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GLOBAL CARDIOLOGY

Editor-in-Chief: Andrew J.S. Coats, Australia

eISSN: 2975-2728 https://www.globalcardiology.info/site

Transcatheter tricuspid valve repair for tricuspid regurgitation: a meta-analysis of MitraClip, TriClip, and PASCAL Systems

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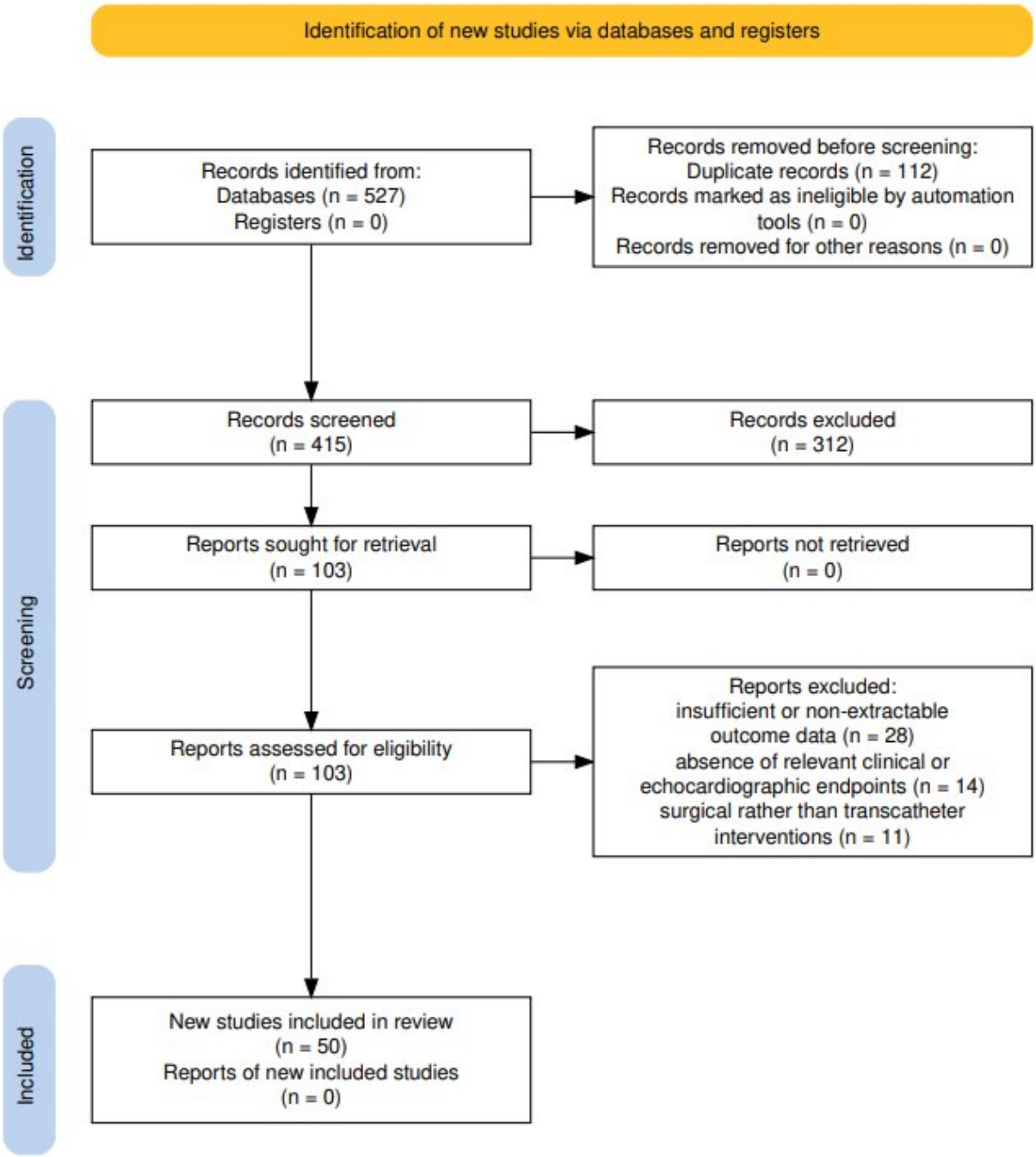
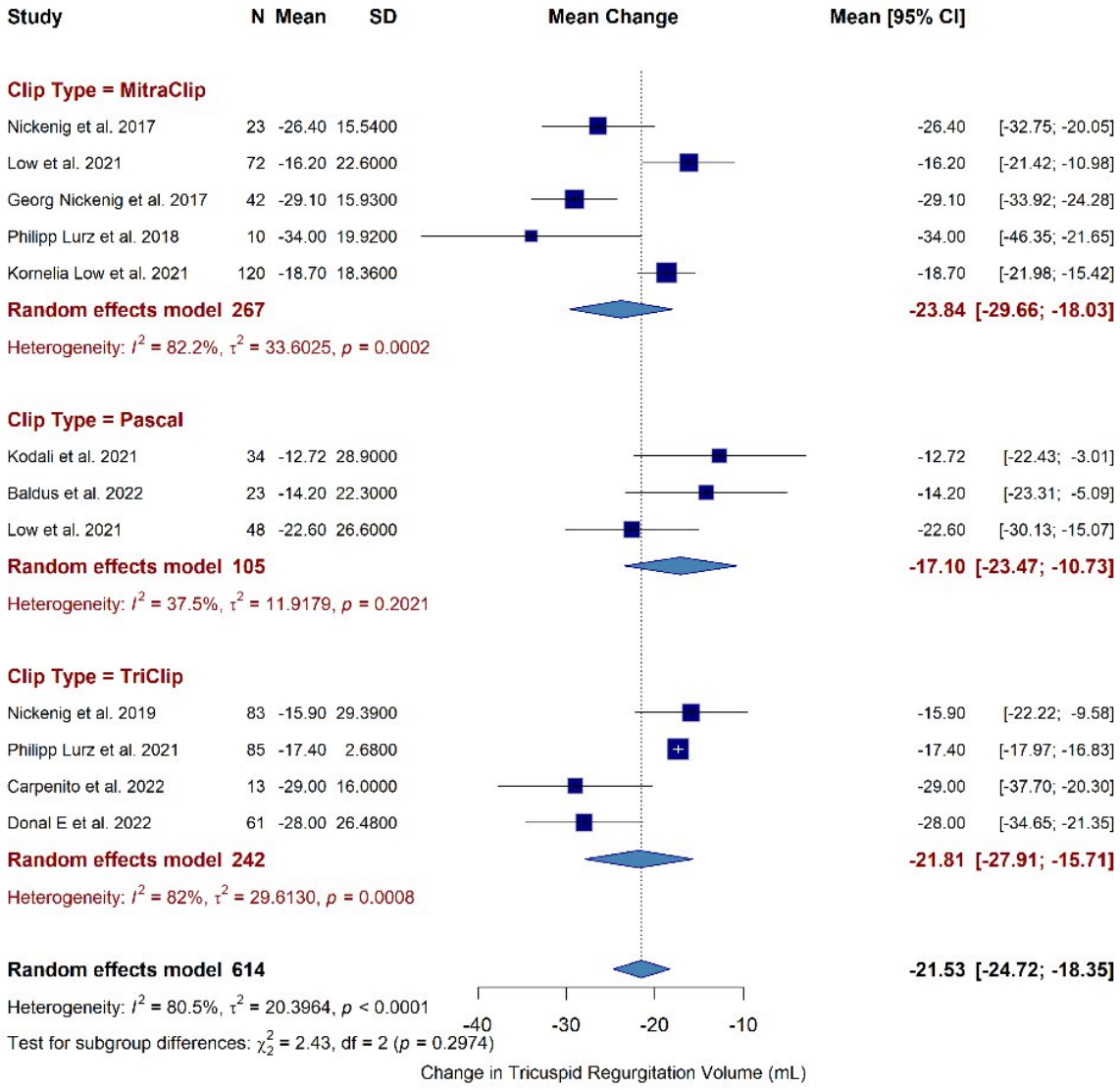
Supplementary Material

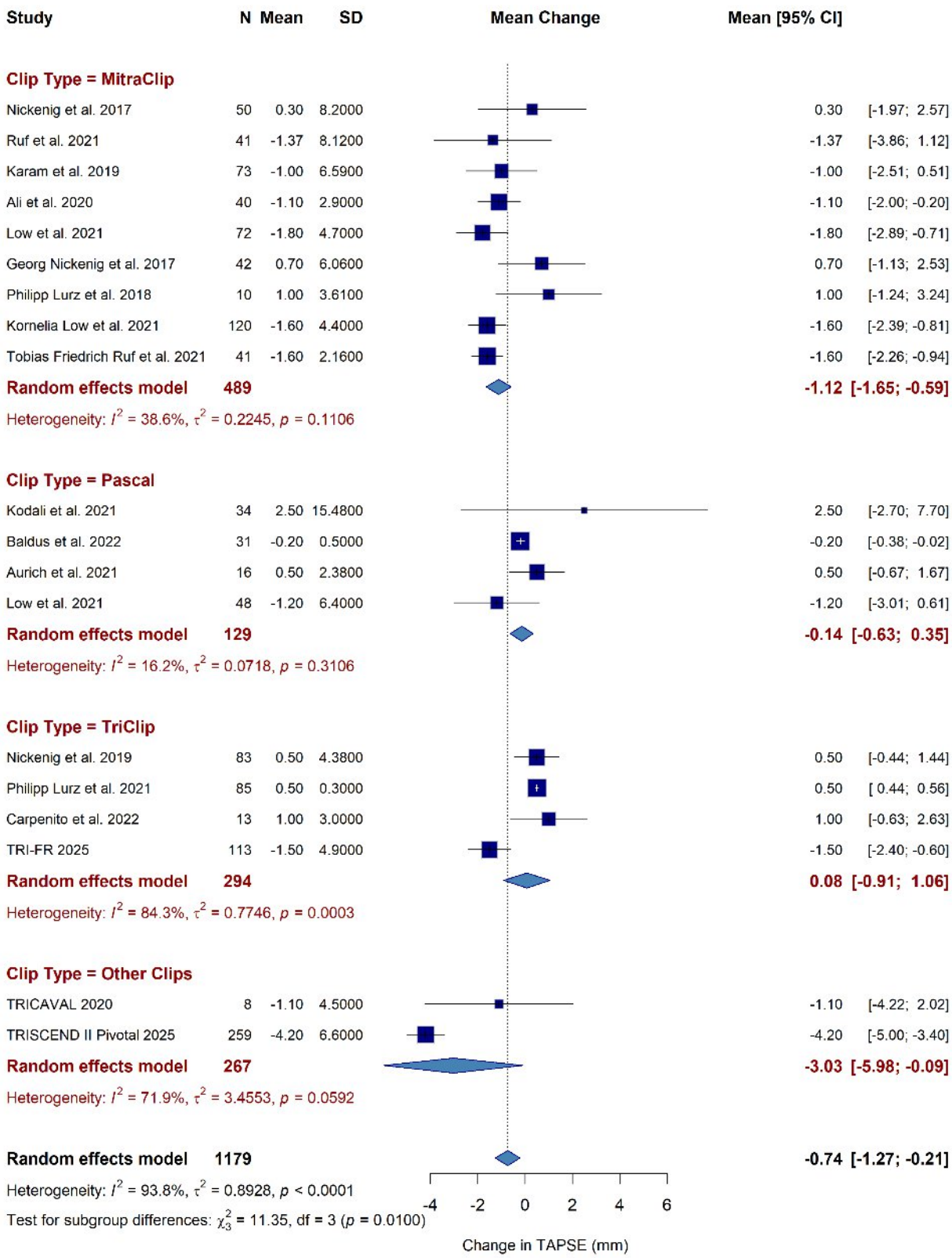
Supplementary Figure S1. Prisma flow diagram



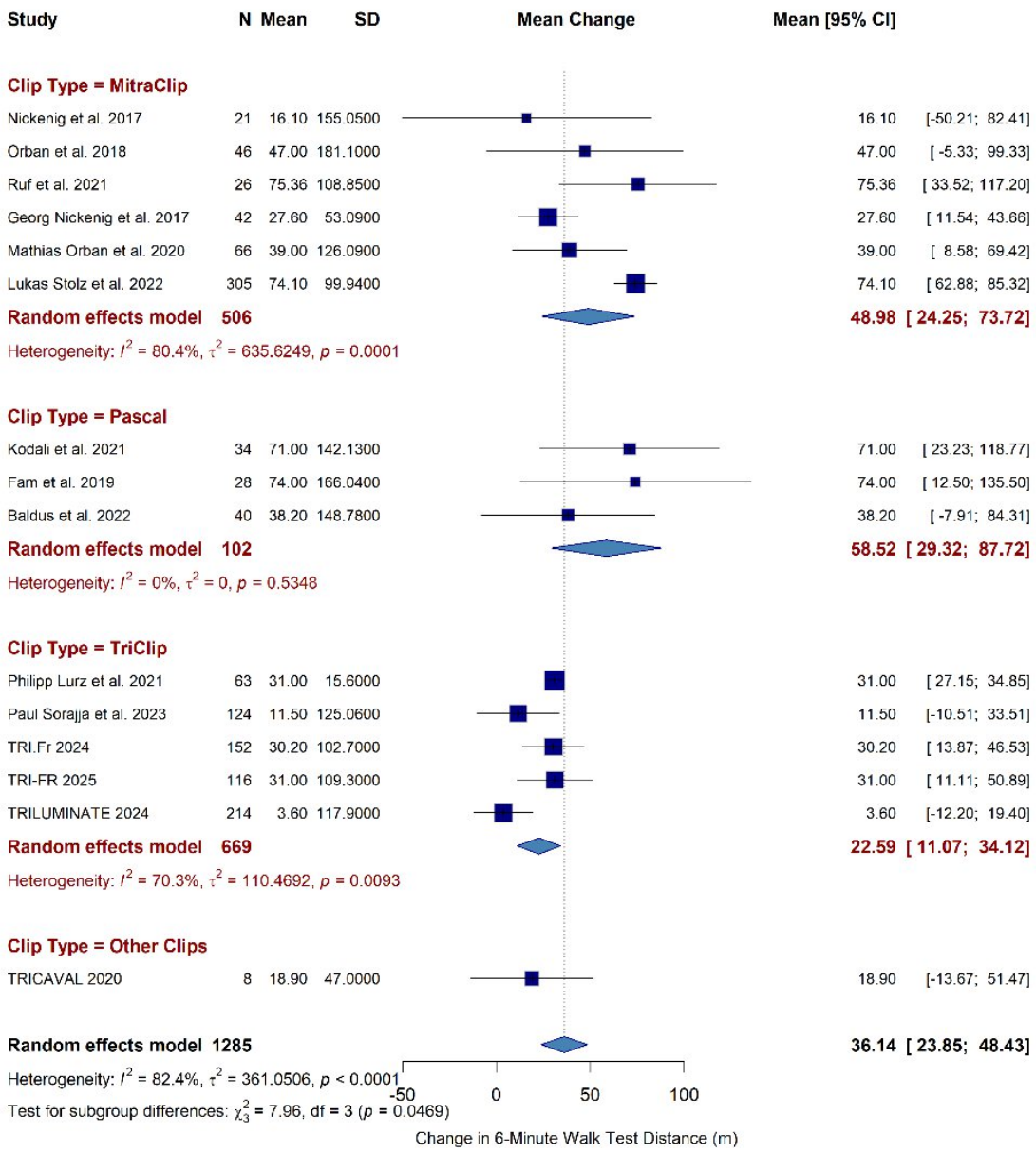
Supplementary Figure S2. Tricusp Regurgitation Volume



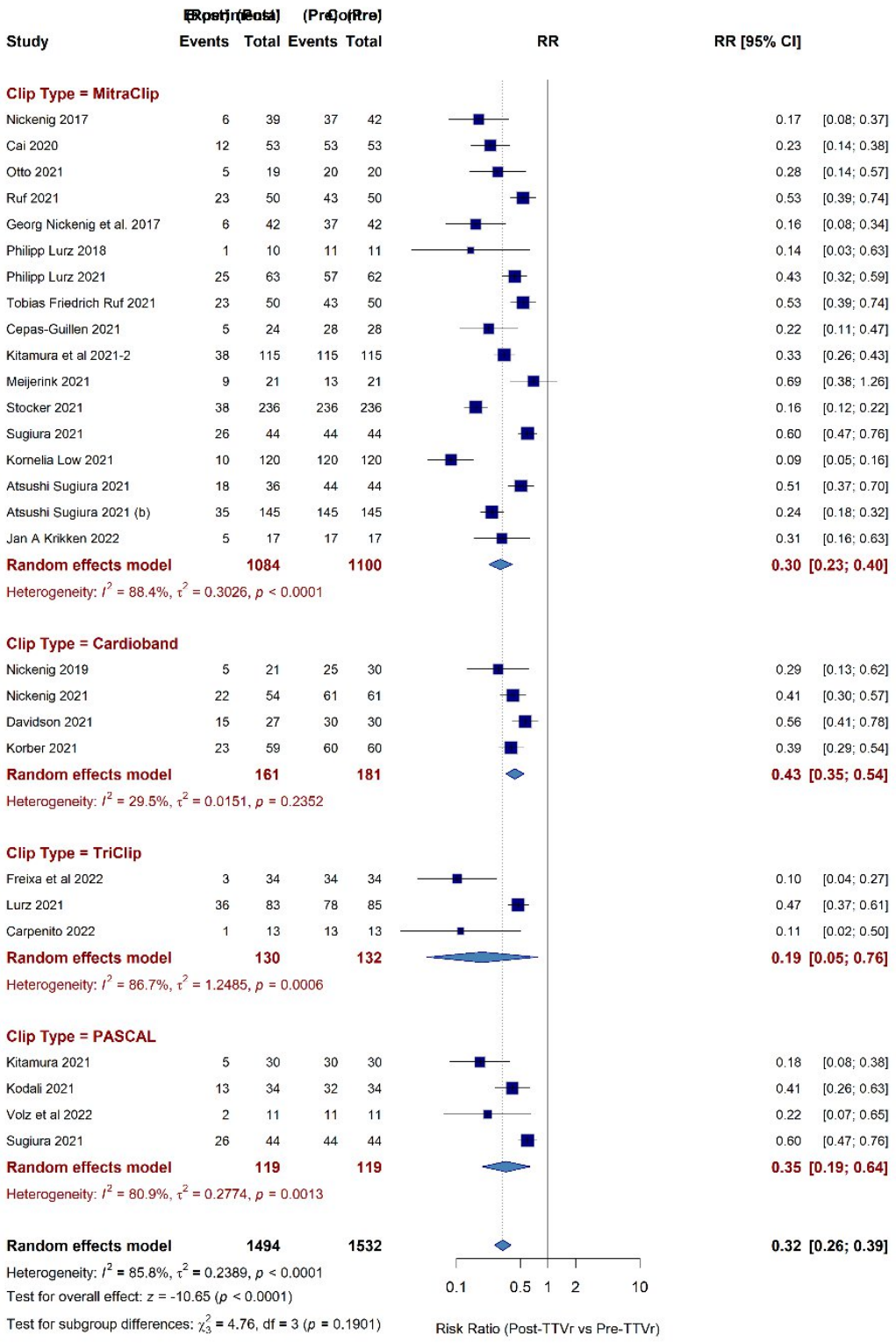
Supplementary Figure S3. TAPSE



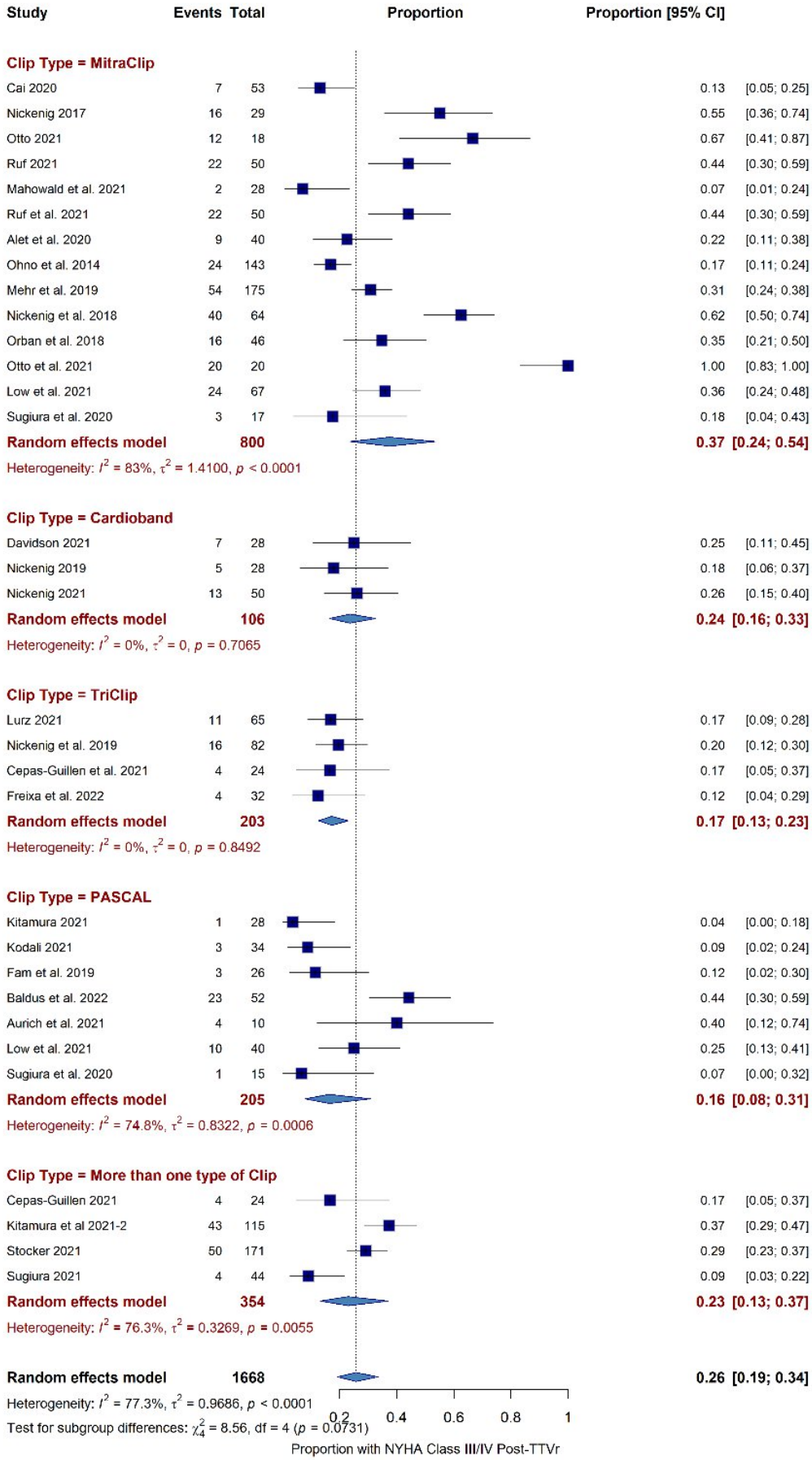
Supplementary Figure S4. 6 MWT



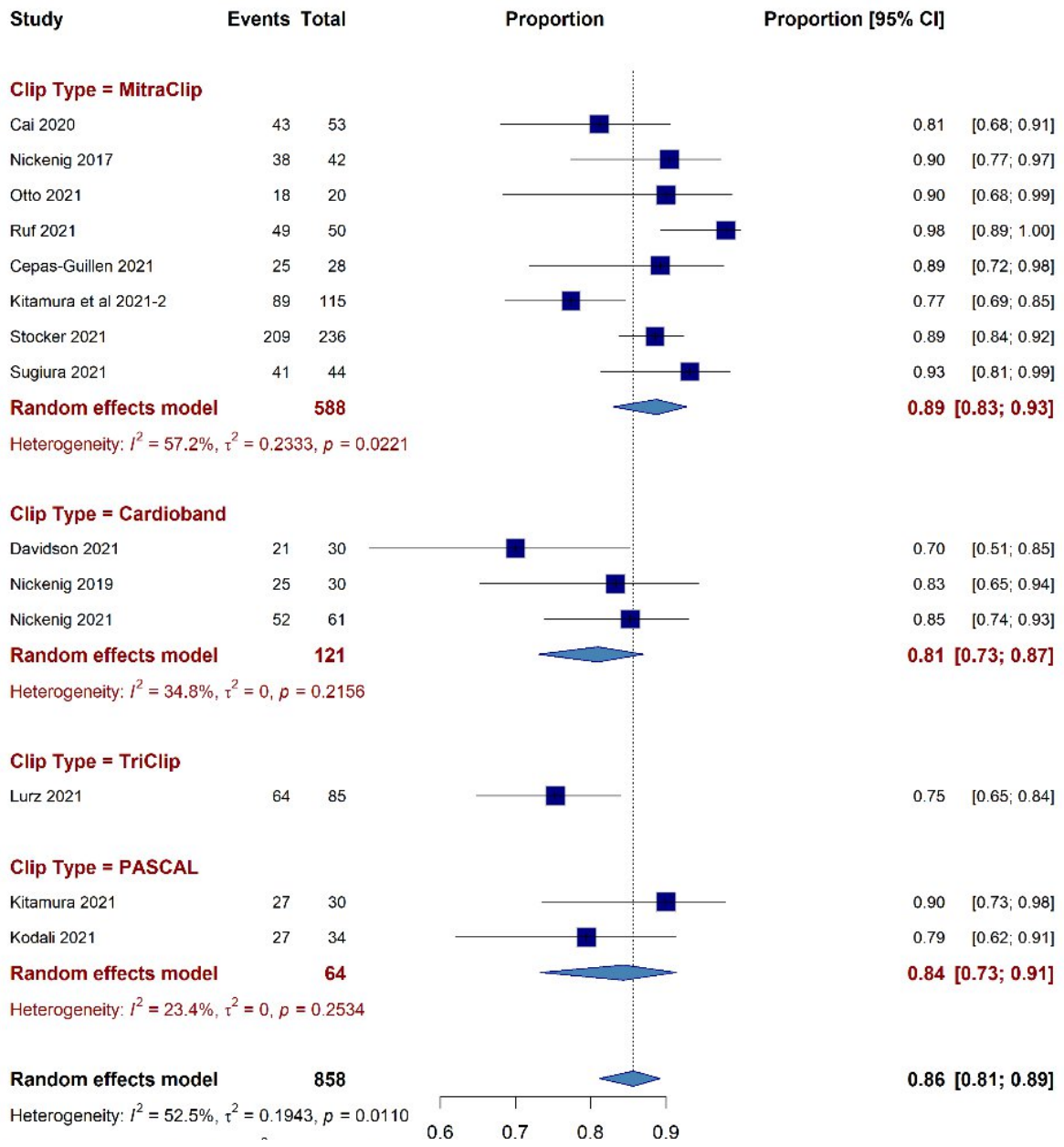
Supplementary Figure S5. TR Severity


Study
Events
Total
Events
Total
RR
RR [95% CI]
Clip Type = MitraClip
Nickenig 2017 6 39 37 42 0.17 [0.08; 0.37]
Cai 2020 12 53 53 53 0.23 [0.14; 0.38]
Otto 2021 5 19 20 20 0.28 [0.14; 0.57]
Ruf 2021 23 50 43 50 0.53 [0.39; 0.74]
Georg Nickenig et al. 2017 6 42 37 42 0.16 [0.08; 0.34]
Philipp Lurz 2018 1 10 11 11 0.14 [0.03; 0.63]
Philipp Lurz 2021 25 63 57 62 0.43 [0.32; 0.59]
Tobias Friedrich Ruf 2021 23 50 43 50 0.53 [0.39; 0.74]
Cepas-Guillen 2021 5 24 28 28 0.22 [0.11; 0.47]
Kitamura et al 2021-2 38 115 115 115 0.33 [0.26; 0.43]
Meijerink 2021 9 21 13 21 0.69 [0.38; 1.26]
Stocker 2021 38 236 236 236 0.16 [0.12; 0.22]
Sugiura 2021 26 44 44 44 0.60 [0.47; 0.76]
Kornelia Low 2021 10 120 120 120 0.09 [0.05; 0.16]
Atsushi Sugiura 2021 18 36 44 44 0.51 [0.37; 0.70]
Atsushi Sugiura 2021 (b) 35 145 145 145 0.24 [0.18; 0.32]
Jan A Krikken 2022 5 17 17 17 0.31 [0.16; 0.63]
Random effects model 1084 1100 0.30 [0.23; 0.40]
Heterogeneity: I^2 = 88.4%, τ^2 = 0.3026, p < 0.0001
Clip Type = Cardioband
Nickenig 2019 5 21 25 30 0.29 [0.13; 0.62]
Nickenig 2021 22 54 61 61 0.41 [0.30; 0.57]
Davidson 2021 15 27 30 30 0.56 [0.41; 0.78]
Korber 2021 23 59 60 60 0.39 [0.29; 0.54]
Random effects model 161 181 0.43 [0.35; 0.54]
Heterogeneity: I^2 = 29.5%, τ^2 = 0.0151, p = 0.2352
Clip Type = TriClip
Freixa et al 2022 3 34 34 34 0.10 [0.04; 0.27]
Lurz 2021 36 83 78 85 0.47 [0.37; 0.61]
Carpenito 2022 1 13 13 13 0.11 [0.02; 0.50]
Random effects model 130 132 0.19 [0.05; 0.76]
Heterogeneity: I^2 = 86.7%, τ^2 = 1.2485, p = 0.0006
Clip Type = PASCAL
Kitamura 2021 5 30 30 30 0.18 [0.08; 0.38]
Kodali 2021 13 34 32 34 0.41 [0.26; 0.63]
Volz et al 2022 2 11 11 11 0.22 [0.07; 0.65]
Sugiura 2021 26 44 44 44 0.60 [0.47; 0.76]
Random effects model 119 119 0.35 [0.19; 0.64]
Heterogeneity: I^2 = 80.9%, τ^2 = 0.2774, p = 0.0013
Random effects model 1494 1532 0.32 [0.26; 0.39]
Heterogeneity: I^2 = 85.8%, τ^2 = 0.2389, p < 0.0001
Test for overall effect: z = -10.65 (p < 0.0001)
Test for subgroup differences: χ^2_3 = 4.76, df = 3 (p = 0.1901)
0.1
0.5
1
2
10
Risk Ratio (Post-TTVr vs Pre-TTVr)

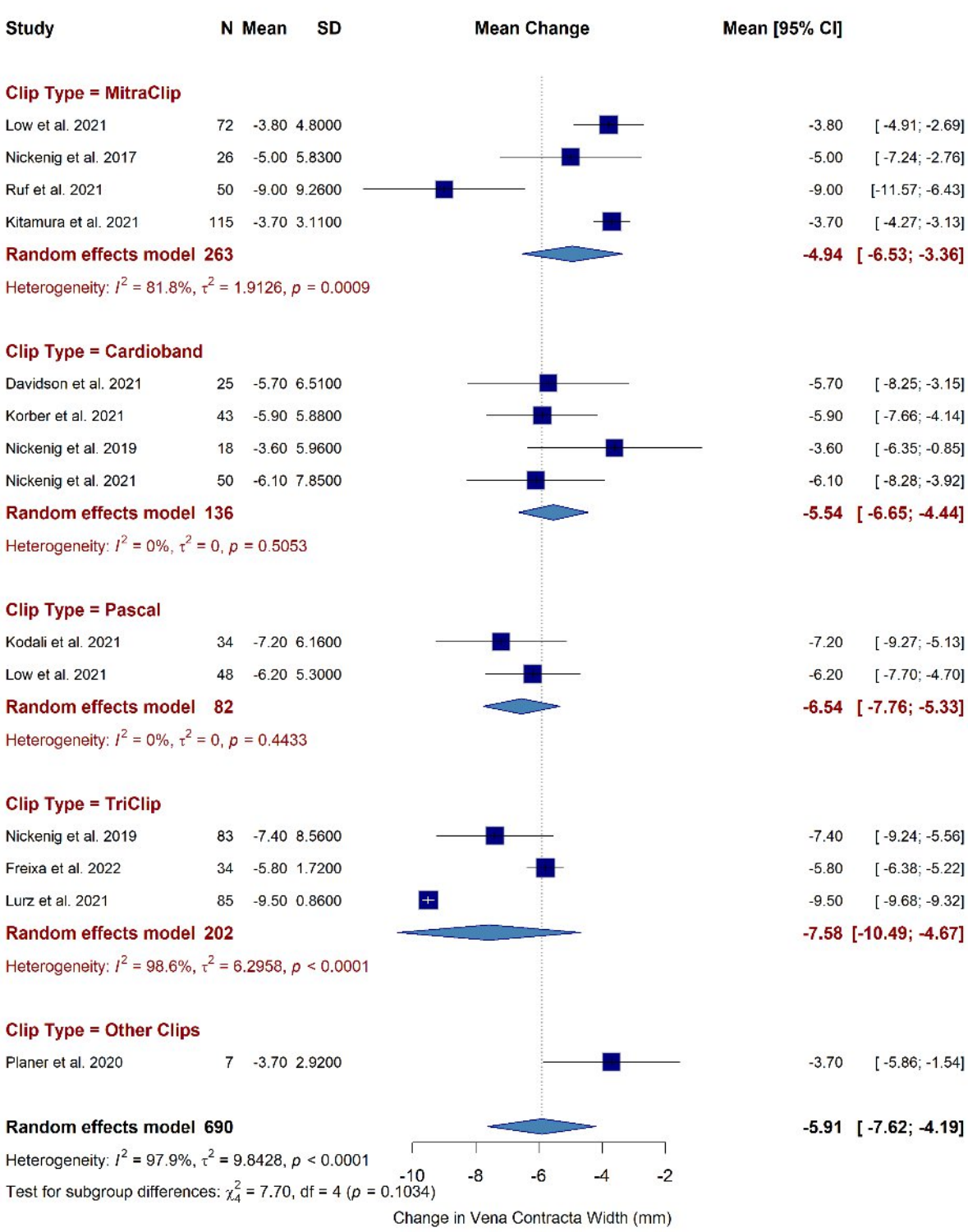
Supplementary Figure S6. Post treatment NYHA Class greater than 3


Study
Events
Total
Proportion
Proportion [95% CI]
Clip Type = MitraClip
Cai 2020 7 53 0.13 [0.05; 0.25]
Nickenig 2017 16 29 0.55 [0.36; 0.74]
Otto 2021 12 18 0.67 [0.41; 0.87]
Ruf 2021 22 50 0.44 [0.30; 0.59]
Mahowald et al. 2021 2 28 0.07 [0.01; 0.24]
Ruf et al. 2021 22 50 0.44 [0.30; 0.59]
Alet et al. 2020 9 40 0.22 [0.11; 0.38]
Ohno et al. 2014 24 143 0.17 [0.11; 0.24]
Mehr et al. 2019 54 175 0.31 [0.24; 0.38]
Nickenig et al. 2018 40 64 0.62 [0.50; 0.74]
Orban et al. 2018 16 46 0.35 [0.21; 0.50]
Otto et al. 2021 20 20 1.00 [0.83; 1.00]
Low et al. 2021 24 67 0.36 [0.24; 0.48]
Sugiura et al. 2020 3 17 0.18 [0.04; 0.43]
Random effects model 800 0.37 [0.24; 0.54]
Heterogeneity: I^2 = 83%, τ^2 = 1.4100, p < 0.0001
Clip Type = Cardioband
Davidson 2021 7 28 0.25 [0.11; 0.45]
Nickenig 2019 5 28 0.18 [0.06; 0.37]
Nickenig 2021 13 50 0.26 [0.15; 0.40]
Random effects model 106 0.24 [0.16; 0.33]
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.7065
Clip Type = TriClip
Lurz 2021 11 65 0.17 [0.09; 0.28]
Nickenig et al. 2019 16 82 0.20 [0.12; 0.30]
Cepas-Guillen et al. 2021 4 24 0.17 [0.05; 0.37]
Freixa et al. 2022 4 32 0.12 [0.04; 0.29]
Random effects model 203 0.17 [0.13; 0.23]
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.8492
Clip Type = PASCAL
Kitamura 2021 1 28 0.04 [0.00; 0.18]
Kodali 2021 3 34 0.09 [0.02; 0.24]
Fam et al. 2019 3 26 0.12 [0.02; 0.30]
Baldus et al. 2022 23 52 0.44 [0.30; 0.59]
Aurich et al. 2021 4 10 0.40 [0.12; 0.74]
Low et al. 2021 10 40 0.25 [0.13; 0.41]
Sugiura et al. 2020 1 15 0.07 [0.00; 0.32]
Random effects model 205 0.16 [0.08; 0.31]
Heterogeneity: I^2 = 74.8%, τ^2 = 0.8322, p = 0.0006
Clip Type = More than one type of Clip
Cepas-Guillen 2021 4 24 0.17 [0.05; 0.37]
Kitamura et al 2021-2 43 115 0.37 [0.29; 0.47]
Stocker 2021 50 171 0.29 [0.23; 0.37]
Sugiura 2021 4 44 0.09 [0.03; 0.22]
Random effects model 354 0.23 [0.13; 0.37]
Heterogeneity: I^2 = 76.3%, τ^2 = 0.3269, p = 0.0055
Random effects model 1668 0.26 [0.19; 0.34]
Heterogeneity: I^2 = 77.3%, τ^2 = 0.9686, p < 0.0001
Test for subgroup differences: χ^2_4 = 8.56, df = 4 (p = 0.0731)
0.2
0.4
0.6
0.8
1
Proportion with NYHA Class III/IV Post-TTVr

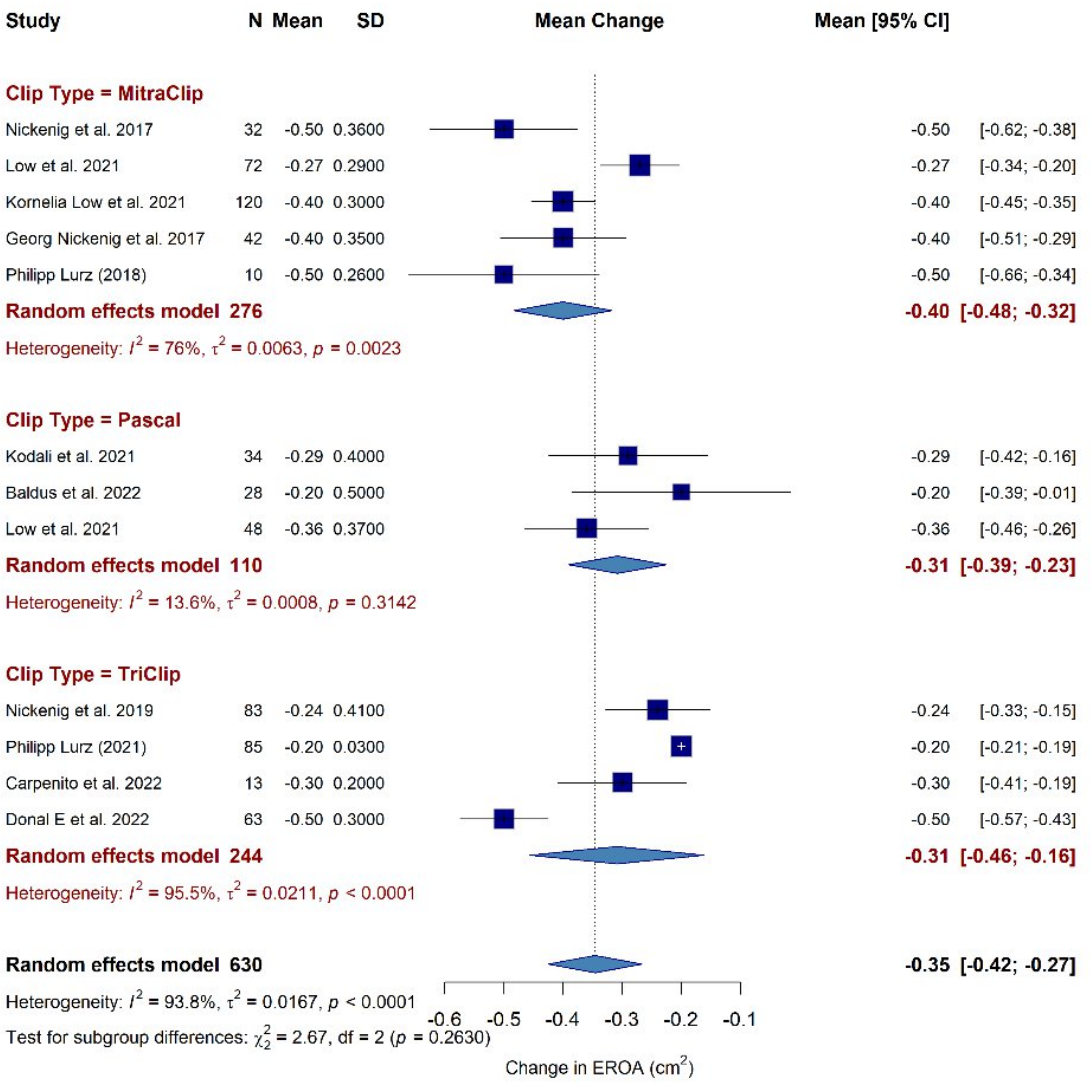
Supplementary Figure S7. Pre treatment NYHA Class greater than 3



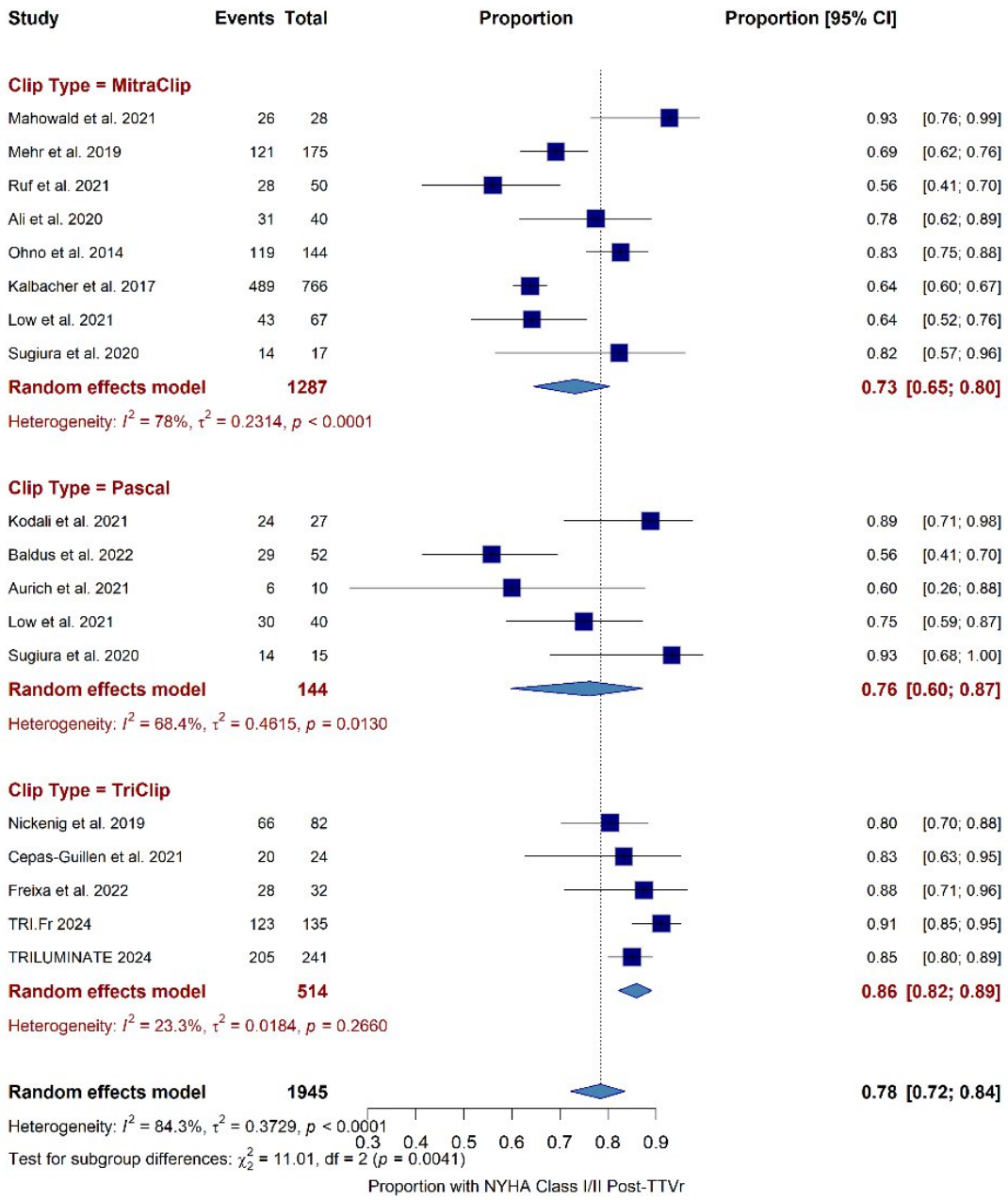
Supplementary Figure S8. Vena contracta width


Study
N Mean SD
Mean Change
Mean [95% CI]
Clip Type = MitraClip
Low et al. 2021 72 -3.80 4.8000 -3.80 [-4.91; -2.69]
Nickenig et al. 2017 26 -5.00 5.8300 -5.00 [-7.24; -2.76]
Ruf et al. 2021 50 -9.00 9.2600 -9.00 [-11.57; -6.43]
Kitamura et al. 2021 115 -3.70 3.1100 -3.70 [-4.27; -3.13]
Random effects model 263 -4.94 [-6.53; -3.36]
Heterogeneity: I^2 = 81.8%, τ^2 = 1.9126, p = 0.0009
Clip Type = Cardioband
Davidson et al. 2021 25 -5.70 6.5100 -5.70 [-8.25; -3.15]
Korber et al. 2021 43 -5.90 5.8800 -5.90 [-7.66; -4.14]
Nickenig et al. 2019 18 -3.60 5.9600 -3.60 [-6.35; -0.85]
Nickenig et al. 2021 50 -6.10 7.8500 -6.10 [-8.28; -3.92]
Random effects model 136 -5.54 [-6.65; -4.44]
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.5053
Clip Type = Pascal
Kodali et al. 2021 34 -7.20 6.1600 -7.20 [-9.27; -5.13]
Low et al. 2021 48 -6.20 5.3000 -6.20 [-7.70; -4.70]
Random effects model 82 -6.54 [-7.76; -5.33]
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.4433
Clip Type = TriClip
Nickenig et al. 2019 83 -7.40 8.5600 -7.40 [-9.24; -5.56]
Freixa et al. 2022 34 -5.80 1.7200 -5.80 [-6.38; -5.22]
Lurz et al. 2021 85 -9.50 0.8600 -9.50 [-9.68; -9.32]
Random effects model 202 -7.58 [-10.49; -4.67]
Heterogeneity: I^2 = 98.6%, τ^2 = 6.2958, p < 0.0001
Clip Type = Other Clips
Planer et al. 2020 7 -3.70 2.9200 -3.70 [-5.86; -1.54]
Random effects model 690 -5.91 [-7.62; -4.19]
Heterogeneity: I^2 = 97.9%, τ^2 = 9.8428, p < 0.0001
Test for subgroup differences: χ^2_4 = 7.70, df = 4 (p = 0.1034)
-10
-8
-6
-4
-2
Change in Vena Contracta Width (mm)

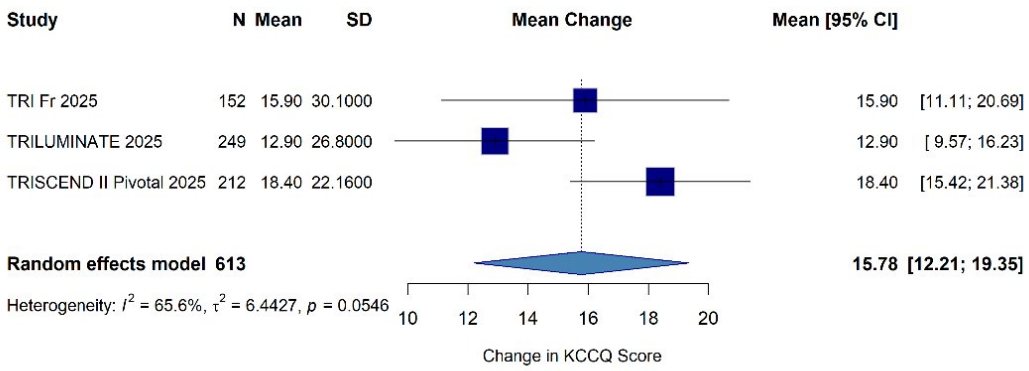
Supplementary Figure S9. EROA



Supplementary Figure S10. NYHA lesser than 3



Supplementary Figure S11. KCCQ



Database	Search Strategy	Search Date	Search results

PubMed/MEDLINE	(“Tricuspid Valve Insufficiency”[Mesh] OR “tricuspid regurgitation” OR “TR”) AND (“Transcatheter Tricuspid Valve Repair” OR “TTVr” OR “transcatheter repair” OR “edge-to-edge repair” OR “TEER”) AND (“MitraClip” OR “TriClip” OR “PASCAL”)	1 March 2026	191
Embase	(‘tricuspid regurgitation’/exp OR ‘tricuspid regurgitation’ OR ‘tricuspid insufficiency’) AND (‘transcatheter tricuspid valve repair’ OR ‘transcatheter repair’ OR ‘edge to edge repair’ OR ‘TEER’) AND (‘mitraclip’ OR ‘triclip’ OR ‘pascal’)	1 March 2026	124
Cochrane Library	(“tricuspid regurgitation” OR “tricuspid insufficiency”) AND (“transcatheter tricuspid valve repair” OR “edge-to-edge repair” OR “TEER”) AND (“MitraClip” OR “TriClip” OR “PASCAL”)	1 March 2026	212
Total			527

Table S1. Search strategy

Study (Author/ Year)	Study Design	No. of Participants	Device(s)	Follow-up	Outcomes Assessed / Primary Endpoints
Carpenito et al., 2022	Prospective, single-arm study	13	TriClip	6 months	surgery, LVEF, TR severity grading
Lurz et al., 2021	Prospective, single-arm study	28	TriClip	30 days and 6 months	, All-cause mortality, TR regurgitan
Low et al., 2021	Retrospective analysis	85	MitraClip, PASCAL	30 days	TAPSE, NYHA (grade III-IV), EROA, TR regurgitation volume, Tricuspid annulus diameter.
Krikken et al., 2022	Retrospective analysis	120	MitraClip, TriClip	30 days	TR severity grading, NYHA (grade III-IV).
Sorajja et al., 2023	Prospective randomized trial	17	TriClip	30 days and 1 year	et renal failure, Nonelective cardiac
Donal et al., 2022	Prospective, single-arm study	350	TriClip device	NA	EROA, PISA radius, TR regurgitant volume.
Sugiura et al., 2021a	Retrospective analysis	146	MitraClip, TriClip, or PASCAL	1 year	TR severity ≥3+, All-cause mortality, TR severity grading.
Orban et al., 2020	Observational study	145	MitraClip or PASCAL system	1 year	6 MWD, All-cause mortality, NYHA (grade III-IV), TR severity grading.

Lurz et al., 2018	Retrospective analysis	119	MitraClip	30 days	6 MWD, Procedural success, Tricuspid annulus diameter, LVEF, PISA, EROA, TR severity grading.
Stolz et al., 2022	Retrospective analysis	42	MitraClip or PASCAL system	1 year	All-cause mortality, Rehospitalization for heart failure, 6-MWD.
Ruf et al., 2021	Retrospective analysis	305	MitraClip	30 days	NYHA (grade III-IV), TAPSE, and TR severity grading.
Sugiura et al., 2021b	Retrospective analysis	50	Pascal, MitraClip	30 days, 3 months	NYHA (grade III-IV), LVEF, TAPS
Nickenig et al., 2017	Observational study	80	MitraClip	30 days	rtality, MI, Stroke, New onset renal
Nickenig et al., 2017	Observational	42	MitraClip NT	In-hospital	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Cai et al., 2020	Observational	53	MitraClip NT	14 mo	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Otto et al., 2021	Observational	20	MitraClip NTR/XTR	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Ruf et al., 2021	Observational	50	MitraClip XTR	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Kitamura et al., 2021	Observational	30	PASCAL	1-y	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Kodali et al., 2021	Single-arm trial	34	PASCAL	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,

Volz et al., 2022	Observational	11	PASCAL	3-month	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Lurz et al., 2021	Single-arm trial	85	TriClip	1-y	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Meijerink et al., 2021	Observational	21	MitraClip, TriClip	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Sugiura et al., 2021	Observational	44	MitraClip, PASCAL	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Stocker et al., 2021	Observational	236	MitraClip, PASCAL	1-y	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Cepas-Guillen et al., 2021	Observational	28	MitraClip, TriClip	3-mo	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Kitamura et al., 2021–2022	Observational	115	MitraClip, TriClip, PASCAL	1-y	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Nickenig et al., 2019	Single-arm trial	30	Cardioband	6-mo	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Davidson et al.,	Single-arm trial	30	Cardioband	30-d	TAPSE, Tricuspid Annulus

2021					Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Körber et al., 2021	Observational	60	Cardioband	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Nickenig et al., 2021	Single-arm trial	61	Cardioband	30-d	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Mahowald et al., 2021	Retrospective Cohort	38	MitraClip	339 (125.25)	Mortality, heart failure hospitalization, reintervention
Low et al., 2021	Retrospective Cohort	120	MitraClip, PASCAL	30	TR severity, (NYHA) functional class, major adverse cardiac, cerebrovascular events
Mehr et al., 2019	Retrospective Cohort	249	MitraClip	274 (187)	ehospitalization for heart failure with
Nickenig et al., 2017	MultiCenter International single-arm trial	64	MitraClip, TriClip	14 (18)	Postprocedural Events, major vascu
Nickenig et al., 2019	Multicentre study prospective single-arm study	85	MitraClip, TriClip	180	0 days post procedure, The primary
Ohno et al., y.d.	Retrospective Cohort	146	MitraClip	660 (494)	ndpoint was freedom from death
Orban et al., 2018	Dual centre single arm Cohort Study	50	MitraClip	188.7 (22.1)	the mid-term device safety and dural
Sugiura et al., 2020	Retrospective Cohort	44	MitraClip, PASCAL	90	Reduction in TR severity by at least one grade at 30 days.
Ali et al., 2020	Prospective Cohort	40	MitraClip	30	major adverse cardiac and cerebrova
Aurich et al., 2021	Prospective Cohort	16	PASCAL Ace	30	Postprocedural reduction in TR of at least 1 grade.
Baldus et al., 2022	Multicenter prospective, single-arm Study	74	PASCAL	30	se events (MAEs) at 30 days, Reduc
Fam et al., 2019	Nonrandomized, single-arm cohort study	28	PASCAL	30	ation of at least 1 device with post-p

Freixa et al., 2022	Multicenter Retrospective Cohort	34	TriClip	90	TR reduction of at least 1 grade assessed by transthoracic echocardiography at discharge.
Kalbacher et al., 2017	Prospective Cohort	766	MitraClip	395 (43.1)	In-hospital, one-year mortality, death, myocardial infarction ± stroke
Karam et al., 2019	Retrospective Cohort	126	MitraClip	187.75 (8.9)	Renal and liver function improvement.
Cai et al., 2020	Single center, retrospective observational cohort	Total: 124 (T-TEER: 71; GDMT: 53)	TriClip (T-TEER) vs GDMT	14–17 months	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
TRILUMINATE, 2025	RCT	Total: 572 (T-TEER: 285; GDMT: 287)	TriClip (T-TEER) vs GDMT	24 months	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
TRISCEND II Pivotal, 2025	RCT	TTVT: 259; OMT: 133	TTVR (EVOQUE)	12 months	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
Tri.Fr Trial, 2024	RCT	300 (TTVT: 152; OMT: 148)	T-TEER (TriClip)	12 months	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,
TRICAVAL, 2020	RCT	28 (TTVT: 14; OMT: 14)	CAVI (Sapien XT)	3 months	TAPSE, Tricuspid Annulus Diameter, TR EROA, TR Severity ≥III, NYHA Class III/IV, TR Volume,

Table S2. Study Characteristics table

Study	Representativeness	Non-Exposed Selection	Exposure Ascertainment	Outcome Absent at Start	Comparability	Outcome Assessment	Follow-up Duration	Adequacy of Follow-up	Total (9☆)
Ali et al., 2020	☆	☆	☆	☆	☆☆	☆	☆	☆	9

Aurich et al., 2021	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Cai et al. (2020)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Cai et al. (2020)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Carcoana et al. (2024)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Cepas-Guillen et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Freixa et al. (2022)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Jan A. Krikken (2022)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Kalbacher et al., 2017	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Karam et al., 2019	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Kitamura et al. (2021–2022)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Kitamura et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Körber et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Low et al., 2021	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Mahowald et al., 2021	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Mehr et al., 2019	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Meijerink et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Nickenig et al. (2017)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Ohno et al.	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Otto et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9

Philipp Lurz (2018)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Ruf et al. (2021)	☆	☆	-+	☆	☆☆	☆	☆	☆	9
Stocker et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Sugiura et al. (2021)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Volz et al. (2022)	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Sorajja et al., 2023	☆	☆	☆	☆	☆☆	☆	☆	☆	9
Stolz et al., 2022	☆	☆	☆	☆	☆☆	☆	☆	☆	9

Table S3. Quality assessment of included observational studies using the Newcastle–Ottawa Scale (NOS). Studies were evaluated across three domains: selection of study groups, comparability of cohorts, and ascertainment of outcomes/exposures. Higher scores indicate better methodological quality. ☆ indicate the presence of the required domain.

dy (Author, Ye	**Randomizatio n Process**	**Deviations from Intended Interventions**	**Missing Outcome Data**	**Measurement of Outcome**	**Selection of Reported Result**	**verall Risk of Bi**
TRI.FR (2024)	Some concerns	Low risk	Low risk	Low risk	Some concerns	Some concerns
TRILUMINAT E (2025)	Low risk	Some concerns	Low risk	Low risk	Low risk	Some concerns
TRISCEND II Pivotal (2025)	Some concerns	High risk	Low risk	Some concerns	Some concerns	High risk
TRICAVAL (2020)	Some concerns	High risk	Low risk	Some concerns	Some concerns	High risk

Table S4. Risk of bias assessment of included randomized controlled trials using the Cochrane Risk of Bias (RoB 2) tool. Studies were evaluated across five domains: bias arising from the randomization process, deviations from intended interventions, missing outcome data, measurement of outcomes, and selection of the reported results.

Study (Year)	**Clearly Stated Aim**	**Consecuti ve Patients**	**Prospecti ve Data Collectio n**	**Appropri ate Endpoint s**	**Unbiased Assessme nt**	**Adequate Follow-up**	**<5% Loss to Follow-up**	**Sample Size Calculati on**	**Total (16)**

Carpenito (2022)	2	2	2	2	1	2	1	2	14
Philipp Lurz (2021)	2	2	2	2	1	2	2	2	15
Donal E (2022)	2	1	1	2	1	2	1	2	12
Kodali et al. (2021)	2	2	1	2	1	2	1	2	13
Lurz et al. (2021)	2	2	1	2	1	2	2	2	14
Nickenig et al. (2019)	2	2	2	2	1	2	1	2	14
Davidson et al. (2021)	2	2	2	2	1	2	2	2	15
Nickenig et al. (2021)	2	1	1	2	1	2	1	2	12
Nickenig et al., 2019	2	2	1	2	1	2	2	2	14
Nickenig et al., 2017	2	2	2	2	1	2	1	2	14
Orban et al., 2018	2	2	2	2	1	2	2	2	15
Baldus et al., 2022	2	1	1	2	1	2	1	2	12
Fam et al., 2019	2	2	1	2	1	2	1	2	13
Kodali et al., 2021	2	2	1	2	1	2	2	2	14

Table S5. Methodological quality assessment of included non-randomized single arm studies using the Methodological Index for Non-Randomized Studies (MINORS) criteria.

)utcome Measur	**Figure**	**Subgroups**	**Total N**	**Pooled Estimate [95% CI]**	**Heterogeneity (I^2)**	**lue (Subgroup I**
TR Regurgitation Volume (mL)	S2	Overall	614	-21.53 [-24.72, -18.35]	80.50%	P=0.33
		MitraClip	224	-23.84 [-29.66, -18.03]	63.80%	

		PASCAL	120	-17.10 [-23.47, -10.73]	73.10%	
		TriClip	270	-21.81 [-27.91, -15.71]	85.50%	
TAPSE (mm)	S3	Overall	1179	-0.74 [-1.27, -0.21]	93.80%	P=0.50
		MitraClip	400	-0.92 [-1.43, -0.40]	82.20%	
		PASCAL	150	-0.45 [-1.15, 0.25]	88.50%	
		TriClip	629	-0.68 [-1.42, 0.05]	95.90%	
6-Minute Walk Test (m)	S4	Overall	1285	36.14 [23.85, 48.43]	82.40%	P=0.04
		MitraClip	362	48.98 [24.25, 73.72]	84.40%	
		PASCAL	150	58.52 [29.32, 87.72]	0.00%	
		TriClip	773	22.59 [11.07, 34.12]	67.50%	
TR Severity (RR)	S5	Overall	1532	0.32 [0.26, 0.39]	85.80%	P=0.90
		MitraClip	465	0.34 [0.26, 0.44]	67.20%	
		PASCAL	114	0.30 [0.21, 0.45]	0.00%	
		TriClip	953	0.32 [0.22, 0.47]	93.60%	
NYHA Class III/IV (Post)	S6	Overall	1668	0.26 [0.19, 0.34]	77.30%	P=0.23
		MitraClip	601	0.29 [0.21, 0.39]	61.20%	
		PASCAL	114	0.30 [0.21, 0.42]	0.00%	
		TriClip	953	0.20 [0.12, 0.36]	87.10%	
Vena Contracta (mm)	S8	Overall	690	-5.91 [-7.62, -4.19]	97.90%	P=0.28
		MitraClip	300	-6.65 [-8.63, -4.68]	95.80%	
		PASCAL	120	-4.10 [-5.91, -2.29]	87.70%	
		TriClip	270	-5.87 [-9.26, -2.48]	99.10%	

EROA (cm^2)	S9	Overall	630	-0.35 [-0.42, -0.27]	93.80%	P=0.34
		MitraClip	240	-0.40 [-0.48, -0.32]	80.40%	
		PASCAL	120	-0.31 [-0.39, -0.23]	76.90%	
		TriClip	270	-0.31 [-0.46, -0.16]	97.40%	
NYHA Class I/II (Post)	S10	Overall	1945	0.78 [0.72, 0.84]	84.30%	P=0.009
		MitraClip	722	0.73 [0.65, 0.80]	73.10%	
		PASCAL	150	0.76 [0.60, 0.87]	71.90%	
		TriClip	1073	0.86 [0.82, 0.89]	62.00%	

Table S6. Summary of the Outcomes