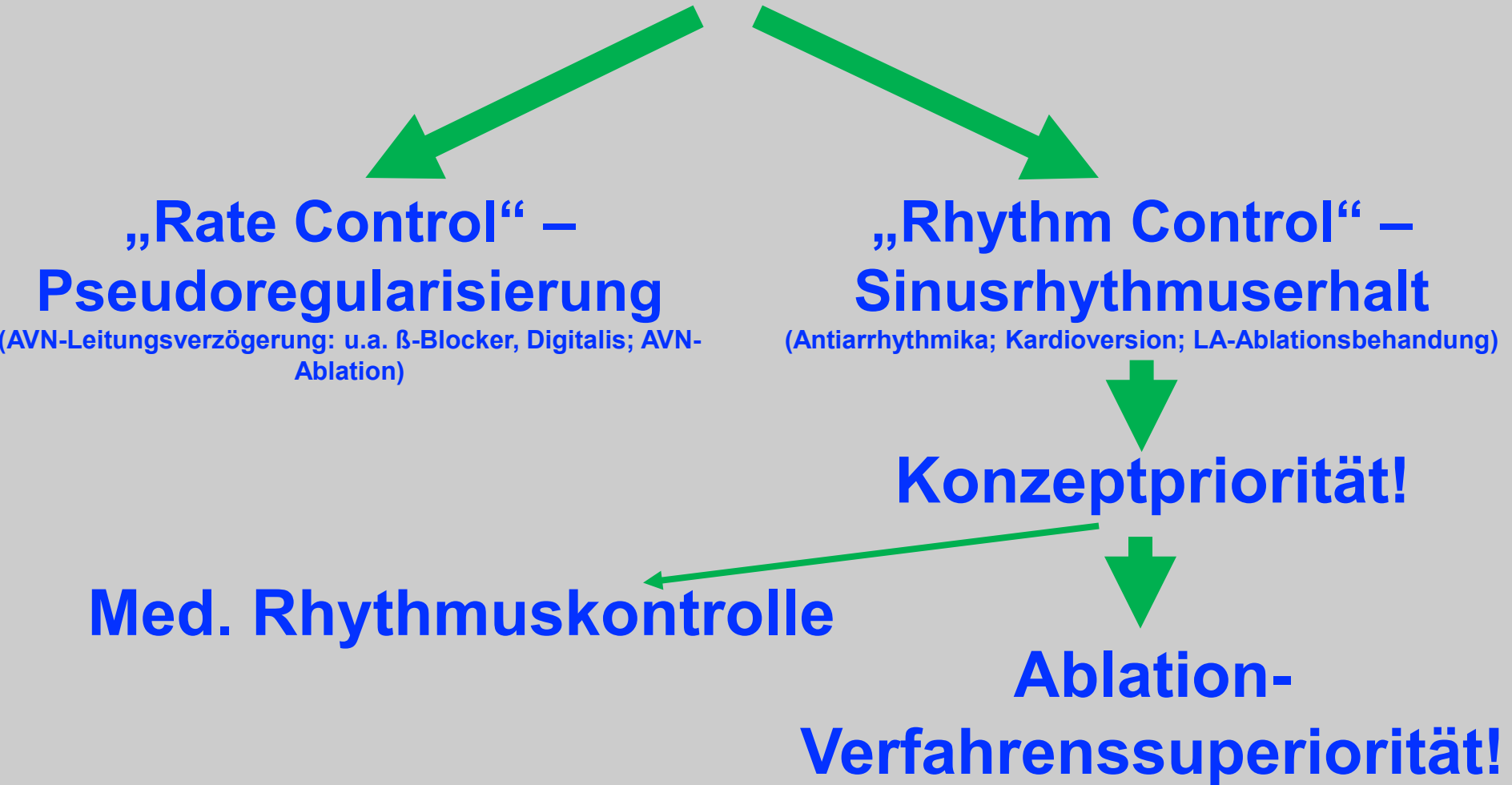
**„Rhythm Control“ –
Sinusrhythmuserhalt**

(Antiarrhythmika; Kardioversion; LA-Ablationsbehandlung)



**Konzeptpriorität!
(u.a. EAST AF-Net)**

Vorhofflimmern – Therapie („Rate vs Rhythm Control“)

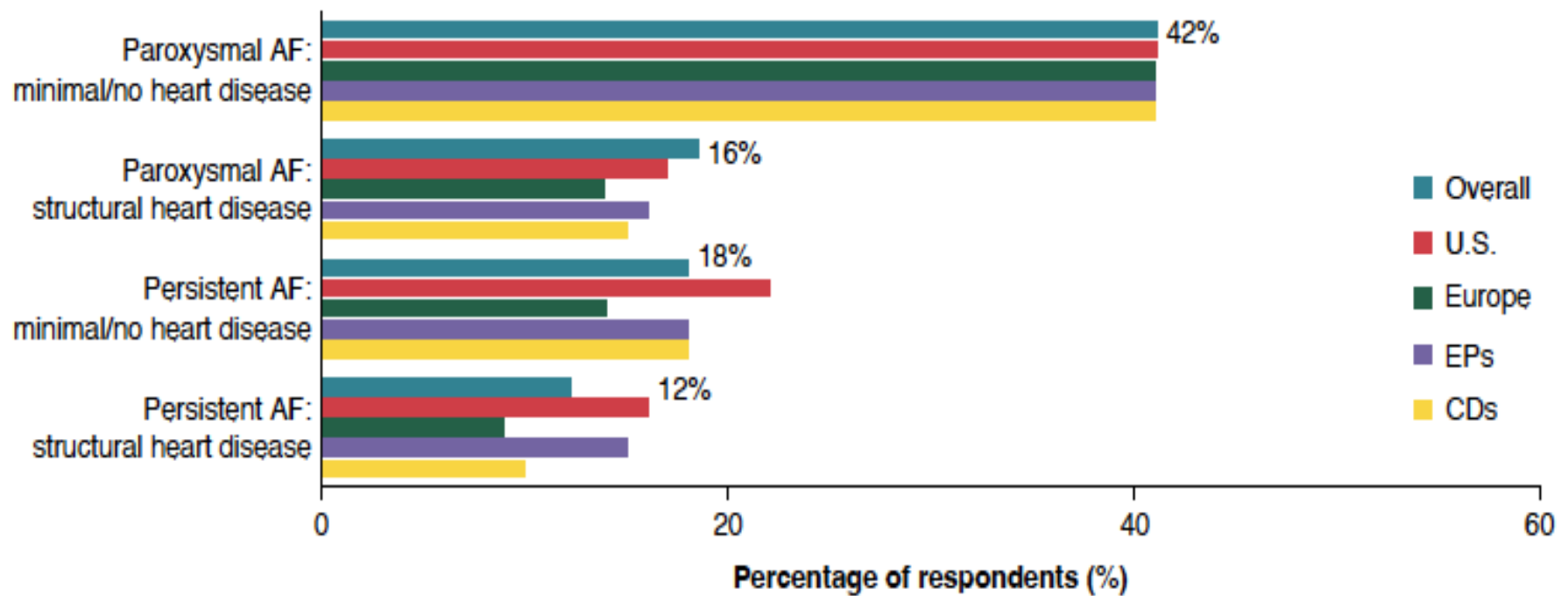


“Real-world utilization of the pill-in-the-pocket method for terminating episodes of atrial fibrillation: data from the multinational Antiarrhythmic Interventions for Managing Atrial Fibrillation (AIM-AF) survey”

Reiffel et al. Europace 2023

600 Kardiologen weltweit - Antiarrhythmic Interventions for Managing Atrial Fibrillation (AIM-AF) survey.

Proportion of patients treated using the PITP approach

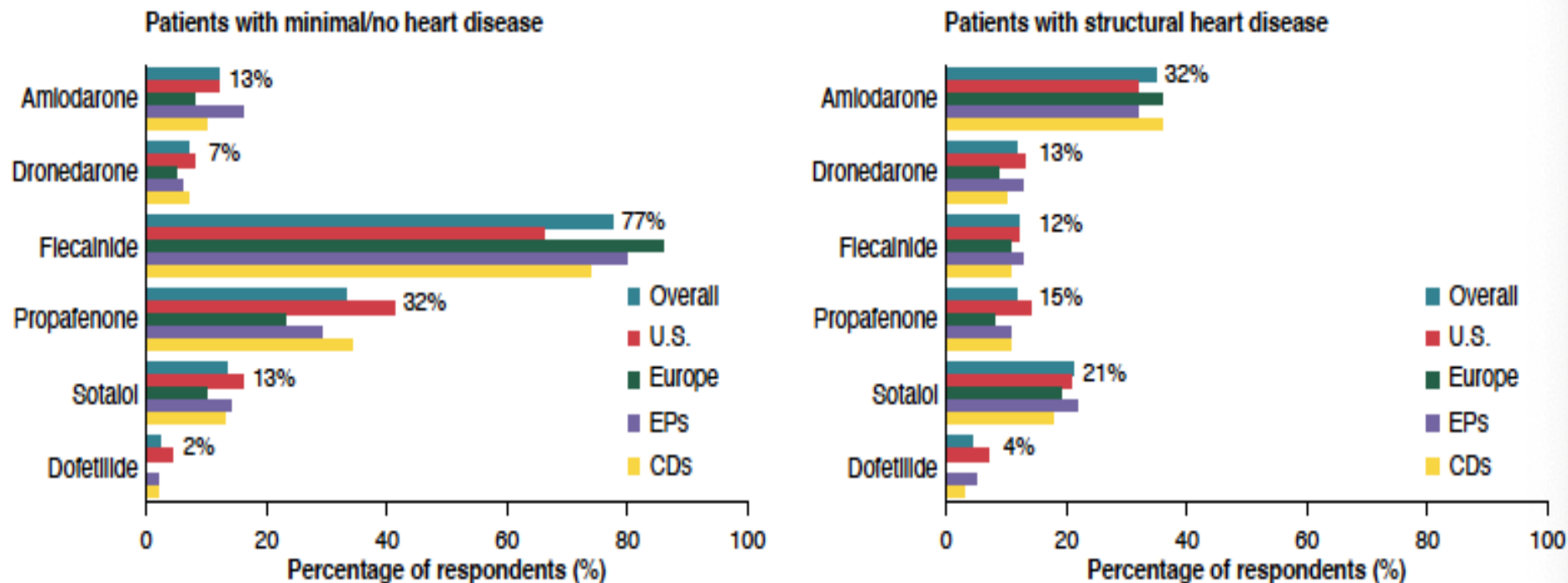


- Overall, respondents reported using PITP in 23% (23% Europe vs. 24% U.S.) of their patients with paroxysmal or persistent AF.
- For persistent AF, PITP was higher in the U.S. than Europe (22% vs. 15%) with minimal or no SHD and 16% vs. 10% with SHD.

“Real-world utilization of the pill-in-the-pocket method for terminating episodes of atrial fibrillation: data from the multinational Antiarrhythmic Interventions for Managing Atrial Fibrillation (AIM-AF) survey”

Reiffel et al. Europace 2023

Antiarrhythmic drug selection for PITP

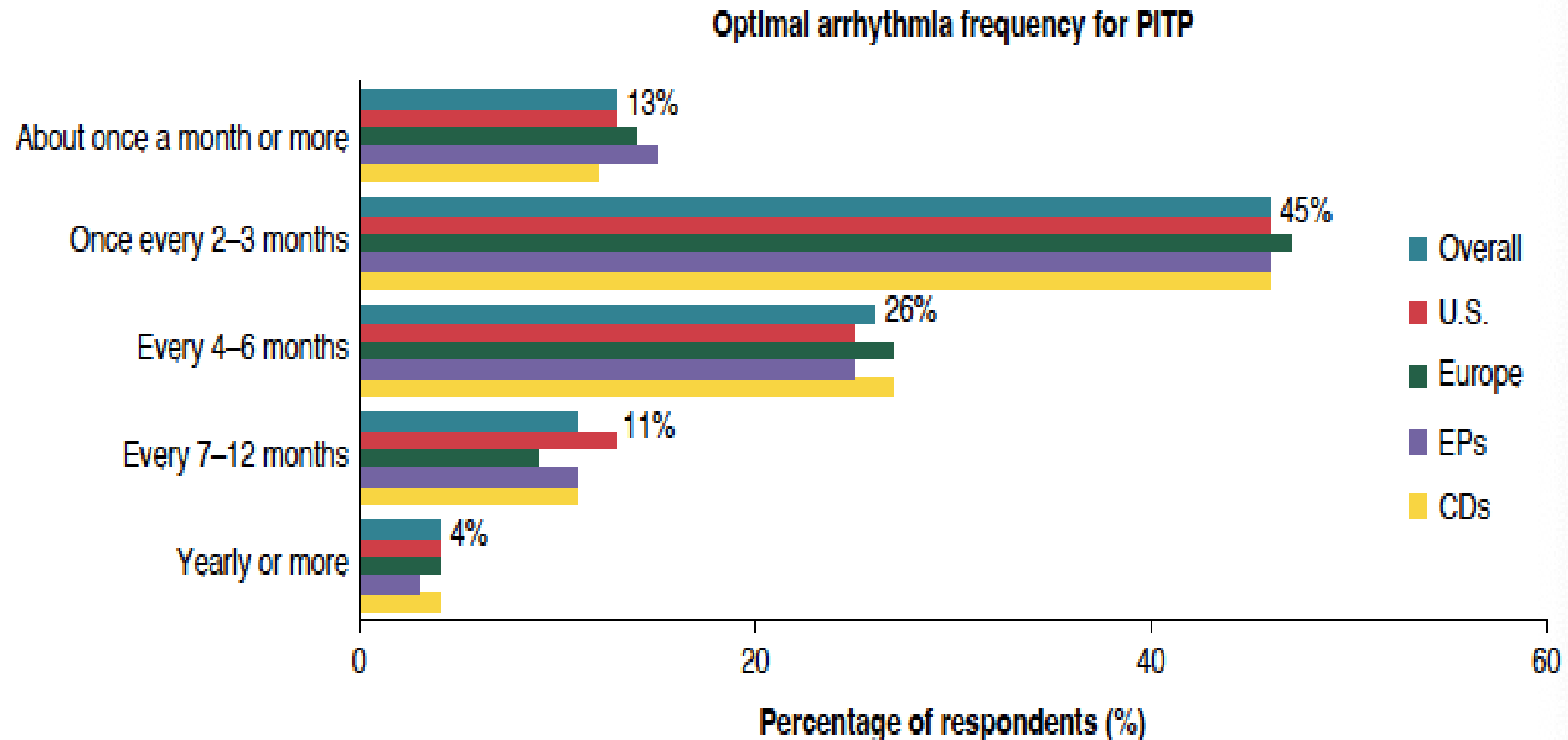


- Amlodarone is considered an inappropriate agent for PITP therapy, owing to its long onset of action.
- Sotalol is also not an appropriate choice for PITP therapy, due to its relatively ineffective cardioversion properties.¹

- Use of class Ic agents (flecainide and propafenone) for PITP was appropriate and highest in patients with minimal/no heart disease.
- However, these agents were also inappropriately used in some patients with structural heart disease.

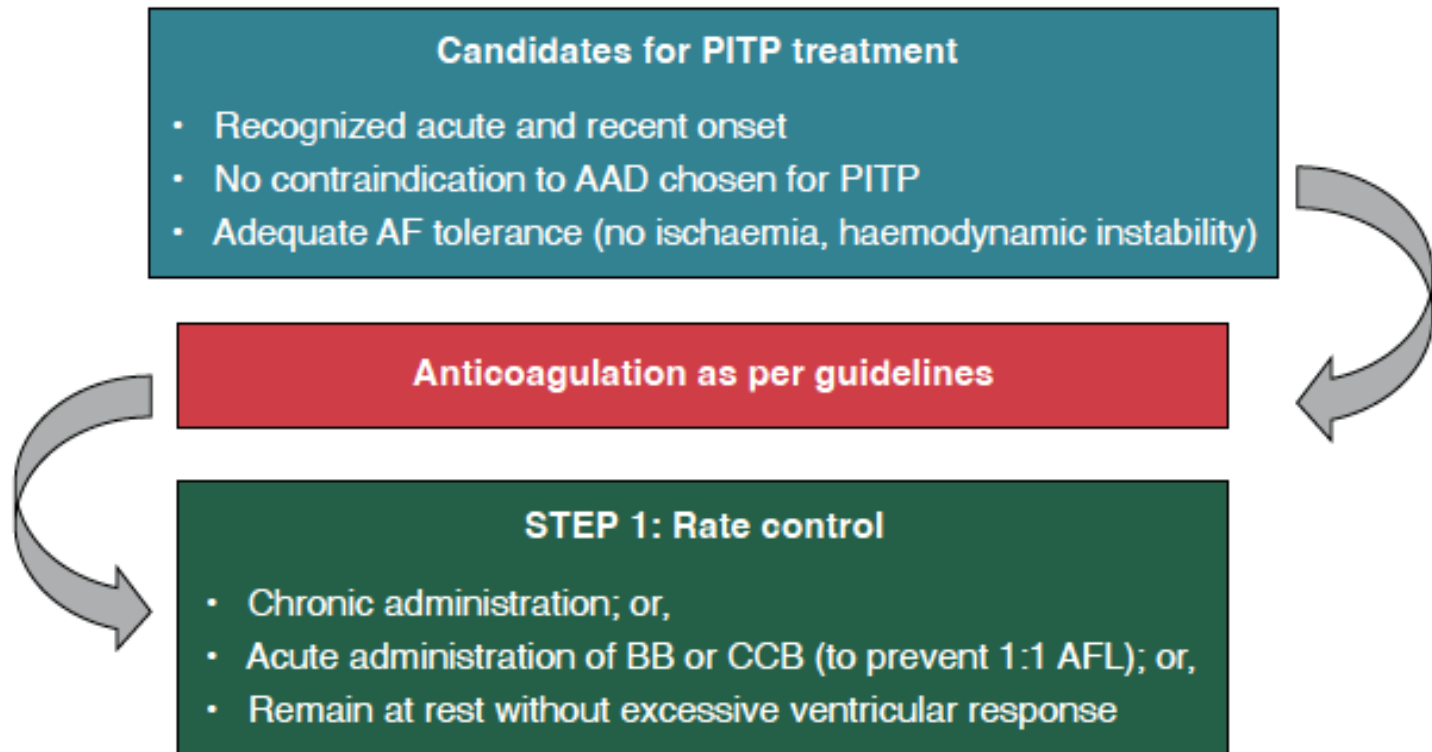
“Real-world utilization of the pill-in-the-pocket method for terminating episodes of atrial fibrillation: data from the multinational Antiarrhythmic Interventions for Managing Atrial Fibrillation (AIM-AF) survey”

Reiffel et al. Europace 2023

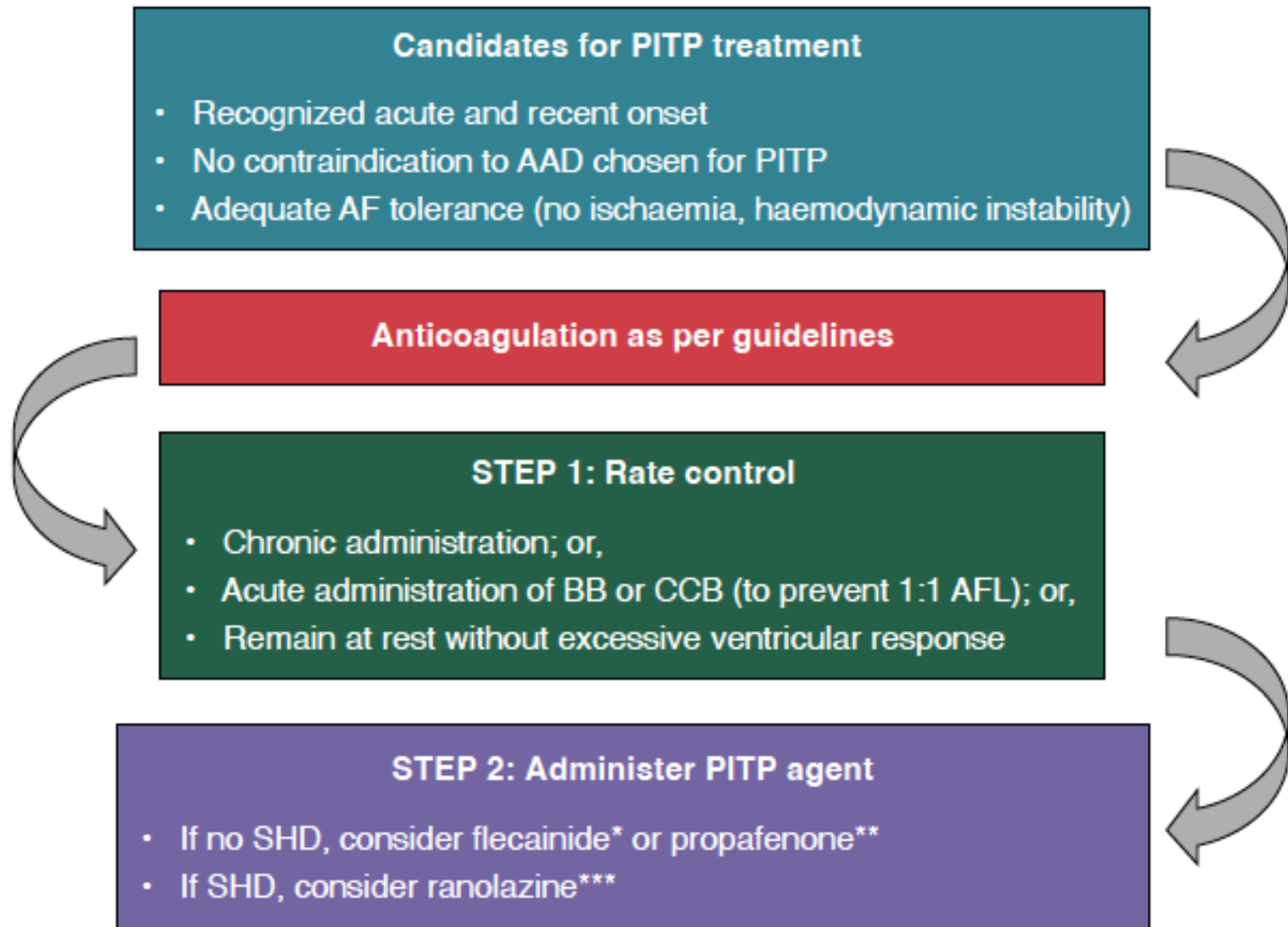


- There were no notable differences between the U.S. and Europe, or between EPs and CDs, with regard to optimal arrhythmia frequencies for PITP

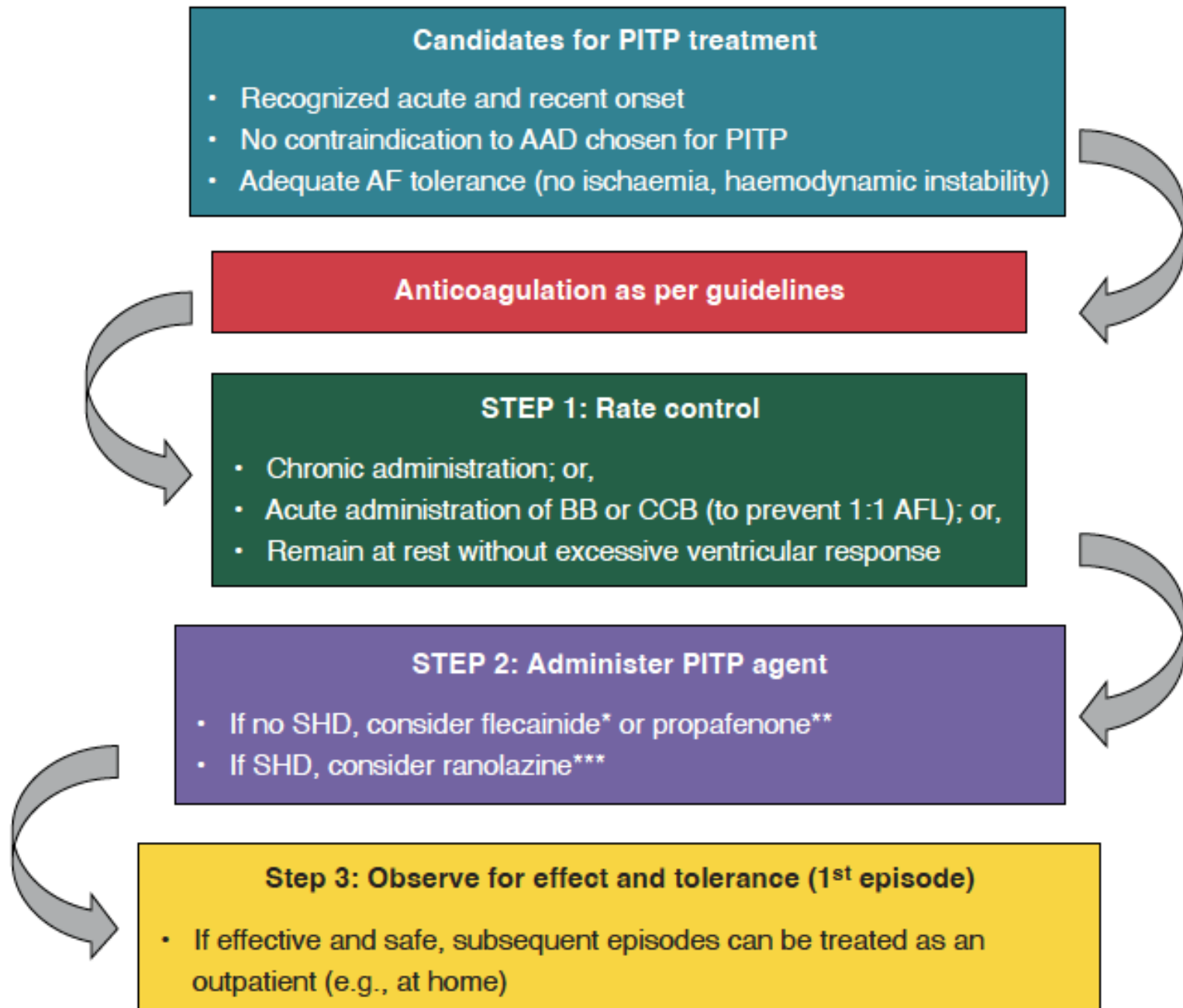
Stufenkonzept: „Pill-in-the-Pocket“ (PiP)



Stufenkonzept: „Pill-in-the-Pocket“ (PiP)



Stufenkonzept: „Pill-in-the-Pocket“ (PiP)



“Pill in the Pocket” Antiarrhythmic Drugs for Orally Administered Pharmacologic Cardioversion of Atrial Fibrillation

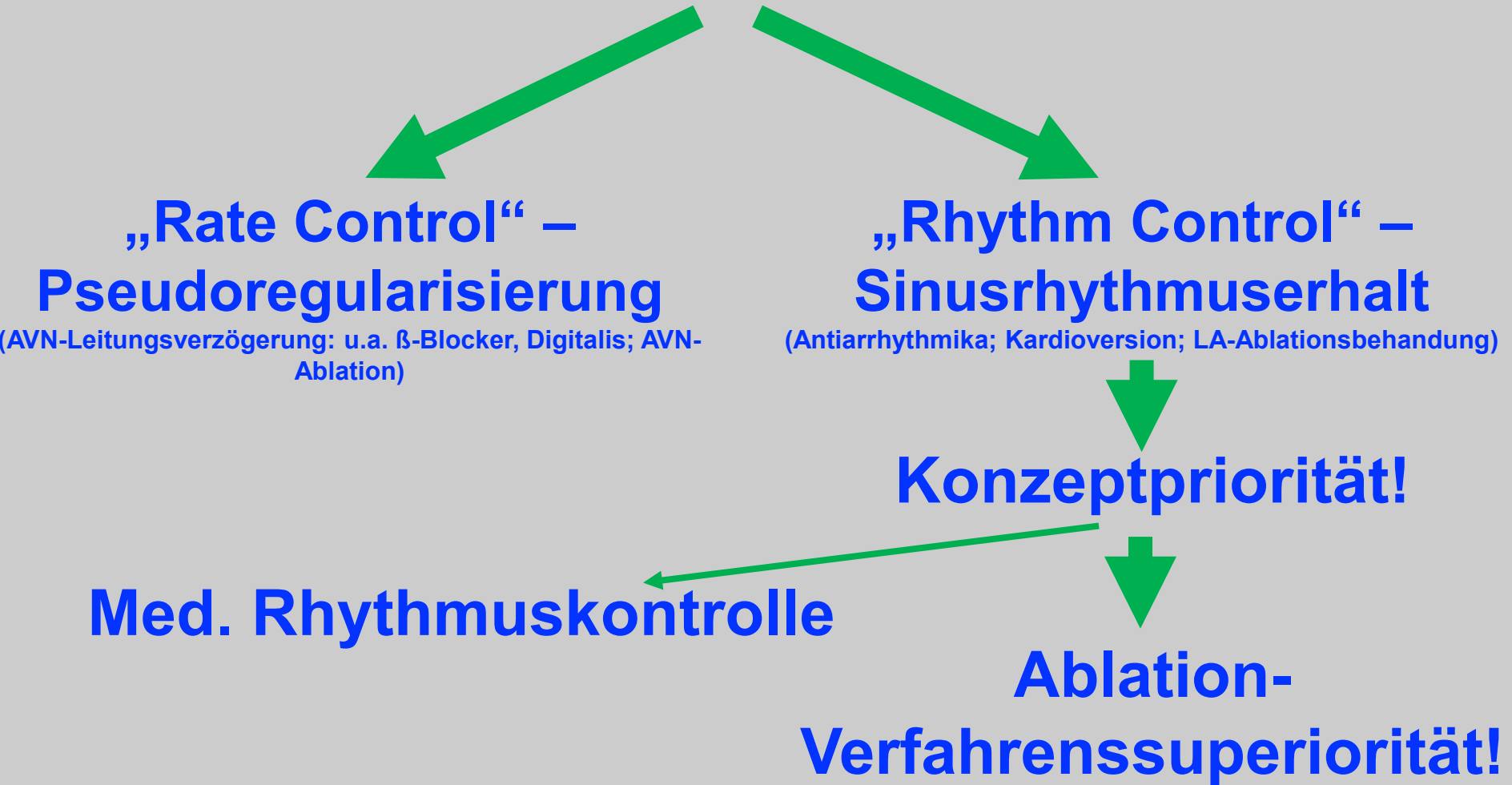
(Am J Cardiol 2021;140:55–61)

James A. Reiffel, MD^{a*}, and Alessandro Capucci, MD^b

Dosing for Pill in the Pocket Therapy

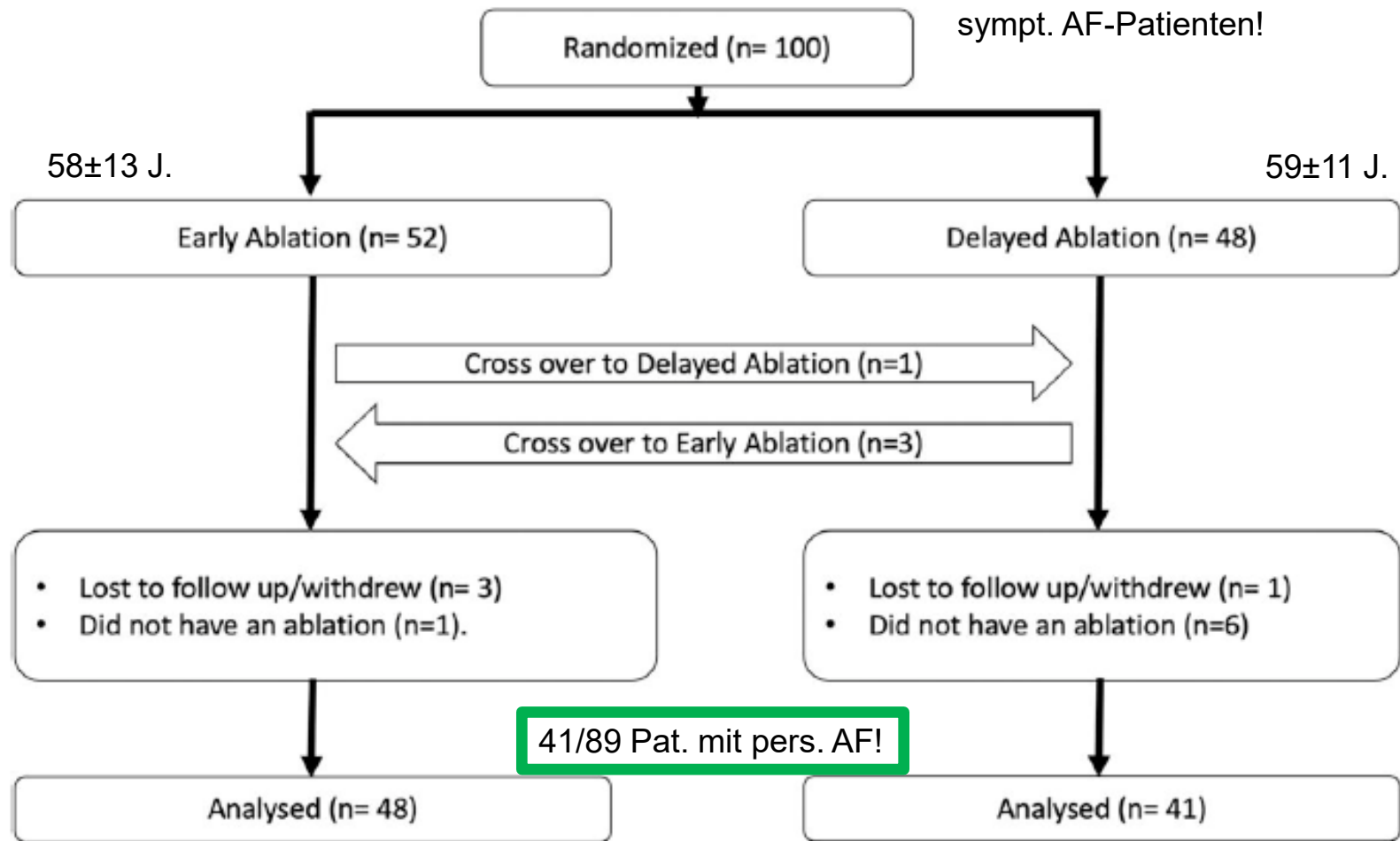
- **Flecainide:** 300 mg single dose (consider 200 mg if weight <70 kg)
- **Propafenone:** 600 mg single dose immediate release formulation (consider 450 mg if weight <70 kg)
- **Ranolazine:** 2000 mg (given as a single dose, or two 1000 mg doses separated by no more than 4 hours)

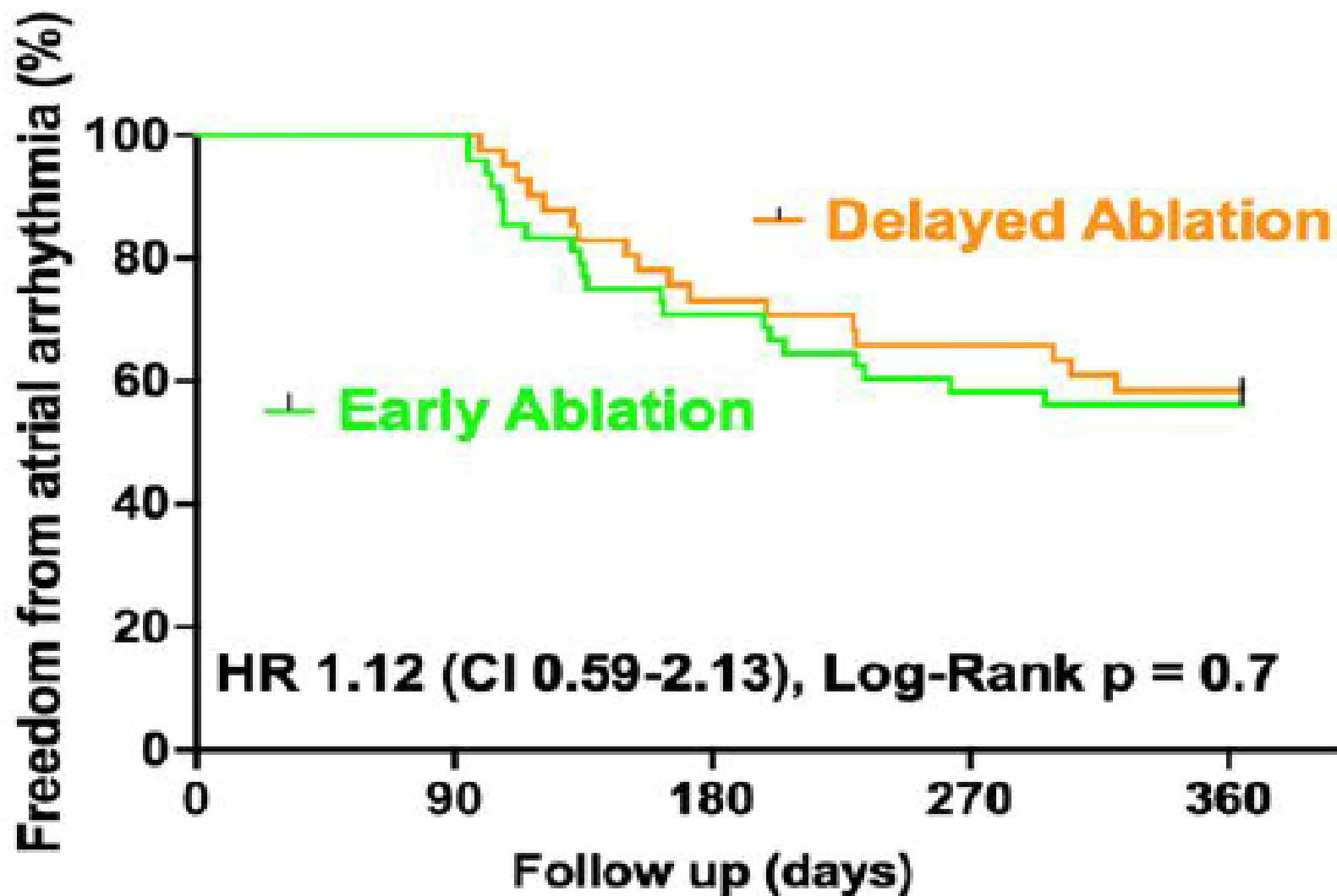
Vorhofflimmern – Therapie („Rate vs Rhythm Control“)



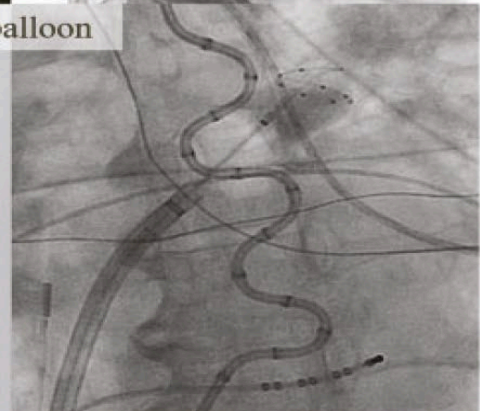
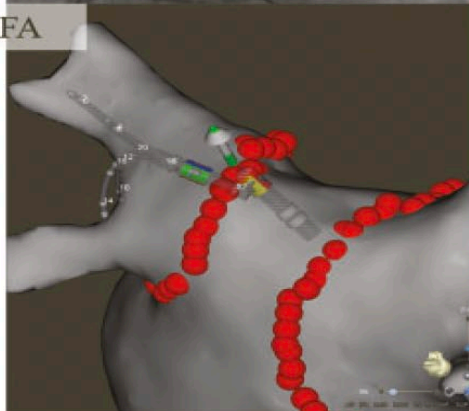
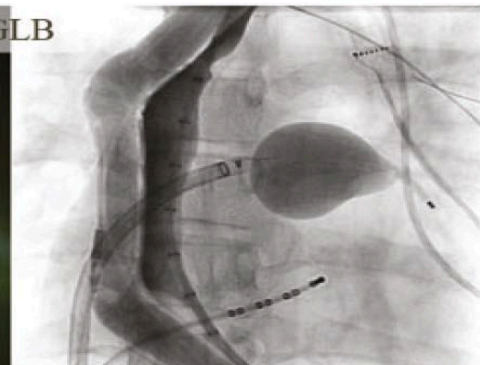
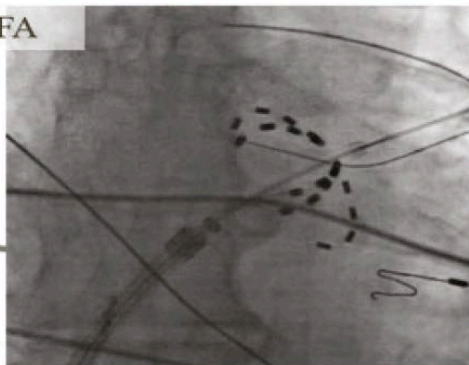
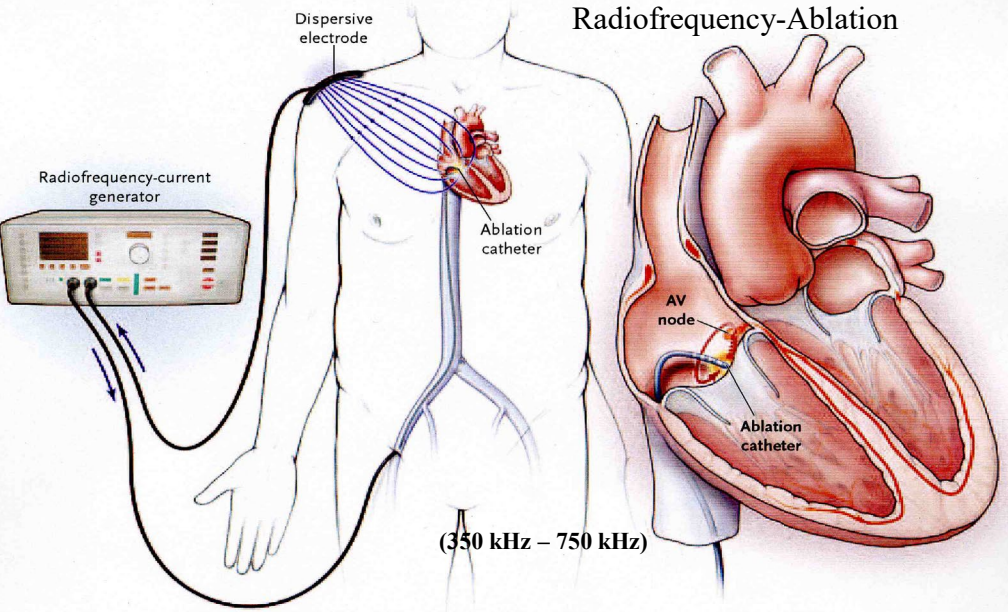
“Impact of early vs. delayed atrial fibrillation catheter ablation on atrial arrhythmia recurrences”

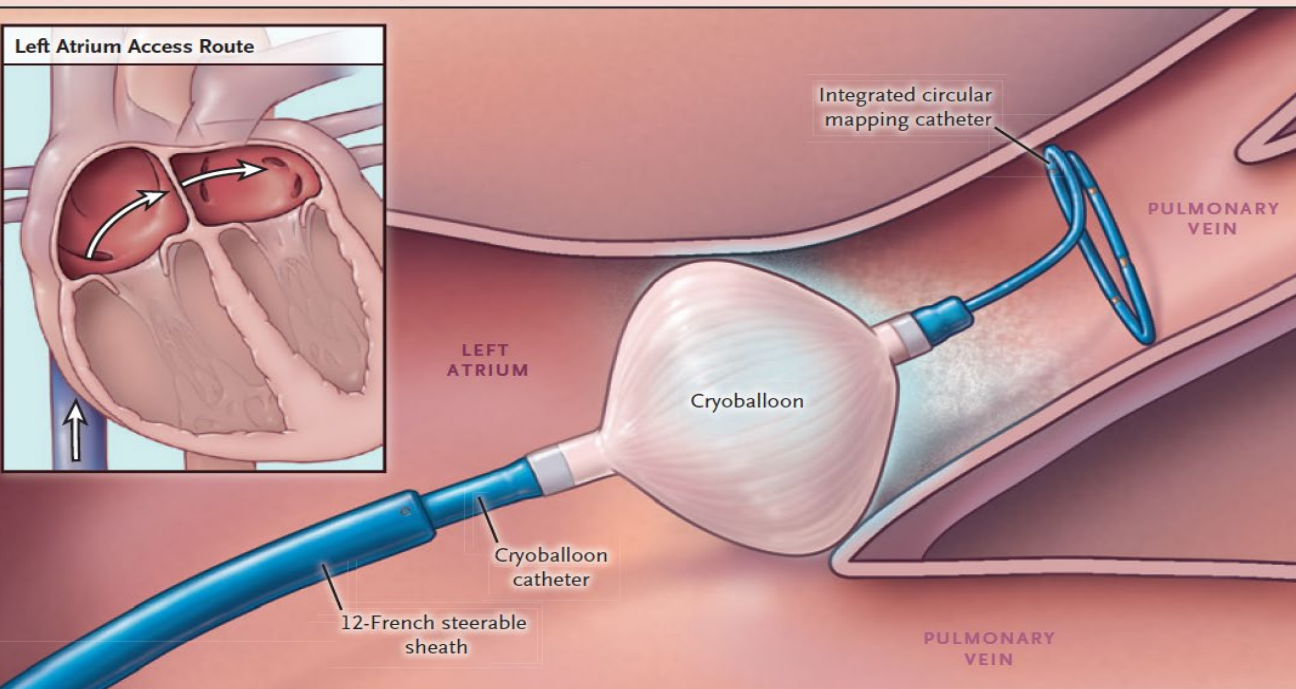
Kalman et al. EHJ 2023



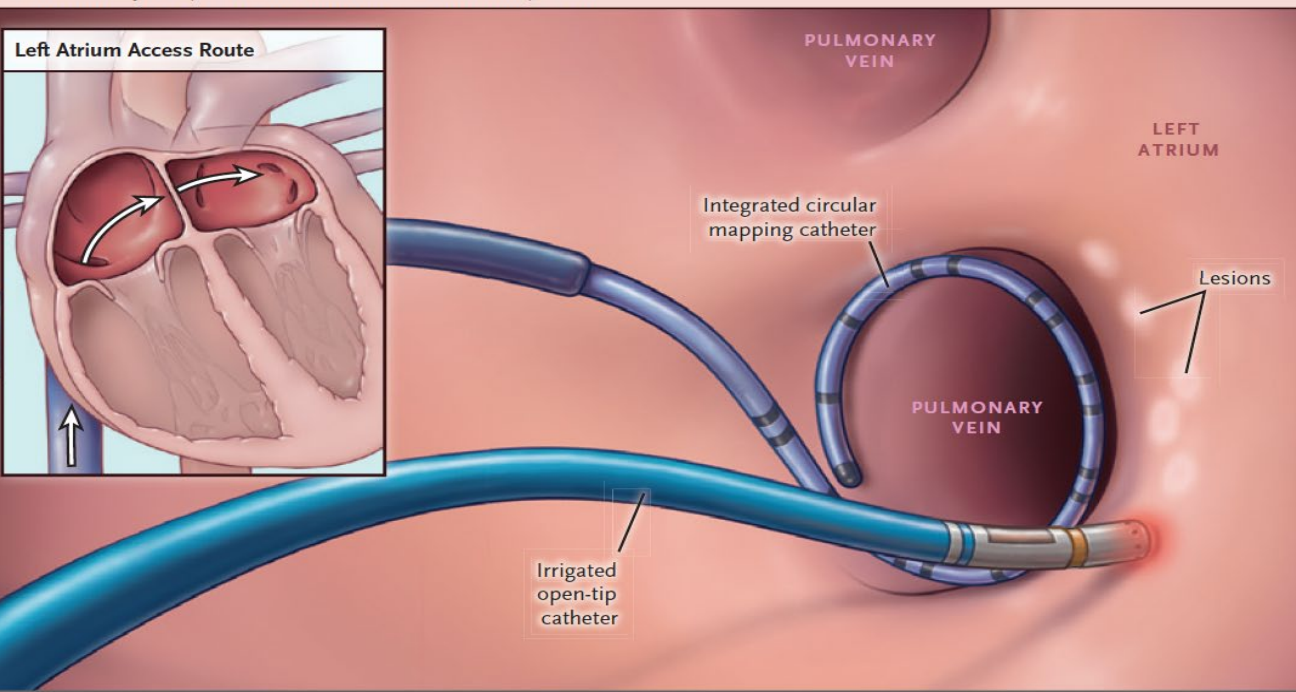


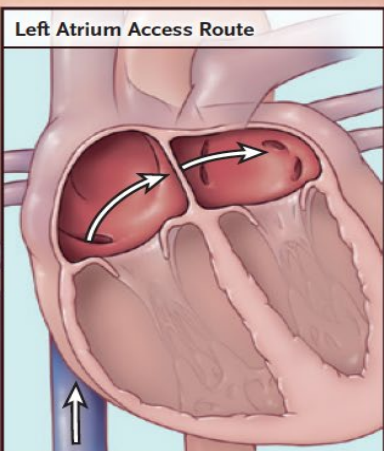
Days		0	90	180	270	365
At Risk	Early	48	48	35	29	27
	Delayed	41	41	31	28	24



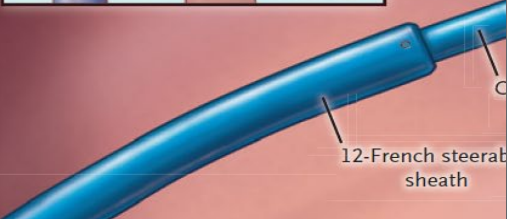


B Radiofrequency Current Ablation of Pulmonary Vein

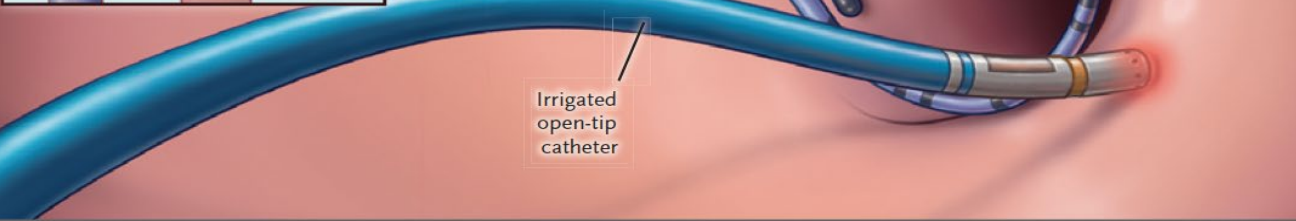
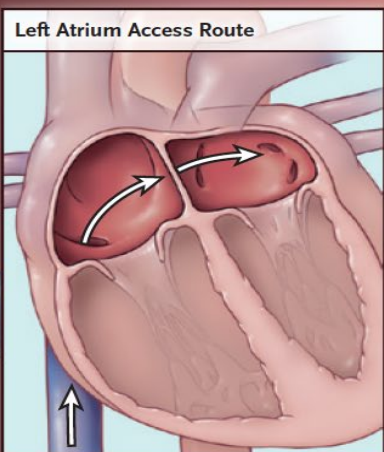




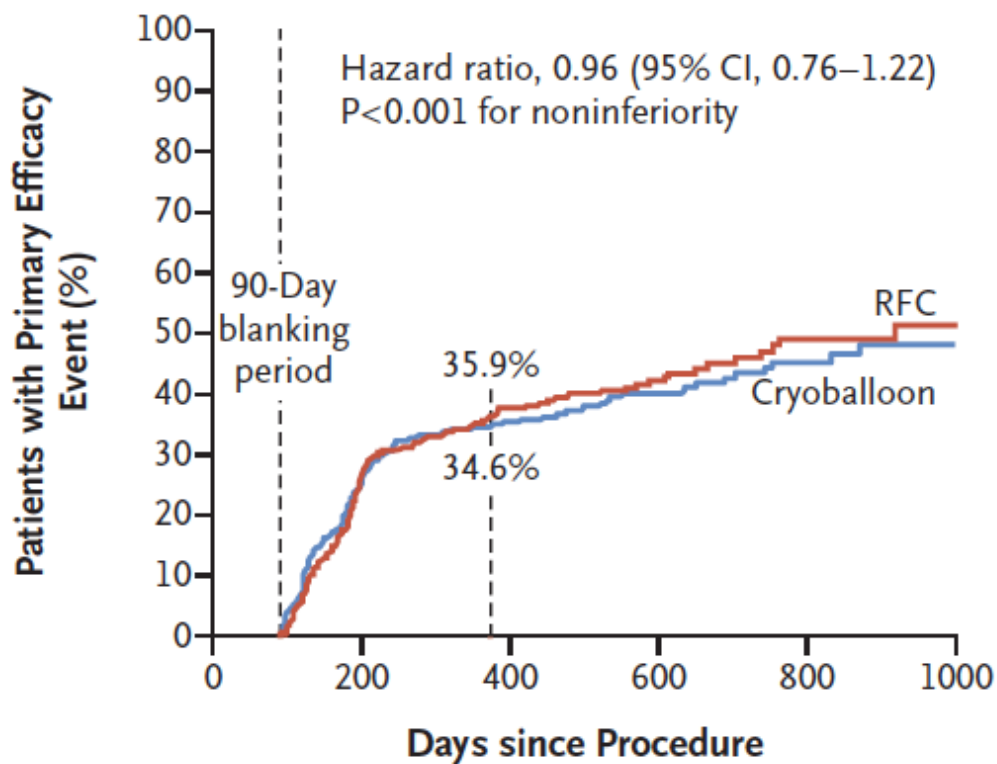
Integrated circular



B Radiofrequency Current Ablation of Pulmonary Vein



A Primary Efficacy End Point



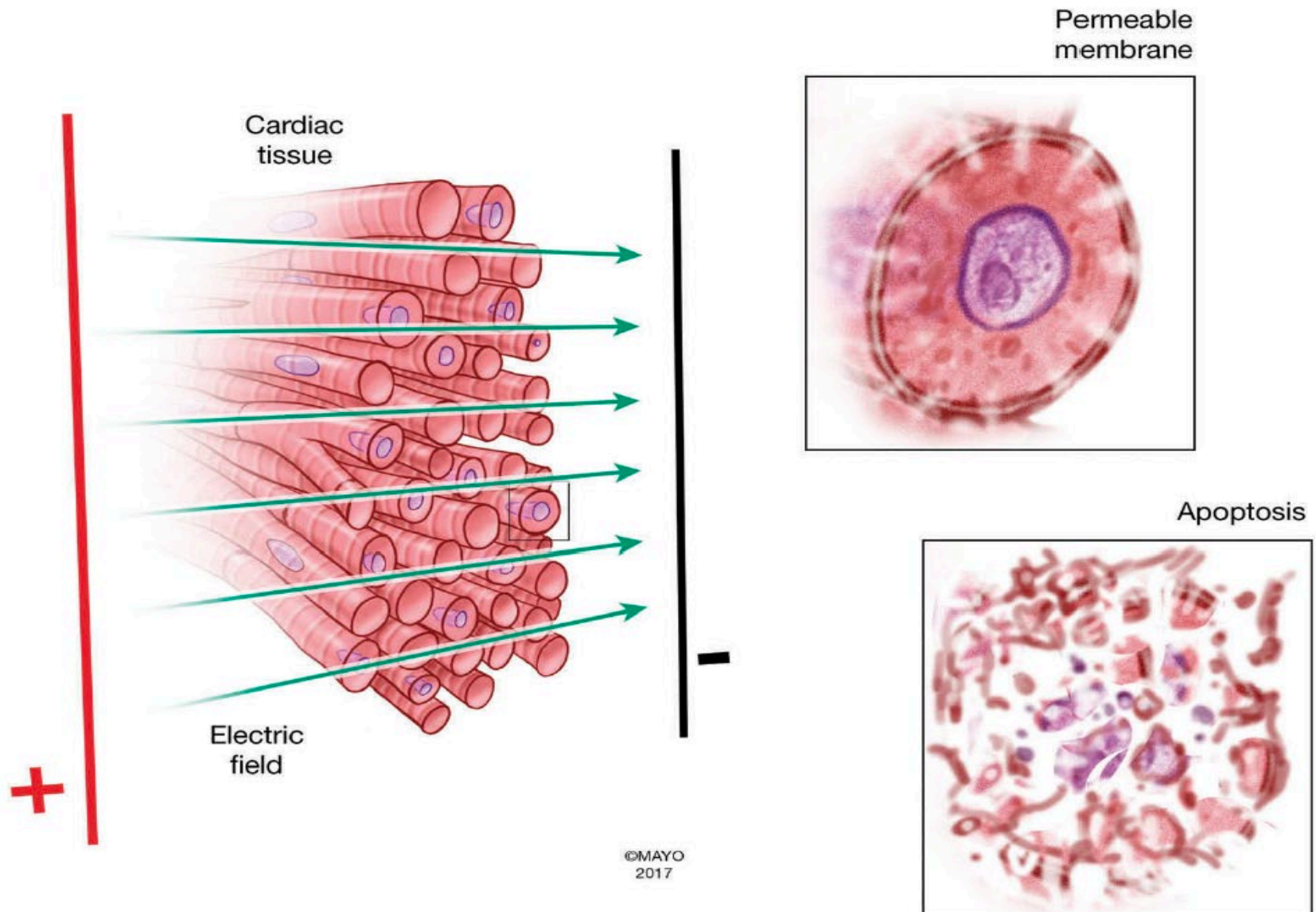
No. at Risk

Cryoballoon	374	338	242	194	165	132	107	70	57	34	12
RFC	376	350	243	191	149	118	93	58	44	25	12

Irreversible electroporation for the treatment of cardiac arrhythmias

EXPERT REVIEW OF CARDIOVASCULAR THERAPY, 2018
VOL. 16, NO. 5, 349-360

Alan Sugrue^a, Elad Maor^b, Antoni Ivorra^c, Vaibhav Vaidya^a, Chance Witt^a, Suraj Kapa^a and Samuel Asirvatham^a



• ADVENT: Pulsed Field Ablation vs Thermal Ablation (RF/Cryo) for Paroxysmal AF



The NEW ENGLAND
JOURNAL of MEDICINE

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Pulsed Field or Conventional Thermal Ablation for Paroxysmal Atrial Fibrillation

Vivek Y. Reddy, M.D., Edward P. Gerstenfeld, M.D., Andrea Natale, M.D.,
William Whang, M.D., Frank A. Cuoco, M.D., Chinmay Patel, M.D.,
Stavros E. Mountantonakis, M.D., Douglas N. Gibson, M.D.,
John D. Harding, M.D., Christopher R. Ellis, M.D., Kenneth A. Ellenbogen, M.D.,
David B. DeLurgio, M.D., Jose Osorio, M.D., Anitha B. Achyutha, M.Tech., M.S.E.,
Christopher W. Schneider, M.Eng., Andrew S. Mugglin, Ph.D.,
Elizabeth M. Albrecht, Ph.D., Kenneth M. Stein, M.D.,
John W. Lehmann, M.D., M.P.H., and Moussa Mansour, M.D.,
for the ADVENT Investigators*



ESC Congress 2023
Amsterdam & Online



#ESCCongress

“Pulsed Field or Conventional Thermal Ablation for Paroxysmal Atrial Fibrillation”

Reddy et al. NEJM 2023

607 Pat., pAF, 78 J.

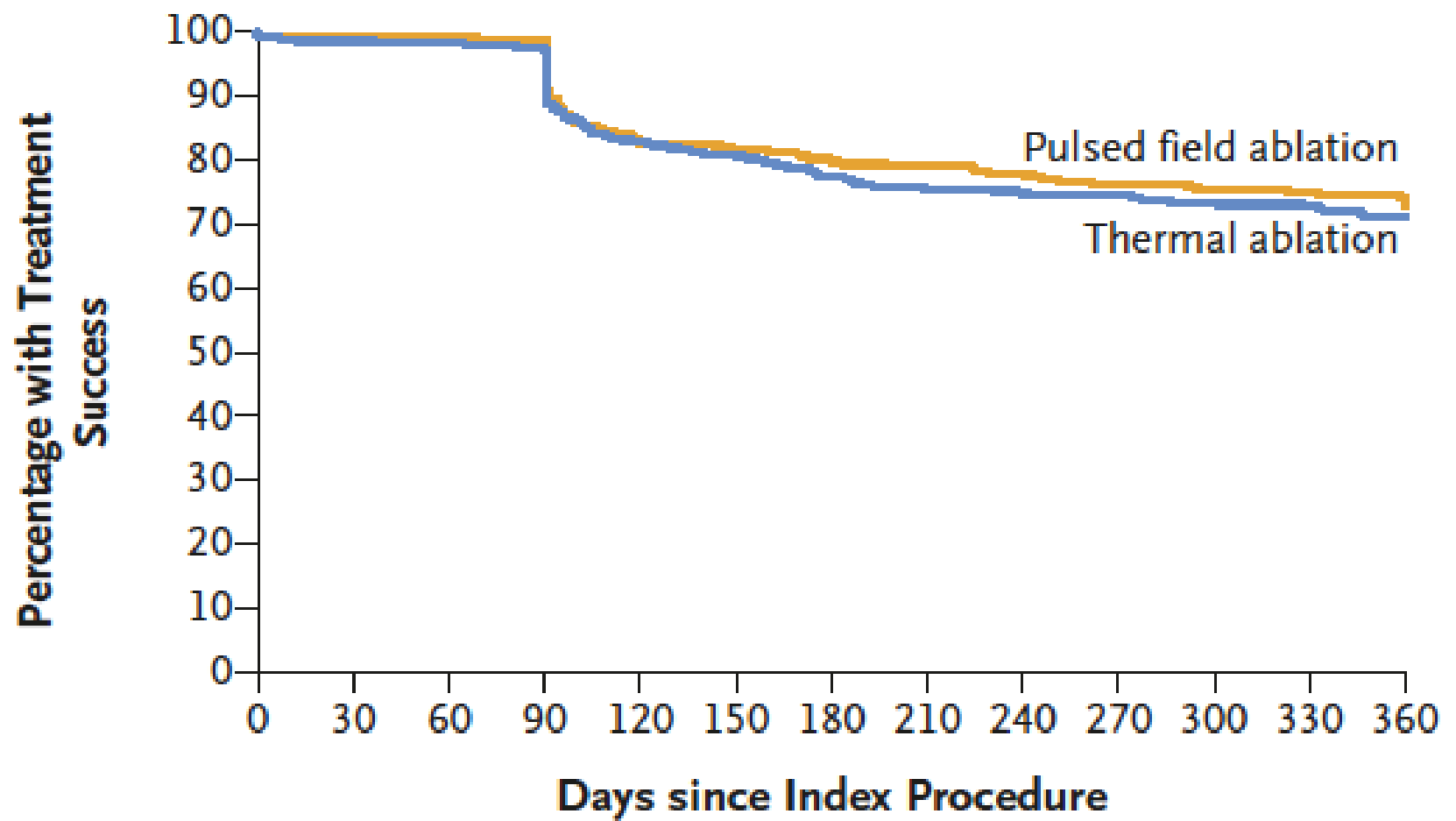
PFA-Ablation
(n=305)

“Thermo“-Ablation
(n=302)

Primärer Endpunkt:
Freiheit von prim. Prozedurversagen
und AF-Rezidiv in 12 Mon.

204 Pat. (73.3%)

194 Pat. (71.3%)



No. at Risk

Pulsed field ablation	301	298	238	228	176
Thermal ablation	296	292	228	219	150

Treatment Success (%)

Pulsed field ablation	99.3	99.0	79.7	76.4	73.1
Thermal ablation	98.7	97.3	77.5	74.5	71.3

CASTLE-HTx

Catheter Ablation versus Medical Therapy to Treat Atrial Fibrillation in End-stage Heart Failure

Christian Sohns, Maximilian Mörsdorf, Harry Crijns,
Jan Tijssen and Philipp Sommer; for the CASTLE-HTx Investigators

Amsterdam, August 27th 2023

ESC Congress 2023
Amsterdam & Online



LIVE



“Catheter Ablation in End-Stage Heart Failure with Atrial Fibrillation”

Sohns et al. NEJM 2023

194 Pat., sympt. AF, “end stage” HF, Evaluation HTX

AF-Ablation (n=97)
(62±12J.; EF 29±6%)

Med. Therapie (n=97)
60±10J.; EF 25±6%)



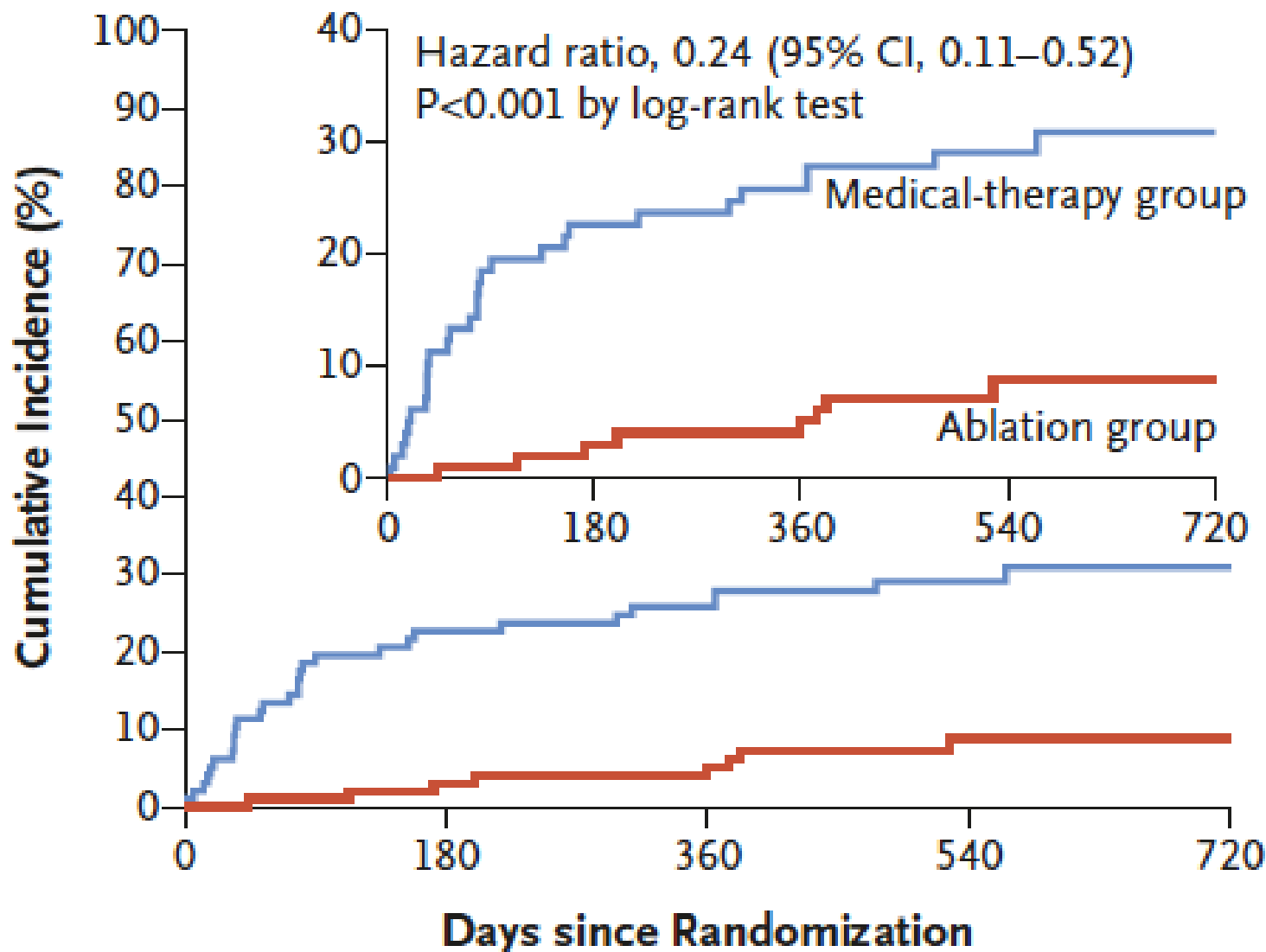
Abl.: 81/97 Pat.
(84%)

Primärer Endpunkt (1 Jahr):
Tod, Impl. LV-assist, dringl. HTX



Abl.: 16/97 Pat.
(16%)

A Primary End Point



No. at Risk

Medical-therapy group	97	75	72	41	12
Ablation group	97	94	88	50	20

Table 2. Primary and Secondary End Points.

End Point	Ablation Group (N = 97)	Medical-Therapy Group (N = 97)	Hazard Ratio (95% CI)*	P Value†
	<i>no. (%)</i>			
Primary end point‡	8 (8)	29 (30)	0.24 (0.11 to 0.52)	<0.001
Secondary end points				
➡ Death from any cause	6 (6)	19 (20)	0.29 (0.12 to 0.72)	
Cardiovascular	5 (5)	18 (19)	0.25 (0.09 to 0.68)	
Cerebrovascular	0	1 (1)		
Cancer	1 (1)	0		
Death after nonfatal primary end point	0	5 (5)		
➡ Implantation of left ventricular assist device	1 (1)	10 (10)	0.09 (0.01 to 0.70)	
➡ Urgent heart transplantation	1 (1)	6 (6)	0.15 (0.02 to 1.25)	

„Catheter ablation improves cardiovascular outcomes in patients with atrial fibrillation and heart failure: a meta-analysis of randomized controlled trials“

Simader et al. Europace 2023

Catheter ablation for Atrial Fibrillation in Heart Failure Meta-Analysis of Randomized Controlled Trials

8 eligible studies from 2,078 search results

Mean age 62.6 years

Mean LVEF 28.2%

Primary Analysis: Trials with ≥ 2 years follow up

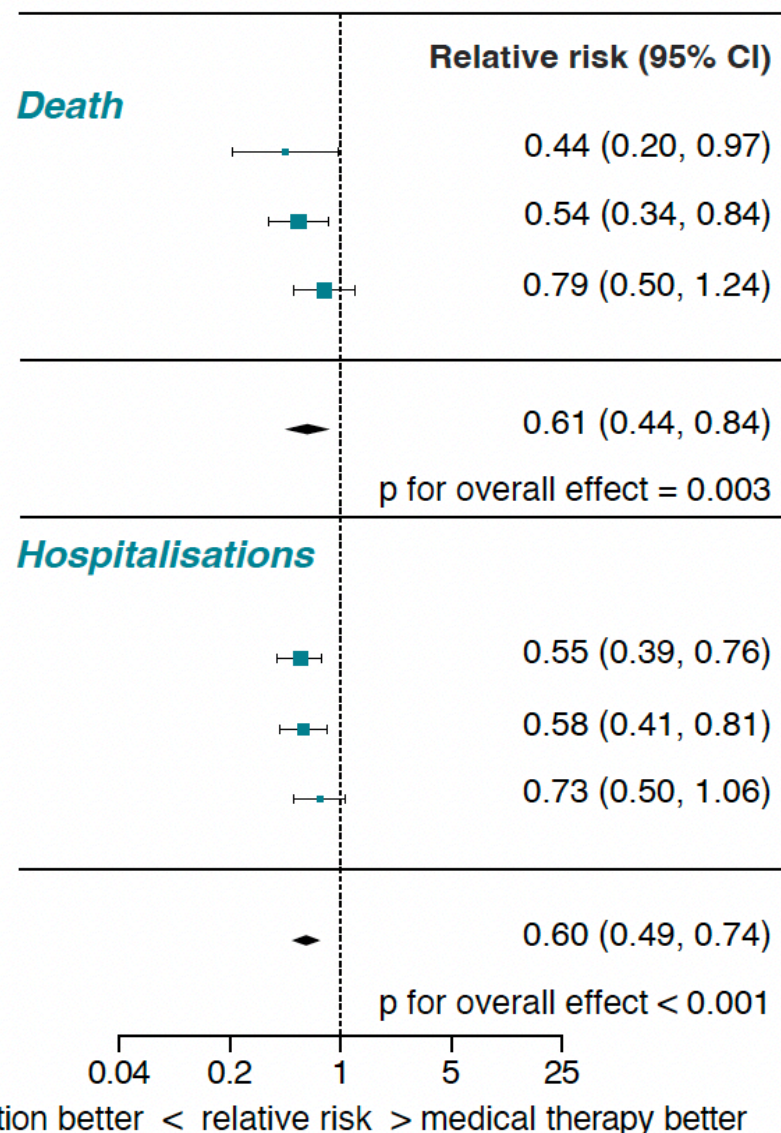
3 studies meeting primary analysis criterion (N = 977)

AATAC (N = 203)

CASTLE-AF (N = 363)

RAFT-AF (N = 411)

Catheter ablation resulted in a significant reduction in all-cause mortality and heart failure hospitalisations



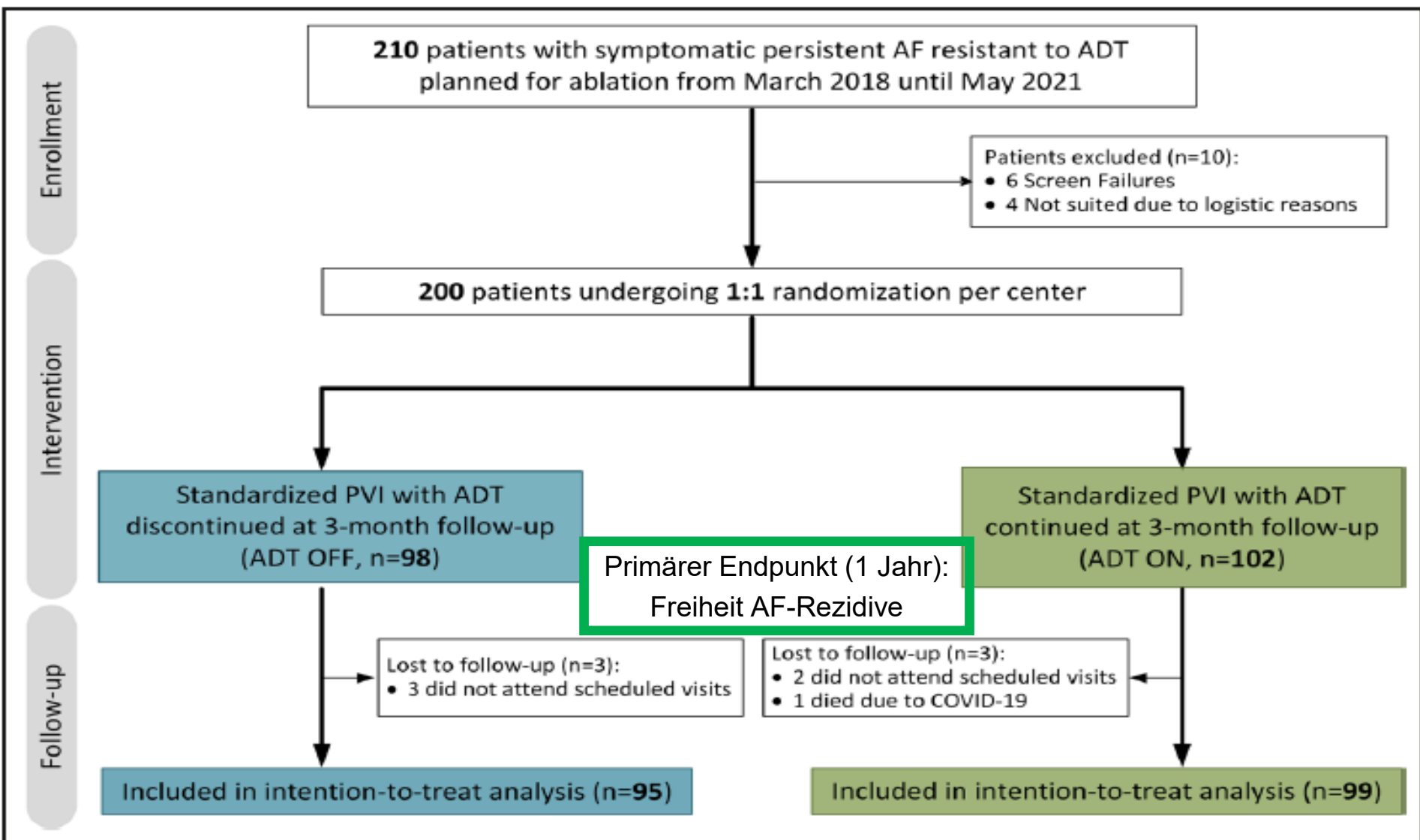
Fazit für Klinik und Praxis

Diskussion - Ablationstherapie

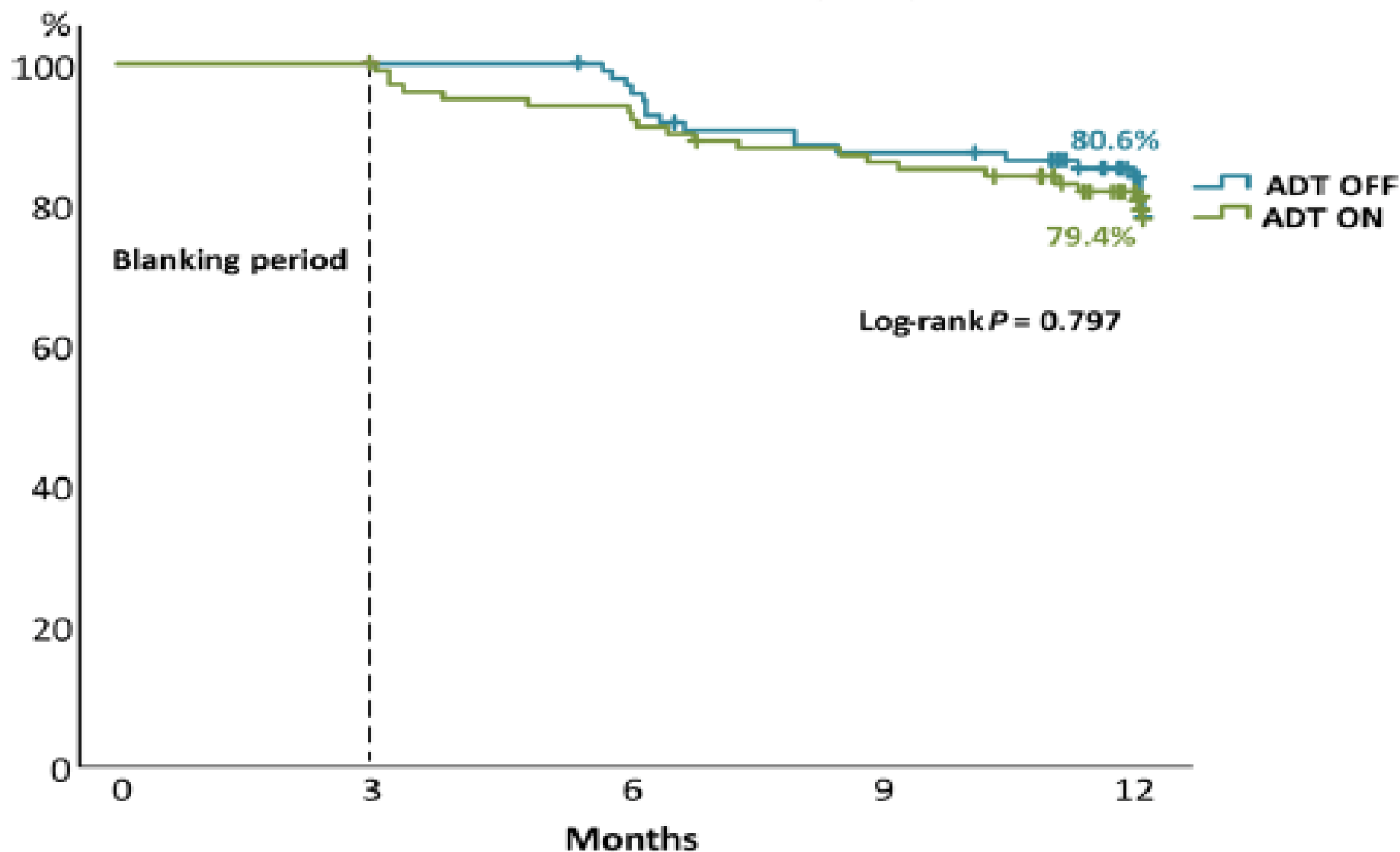
- ➔ pAF: Verzögerung Ablationstherapie ohne relevante Verschlechterung des Resultates
- ➔ „Pulsed Field Ablation“:
 - „nicht-unterlegen“ und „nicht-überlegen“ vs. Thermoablation
 - günstiges „regionales“ Sicherheitsprofil
 - Standortbestimmung Substratbehandlung ausstehend
- ➔ Ablation AF bei schwerer Herzinsuffizienz mit prognostischen Vorteilen! (CASTLE-HTx)

“No Effect of Continued Antiarrhythmic Drug Treatment on Top of Optimized Pulmonary Vein Isolation in Patients With Persistent Atrial Fibrillation: Results From the POWDER-AF2 Trial”

Demolder et al. Circ EP 2023



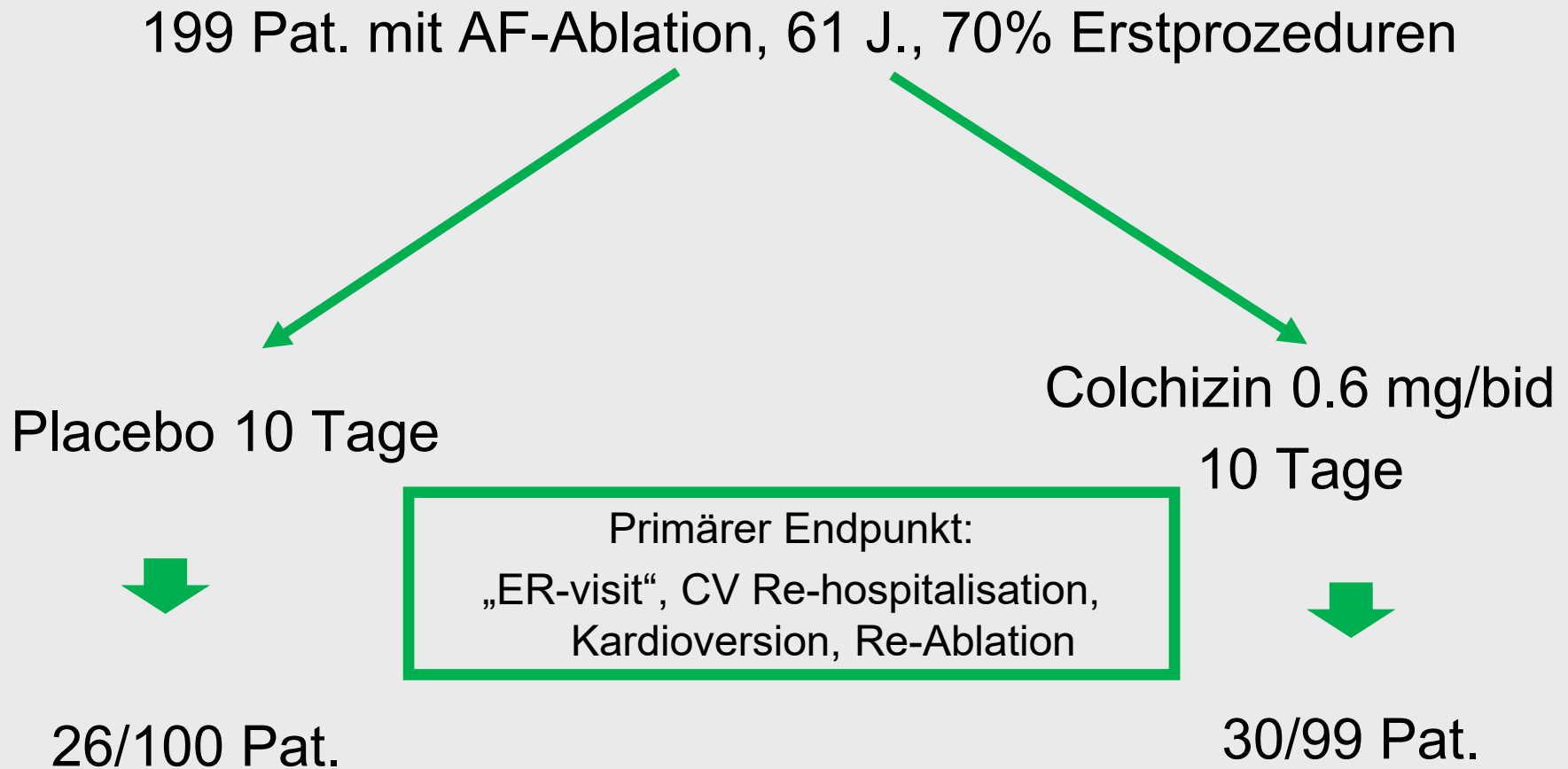
Freedom from Atrial Tachyarrhythmia

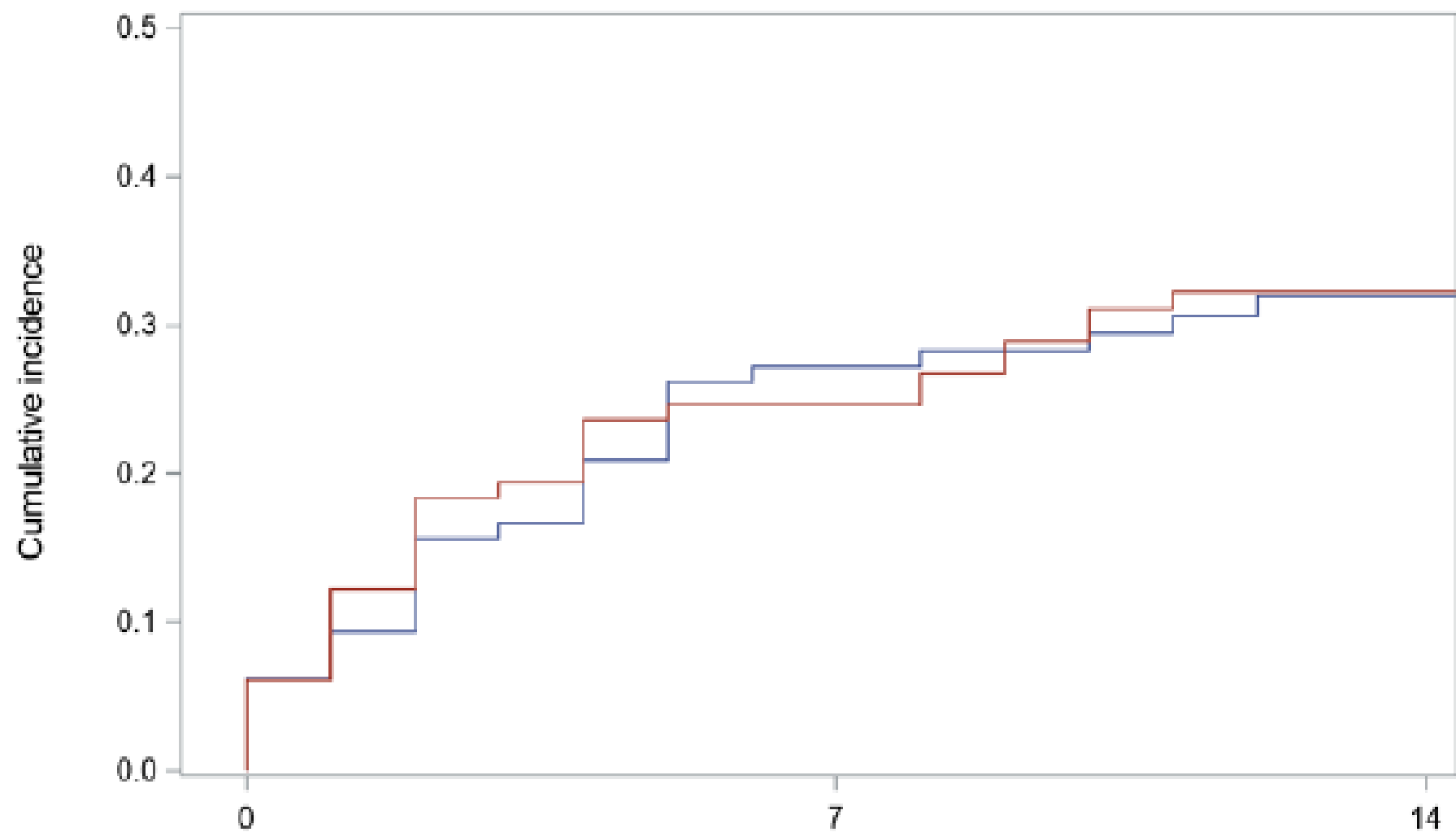


Number at risk

ADT OFF	98	93	82	73
ADT ON	102	94	85	73

“Colchicine to Prevent Atrial Fibrillation Recurrence After Catheter Ablation: A Randomized, Placebo-Controlled Trial” Benz et al. CircEP 2023





Time to atrial arrhythmia recurrence (days)

Colchicine Placebo

Colchicine

96

69

42

Placebo

98

72

45

“Prevention of cerebral thromboembolism by oral anticoagulation with dabigatran after pulmonary vein isolation for atrial fibrillation: the ODIn-AF trial“

Schricket al. CRC 2023

200 Pat., 6 Monate nach AF-Ablation, keine Rezidive

OAC on (n=99)

OAC off (n=101)

Primärer Endpunkt (1 Jahr):
Neue cerebrale Läsionen, MRI

2 Pat. (2%)

0 Pat. (0%)

G-DRG system data



OPS/OCD codes



Administrative data from four large german tertiary EP centres



Total number of patients ($n = 43031$)

2005



2020

Atrial fibrillation
 $n = 30361$

Vascular: 66 (0.22%)
Stroke: 46 (0.16%)
Tamponade: 202 (0.67%)
Death: 11 (0.04%)

Atrial flutter
 $n = 9364$

Vascular: 49 (0.52%)
Stroke: 8 (0.13%)
Tamponade: 25 (0.27%)
Death: 13 (0.14%)

Ventr. tachycardia
 $n = 3306$

Vascular: 42 (1.27%)
Stroke: 11 (0.37%)
Tamponade: 73 (2.20%)
Death: 49 (1.48%)

“True” incidence after individual case-inspection



Vascular: 63 (0.21%)
Stroke: 46 (0.16%)
Tamponade: 202 (0.7%)
Death: 9 (0.03%)



Vascular: 49 (0.5%)
Stroke: 8 (0.13%)
Tamponade: 25 (0.3%)
Death: 4 (0.04%)



Vascular: 37 (1.1%)
Stroke: 11 (0.37%)
Tamponade: 73 (2.2%)
Death: 14 (0.42%)

G-DRG system data



OPS/OCD codes



Administrative data from four large german tertiary EP centres

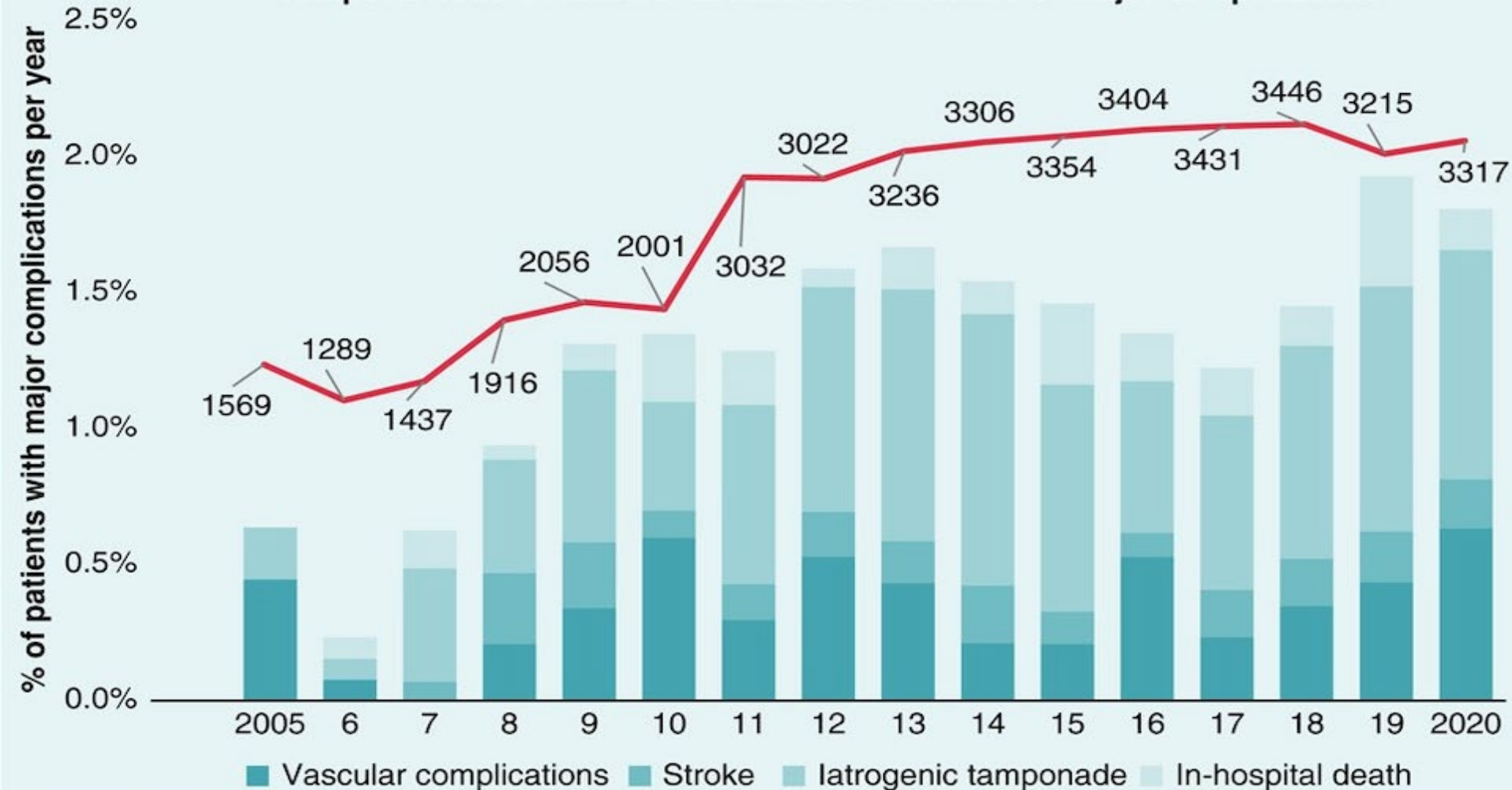


Total number of patients ($n = 43031$)

2005

2020

Temporal trend of catheter ablations & incidence of major complications



Fazit für Klinik und Praxis/Diskussion

Nachbehandlung Ablation / Komplikationen

- ➡ Persistierendes AF: Fortführung AA-Therapie > 3Mon. nach Ablation verbessert nicht das Ergebnis!
- ➡ Post-ablatives Colchizin verhindert weder periinterventionelle Perikarditis noch AF-Rezidive, erhöht aber GI-NW
- ➡ OAC-Terminierung 6 Monate nach erfolgreicher AF-Ablation und intermediärem Risiko (CHADS-Vasc 2.6) ohne Hinweise auf erhöhte cerebrale Embolierate