Self-Expanding vs. Balloon-Expandable TAVR in Small Aortic Annuli: A Meta-Analysis of Clinical and Hemodynamic Outcomes

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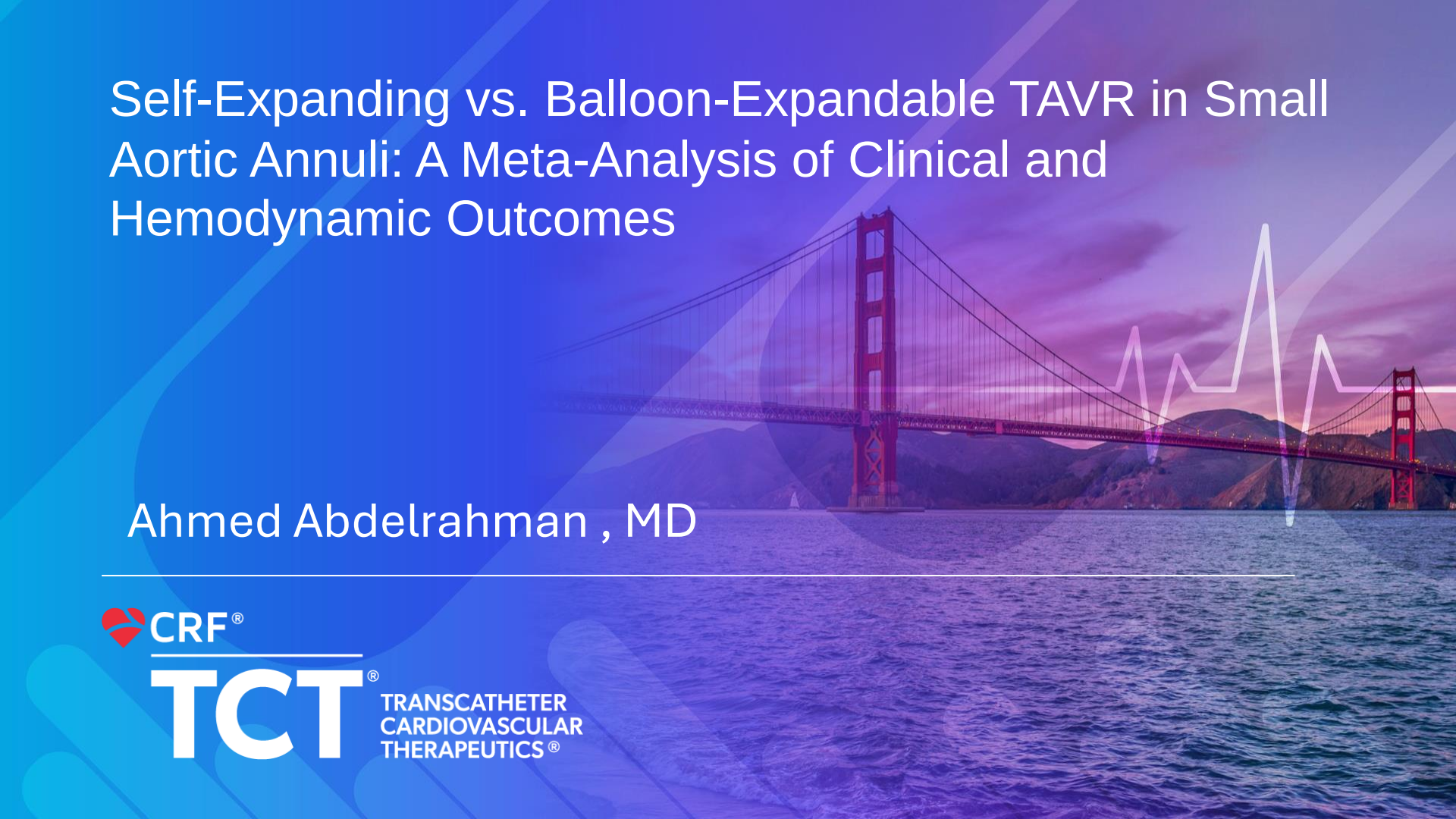

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Disclosure of Relevant Financial Relationships

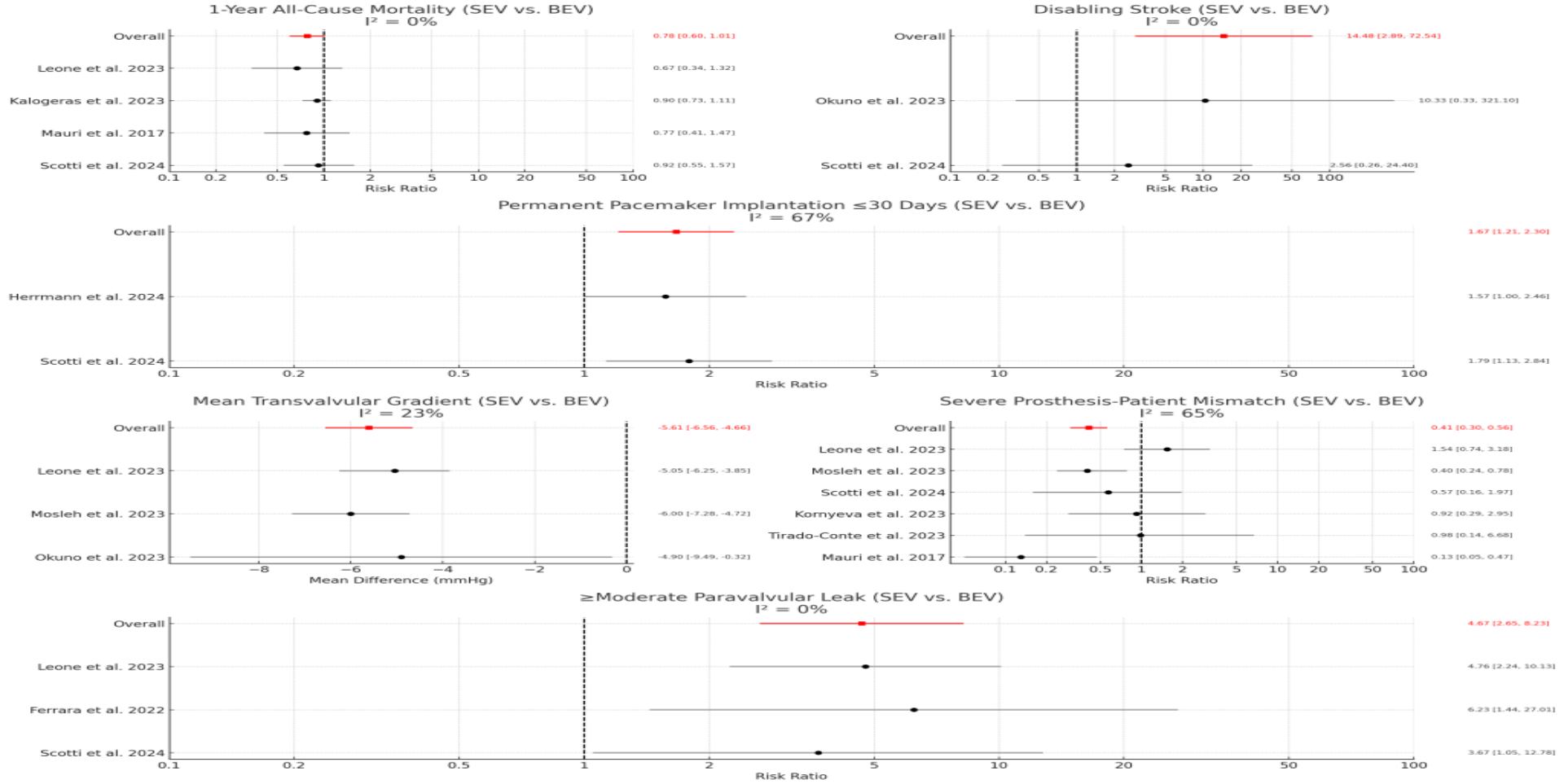
I, Ahmed Abdelrahman, DO NOT have any financial relationships to disclose.

The optimal (TAVR) strategy for patients with a small aortic annulus (SAA), a common and challenging anatomy, remains debated. We performed a meta-analysis comparing outcomes between self-expanding (SEV) and balloon-expandable (BEV) valves in this high-risk population.

A systematic review and meta-analysis of randomized and observational studies comparing SEV and BEV in SAA was conducted. Data were pooled for key clinical and hemodynamic endpoints. The analysis included a total of 4,638 patients across 10 studies.

SEV showed better hemodynamics, with significantly lower mean transvalvular gradients (Mean Difference -5.61 mmHg, 95% CI -6.56 to -4.66) and a 59% relative risk reduction in severe prosthesis-patient mismatch (RR 0.41, CI 0.30-0.56).

- However, it showed higher risks of 30-day permanent pacemaker implantation (RR 1.67, CI 1.21-2.30), ≥moderate paravalvular leak (RR 4.67, CI 2.65-8.23), and a signal for disabling stroke in two studies (RR 14.48, CI 2.89-72.54). The hemodynamic advantages did not translate into a statistically significant survival benefit. At 1-year, all-cause mortality showed a non-significant trend favoring SEV (RR 0.78, CI 0.60-1.01)


1-Year All-Cause Mortality (SEV vs. BEV)
I² = 0%
Overall
Leone et al. 2023
Kalogeras et al. 2023
Mauri et al. 2017
Scotti et al. 2024
0.78 [0.60, 1.01]
0.67 [0.34, 1.32]
0.90 [0.73, 1.11]
0.77 [0.41, 1.47]
0.92 [0.55, 1.57]
0.1 0.2 0.5 1 2 5 10 20 50 100
Risk Ratio
Disabling Stroke (SEV vs. BEV)
I² = 0%
Overall
Okuno et al. 2023
Scotti et al. 2024
14.48 [2.89, 72.54]
10.33 [0.33, 321.10]
2.56 [0.26, 24.40]
0.1 0.2 0.5 1 2 5 10 20 50 100
Risk Ratio
Permanent Pacemaker Implantation ≤30 Days (SEV vs. BEV)
I² = 67%
Overall
Herrmann et al. 2024
Scotti et al. 2024
1.67 [1.21, 2.30]
1.57 [1.00, 2.46]
1.79 [1.13, 2.84]
0.1 0.2 0.5 1 2 5 10 20 50 100
Risk Ratio
Mean Transvalvular Gradient (SEV vs. BEV)
I² = 23%
Overall
Leone et al. 2023
Mosleh et al. 2023
Okuno et al. 2023
-5.61 [-6.56, -4.66]
-5.05 [-6.25, -3.85]
-6.00 [-7.28, -4.72]
-4.90 [-9.49, -0.32]
−8 −6 −4 −2 0
Mean Difference (mmHg)
Severe Prosthesis-Patient Mismatch (SEV vs. BEV)
I² = 65%
Overall
Leone et al. 2023
Mosleh et al. 2023
Scotti et al. 2024
Kornyeva et al. 2023
Tirado-Conte et al. 2023
Mauri et al. 2017
0.41 [0.30, 0.56]
1.54 [0.74, 3.18]
0.40 [0.24, 0.78]
0.57 [0.16, 1.97]
0.92 [0.29, 2.95]
0.98 [0.14, 6.68]
0.13 [0.05, 0.47]
0.1 0.2 0.5 1 2 5 10 20 50 100
Risk Ratio
≥Moderate Paravalvular Leak (SEV vs. BEV)
I² = 0%
Overall
Leone et al. 2023
Ferrara et al. 2022
Scotti et al. 2024
4.67 [2.65, 8.23]
4.76 [2.24, 10.13]
6.23 [1.44, 27.01]
3.67 [1.05, 12.78]
0.1 0.2 0.5 1 2 5 10 20 50 100
Risk Ratio

In patients with SAA, SEV provides better hemodynamics but at the cost of increased procedural complications. The absence of a definitive mortality benefit at 1 year highlights a critical trade-off. Valve selection must be personalized, carefully weighing the long-term benefits of improved hemodynamics against immediate procedural risks.

Questions

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