

## Supplementary File

### Appendix I: Search strategies

#### **MEDLINE (Ovid)**

1. (left ventricular thrombus or LV thrombus or apical thrombus or intraventricular thrombus or intracardiac thrombus).mp.
2. (management or treatment or anticoagulant\* or anticoagulation or antiplatelet\*).mp.
3. 1 and 2
4. limit 3 to English language

647 results

#### **EMBASE (Ovid)**

1. (left ventricular thrombus or LV thrombus or apical thrombus or intraventricular thrombus or intracardiac thrombus).mp.
2. (management or treatment or anticoagulant\* or anticoagulation or antiplatelet\*).mp.
3. 1 and 2
4. limit 3 to English language

1933 results

#### **Scopus**

( TITLE-ABS-KEY ( "left ventricular thrombus" OR "LV thrombus" OR "apical thrombus" OR "intraventricular thrombus" OR "intracardiac thrombus" ) AND TITLE-ABS-KEY ( "management" OR "treatment" OR "anticoagulation" OR "antiplatelet" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) )

970 results

#### **Google Scholar**

left ventricular thrombus treatment OR management "left ventricular thrombus"

100 results (first 10 pages)

## Appendix II: Overview of all studies

S/n	First author	Year	Sample size	Study design	Treatment assignment	Aetiology	Duration of treatment (months)	Thrombus details	Mean LVEF (%)	LVT resolution (%)	2 <sup>nd</sup> line treatment if persistence	Embolic events (%)	Major bleeding (%)
1	Abdelnabi et al <sup>1</sup>	2021	79	RCT	Rivaroxaban (39) Warfarin (40)	Ischemic CM (78.5%)	6	NR	36.6	Rivaroxaban: 71.8 (1 month), 76.9 (3 months), 87.2 (6 months) Warfarin: 47.5 (1 month), 67.5 (3 months), 80 (6 months)	NR	0 (rivaroxaban) 5 (Warfarin)	5.1 (rivaroxaban) 15 (warfarin)
2	Albabbain et al <sup>2</sup>	2021	63	Retrospective cohort	Rivaroxaban (28) Warfarin (35)	AMI (65.1%)	9.5 (6-32.5) (rivaroxaban) 14 (3-41) (warfarin)	NR	27.3 (warfarin) 26.4 (DOACs)	Rivaroxaban: 71.4 Warfarin: 68.6	NR	3.8 (rivaroxaban) 0 (warfarin)	NR
3	Alcalai et al <sup>3</sup>	2021	35	RCT	Apixaban (18) Warfarin (17)	AMI (100%)	3	Baseline size: 19.2 ± 8.2mm (length) 12.3 ± 4.9mm (width)	36 ± 6	94 (apixaban) 97 (warfarin)	NR	NR	0 (apixaban) 13.3 (warfarin)
4	Ali et al <sup>4</sup>	2020	96	Retrospective cohort	Warfarin (60) Rivaroxaban (18) Apixaban (13) Dabigatran (1) Long-term enoxaparin (4)	Ischemic CM (58%) Non-ischemic CM (23%) AMI (15%) Takotsubo (3%)	NR	NR	23.2 (warfarin) 23 (DOACs)	62 (warfarin) 53 (DOAC)	NR	5.5 (warfarin) 0 (DOAC)	NR
5	Bahmaid et al <sup>5</sup>	2019	7	Case series	Rivaroxaban (6) Dabigatran (1)	AMI (14.2%) CHF (85.7%)	12.6 (2-28)	All apical thrombi, moderate in size	34.3	100	NR	NR	NR
6	Bass et al <sup>6</sup>	2021	949	Retrospective cohort	Apixaban (79) Rivaroxaban	AMI (51.3%)	NR	NR	NR	NR	NR	30.6 (DOAC)	1.1 (DOAC) 0.78 (warfarin)

					n (77) Dabigatran (29) Warfarin (769)	CHF (73.3%)						33 (Warfarin)	
7	Cochran et al <sup>7</sup>	2021	73	Retrospective cohort	DOACs (14) warfarin (59)	Ischemic CM (43.4%) CHF (58)	NR	NR		76.3 (DOAC) 85.7 (warfarin)	NR	NR	14.3 (DOAC) 13.6 (warfarin)
8	Daher et al <sup>8</sup>	2020	59	Retrospective cohort	Apixaban (12) Rivaroxaban (4) Dabigatran (1) Warfarin (14) Fluindione (16) Acenocoumarol (12)	Ischemic CM (86.5%)	3	NR	36 ± 12 (warfarin) 41 ± 8 (DOACs)	71.5 (VKA) 70.6 (DOACs)	If DOACs fail, switch to VKAs with INR control 3-4 for at least 3 months (all LVT resolved when switched)	11.8 (DOACs) 9.5 (VKAs)	NR
9	De Luca et al <sup>9</sup>	2022	83	Retrospective cohort	VKA, aspirin, clopidogrel (TAT) VKA + aspirin/clopidogrel (DAT)	AMI (19.3%)	3.4 (IQR 1.4-7.8)	NR	35.9 ± 9.3	NR	NR	NR	19.1 (TAT) 3.3 (DAT)
10	Fleddermann et al <sup>10</sup>	2019	52	Retrospective cohort	Apixaban (26) Rivaroxaban (24) Dabigatran (2)	NR	NR	Size: 2.7 ± 2.9cm <sup>2</sup>	31.5	55.8	Continue therapy	NR	11.9
11	Guddeti et al <sup>11</sup>	2020	99	Retrospective cohort	Warfarin (80) apixaban (15) dabigatran (2) rivaroxaban (2)	Ischemic CM (59%) AMI (54.5%)	NR	NR	25 [20-35] (warfarin) 25 [20-40] (DOACs)	81	NR	NR	5.1

12	Herald et al <sup>12</sup>	2022	433	Retrospective cohort	warfarin (299) Dabigatran (108) Apixaban (20) Rivaroxaban (6)	Ischemic CM (35.6%) CHF (88.2)	NR	NR	NR	NR	2.3	34.6	
13	Iqbal et al <sup>13</sup>	2020	84	Retrospective cohort	Warfarin (62) Rivaroxaban (13) Apixaban (8) Dabigatran (1)	Ischemic CM (87%) AMI (35%) DCM (5%) HCM (4%) Acute myocarditis (2%) Unknown (2%)	22.6 +/- 18.9	NR	NR	76 (warfarin) 65 (DOAC)	NR	2 (Warfarin)	10 (warfarin) 0 (DOACs)
14	Iskaros et al <sup>14</sup>	2021	77	Retrospective cohort	Warfarin (45) Apixaban (24) Rivaroxaban (7) Dabigatran (1)	CHF (51.9%) AMI (39.0%) Valvular disease (2.6%)	NR	Size: 2.2cm <sup>2</sup> (1.3–3.2) (warfarin) 3.2cm <sup>2</sup> (1.8–6.6)	25 (20–35) (warfarin) 25 (15–30) (DOACs)	76 (warfarin) 84 (DOAC)	Treatment failure in 11 patients in DOAC group -> 3 switched to warfarin and 4 switched to a different DOAC (median 67 days) Treatment failure in 17 patients in warfarin group -> 7 switched to DOAC and 2 switched to enoxaparin (median 61 days)	NR	5 (warfarin) 3 (DOAC)
15	Jones et al <sup>15</sup>	2021	101	Prospective cohort	warfarin (60) Rivaroxaban (24) Apixaban (15) Edoxaban (2)	Anterior AMI (87.8%)	5.1 (NOAC) 8.7 (warfarin)	NR	3.2 (1.8–6.6) (warfarin) 3.2 (1.8–6.6) (DOAC)	86.1	NR	NR	6.7 (warfarin) 0 (NOAC)

16	Kurisu et al <sup>16</sup>	2011	5	Case series	NR	Takotsubo cardiomyopathy (100%)	NR	Mural/immobile in 2 (40%) Protruding/mobile in 3 (60%)	45 ± 6	80	NR	NR	20
17	Lattuca et al <sup>17</sup>	2020	159	Retrospective cohort	VKA, mostly fluindione n=74 (77) LMWH (37) UFH (7) Antiplatelet alone (2) Apixaban (18) Dabigatran (5) Rivaroxaban (13)	Ischemic CM (78.6%) DCM (14.5%) HCM (1.3%) Myocarditis (3.8%) Takotsubo cardiomyopathy (1.3%) ARVD (0.6%)	16.9 (IQR 3.8-32.9)	Apical in 98.1% Mobile in 34.6% (n=24) Calcified in 1.3% (n=2)  Largest diameter, mm: 19 (13-24) Area, cm <sup>2</sup> : 1.34 (0.8-2.57) Volume, cm <sup>3</sup> : 1.06 (0.49-2.40)	31.9 ± 12.5	62.3	Continue therapy	22.2	13.2
18	Lee et al <sup>18</sup>	2013	62	Retrospective cohort	Warfarin (42) Operative (8) Antiplatelets only (12)	Ischemic CM (80.6%) Dilated CM (8.1%) HCM (3.2%) Stress-induced CM (4.8%) Severe aortic stenosis (1.6%)	10.9	Maximum size: 17.44±7.48mm Apical location: 62 (100%) Mobile/multiple: 9 (14.5%) Mural/sessile: 53 (85.5%)	40.23±14.29	65.6 (anticoagulation) 100 (operative) 25 (antiplatelet)	Operative management in patients with 3VD/severe AS, with lower rates of post-treatment embolism compared to anticoagulation -> consider in patients with high rates of embolism  Antiplatelet only in patients with contraindications to anticoagulation (mostly bleeding tendency) -> follow-up size of thrombus not significantly different	9.5 (anticoagulation) 12.5 (operative) 0 (antiplatelet)	4.8 (anticoagulation) 12.5 (operative) 0 (antiplatelet)
19	Lorent-Ros et al <sup>19</sup>	2022	98	Retrospective cohort	Short-term anticoagulation (37)		38.5 (IQR 23.4-60)	Max diameter: 2.20 ± 0.98 cm	40.7±10.8	NR	NR	NR	3 (Long-term anticoagulation) 7 (Long-term anticoagulation)

					Long-term anticoagulation (61)							27 (Short-term anticoagulation)	8 (Short-term anticoagulation)
20	Makrides et al <sup>20</sup>	2016	3	Case series	Rivaroxaban	AMI (100%)	3	Apical pedunculated in 2 (67%) Apical sessile in 1 (33%)	35-40	100	NR	0	0
21	Maniwa et al <sup>21</sup>	2018	92	Retrospective cohort	VKA	AMI (92%)	34 (IQR 7-90)	NR	36±8	NR	Continue therapy	16.3	8.5
22	Meurin et al <sup>22</sup>	2015	26	Prospective cohort	Warfarin	AMI (100%)	>6 months until resolution	NR	33.5 ± 6.0	92.3	Continue therapy	3.8	7.7
23	Meurin et al <sup>23</sup>	2005	26	Non-randomised, open-label trial	Enoxaparin + Fluindione	AMI (73.1)	NR	Area: 2.30±0.32cm <sup>2</sup> Mobile in 4/26 (15.4%) Protruding in 17/26 (65.4%)	34± 3	73.1	Continue therapy	0	0
24	Mihm et al <sup>24</sup>	2021	108	Retrospective cohort	Apixaban (23) Rivaroxaban (10) Warfarin (75)	Ischemic CM (63.9%) AMI (15.7%)	NR	Mobile thrombus: 4 (5.3) (warfarin) 4 (12.1) (DOACs) Measurement (mm): 215.9 (264.1) (warfarin) 306.2 (242.9) (DOACs)	27.95 (12.6) (warfarin) 32.58 (16.4) (DOACs)	63 (n=64 with follow-up)	NR	6.1 (DOAC) 0 (warfarin)	15.2 (DOAC) 2.7 (warfarin)
25	Robinson et al <sup>25</sup>	2020	514	Retrospective cohort	Apixaban (141) Rivaroxaban (46) Dabigatran (9) Warfarin (236) None (93)	Ischemic CM (59.9%) Non-ischemic CM (25.3%) Others (14.8%)	NR	Apical thrombus: 212 (89.8) (warfarin) 115 (95.0) (DOACs) Mobile thrombus:	28.2 (12.4) (warfarin) 27.7 (13.8) (DOACs)	46.2 (DOAC) 55.5 (warfarin)	Continue therapy	14 (DOAC) 5.9 (warfarin)	6.6 (DOAC) 8.1 (Warfarin)

								39 (16.5) (warfarin) 19 (15.7) (DOACs)  Size, cm <sup>2</sup> : 2.8 (2.5) (warfarin) 2.8 (2.1) (DOACs)  Protruding or pedunculated thrombus morphologic characteristics: 12 (5.1) (warfarin) 12 (9.9) (DOACs)					
26	Shacham et al <sup>26</sup>	2012	14	Retrospective cohort	Warfarin	AMI (100%)	NR	NR	42 ± 7.0	66.7	Continue therapy	NR	NR
27	Sia et al <sup>27</sup>	2021	170	Retrospective cohort	Warfarin DAPT alone (3) None (2)	AMI (100%)	NR	NR	28.8 [9.8] (renal impairment) 35.8 [10.3] (no renal impairment)	57.6	NR	NR	5.3
28	Varwani et al <sup>28</sup>	2021	100	Retrospective cohort	Warfarin (34) Rivaroxaban (46) Dabigatran (7) Apixaban (5) None (8)	Ischemic CM (42%) AMI (28%) Non-ischemic CM (30%)	3 to >12 (>60% had >12 months anticoagulation)	Mean size of thrombus is 19.7 (SD 6.4) mm  97 (94.2%) of the thrombi were located in the apex, 4 (3.9%) along	28.5 (SD 11.0)	59.4	Continue therapy, some changed from warfarin to DOAC due to labile INR	0	9.4

								the inferior wall and 2 (1.9%) along the septum					
29	W. Isa et al <sup>29</sup>	2020	27	RCT	Warfarin (13) Apixaban (14)	CHF (100%)	3	NR	NR	NR	NR	VKA: 0 (0) Apixaban: 1 (7.1%)	NR
30	Willeford et al <sup>30</sup>	2021	151	Retrospective cohort	Warfarin (129) DOAC (22) - apixaban 4, rivaroxaban 18	CHF (85.4%)	NR	NR	NR	50.3	Continue therapy	0.7	4
31	Xu et al <sup>31</sup>	2021	87	Retrospective cohort	Warfarin (62) Rivaroxaban (16) Dabigatran (9)	Ischemic CM (75.9%) AMI (19.5%) Hypertrophic CM (4.6%)	NR	NR	37.6±6.6 (warfarin) 33.8±5.7 (DOACs)	74.7	Continue therapy	1.1	3.4
32	Zhang et al <sup>32</sup>	2022	77	Retrospective cohort	Rivaroxaban (33) Warfarin (31) Others (13)	AMI (100%)	8.5 (IQR 5-17)	NR	41.0 (31.0–49.5)	76.6 (VKA, rivaroxaban)	Continue therapy (long-term triple therapy under close follow-up)	12.9 (warfarin) 3 (rivaroxaban)	3.2 (warfarin) 0 (rivaroxaban)

RCT: randomised controlled trial  
IQR: interquartile range  
CM: cardiomyopathy  
CHF: congestive heart failure  
AMI: acute MI  
DOAC: direct oral anticoagulant  
VKA: vitamin K antagonist  
INR: international normalised ratio  
LVT: left ventricular thrombus



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