BRIEF REPORT

Prevalence of atrial fibrillation and/or atrial flutter in multicenter randomized controlled trials for catheter ablation of ventricular tachycardia in structural heart disease: A meta-analysis

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Introduction

Catheter ablation of sustained ventricular tachycardia (VT) in structural heart disease has a class I recommendation when arrhythmias are recurrent and refractory to antiarrhythmic drug therapy, including electrical storm.[1] Nevertheless, results are suboptimal. The ability of atrial arrhythmias to initiate VT has been suggested by responses to programmed atrial stimulation and review of implantable cardioverter-defibrillator electrograms.[2,3] Catheter ablation to treat atrial arrhythmias may hold promise as adjunctive therapy to decrease VT recurrence in select patients.[4,5]

The proportion of people with a medical condition of interest is "an essential starting point for the assessment of need" for health care systems.[6] Our objective was to perform a meta-analysis on the prevalence of atrial fibrillation (AF) and/or atrial flutter (AFL) in subjects with structural heart disease enrolled in multicenter randomized controlled trials for catheter ablation of VT.

KEY FINDINGS

- Approximately a quarter of subjects enrolled in multicenter randomized controlled trials for catheter ablation of ventricular tachycardia (VT) in structural heart disease have a history of atrial fibrillation (AF) and/or atrial flutter (AFL).
- Predominant characteristics of the enrolled subjects included age in the sixth decade of life or older, male sex, ischemic etiology of cardiomyopathy, and implantable cardioverter-defibrillator recipient.
- The prevalence of AF and/or AFL in subjects enrolled in multicenter randomized controlled trials for catheter ablation of VT in structural heart disease is similar to that reported from the International VT Ablation Center Collaborative Group observational database.

Methods

The meta-analysis was performed in accordance with guidance for systematic review and meta-analysis of prevalence from The Joanna Briggs Institute.[7] Institutional review board approval was not sought, as data of interest were publicly available. Eligible articles were multicenter randomized controlled trials for catheter ablation of VT in structural heart disease that reported baseline rates of AF and/or AFL. A search of the MEDLINE database via PubMed was performed on December 22, 2023, using the Medical Subject Headings term "ventricular tachycardia catheter ablation trial." English language and human species filters were applied. Articles were screened by Melina A. McCabe (proctored by Madhurmeet Singh) and Daniel G. Wann. Discrepancies were resolved by Norman C. Wang. Prevalence was expressed as a percentage by dividing the number of enrolled subjects with a history of AF and/or AFL by the total number of enrolled subjects and then multiplying the proportion by 100. Other variables of interest were collected for presentation in table format.

The principal summary measure, a pooled estimate of AF and/or AFL prevalence with corresponding confidence

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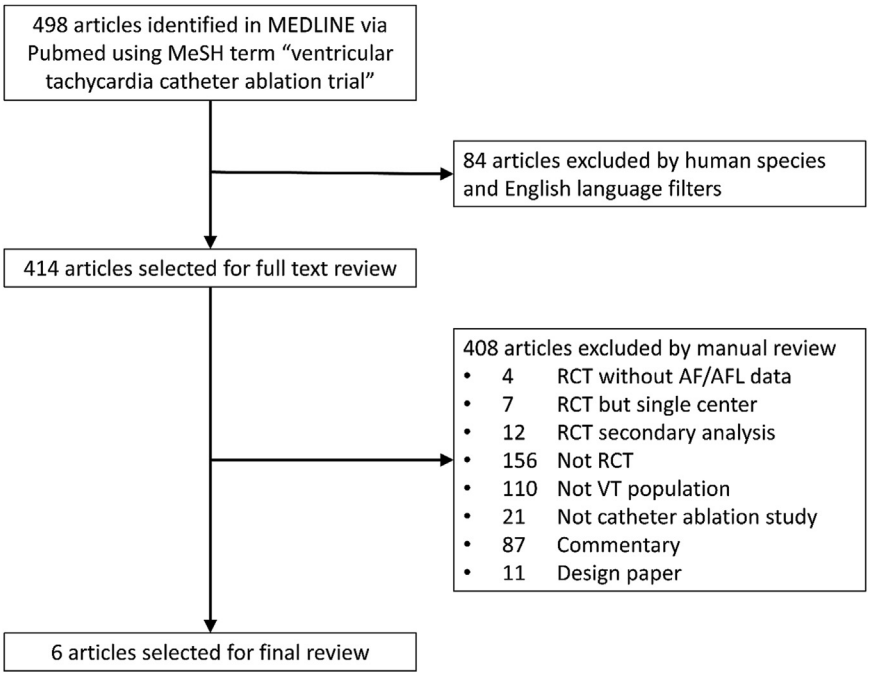

Figure 1 Flow diagram of article selection. AF = atrial fibrillation; AFL = atrial flutter; MeSH = Medical Subject Headings; RCT = randomized controlled trial; VT = ventricular tachycardia.

intervals, was calculated using a random effects model with weighting by sample size and summarized in a forest plot. Analysis for heterogeneity was performed using the I^2 statistic. Excel 2019 Microsoft Online (Microsoft, Redmond, WA) was used for statistical analyses.[8]

Results

The article flow diagram is presented in Figure 1. Of the 498 screened articles, 6 articles were multicenter randomized controlled trials for catheter ablation of VT in structural heart disease that reported baseline prevalence of AF and/or AFL.[9–14] These included the Catheter Ablation for Ventricular Tachycardia in Patients with an Implantable Cardioverter Defibrillator pilot trial, the Ventricular Tachycardia Ablation versus Escalated Antiarrhythmic Drug Therapy in Ischemic Heart Disease trial, the Preventive Ablation of Ventricular Tachycardia in Patients with Myocardial Infarction trial, the Substrate Ablation versus Antiarrhythmic Drug Therapy for Symptomatic Ventricular Tachycardia trial, the Does Timing of Ventricular Tachycardia Ablation Affect Prognosis in Patients With an Implantable Cardioverter-Defibrillator? trial, and the Pan-Asia United States Prevention of Sudden Cardiac Death trial. Select variables of interest are listed by trial in Table 1.

The fixed effects model revealed significant heterogeneity (I^2 = 88.3%). Therefore, a random effects model was justified. The pooled AF and/or AFL prevalence was 26.2% (95% confidence interval 15.6%–36.8%) (Figure 2).

Discussion

To our knowledge, there exists only 1 large sample size study that reported AF prevalence data in a similar population. The International VT Ablation Center Collaborative Group, composed of 12 centers (10 United States, 1 Italy, and 1 Japan), described a history of AF in 557 of 2061 patients (27.0%) who underwent catheter ablation for "scar-mediated" monomorphic VT between 2002 and 2013 in a "real-world" setting.[15] The similarity between real-world and randomized controlled trial data is encouraging, particularly given geographical and temporal differences.

Conclusion

Approximately a quarter of subjects enrolled in multicenter randomized controlled trials for catheter ablation of VT in structural heart disease had a history of AF and/or AFL.

Table 1 Selected characteristics from multicenter randomized controlled trials for catheter ablation of ventricular tachycardia in structural heart disease reporting a baseline history of AF and/or AFL

Characteristic	CALYPSO[9]	VANISH[10]	BERLIN VT[11]	SURVIVE-VT[12]	PARTITA[13]	PAUSE-SCD[14]
Country or region	United States	Canada, Europe, United States, Australia	Europe	Spain	Europe	Asia
Enrollment years	2012–2014	2009–2014	2015–2018	2010–2017	2012–2021	2015–2020
Study size, n	27	259	159	144	47	121
Mean age (y)	65	69	66	71	68	55
Male sex, n (%)	25 (93)	241 (93)	139 (87)	138 (96)	40 (85)	98 (81)
Race, n (%)						
White	21 (78)	–	–	–	–	–
Black	6 (22)	–	–	–	–	–
Cardiomyopathy, n (%)						
Ischemic	27 (100)	259 (100)	159 (100)	144 (100)	38 (81)	42 (35)
Nonischemic	0 (0)	0 (0)	0 (0)	0 (0)	9 (19)	37 (31)
Arrhythmogenic	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	42 (35)
Mean ejection fraction (%)	24	31	41	34	32	40
NYHA functional class, n (%)						
I	5 (19)	61 (24)	43 (27)	62 (43)	8 (17)	35 (29)
II	8 (30)	137 (53)	81 (51)	70 (49)	29 (62)	62 (51)
III	4 (15)	61 (24)	35 (22)	11 (8)	7 (15)	20 (17)
IV	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (3)
Not reported	10 (37)	0 (0)	0 (0)	1 (1)	3 (6)	0 (0)
History of AF and/or AFL, n (%)	9 (33)	99 (38)	46 (29)	17 (12)	18 (38)	17 (14)
Amiodarone, n (%)	7 (26)	169 (65)	53 (33)	0 (0)	5 (12)	43 (36)
CIED, n (%)	27 (100)	259 (100)	156 (98)	133 (92)	47 (100)	121 (100)
S-ICD	7 (26)	87 (34)	104 (65)	99 (69)	13 (28)	80 (66)
D-ICD	14 (52)	121 (47)	41 (26)	10 (7)	19 (40)	33 (27)
CRT-D	6 (22)	51 (20)	11 (7)	24 (17)	15 (32)	8 (7)

Dashes (–) indicate data not reported.

AF = atrial fibrillation; AFL = atrial flutter; BERLIN VT = Preventive Ablation of Ventricular Tachycardia in Patients with Myocardial Infarction; CALYPSO = Catheter Ablation for Ventricular Tachycardia in Patients with an Implantable Cardioverter Defibrillator; CIED = cardiac implantable electronic device; CRT-D = cardiac resynchronization therapy – defibrillator; D-ICD = dual-chamber implantable cardioverter-defibrillator; NYHA = New York Heart Association; PARTITA = Does Timing of Ventricular Tachycardia Ablation Affect Prognosis in Patients With an Implantable Cardioverter-Defibrillator? PAUSE-SCD = Pan-Asia United States Prevention of Sudden Cardiac Death; S-ICD = single-chamber implantable cardioverter-defibrillator; SURVIVE-VT = Substrate Ablation versus Antiarrhythmic Drug Therapy for Symptomatic Ventricular Tachycardia; VANISH = Ventricular Tachycardia Ablation versus Escalated Antiarrhythmic Drug Therapy in Ischemic Heart Disease.

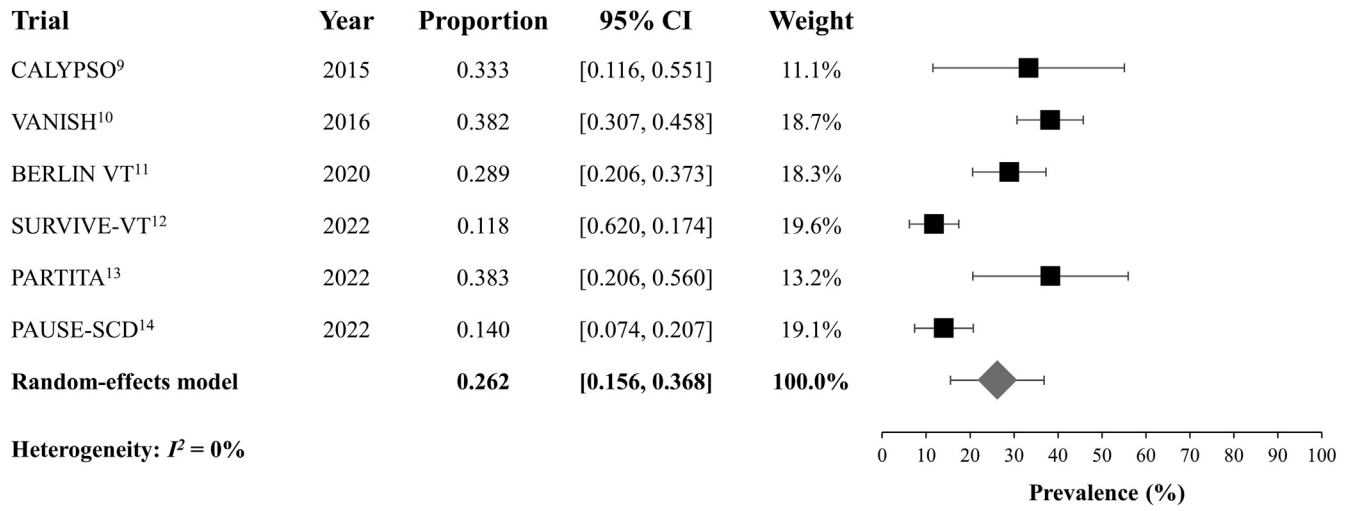

Figure 2 Forest plot of prevalence as a percentage (proportion × 100) of subjects with atrial fibrillation and/or atrial flutter in multicenter randomized controlled trials for catheter ablation of ventricular tachycardia in structural heart disease. Boxes are not sized by weights. BERLIN VT = Preventive Ablation of Ventricular Tachycardia in Patients with Myocardial Infarction; CALYPSO = Catheter Ablation for Ventricular Tachycardia in Patients with an Implantable Cardioverter Defibrillator; CI = confidence interval; PARTITA = Does Timing of Ventricular Tachycardia Ablation Affect Prognosis in Patients With an Implantable Cardioverter-Defibrillator? PAUSE-SCD = Pan-Asia United States Prevention of Sudden Cardiac Death; SURVIVE-VT = Substrate Ablation versus Antiarrhythmic Drug Therapy for Symptomatic Ventricular Tachycardia; VANISH = Ventricular Tachycardia Ablation versus Escalated Antiarrhythmic Drug Therapy in Ischemic Heart Disease.

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Ethics Statement: This study did not require review by the University of Pittsburgh Institutional Review Board, given the publicly available nature of the data. The study protocol followed guidance for systematic review and meta-analysis of prevalence from The Joanna Briggs Institute.

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