Vorhofflimmern – ab wann und bis wann sollte man an eine Ablation denken?

18. Mai 2022

8. Pflegekongress für Herzmedizin am 18. Mai 2022

Prof. Laurent Roten – Rhythmologie / Elektrophysiologie

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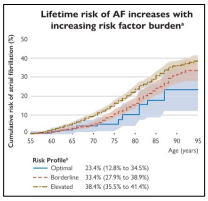
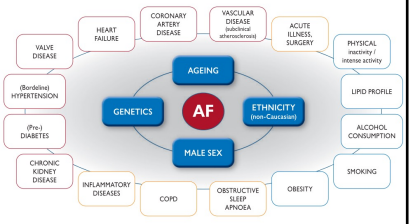
1

Vorhofflimmern Guidelines 2020

Risk of Atrial Fibrillation



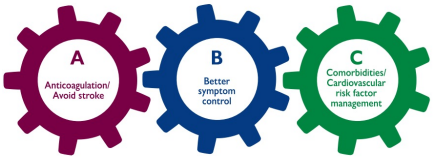
Lifetime AF risk
1 in 3 individuals of European ancestry at index age of 55 years



2

Vorhofflimmern Guidelines 2020

Treat AF: The ABC pathway



1. Identify low-risk patients CHA_2DS_2-VASc 0(m), 1(f)
2. Offer stroke prevention if CHA_2DS_2VASc ≥1(m), 2(f)

Assess bleeding risk, address modifiable bleeding risk factors

3. Choose OAC (NOAC or VKA with well-managed TTR)

Assess symptoms, QoL and patient's preferences

Optimize rate control

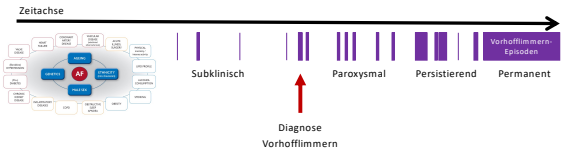
Consider a rhythm control strategy (CV, AADs, ablation)

Comorbidities and cardiovascular risk factors

Lifestyle changes (obesity reduction, regular exercise, reduction of alcohol use, etc.)

3

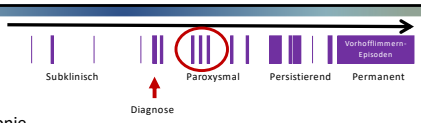
Ablation von Vorhofflimmern – Zeitpunkt?



Vorhofflimmertyp	Definition
Paroxysmal	Selbstlimitierendes Vorhofflimmern, meist <48h, kann aber bis 7 Tage andauern.
Persistierend	Vorhofflimmernepisode welche entweder länger als 7 Tage andauert oder mittels Kardioversion/Medikamente terminiert wird
Permanent	Wenn das Vorliegen von Vorhofflimmern vom Patienten und Arzt akzeptiert wird (keine Rhythmuskontrolle mehr vorgesehen)
Subklinisch	Vorhofflimmern, welches weder vom Patienten noch vom Arzt bemerkt wird

4

Fall 1



- 61-jährige ♀
- Arterielle Hypertonie
- LVEF normal, linker Vorhof nicht dilatiert
- Vorhofflimmern seit ca. 2 Jahren, paroxysmal, Episoden 1-2x/Woche, Dauer 1-4 Stunden, kann weiter funktionieren, Episoden aber als störend wahrgenommen
- Medikamente NOAC
  Betablocker
  ACE-Hemmer

?

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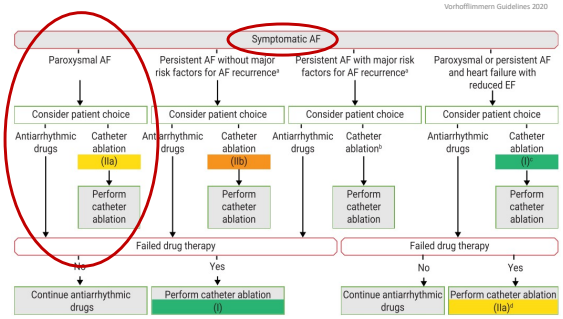
Vorhofflimmern Guidelines 2020



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Verma et al., JAMA Intern Med 2013;173:149-156

Vorhofflimmern und Symptome

Modifizierter EHRA Score	Symptome	Beschreibung
1	Keine	Keine Symptome
2a	Mild	Alltägliche Aktivitäten nicht beeinträchtigt, Symptome nicht als störend empfunden
2b	Mässig	Alltägliche Aktivitäten nicht beeinträchtigt, aber Symptome als störend empfunden
3	Schwer	Alltägliche Aktivitäten beeinträchtigt
4	Invalidisierend	Alltägliche Aktivitäten werden eingestellt

Typische Symptome

- Keine
- Fatigue
- Angstgefühl
- Innere Unruhe
- Eingeschränkte Leistungsfähigkeit
- Dyspnoe
- Angina pectoris
- Palpitationen
- Schwindel
- Synkope
- Herzinsuffizienz
- Thromboembolische Ereignisse

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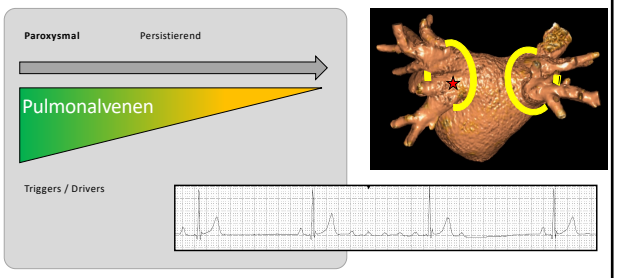
Wijesurendra et al., Heart 2019;105:1860–1867

Vorhofflimmern Mechanismen



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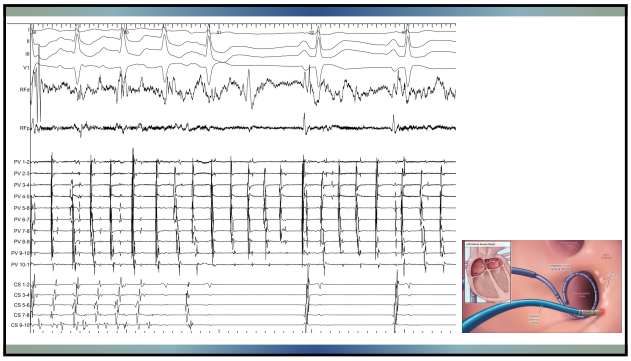

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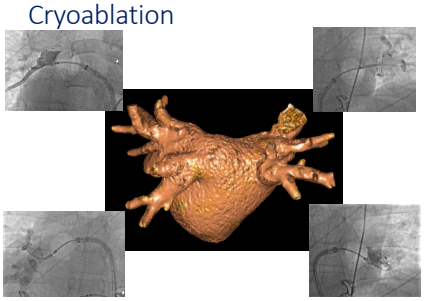
Cryoablation



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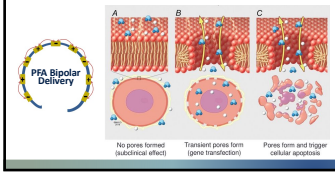
Elektroporation / Pulsed Field Ablation (PFA)

PFA ist eine nicht-thermische Ablationstechnologie, welche ein gepulstes, elektrisches Feld generiert und damit Gewebe mittels irreversibler Elektroporation abladiert



Tissue Type	PEF Ablation Threshold (V/cm)
Nerve	3800
Vascular smooth muscle	1750
Red blood cells	1600
Liver	700
Kidney	600
Pancreas	500
Myocardium	400

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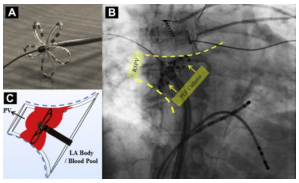
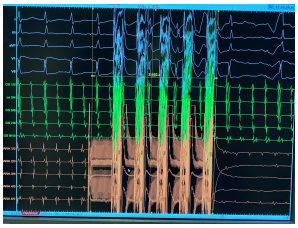
Elektroporation / Pulsed Field Ablation (PFA)





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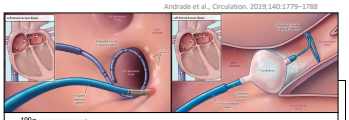
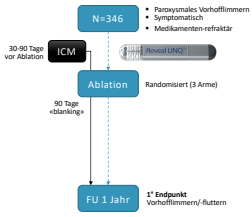
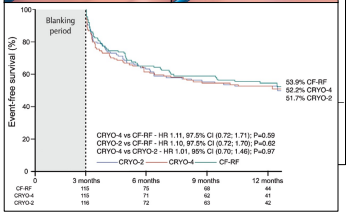
CIRCA-DOSE Studie

Andrade et al., Circulation. 2019;140:1779–1788







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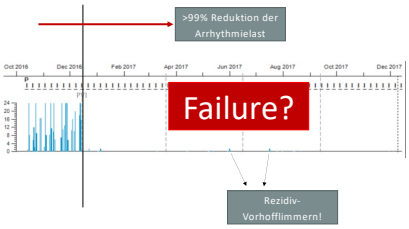
Endpunkt Vorhofflimmerablation?

Verma et al., JAMA Intern Med 2013;173:149-156



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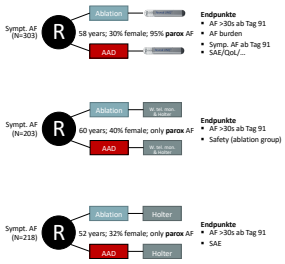
Andrade et al., N Engl J Med 2021; 384:305-315
Wazni et al., N Engl J Med 2021; 384:316-324
Kuniss et al., 2021;23:1033-1041



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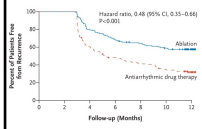
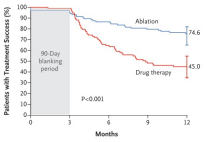
Andrade et al., N Engl J Med 2021; 384:305-315
Wazni et al., N Engl J Med 2021; 384:316-324
Kuniss et al., 2021;23:1033-1041

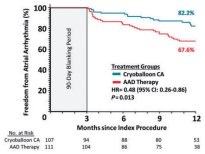
EARLY-AF



STOP AF First



Cryo First



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Andrade et al., N Engl J Med 2021; 384:305-315
Wazni et al., N Engl J Med 2021; 384:316-324
Kuniss et al., Europace 2021;23:1033-1041

EARLY-AF

SAE Ablationsgruppe 3.2%

- 3x Phrenicusparese
- 2x SM bei Bradykardie

SAE AAD 4.0%

- 2x Breitkomplextachykardie (Fl/So)
- 2x SM bei Bradykardie
- 1x Synkope (MI mit KT) (Fl)
- 1x akute Herzinsuffizienz (Fl)

Safety endpoints
Ablation: 14 in 15 Patienten
AAD: 24 in 27 Patienten

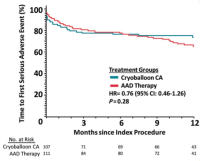
STOP AF First

Serious Adverse Event	Ablation (N = 126)		Drug Therapy (N = 99)	
	no. of events	no. of patients (%)	no. of events	no. of patients (%)
Any serious adverse event	22	15 (14)	16	14 (14)
Acute myocardial infarction	2	1 (1)	0	0
Angina unstable	0	0	1	1 (1)
Atrial flutter	3	2 (2)	1	1 (1)
Bradycardia	0	0	1	1 (1)
Chest pain	1	1 (1)	1	1 (1)
Fluid overload	0	0	1	1 (1)
Heart rate increase	1	1 (1)	0	0
Hypertension	1	1 (1)	0	0
Hypotension	1	1 (1)	0	0
Muscle hemorrhage	1	1 (1)	0	0
Palpitations	0	0	1	1 (1)
Pericardial effusion	1	1 (1)	0	0
Pericarditis	0	0	1	1 (1)
Presyncope	0	0	1	1 (1)
Pulmonary embolism	0	0	1	1 (1)
Syncope	0	0	2	2 (2)
Ventricular tachyarrhythmia	1	1 (1)	0	0
Other	19	9 (9)	12	3 (3)

Safety endpoint Ablation

- 1x Perikarderguss
- 1x MI innerhalb 7d

Cryo First



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Komplikationen linksatriale Eingriffe 2020

N Eingriffe 462
N Operateure 9

Total Komplikationen	23 (5.0%)
Tod	0
Tamponade	1 (0.2%)
Stroke	0
TIA	0
Leistenkomplikation mit Intervention	2 (0.4%)
Phrenicusparese (ohne Erholung bis Austritt)	5 (1.1%)
Andere Komplikationen	
Kopfschmerz und Tunnelblick	1 (0.2%)
Leistenhämatom	3 (0.6%)
Luftembolie**	1 (0.2%)
Lungenödem	1 (0.2%)
Perikarderguss, nicht tamponierend¶	4 (0.9%)
Sedationsproblem¶	4 (0.9%)
Pneumonie und Hämoptyse	1 (0.2%)
Zementembolie	1 (0.2%)

* inklusive mit linksatrialen Prozeduren kombinierte Ablationen / Eingriffe (z.B. PVI & Vorhofflattern)
** während LAA-Verschluss i.R. eines kombinierten Eingriffs
¶ 1 Patient mit Perikarderguss und Sedationsproblem

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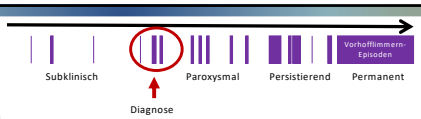
Fall 2



- 45-jähriger ♂
- Fit, bisher gesund
- LVEF normal, linker Vorhof nicht dilatiert
- Erstdiagnose von paroxysmalem Vorhofflimmern, Zufallsbefund über seine Apple Watch, asymptomatisch
- Medikamente keine

?

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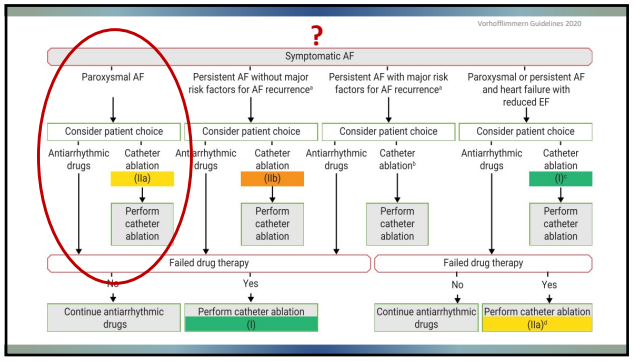
Vorhofflimmern Guidelines 2020
?
Symptomatic AF
Paroxysmal AF
Persistent AF without major risk factors for AF recurrence[a]
Persistent AF with major risk factors for AF recurrence[a]
Paroxysmal or persistent AF and heart failure with reduced EF
Consider patient choice
Antiarrhythmic drugs
Catheter ablation (IIa)
Catheter ablation (IIb)
Catheter ablation[b]
Catheter ablation (I)[c]
Perform catheter ablation
Failed drug therapy
No
Yes
Continue antiarrhythmic drugs
Perform catheter ablation (I)
Perform catheter ablation (IIa)[d]

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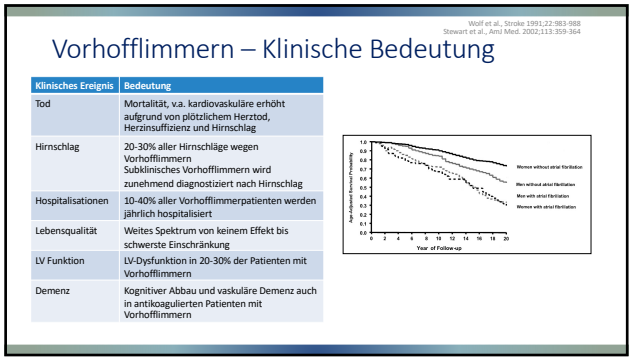
Wolf et al., Stroke 1991;22:983-988
Stewart et al., Am J Med. 2002;113:359-364
Vorhofflimmern – Klinische Bedeutung
Klinisches Ereignis | Bedeutung
Tod | Mortalität, v.a. kardiovaskuläre erhöht aufgrund von plötzlichem Herztod, Herzinsuffizienz und Hirnschlag
Hirnschlag | 20-30% aller Hirnschläge wegen Vorhofflimmern
Subklinisches Vorhofflimmern wird zunehmend diagnostiziert nach Hirnschlag
Hospitalisationen | 10-40% aller Vorhofflimmerpatienten werden jährlich hospitalisiert
Lebensqualität | Weites Spektrum von keinem Effekt bis schwerste Einschränkung
LV Funktion | LV-Dysfunktion in 20-30% der Patienten mit Vorhofflimmern
Demenz | Kognitiver Abbau und vaskuläre Demenz auch in antikoagulierten Patienten mit Vorhofflimmern
Age-Adjusted Survival Probability
Year of Follow-up
Women without atrial fibrillation
Men without atrial fibrillation
Men with atrial fibrillation
Women with atrial fibrillation

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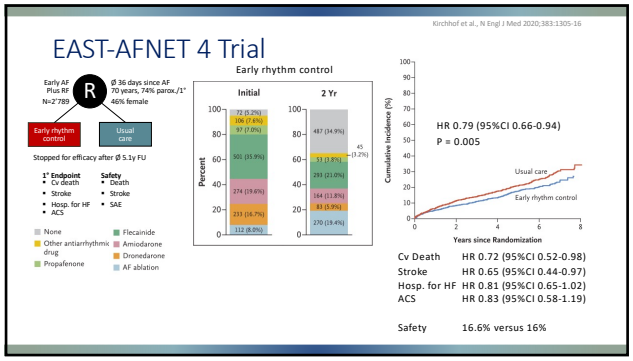
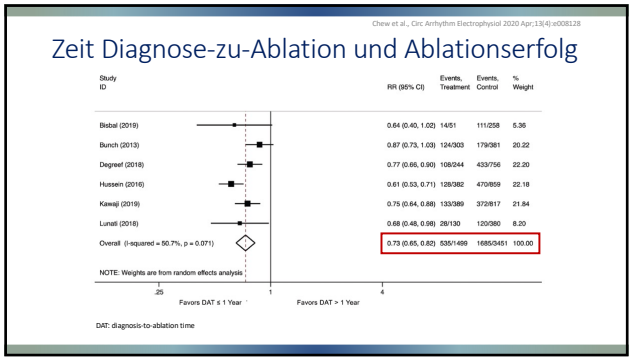

Kirchhof et al., N Engl J Med 2020;383:1305-16
EAST-AFNET 4 Trial
Early AF Plus RF N=2'789
R
Ø 36 days since AF 70 years, 74% parox./1' 46% female
Early rhythm control
Usual care
Stopped for efficacy after Ø 5.1y FU
1° Endpoint
Cv death
Stroke
Hosp. for HF
ACS
Safety
Death
Stroke
SAE
None
Other antiarrhythmic drug
Propafenone
Flecainide
Amiodarone
Dronedarone
AF ablation
Early rhythm control
Initial
2 Yr
Percent
HR 0.79 (95%CI 0.66-0.94)
P = 0.005
Usual care
Early rhythm control
Cumulative incidence (%)
Years since Randomization
Cv Death HR 0.72 (95%CI 0.52-0.98)
Stroke HR 0.65 (95%CI 0.44-0.97)
Hosp. for HF HR 0.81 (95%CI 0.65-1.02)
ACS HR 0.83 (95%CI 0.58-1.19)
Safety 16.6% versus 16%

23


Chew et al., Circ Arrhythm Electrophysiol 2020 Apr;13(4):e008128
Zeit Diagnose-zu-Ablation und Ablationserfolg
Study ID
RR (95% CI)
Events, Treatment
Events, Control
% Weight
Bisbal (2019) 0.64 (0.40, 1.02) 14/51 111/258 5.36
Bunch (2013) 0.87 (0.73, 1.03) 124/303 179/381 20.22
Degreef (2018) 0.77 (0.66, 0.90) 108/244 433/756 22.20
Hussein (2016) 0.61 (0.53, 0.71) 128/382 470/859 22.18
Kawaji (2019) 0.75 (0.64, 0.88) 133/389 372/817 21.84
Lunati (2018) 0.68 (0.48, 0.98) 28/130 120/380 8.20
Overall (I-squared = 50.7%, p = 0.071) 0.73 (0.65, 0.82) 535/1499 1685/3451 100.00
NOTE: Weights are from random effects analysis
.25
1
4
Favors DAT ≤ 1 Year
Favors DAT > 1 Year
DAT: diagnosis-to-ablation time

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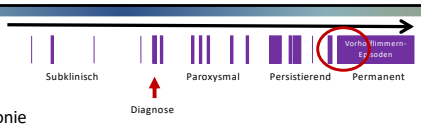
Fall 3



- 70-jähriger ♂
- Arterielle Hypertonie
- KHK, inferiorer STEMI vor 5 Jahren, revaskularisiert
- LVEF 50%, linker Vorhof dilatiert (LAVI 60 ml/m²)
- Vorhofflimmern, persistierend seit ca. 3 Jahren, Dyspnoe bei Anstrengung
- Medikamente NOAC
  Betablocker
  Sartan
  Statin

?

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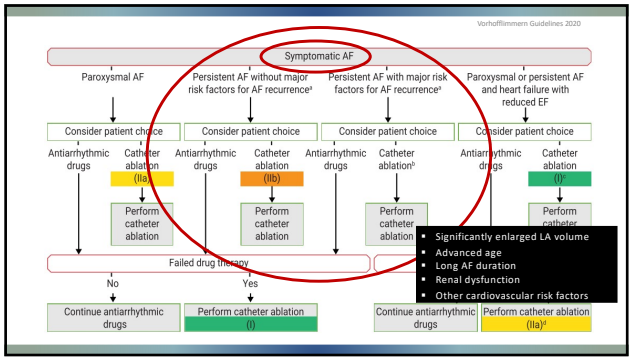

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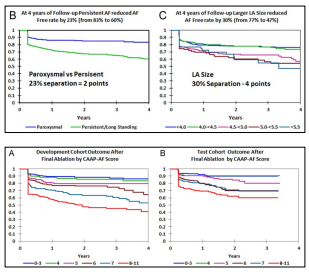
Erfolgsprädiktoren Vorhofflimmerablation

Winkle et al., Heart Rhythm 2016;13:2119–2125

CAAP-AF Score

	Clinical Descriptor	Score
C	Coronary Artery Disease	1
A	Atrial diameter (left, cm)	
	<4.0	0
	4.0–<4.5	1
	4.5–<5.0	2
	5.0–<5.5	3
	≥5.5	4
A	Age	
	<50	0
	50–<60	1
	60–<70	2
	≥70	3
P	Persistent or longstanding AF	2
A	Antiarrhythmics failed	
	None	0
	1 or 2	1
	>2	2
F	Female gender	1
	Maximum score	13



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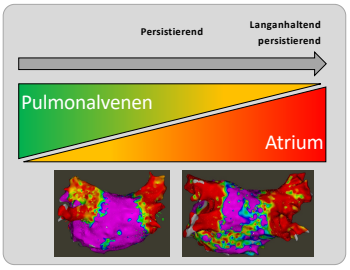
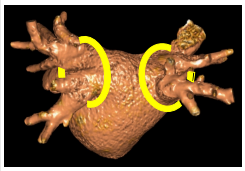
Mechanisms of Atrial Fibrillation

Wijesurendra et al., Heart 2019;105:1860–1867





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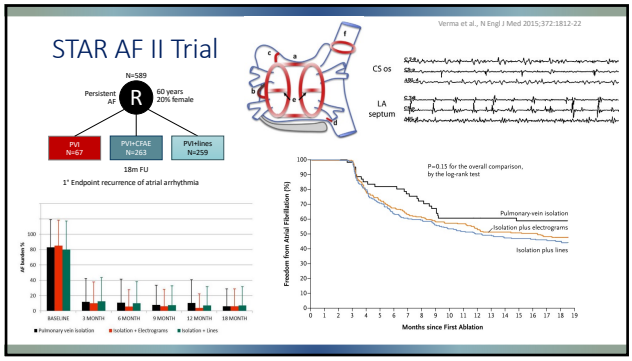
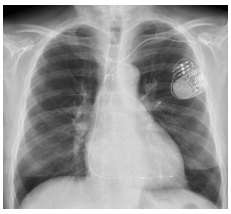
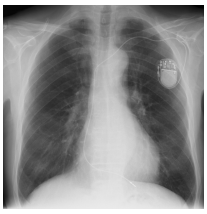


29

Schrittmacherimplantation und Ablation des AV-Knoten





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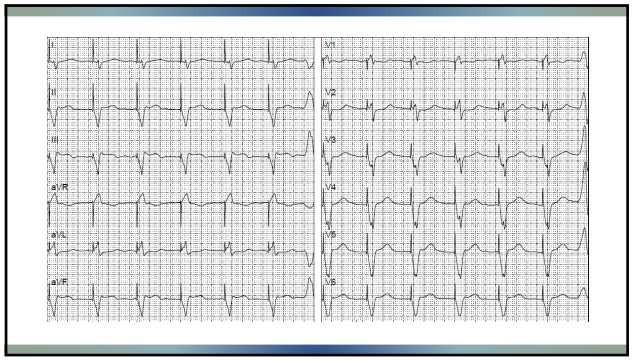

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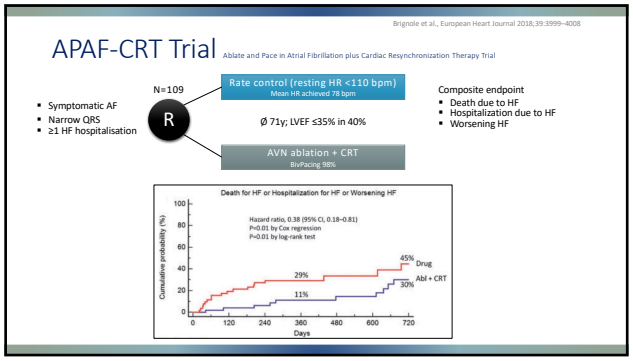
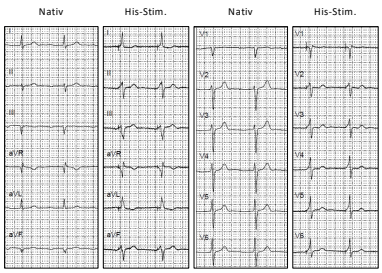
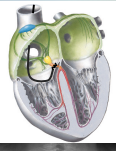
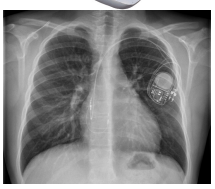


32

His-Bündel Stimulation







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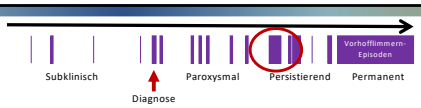
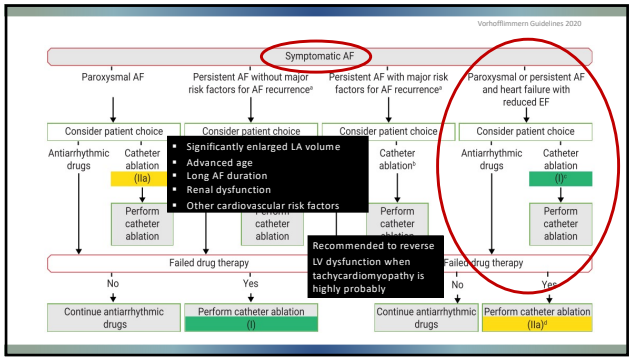
Fall 4



- 55-jähriger ♂
- Adipositas (BMI 34 kg/m²), Hypercholesteriämie
- Dyspnoe und Gewichtszunahme (+8kg) seit 3 Wochen
- Neu persistierendes Vorhofflimmern
- LVEF 25%, linker Vorhof dilatiert (LAVI 47 ml/m²)
- Medikamente NOAC
  Betablocker
  ARNI
  Diuretikum
  MRA
  Statin

?

34



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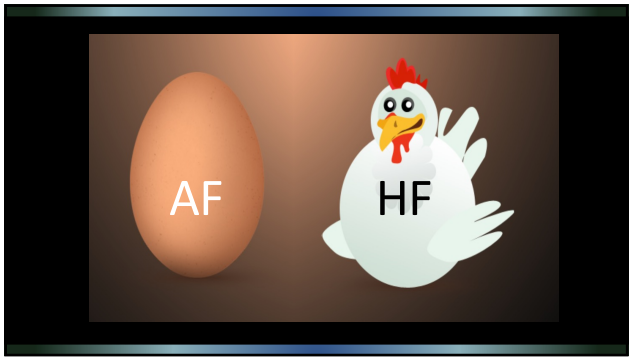


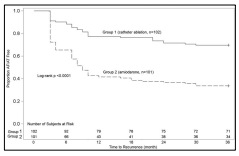
36

Ablation

Di Biase et al., Circulation. 2016;133:1637-1644
Marrouche et al., N Engl J Med 2018;378:417-27

AATAC

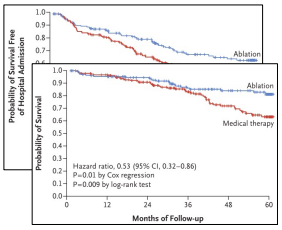
Persistierend; LVEF <40%; NYHA II/III; CRT-D/2K-ICD; FU 24m



Endpunkt	Ablation	Amiodaron	P-Wert	RR (95% CI)
Ungeplante Hospitalisationen	32 (31%)	58 (57%)	<0.001	0.55 (0.39-0.76)
Mortalität	8 (8%)	18 (18%)	0.037	0.44 (0.20-0.96)

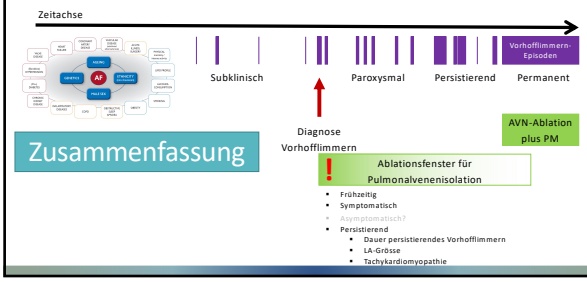
CASTLE-AF

Paroxysmal/persistierend; NYHA II-IV; LVEF ≤35%; 2K-ICD mit Telemedizin; N=363



37

Ab wann und bis wann sollte man an eine Ablation von Vorhofflimmern denken?



Zusammenfassung

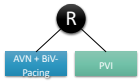
38

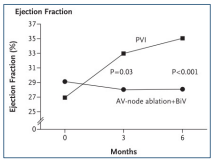
PABA-CHF Trial

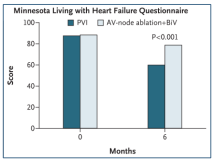
Khan et al., N Engl J Med 2008;359:1778-85

PVI vs. AVN Ablation with Bi-Ventricular Pacing for Treatment of AF in Patients with HF Study

- Symptomatic AF (half non-paroxysmal)
- LVEF ≤40%
- NYHA class II or III







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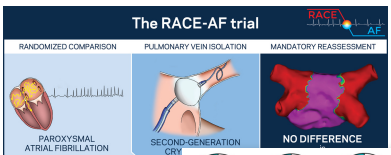
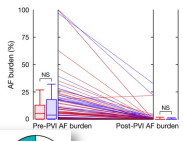
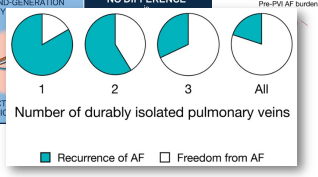
The RACE-AF trial

Sorensen et al., 2021;14:e009573







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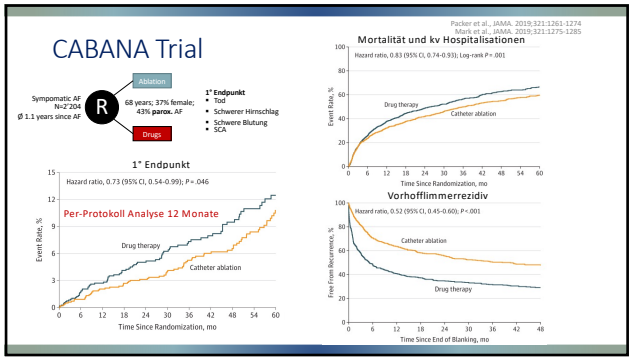
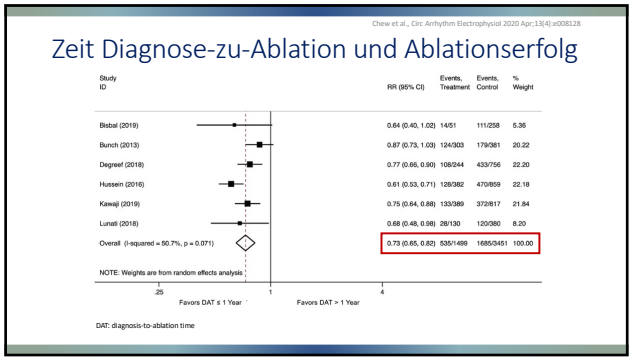

Packer et al., JAMA. 2019;321:1261-1274
Mark et al., JAMA. 2019;321:1275-1285
CABANA Trial
Ablation
Sympomatic AF
N=2'204
ø 1.1 years since AF
R
68 years; 37% female;
43% parox. AF
Drugs
1° Endpunkt
Tod
Schwerer Hirnschlag
Schwere Blutung
SCA
1° Endpunkt
Hazard ratio, 0.73 (95% CI, 0.54-0.99); P = .046
Per-Protokoll Analyse 12 Monate
Drug therapy
Catheter ablation
Event Rate, %
Time Since Randomization, mo
Mortalität und kv Hospitalisationen
Hazard ratio, 0.83 (95% CI, 0.74-0.93); Log-rank P = .001
Drug therapy
Catheter ablation
Event Rate, %
Time Since Randomization, mo
Vorhofflimmerrezidiv
Hazard ratio, 0.52 (95% CI, 0.45-0.60); P < .001
Catheter ablation
Drug therapy
Free from Recurrence, %
Time Since End of Blanking, mo

41


Chew et al., Circ Arrhythm Electrophysiol 2020 Apr;13(4):e008128
Zeit Diagnose-zu-Ablation und Ablationserfolg
Study ID
RR (95% CI)
Events, Treatment
Events, Control
% Weight
Bisbal (2019) 0.64 (0.40, 1.02) 14/51 111/258 5.36
Bunch (2013) 0.87 (0.73, 1.03) 124/303 179/381 20.22
Degreef (2018) 0.77 (0.66, 0.90) 108/244 433/756 22.20
Hussein (2016) 0.61 (0.53, 0.71) 128/382 470/859 22.18
Kawaji (2019) 0.75 (0.64, 0.88) 133/389 372/817 21.84
Lunati (2018) 0.68 (0.48, 0.98) 28/130 120/380 8.20
Overall (I-squared = 50.7%, p = 0.071) 0.73 (0.65, 0.82) 535/1499 1685/3451 100.00
NOTE: Weights are from random effects analysis
.25
1
4
Favors DAT ≤ 1 Year
Favors DAT > 1 Year
DAT: diagnosis-to-ablation time

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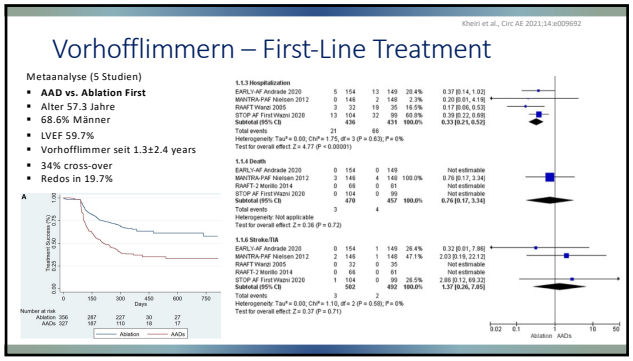
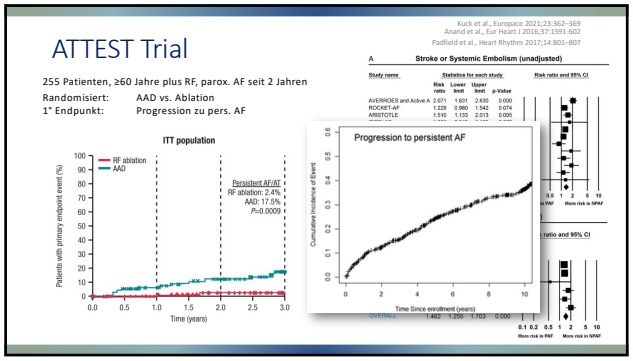

Kheiri et al., Circ AE 2021;14:e009692
Vorhofflimmern – First-Line Treatment
Metaanalyse (5 Studien)
AAD vs. Ablation First
Alter 57.3 Jahre
68.6% Männer
LVEF 59.7%
Vorhofflimmer seit 1.3±2.4 years
34% cross-over
Redos in 19.7%
Treatment Success (%)
Days
Number at risk
Ablation 306 287 227 30 27
AADs 327 187 110 16 17
Ablation
AADs
1.1.3 Hospitalization
EARLY-AF Andrade 2020 5 154 13 149 20.4% 0.37 [0.14, 1.02]
MANTRA-PAF Nielsen 2012 0 146 2 146 2.3% 0.20 [0.01, 4.18]
RAFFT Wanzi 2005 3 32 19 35 16.5% 0.17 [0.06, 0.53]
STOP AF First Vitazni 2020 13 104 32 99 60.9% 0.39 [0.22, 0.69]
Subtotal (95% CI) 436 431 100.0% 0.33 [0.21, 0.53]
Total events 21 66
Heterogeneity: Tau² = 0.00; Chi² = 1.75, df = 3 (P = 0.63); I² = 0%
Test for overall effect: Z = 4.77 (P < 0.00001)
1.1.4 Death
EARLY-AF Andrade 2020 0 154 0 149 Not estimable
MANTRA-PAF Nielsen 2012 3 146 4 146 100.0% 0.78 [0.17, 3.34]
RAFFT-2 Montillo 2014 0 68 0 61 Not estimable
STOP AF First Vitazni 2020 0 104 0 99 Not estimable
Subtotal (95% CI) 470 457 100.0% 0.78 [0.17, 3.34]
Total events 3 4
Heterogeneity: Not applicable
Test for overall effect: Z = 0.36 (P = 0.72)
1.1.6 Stroke/TIA
EARLY-AF Andrade 2020 0 154 1 149 26.4% 0.32 [0.01, 7.86]
MANTRA-PAF Nielsen 2012 2 146 1 146 47.1% 2.03 [0.18, 22.12]
RAFFT Wanzi 2005 0 32 0 35 Not estimable
RAFFT-2 Montillo 2014 0 68 0 61 Not estimable
STOP AF First Vitazni 2020 1 104 0 99 26.5% 2.86 [0.12, 69.22]
Subtotal (95% CI) 562 492 100.0% 1.37 [0.26, 7.05]
Total events 3 2
Heterogeneity: Tau² = 0.00; Chi² = 1.10, df = 2 (P = 0.58); I² = 0%
Test for overall effect: Z = 0.37 (P = 0.71)
0.02
0.1
1
10
50
Ablation
AADs

43


Kuck et al., Europace 2021;23:362–369
Anand et al., Eur Heart J 2016;37:1591-602
Padfield et al., Heart Rhythm 2017;14:801–807
ATTEST Trial
255 Patienten, ≥60 Jahre plus RF, parox. AF seit 2 Jahren
Randomisiert: AAD vs. Ablation
1° Endpunkt: Progression zu pers. AF
ITT population
RF ablation
AAD
Persistent AF/AT
RF ablation: 2.4%
AAD: 17.5%
P=0.0009
Patients with primary endpoint event (%)
Time (years)
Progression to persistent AF
Cumulative Incidence of Event
Time Since enrollment (years)
A
Stroke or Systemic Embolism (unadjusted)
Study name
Statistics for each study
Risk ratio
Lower limit
Upper limit
p-Value
Risk ratio and 95% CI
AVERROES and Active A 2.071 1.601 2.680 0.000
ROCKET-AF 1.229 0.980 1.542 0.074
ARISTOTLE 1.510 1.133 2.013 0.005
More risk in PAF
More risk in NPAF

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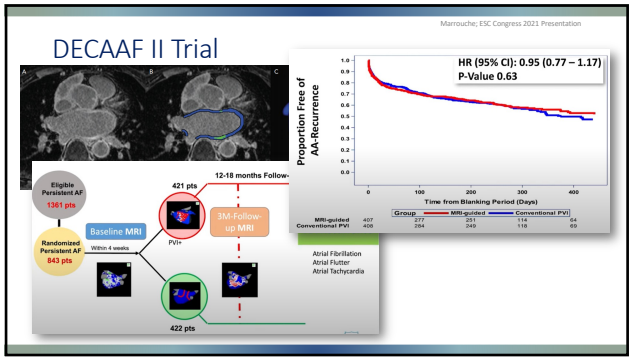
Marrouche; ESC Congress 2021 Presentation
DECAAF II Trial
HR (95% CI): 0.95 (0.77 – 1.17)
P-Value 0.63
Proportion Free of AA-Recurrence
Time from Blanking Period (Days)
Eligible Persistent AF
1361 pts
Randomized Persistent AF
843 pts
Baseline MRI
Within 4 weeks
421 pts
422 pts
PVI+
12-18 months Follow-
3M-Follow-up MRI
Group
MRI-guided
Conventional PVI
Atrial Fibrillation
Atrial Flutter
Atrial Tachycardia

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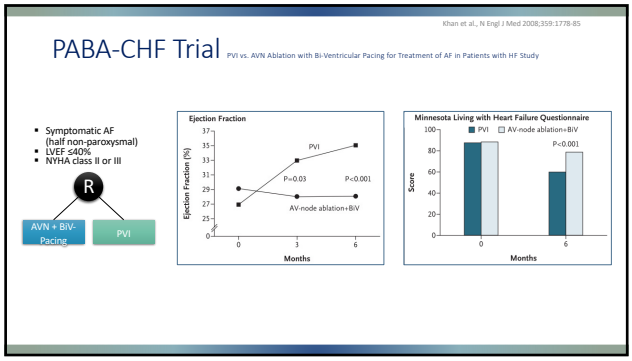
Khan et al., N Engl J Med 2008;359:1778-85
PABA-CHF Trial
PVI vs. AVN Ablation with Bi-Ventricular Pacing for Treatment of AF in Patients with HF Study
Symptomatic AF (half non-paroxysmal)
LVEF ≤40%
NYHA class II or III
R
AVN + BiV-Pacing
PVI
Ejection Fraction
Ejection Fraction (%)
PVI
P=0.03
P<0.001
AV-node ablation+BiV
Months
Minnesota Living with Heart Failure Questionnaire
PVI
AV-node ablation+BiV
P<0.001
Score
Months

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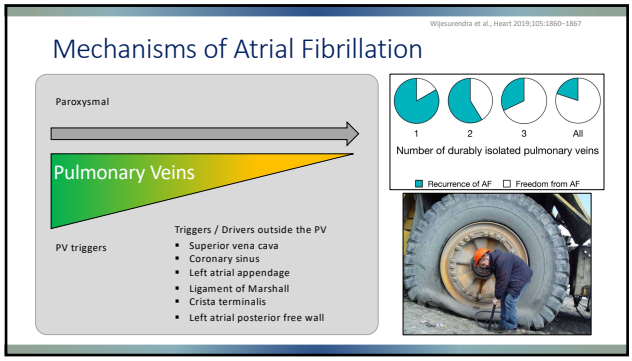
Wijesurendra et al., Heart 2019;105:1860–1867
Mechanisms of Atrial Fibrillation
Paroxysmal
Pulmonary Veins
PV triggers
Triggers / Drivers outside the PV
Superior vena cava
Coronary sinus
Left atrial appendage
Ligament of Marshall
Crista terminalis
Left atrial posterior free wall
1
2
3
All
Number of durably isolated pulmonary veins
Recurrence of AF
Freedom from AF

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