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Multimodality imaging assessment and treatment are needed in suspected subclinical prosthetic valve thrombosis

- Opposition -

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Professor - Laval University (Quebec, Canada)

Eurovalve 2022, 7th October

Disclosures

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Core laboratory contract - Edwards Lifesciences

Research grant - Medtronic

Evaluation prosthesis: Echocardiography

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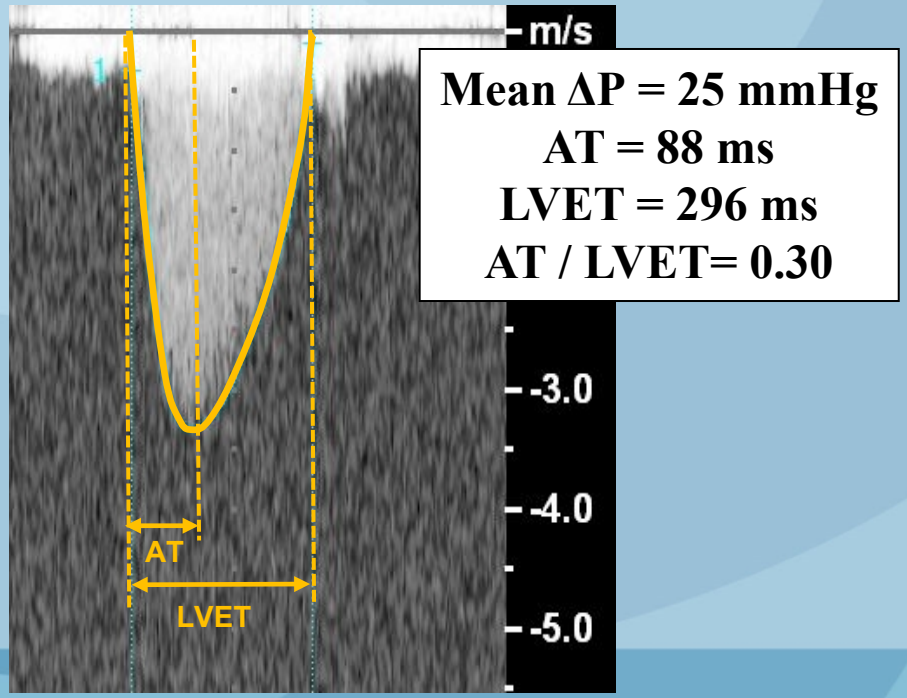
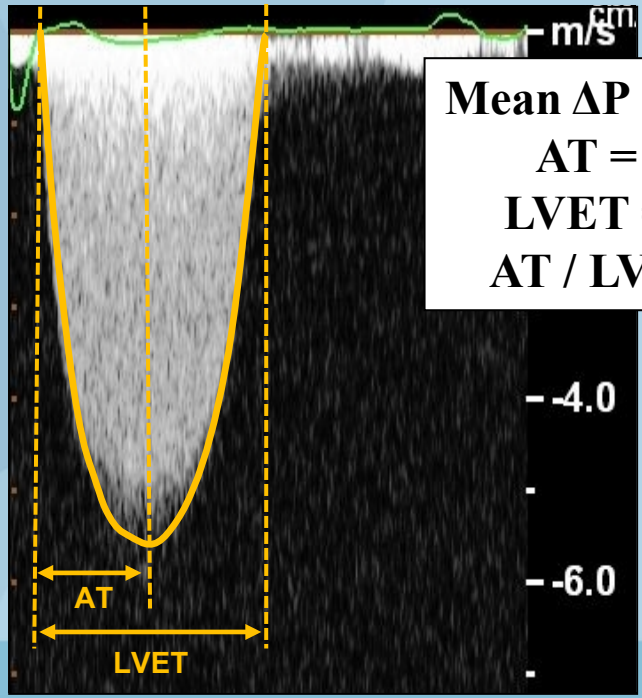
Non invasive and non-expensive imaging modality

Evaluation of hemodynamic of the prosthesis as well as LV/RV remodelling/function



Mean ΔP = 25 mmHg
AT = 88 ms
LVET = 296 ms
AT / LVET= 0.30



Mean ΔP = 69 mmHg
AT = 151 ms
LVET = 315 ms
AT / LVET= 0.47

Evaluation prosthesis: Echocardiography

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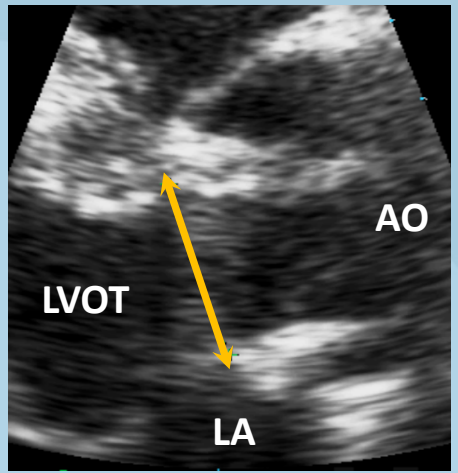
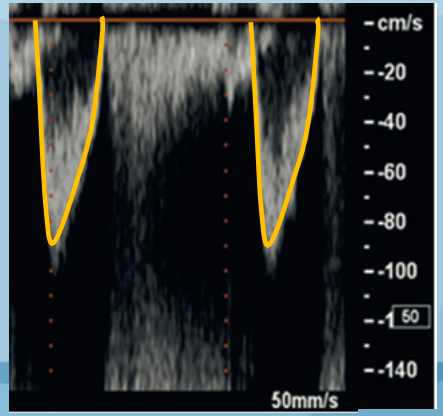
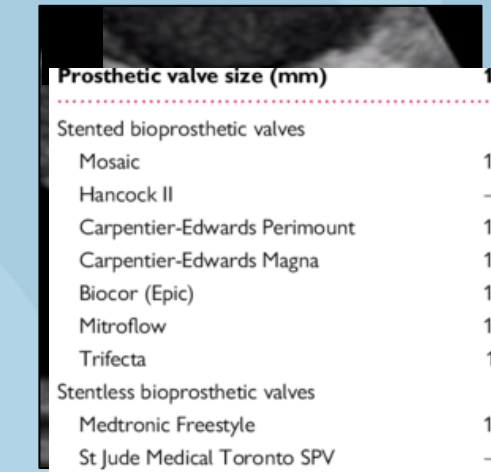
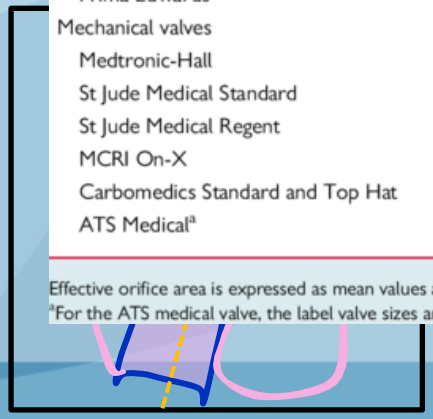








Prosthetic valve size (mm)	19	21	23	25	27	29
Stented bioprosthetic valves						
Mosaic	1.1 ± 0.2	1.2 ± 0.3	1.4 ± 0.3	1.7 ± 0.4	1.8 ± 0.4	2.0 ± 0.4
Hancock II	–	1.2 ± 0.2	1.3 ± 0.2	1.5 ± 0.2	1.6 ± 0.2	1.6 ± 0.2
Carpentier-Edwards Perimount	1.1 ± 0.3	1.3 ± 0.4	1.5 ± 0.4	1.8 ± 0.4	2.1 ± 0.4	2.2 ± 0.4
Carpentier-Edwards Magna	1.3 ± 0.3	1.5 ± 0.3	1.8 ± 0.4	2.1 ± 0.5	–	–
Biocor (Epic)	1.0 ± 0.3	1.3 ± 0.5	1.4 ± 0.5	1.9 ± 0.7	–	–
Mitroflow	1.1 ± 0.2	1.2 ± 0.3	1.4 ± 0.3	1.6 ± 0.3	1.8 ± 0.3	–
Trifecta	1.4	1.6	1.8	2.0	2.2	2.4
Stentless bioprosthetic valves						
Medtronic Freestyle	1.2 ± 0.2	1.4 ± 0.2	1.5 ± 0.3	2.0 ± 0.4	2.3 ± 0.5	–
St Jude Medical Toronto SPV	–	1.3 ± 0.3	1.5 ± 0.5	1.7 ± 0.8	2.1 ± 0.7	2.7 ± 1.0
Prima Edwards	–	1.3 ± 0.3	1.6 ± 0.3	1.9 ± 0.4	–	–
Mechanical valves						
Medtronic-Hall	1.2 ± 0.2	1.3 ± 0.2	–	–	–	–
St Jude Medical Standard	1.0 ± 0.2	1.4 ± 0.2	1.5 ± 0.5	2.1 ± 0.4	2.7 ± 0.6	3.2 ± 0.3
St Jude Medical Regent	1.6 ± 0.4	2.0 ± 0.7	2.2 ± 0.9	2.5 ± 0.9	3.6 ± 1.3	4.4 ± 0.6
MCRI On-X	1.5 ± 0.2	1.7 ± 0.4	2.0 ± 0.6	2.4 ± 0.8	3.2 ± 0.6	3.2 ± 0.6
Carbomedics Standard and Top Hat	1.0 ± 0.4	1.5 ± 0.3	1.7 ± 0.3	2.0 ± 0.4	2.5 ± 0.4	2.6 ± 0.4
ATS Medical[a]	1.1 ± 0.3	1.6 ± 0.4	1.8 ± 0.5	1.9 ± 0.3	2.3 ± 0.8	–

Effective orifice area is expressed as mean values available in the literature. Further studies are needed to validate these reference values.
[a]For the ATS medical valve, the label valve sizes are 18, 20, 22, 24, and 26 mm. High velocities are common in size 19 or 21 prostheses. Adapted with permission from Ref. 7.

Natural history of SLT

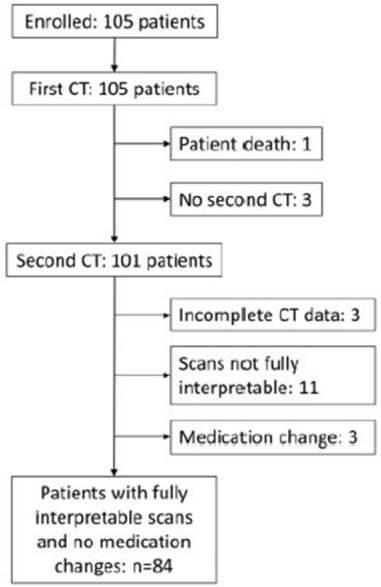
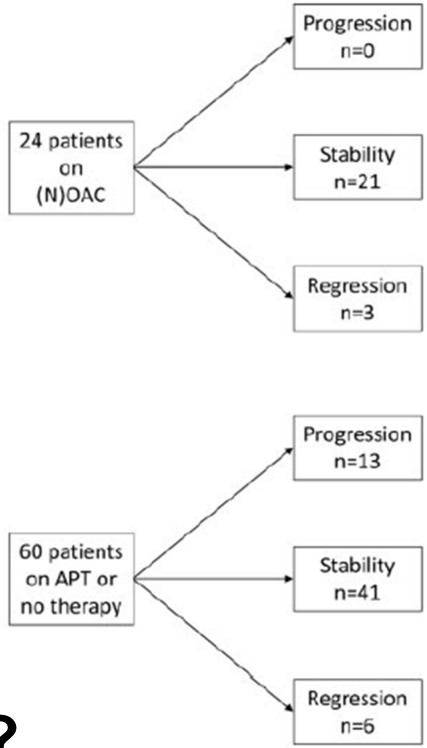


Table I Evolution pattern of leaflet status between the first and second computed tomography scan

HALT/HAM at first CT	HALT/HAM at second CT			
	HALT− HAM−	HALT+ HAM−	HALT+ HAM+	Total
HALT-HAM-	53	7	4	64
HALT+HAM-	5	3	2	10
HALT+HAM+	2	2	7	11
Total	60	12	13	85

HALT, hypo-attenuating leaflet thickening, HAM, hypo-attenuation affecting motion; Green, regression; orange, progression; CT, computed tomography.



When should we perform a contrast CT???

Sondergaard et al. J Am Coll Cardiol 2019;74:1851–63

Prevalence of SLT and outcomes

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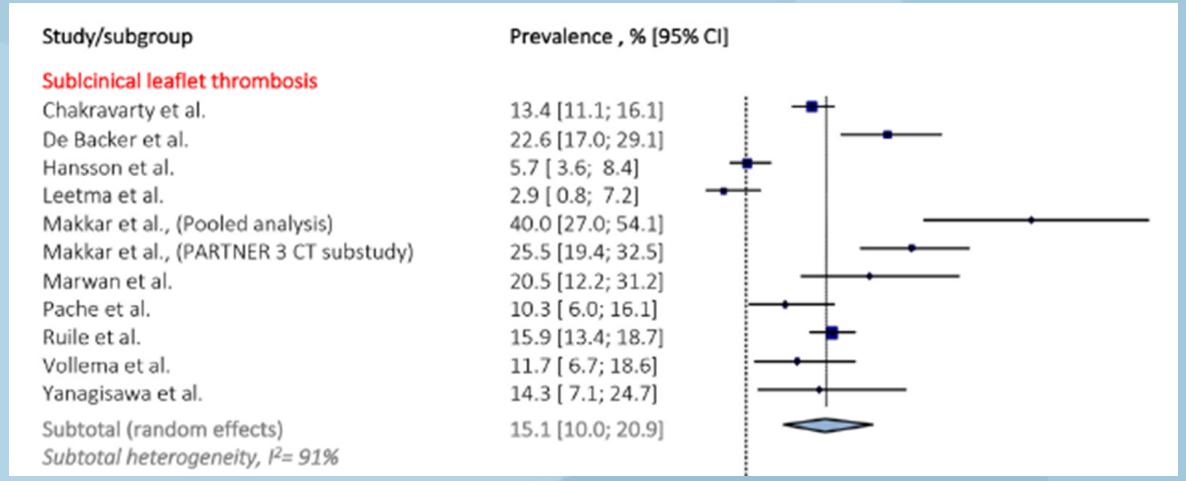

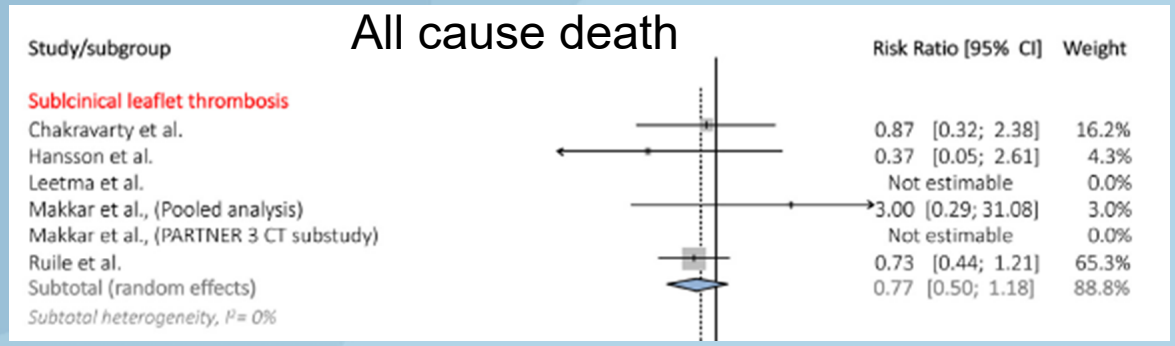

Rheude et al. Am J Cardiol. 2021 Jan 1;138:92-99.

Prevalence of Clinical LT and outcomes

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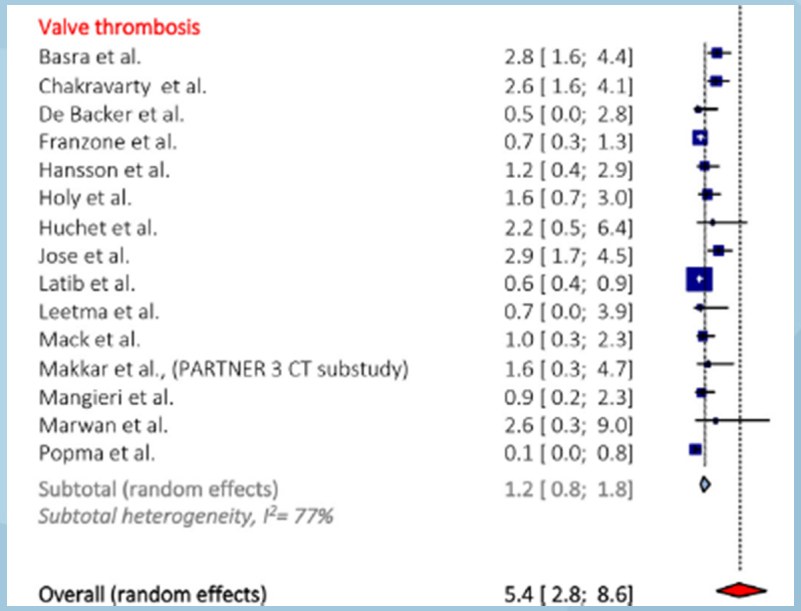
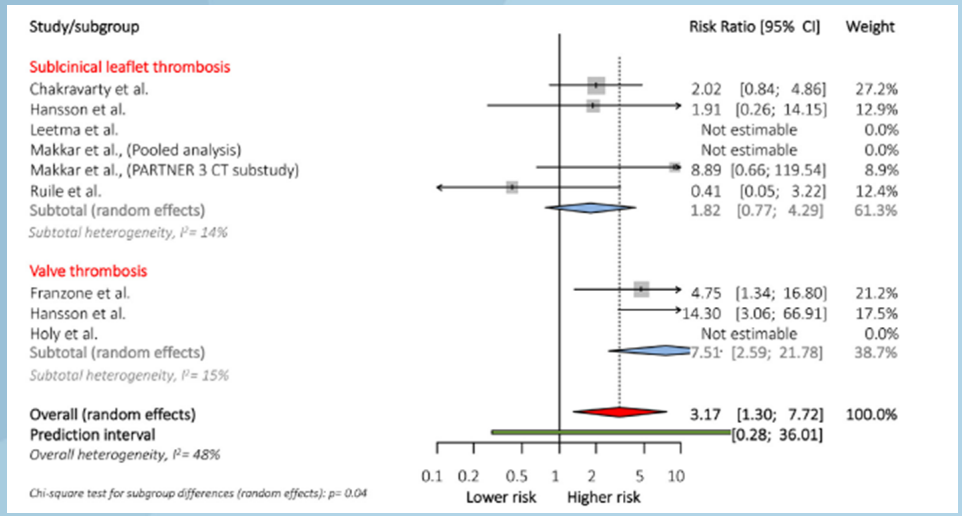


All cause mortality



Rheude et al. Am J Cardiol. 2021 Jan 1;138:92-99.

Impact of SLT on stroke occurence

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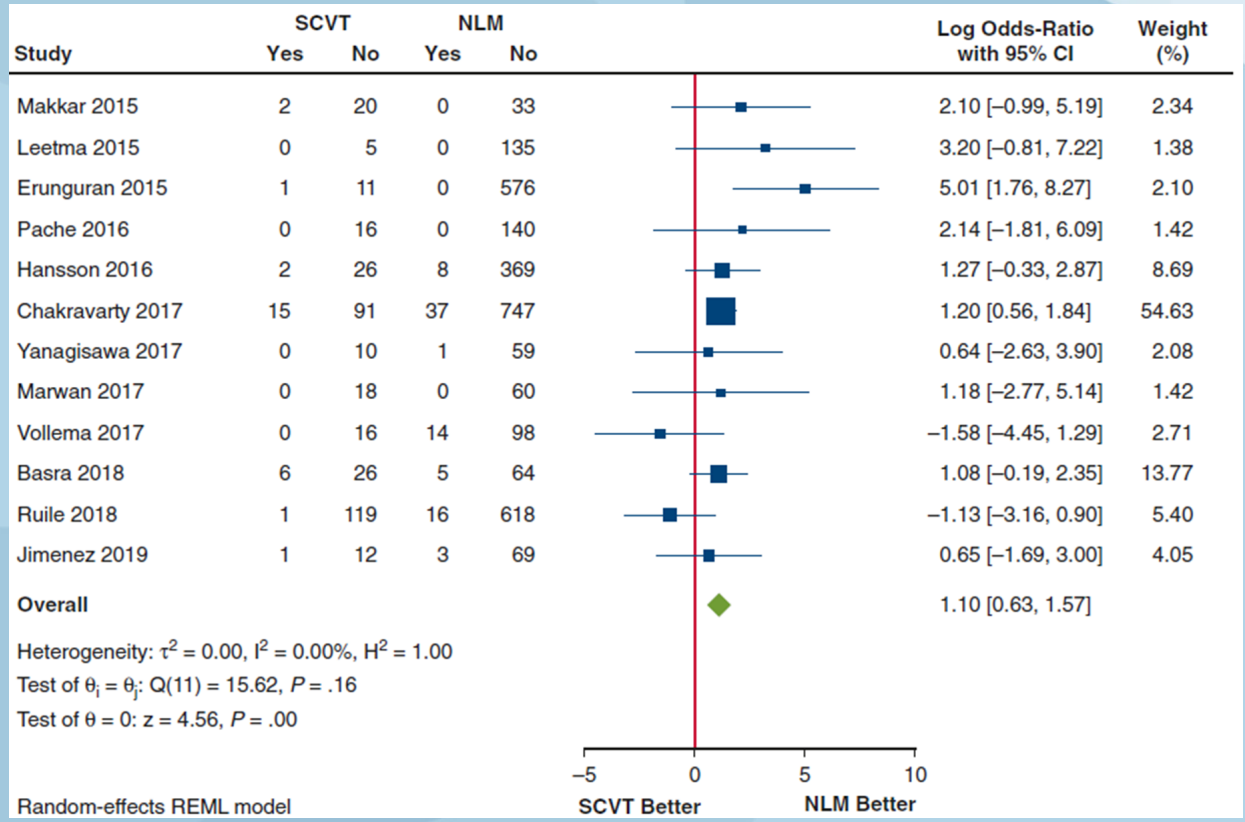

Study	SCVT Yes	SCVT No	NLM Yes	NLM No	Log Odds-Ratio with 95% CI	Weight (%)
Makkar 2015	2	20	0	33	2.10 [–0.99, 5.19]	2.34
Leetma 2015	0	5	0	135	3.20 [–0.81, 7.22]	1.38
Erunguran 2015	1	11	0	576	5.01 [1.76, 8.27]	2.10
Pache 2016	0	16	0	140	2.14 [–1.81, 6.09]	1.42
Hansson 2016	2	26	8	369	1.27 [–0.33, 2.87]	8.69
Chakravarty 2017	15	91	37	747	1.20 [0.56, 1.84]	54.63
Yanagisawa 2017	0	10	1	59	0.64 [–2.63, 3.90]	2.08
Marwan 2017	0	18	0	60	1.18 [–2.77, 5.14]	1.42
Vollema 2017	0	16	14	98	–1.58 [–4.45, 1.29]	2.71
Basra 2018	6	26	5	64	1.08 [–0.19, 2.35]	13.77
Ruile 2018	1	119	16	618	–1.13 [–3.16, 0.90]	5.40
Jimenez 2019	1	12	3	69	0.65 [–1.69, 3.00]	4.05
Overall					1.10 [0.63, 1.57]	

Heterogeneity: $\tau^2 = 0.00$, $I^2 = 0.00\%$, $H^2 = 1.00$
Test of $\theta_i = \theta_j$: $Q(11) = 15.62$, $P = .16$
Test of $\theta = 0$: $z = 4.56$, $P = .00$

Random-effects REML model

Woldendorp et al. J Thorac Cardiovasc Surg. 2021 Nov;162(5):1491-1499.e2

Predictors of SLT

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- ✓ Male sex; obesity; hypertension; hypercoagulable state (COPD)
- ✓ Reduce ejection fraction
- ✓ Paravalvular leak
- ✓ Larger prosthesis
- ✓ Prosthesis eccentricity

Also Predictors of stroke

Need to treat patients at risk of stroke post TAVR

Ruile et al. JACC Cardiovasc. Interv. 2018;11:1164–1171; Rashid et al. Heart Vessels. 2021 Sep;36(9):1374-1383; Rashid et al. Heart Lung Circ. 2022 May;31(5):678-684; Pieniak et al. J Clin Med . 2020 Nov 21;9(11):3742.

Anticoagulation associated with less SLT

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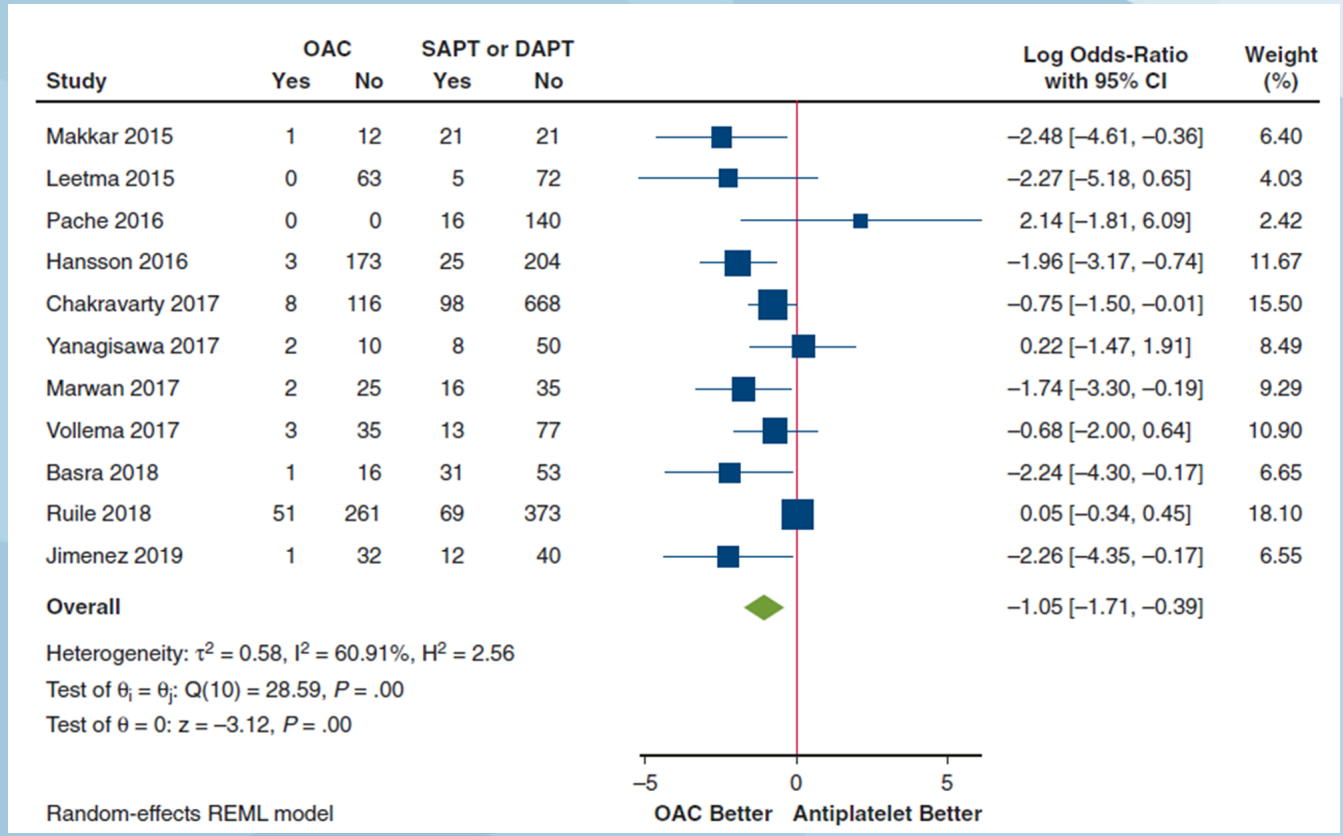

Woldendorp et al. J Thorac Cardiovasc Surg. 2021 Nov;162(5):1491-1499.e2

Conclusion

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- Incidence of subclinical leaflet thrombosis could happen at **any time** post TAVR
- Subclinical leaflet thrombosis is **not constant** after TAVR (spontaneous regression)
- Associated with clinical **stroke** or subclinical stroke
- SLT has **similar predictors** than stroke, thus SLT could be a marker of stroke not a predictor

Thank you for your attention

Cat Scan