ALLE INS EN OUTS OVER CHEMISCHE EN ELEKTRISCHE CARDIOVERSIE

Dr. S.R.D. Piers, cardioloog
Leids Universitair Medisch Centrum

Praktische aspecten cardioversie…

de wetenschap erachter…

… quiz!

Waar is de cardioversie uitgevonden?

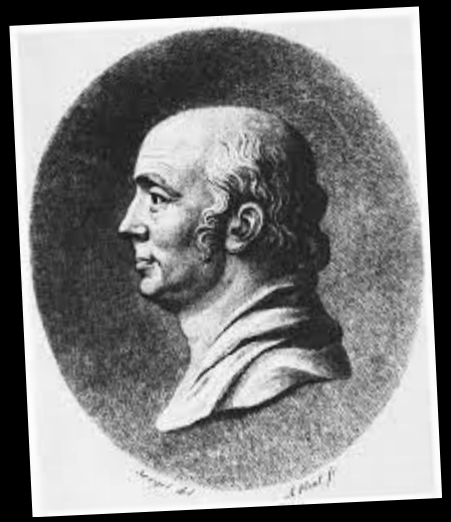
A. Amsterdam
B. Leiden
C. Maastricht
D. Online

Waar is de cardioversie uitgevonden?

A. Amsterdam
B. **Leiden**
C. Maastricht
D. Online

Leidse fles

1746: Pieter van Musschenbroeck
Hoogleraar natuurkunde Universiteit Leiden



1775: Peter Abildgaard

“He systematically shocked hens, delivering electric charges in different parts of their body. Electric stimuli applied anywhere across the body of the hen, particularly in the head, could render the animal lifeless, but subsequent shocks delivered to the chest could revive the heart.”

Eerste publicatie defibrillatie

1947: Claude S. Beck, Cleveland, Ohio

Hartoperatie jongen 14

Reanimatie, inwendige hartmassage 45 minuten

ECG: VF

Tweede shock: sinusritme!

WECAM

Hoeveel patienten converteren binnen 48 uur spontaan naar sinusritme?

A. 28%
B. 48%
C. 69%
D. 84%

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WECAM

The NEW ENGLAND JOURNAL of MEDICINE

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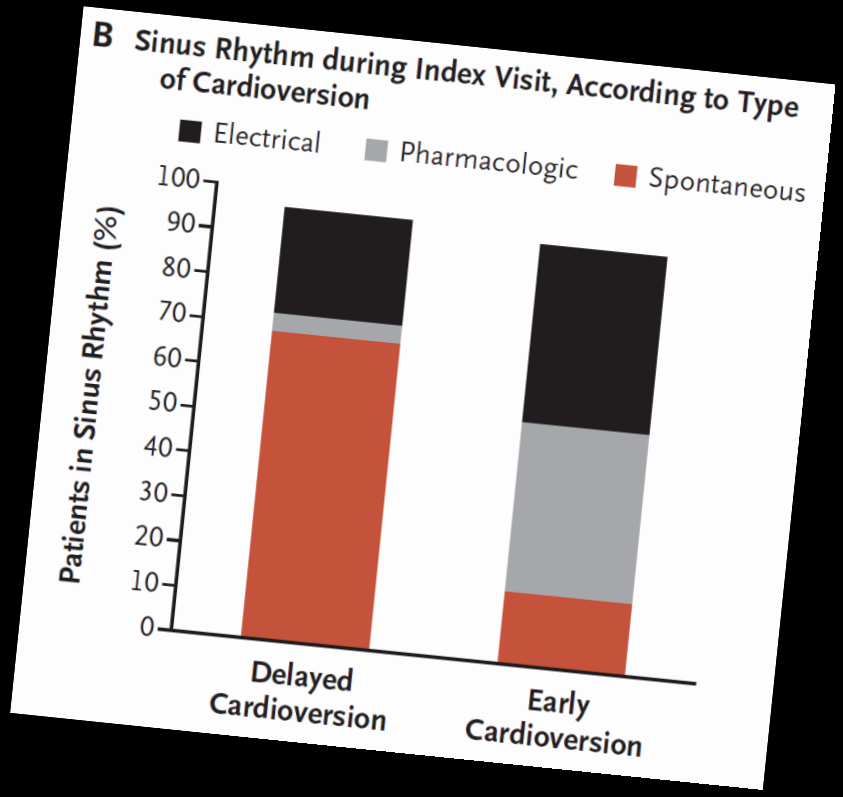
Early or Delayed Cardioversion in Recent-Onset Atrial Fibrillation

N.A.H.A. Pluymaekers, E.A.M.P. Dudink, J.G.L.M. Luermans, J.G. Meeder, T. Lenderink, J. Widdershoven, J.J.J. Bucx, M. Rienstra, O. Kamp, J.M. Van Opstal, M. Alings, A. Oomen, C.J. Kirchhof, V.F. Van Dijk, H. Ramanna, A. Liem, L.R. Dekker, B.A.B. Essers, J.G.P. Tijssen, I.C. Van Gelder, and H.J.G.M. Crijns, for the RACE 7 ACWAS Investigators*



- Patienten met symptomatisch AF < 36 uur
- Spontaan sinusritme binnen 48 uur bij **69%** in de groep met delayed cardioversion
- Sinusritme na 4 weken in 91% met delayed cardioversion, vs. 94% na early cardioversion

WECAM

Welke positie electrodes?

A. Anterior-lateraal
B. Anterior-posterior
C. Lateraal-posterior
D. Maakt niet uit

Welke positie electrodes?

A. Anterior-lateraal
B. Anterior-posterior
C. Lateraal-posterior
D. Maakt niet uit

Anterior-posterior?

AF duur bij ECV: mediaan 5 maanden

74% anti-aritmica

Anterior-posterior effectief bij 96%

Anterior-lateraal effectief bij 78%

Cross-over van AL->AP: 8/12 success

Cross-over van AP->AL: 0/2 succes

Kirchhof, Anterior-posterior versus anterior-lateral electrode positions for external cardioversion of atrial fibrillation, Lancet 2002

WECAM

Of tch anterior-lateraal?

AF duur bij ECV: mediaan 27-30 dagen

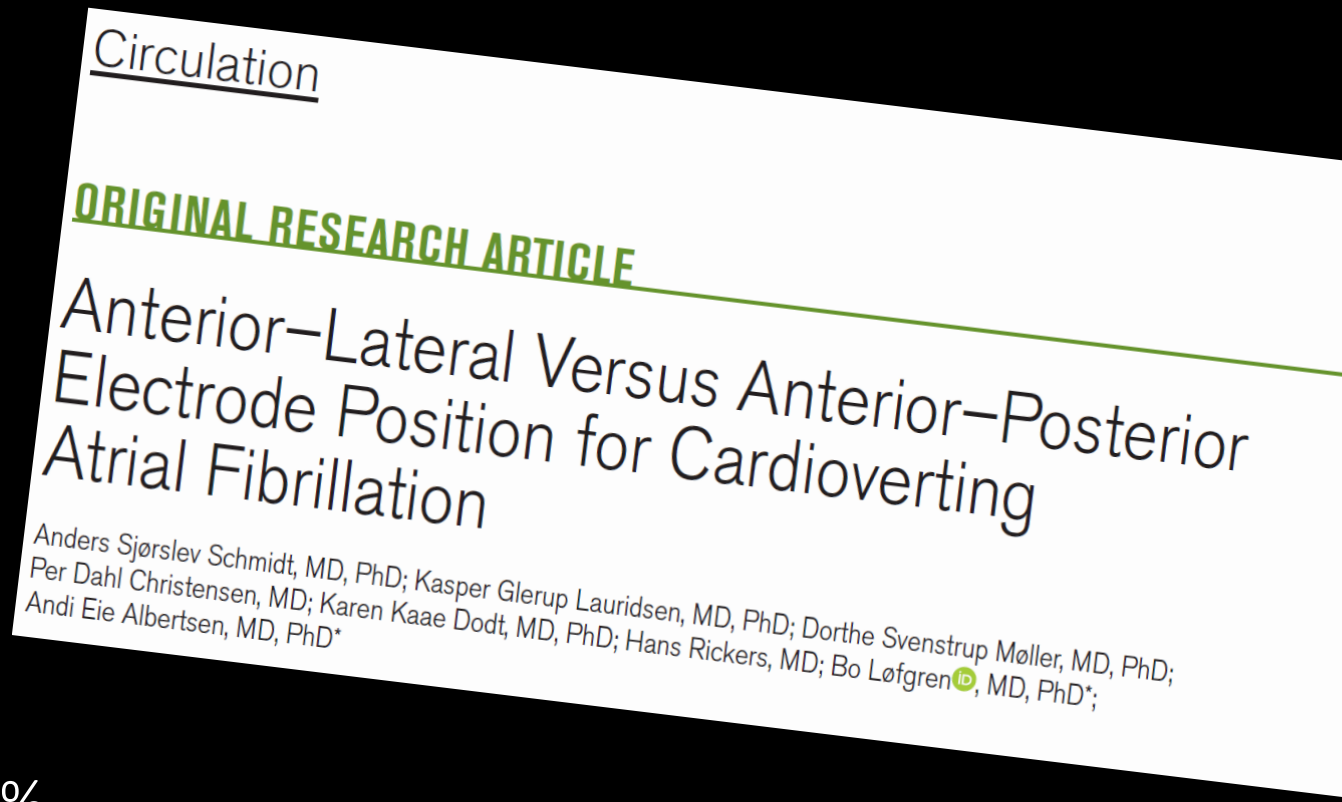
17% anti-aritmica

Shocks: 100 J, 150 J, 200 J, and 360J

AP 1e shock effectief bij 33%, 4e shock 85%

AL 1e shock effectief bij 54%, 4e shock 93%

$p < 0.001$


Circulation

ORIGINAL RESEARCH ARTICLE

Anterior–Lateral Versus Anterior–Posterior Electrode Position for Cardioverting Atrial Fibrillation

Anders Sjørslev Schmidt, MD, PhD; Kasper Glerup Lauridsen, MD, PhD; Dorthe Svenstrup Møller, MD, PhD; Per Dahl Christensen, MD; Karen Kaae Dodt, MD, PhD; Hans Rickers, MD; Bo Løfgren, MD, PhD*; Andi Eie Albertsen, MD, PhD*

Schmidt, Anterior–Lateral Versus Anterior–Posterior Electrode Position for Cardioverting Atrial Fibrillation Circulation. 2021;144:1995–2003

WECAM

Shock: bifasisch of monofasisch?

A. Bifasisch
B. Monofasisch

WECAM

Shock: bifasisch of monofasisch?

A. Bifasisch
B. Monofasisch

Biphasic shocks cardioverted 102/104 patients (98%) and monophasic shocks 83/97 patients (86%, P < 0.001).

Kirchhof, A trial of self-adhesive patch electrodes and hand-held paddle electrodes for external cardioversion of atrial fibrillation, EHJ 2005

WECAM

Hoeveel joules voor AF?

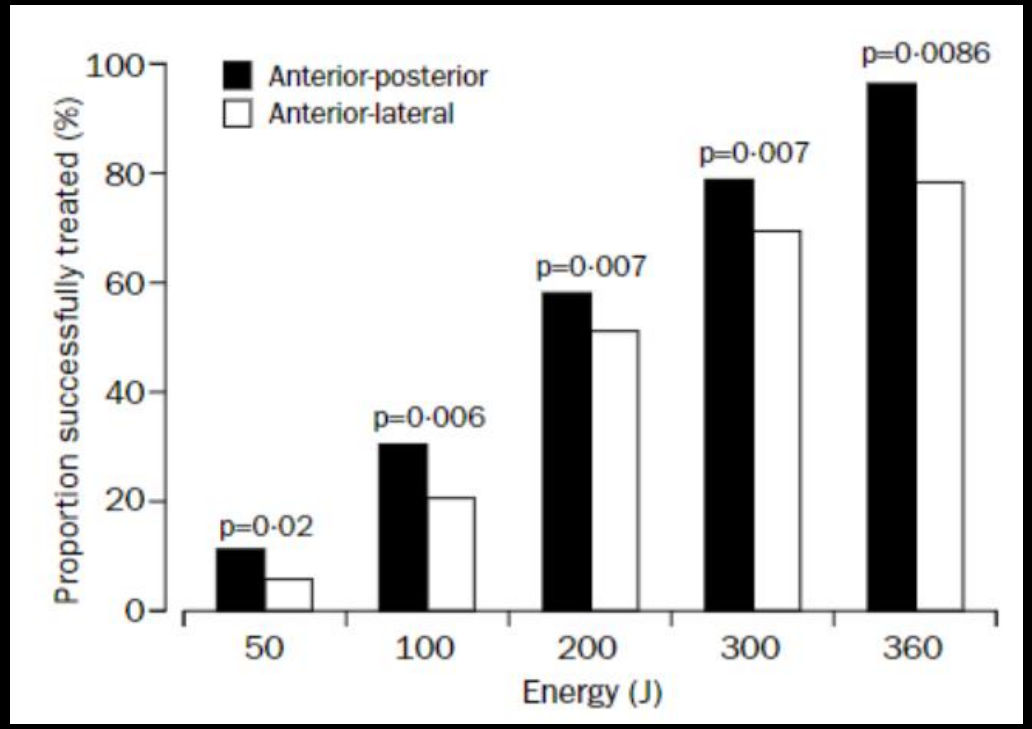
A. 50
B. 100
C. 200
D. 300
E. 360

Hoeveel joules voor AF?

A. 50
B. 100
C. 200
D. 300
E. 360

AF duur bij ECV: mediaan 5 maanden

74% anti-aritmica



Kirchhof, Anterior-posterior versus anterior-lateral electrode positions for external cardioversion of atrial fibrillation, Lancet 2002

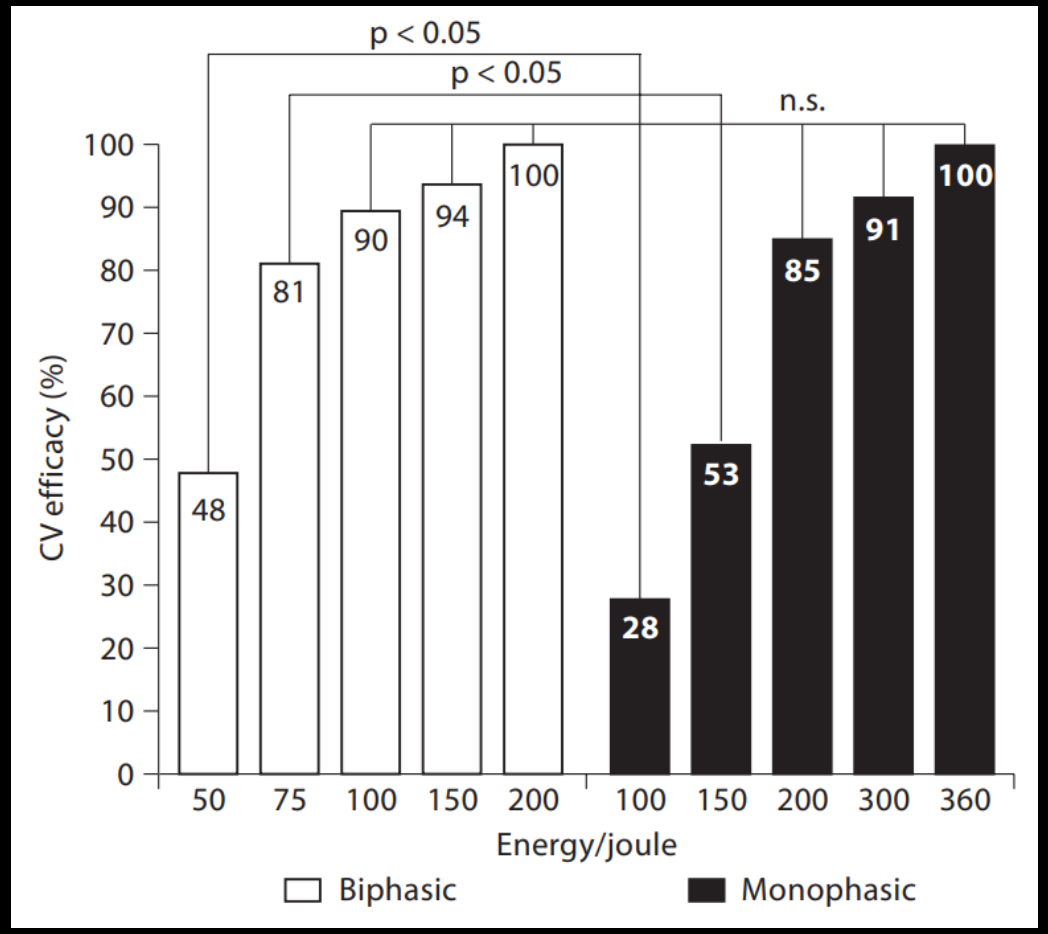
WECAM

En hoeveel joules voor een flutter?

A. 50
B. 70
C. 100
D. 150
E. 200

En hoeveel joules voor een flutter?

A. 50
B. 70
C. <u>100</u>
D. 150
E. 200



Mortensen, Biphasic versus monophasic shock for external cardioversion of atrial flutter: a prospective, randomized trial, Cardiology 2008

WECAM

Amiodaron ….

A. Vergroot de kans op succesvolle ECV
B. Vergroot de kans op behoud sinusritme na ECV
C. Beiden
D. Geen van beiden

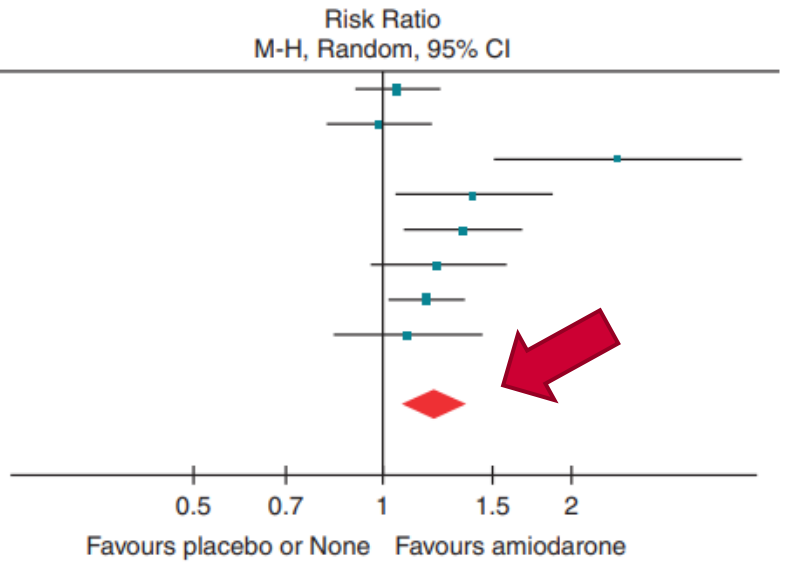
Amiodaron ….

A. Vergroot de kans op succesvolle ECV
B. Vergroot de kans op behoud sinusritme na ECV
C. Beiden
D. Geen van beiden

Amiodaron ....

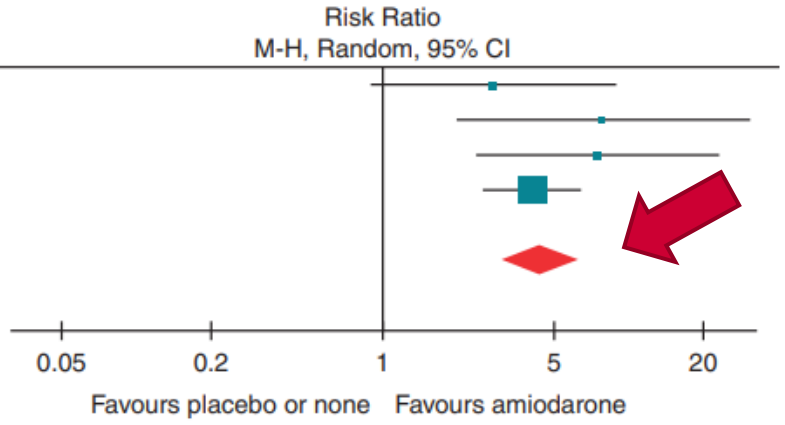
Study or Subgroup	Amiodarone Events	Amiodarone Total	Placebo or None Events	Placebo or None Total	Weight	Risk Ratio M-H, Random, 95% CI
Boos 2004	17	17	17	18	16.2%	1.06 [0.91, 1.23]
Channer 2004	96	123	30	38	14.5%	0.99 [0.82, 1.19]
Galperin 2001	35	47	15	48	6.0%	2.38 [1.52, 3.74]
Jong 1995	39	48	25	43	10.4%	1.40 [1.05, 1.86]
Kanoupakis 2004	44	48	32	47	13.4%	1.35 [1.09, 1.67]
Manios 2003	31	36	26	37	11.9%	1.23 [0.96, 1.57]
Singh 2005	206	267	90	137	16.9%	1.17 [1.02, 1.35]
Vijaylakshmi 2006	22	27	23	31	10.8%	1.10 [0.83, 1.45]
Total (95%) CI		613		399	100.0%	1.22 [1.07, 1.39]
Total events	490		258			

Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 20.09$, $df = 7$ ($P = 0.005$); $I^2 = 65\%$
Test for overall effect: $Z = 2.92$ ($P = 0.004$)



Study or Subgroup	Amiodarone Events	Amiodarone Total	Placebo or None Events	Placebo or None Total	Weight	Risk Ratio M-H, Random, 95% CI
Boos 2004	8	17	3	18	11.2%	2.82 [0.89, 8.91]
Channer 2004	51	123	2	38	7.9%	7.88 [2.01, 30.85]
Galperin 2001	22	47	3	48	11.4%	7.49 [2.40, 23.35]
Singh 2005	134	267	17	137	69.5%	4.04 [2.55, 6.41]
Total (95% CI)		454		241	100.0%	4.39 [2.99, 6.45]
Total events	215		25			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 2.31$, $df = 3$ ($P = 0.51$); $I^2 = 0\%$
Test for overall effect: $Z = 7.55$ ($P < 0.00001$)



Um Europace 2019 Pre- and post-treatment with amiodarone for elective electrical cardioversion of atrial fibrillation: a systematic review and meta-analysis

WECAM

Welk medicijn is het meest effectief voor chemische cardioversie?

A. Sotalol
B. Flecainide
C. Amiodaron

Welk medicijn is het meest effectief voor chemische cardioversie?

A. Sotalol
B. Flecainide
C. Amiodaron

Study	Amio No. of Patients	Placebo No. of Patients	Conversion to Sinus Rhythm No. of Patients (%)							
			1–2 h		3–5 h		6–8 h		24 h	
			Amio	Ic	Amio	Ic	Amio	Ic	Amio	Ic
Propafenone										
Boriani et al. (9)	51	57	3 (6)	22 (39)	13 (25)	33 (58)	29 (57)	46 (75)	—	—
		119		10 (8)		53 (45)		90 (76)		
Blanc et al. (17)	43	43	—	—	7 (16)	16 (37)	11 (26)	19 (44)	20 (47)	24 (56)
Kochiadakis et al. (12)	48	46	—	—	—	—	—	—	40 (83)	36 (78)
Negrini et al. (19)	30	31	6 (20)	18 (58)	10 (30)	20 (64)	12 (40)	22 (71)	24 (80)	27 (87)
Martinez-Marcos et al. (18)	50	50	7 (14)	30 (60)	—	—	21 (42)	34 (68)	—	—
Treglia et al. (20)	27	27	1 (4)	7 (26)	3 (15)	13 (65)	7 (26)	15 (55)	13 (48)	18 (67)
Flecainide										
Boriani et al. (9)	51	69	3 (6)	9 (13)	13 (25)	39 (56)	29 (57)	52 (75)	—	—
Donovan et al. (8)	32	34	11 (34)	20 (59)	—	—	19 (59)	23 (68)	—	—
Martinez-Marcos et al. (18)	50	50	7 (14)	29 (58)	—	—	21 (42)	41 (82)	—	—
Total	281*	526	28 (15)	139 (32)	23 (22)	174 (50)	99 (42)	301 (63)	97 (66)	104 (71)

Chevalier, Amiodarone Versus Placebo and Class Ic Drugs for Cardioversion of Recent-Onset Atrial Fibrillation, JACC 2003

ESC guideline: farmacologische cardioversie

Antiarrhythmic drugs for restoration of sinus rhythm (pharmacological cardioversion)

Drug	Administration route	Initial dose for cardioversion	Further dosing for cardioversion	Acute success rate and expected time to sinus rhythm	Contraindications/precautions/comments
Flecainide[a]	Oral[b] i.v.	200–300 mg 2 mg/kg over 10 min	-	Overall: 59–78% (51% at 3 h, 72% at 8 h)	• Should not be used in ischaemic heart disease and/or significant structural heart disease • May induce hypotension, AFL with 1:1 conduction (in 3.5 - 5.0% of patients) • Flecainide may induce mild QRS complex widening • Do NOT use for pharmacological cardioversion of AFL
Propafenone[a]	Oral[b] i.v.	450–600 mg 1.5 - 2 mg/kg over 10 min	-	Oral: 45–55% at 3 h, 69–78% at 8 h; i.v.: 43–89% Up to 6 h	
Vernakalant[c]	i.v.	3 mg/kg over 10 min	2 mg/kg over 10 min (10 - 15 min after the initial dose)	<1 h (50% conversion within 10 min)	• Should not be used in patients with arterial hypotension (SBP <100 mmHg), recent ACS (within 1 month), NYHA III or IV HF, prolonged QT, or severe aortic stenosis • May cause arterial hypotension, QT prolongation, QRS widening, or non-sustained ventricular tachycardia
Amiodarone[a]	i.v.	5 - 7 mg/kg over 1 - 2 h	50 mg/h (maximum 1.2 g for 24 h)	44% (8–12 h to several days)	• May cause phlebitis (use a large peripheral vein, avoid i.v. administration >24 hours and use preferably volumetric pump) • May cause hypotension, bradycardia/atrioventricular block, QT prolongation • Only if no other options in patients with hyperthyroidism (risk of thyrotoxicosis)
Ibutilide[c]	i.v.	1 mg over 10 min 0.01 mg/kg if body weight <60 kg	1 mg over 10 min (10 - 20 min after the initial dose)	31–51% (AF) 63–73% (AFL) ≈1 h	• Effective for conversion of AFL • Should not be used in patients with prolonged QT, severe LVH, or low LVEF • Should be used in the setting of a cardiac care unit as it may cause QT prolongation, polymorphic ventricular tachycardia (torsades de pointes) • ECG monitoring for at least 4 hours after administration to detect a proarrhythmic event

WECAM

Moet een device worden gecontroleerd na externe ECV?

A. Ja
B. Nee
C. Afhankelijk van het type

Moet een device worden gecontroleerd na externe ECV?

A. Ja
B. **Nee**
C. Afhankelijk van het type

Kans op CVA/TIA na ECV zonder antistolling bij AF 30 uur en CHADSVASc 0-1?

A. 0.0%
B. 0.1%
C. 0.9%
D. 1.9%

Kans op CVA/TIA na ECV zonder antistolling bij AF 30 uur en CHADSVASc 0-1?

A. 0.0%
B. 0.1%
C. **0.9%**
D. 1.9%

- Nuotio et al., JAMA 2014: 5116 cardioversions in 2481 patients without anticoagulation
- 38 thromboembolic events occurred within 30 days after cardioversion (of which 31 strokes)

	Total No. of Patients	No. (%) of Patients by Time to Cardioversion[b]			*P* Value[c]
		<12 h (n = 2440)	12-<24 h (n = 1840)	24-<48 h (n = 836)	
		No. (%) [95% CI] of Patients by Time to Cardioversion			
Thromboembolic complications	38	8 (0.3) [0.1-0.6]	21 (1.1) [0.7-1.6]	9 (1.1) [0.4-1.8]	.004
By sex					
Female	22	3 (0.4) [0-0.8]	13 (2.4) [1.1-3.6]	6 (2.5) [0.5-4.6]	.001
Male	16	5 (0.3) [0-0.6]	8 (0.6) [0.2-1.0]	3 (0.5) [0-1.1]	.48
By CHA_2DS_2-VASc score					
0-1	10	2 (0.2) [0-0.4]	4 (0.4) [0-0.8]	4 (0.9) [0-1.8]	.06
>1	28	6 (0.5) [0.1-0.9]	17 (2.0) [1.1-2.9]	5 (1.2) [0.2-2.3]	.008

Vrouw 54 jaar, CHADSVASc = 1 o.b.v. vrouwelijk geslacht
30 uur AF
Na ECV …

A. Naar huis zonder antistolling
B. Naar huis met antistolling

Vrouw 54 jaar, CHADSVASc = 1 o.b.v. vrouwelijk geslacht
30 uur AF
Na ECV …

A. Naar huis zonder antistolling
B. Naar huis met antistolling

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Hoeveel weken antistolling na ECV?

A. 1
B. 3
C. 4
D. 6

WECAM

Hoeveel weken antistolling na ECV?

A. 1
B. 3
C. 4
D. 6

Hoeveel weken antistolling na ECV?

No RCT has evaluated anticoagulation
patients undergoing cardioversion wi
AF<48 h. Observational data suggest
thrombo-embolism is very low (0 - 0.2%
AF duration of <12 h and a very low str
in men, 1 in women),[860,864,865] in whom the benefit of 4-week antico-
agulation after cardioversion is undefined and the prescription of anti-
coagulants can be optional, based

In patients with AF duration of >24 h undergoing cardioversion, therapeutic anticoagulation should be continued for at least 4 weeks, even after successful cardioversion to sinus rhythm (beyond 4 weeks, the decision about long-term OAC treatment is determined by the presence of stroke risk factors).[860,861]	IIa	B

In patients with a definite duration of AF ≤24 h and a very low stroke risk (CHA_2DS_2-VASc of 0 in men or 1 in women) post-cardioversion anti-coagulation for 4 weeks may be omitted.[871,876]	IIb	C

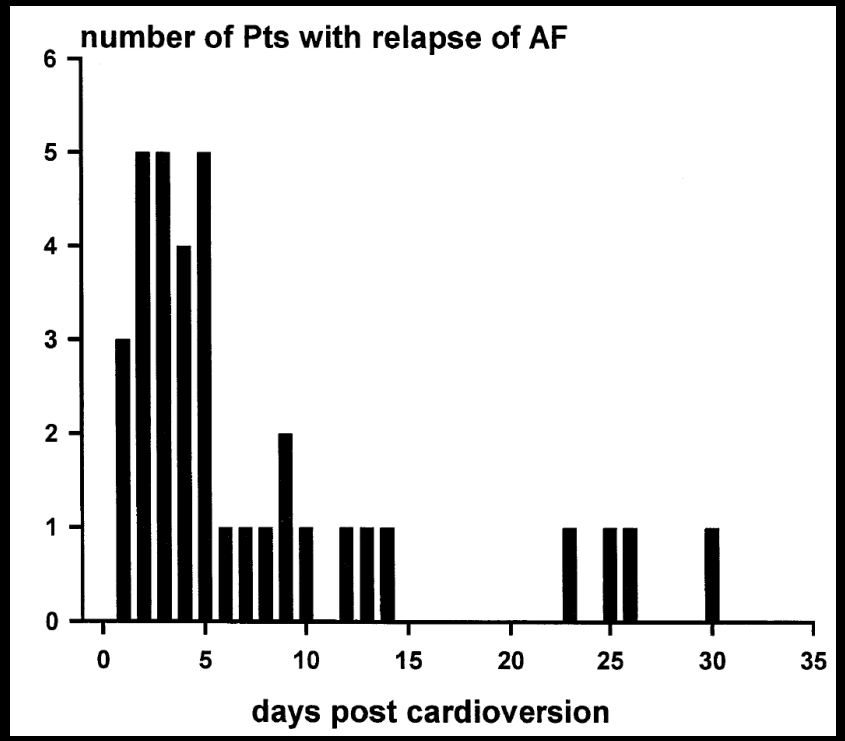
WECAM

Wanneer treden de meeste recidieven op na elektrische cardioversie?

A. 1e dag na ECV
B. 2-5 dagen na ECV
C. 5-10 dagen na ECV
D. >10 dagen na ECV

Wanneer treden de meeste recidieven op na elektrische cardioversie?

A. 1e dag na ECV
B. **2-5 dagen na ECV**
C. 5-10 dagen na ECV
D. >10 dagen na ECV



Tieleman JACC 1998, Early Recurrences of Atrial Fibrillation After Electrical Cardioversion

WECAM

Factoren die geassocieerd zijn met recidieven AF na ECV zijn…

A. Langere duur AF
B. LA volume
C. A + B + overgewicht
D. A + B + overgewicht + OSAS

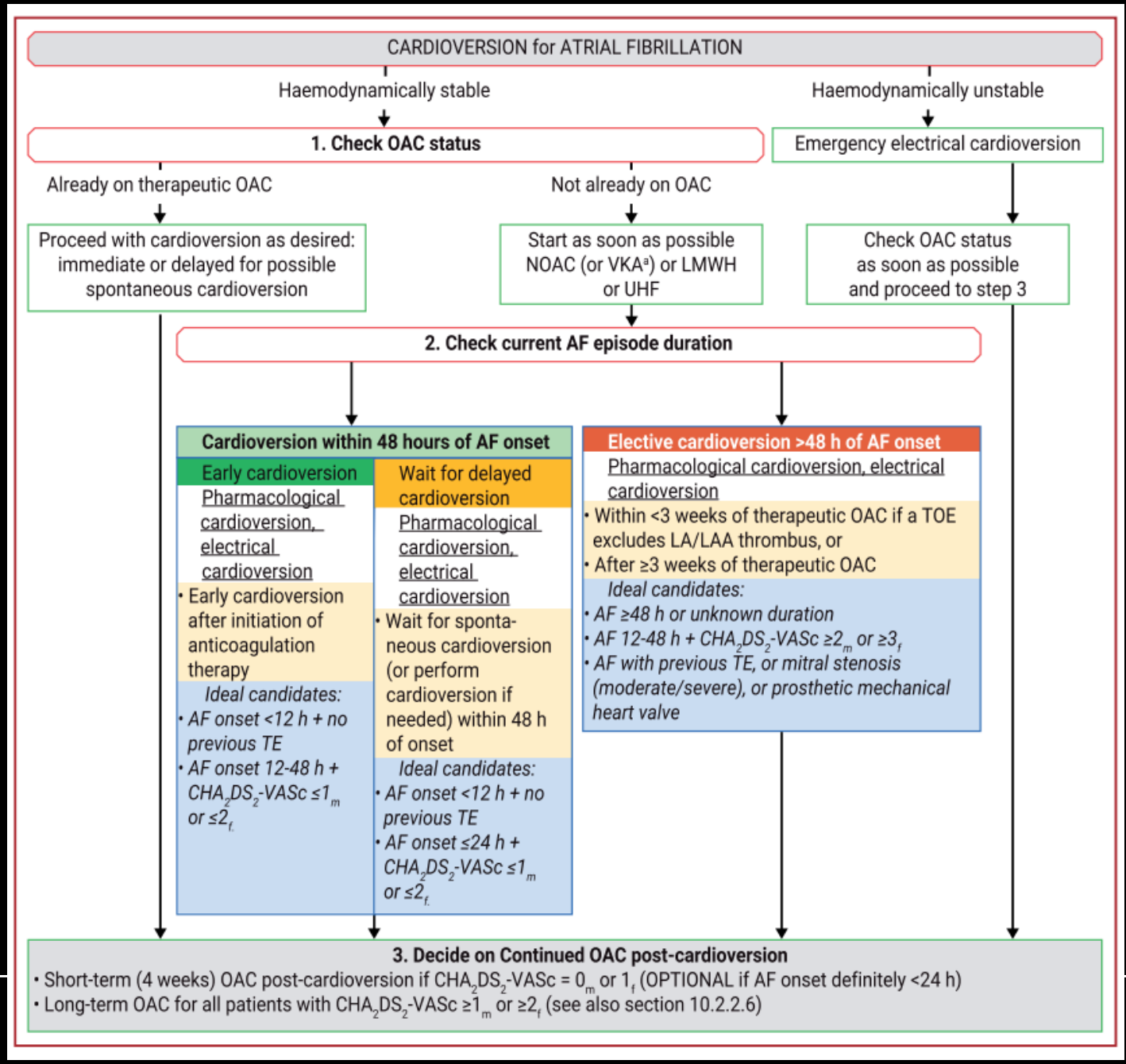
Factoren die geassocieerd zijn met recidieven AF na ECV zijn…

A. Langere duur AF
B. LA volume
C. A + B + overgewicht
D. A + B + overgewicht + OSAS

Ecker, A review of factors associated with maintenance of sinus rhythm after elective electrical cardioversion for atrial fibrillation, Clin Cardiol 2018

WECAM

ESC guideline

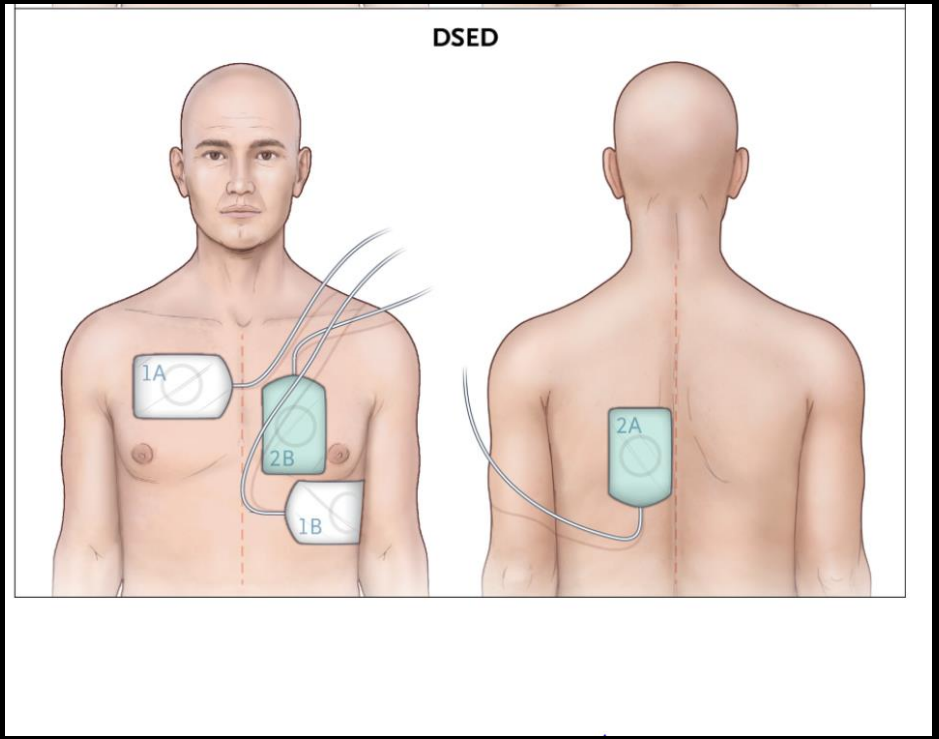


WECAM

Double sequential shocks

https://www.nejm.org/do/10.1056/NEJMdo006810/full/?requestType=popUp&relatedArticle=10.1056%2FNEJMoa2207304

- Survival to hospital discharge:
  double sequential 30.4%
  vector change 21.7%
  standard 13.3%
- Good neurological outcome
  double sequential 27.4%
  vector change 16.2%
  standard 11.2%



Cheskes et al., Defibrillation Strategies for Refractory VF, NEJM 2022

WECAM

Discussie

- Tot welke leeftijd doen we een cardioversie?
- Wat als er binnen minuten een recidief optreedt? En wat als er na een uur een recidief optreedt?
- Sotalol/flecainide voor ECV starten of direct erna?

WECAM

Dank voor jullie aandacht!