

Outcomes of Minimally Invasive vs. Sternotomy Approaches in Aortic Valve Replacement for Infective Endocarditis: A Retrospective Study

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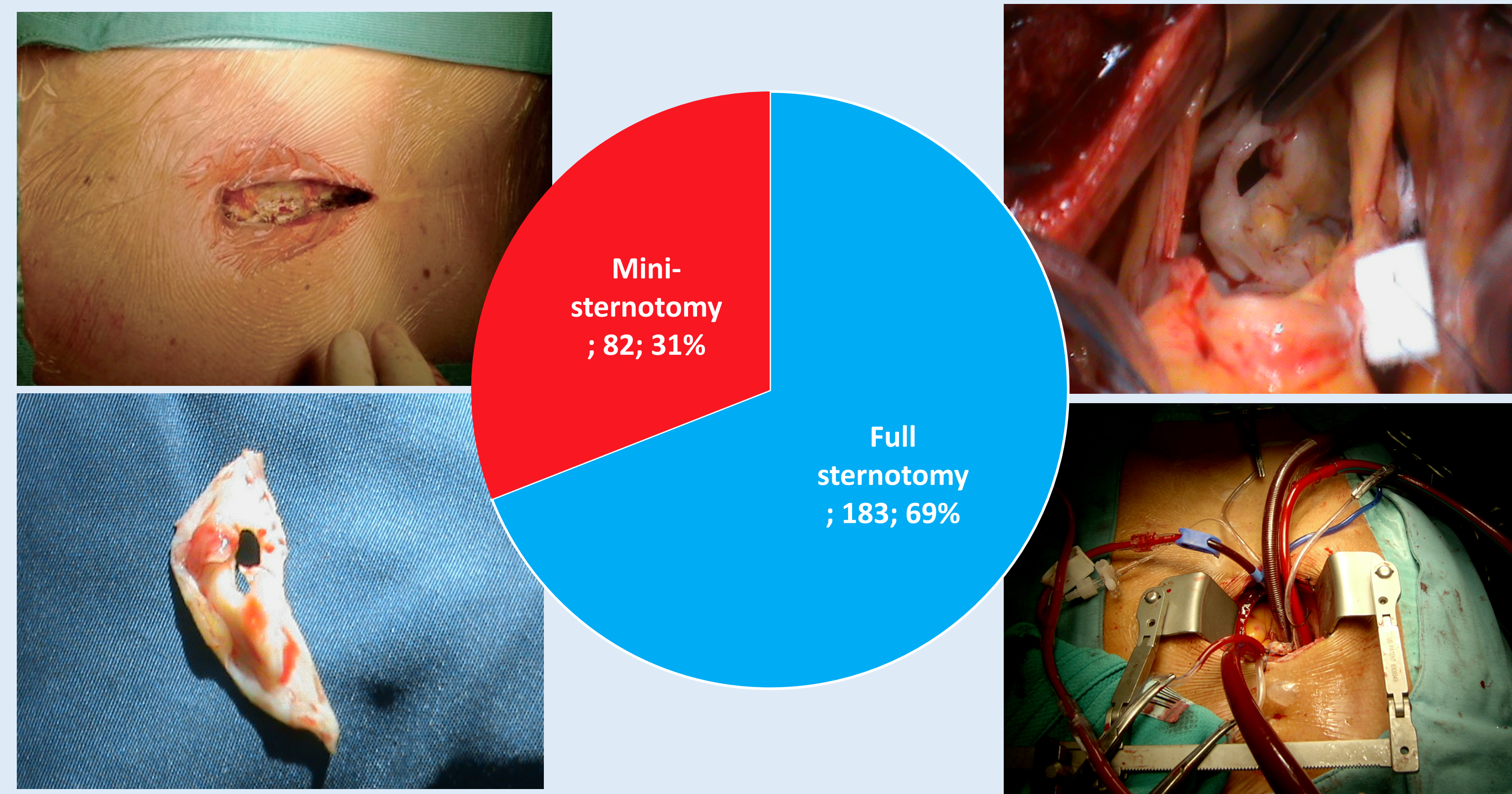


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Background

This study aimed to evaluate the outcomes of isolated aortic valve replacement (AVR) for infective endocarditis, comparing traditional full sternotomy with minimally invasive surgical (MIS) approaches. While MIS techniques have gained traction in AVR, their role in endocarditis remains underexplored, with limited evidence on safety and efficacy in this high-risk cohort.

Surgical approach



Methods

A retrospective analysis was conducted on 265 patients who underwent isolated AVR for infective endocarditis at our institution between January 2010 and March 31, 2024. Patients were categorized into two groups: full sternotomy (Group 1, n=183) and MIS (Group 2, n=82). MIS techniques included ministernotomy or minithoracotomy. Preoperative, intraoperative, and postoperative variables, including mortality, complications, and hospital length of stay, were analyzed. To adjust for baseline disparities, inverse probability weighting was applied.

Pre-operative characteristics

	Before IPW				After IPW		
	Full stern.	MIS	p	SMD	Full stern.	MIS	SMD
N / sum of weights	183	82			297.2	280.5	
Age, median (IQR)	72 (63, 77)	64 (52, 73)	<0.001	0.525	68 (57, 76)	71 (59, 74)	0.006
Female, n (%)	51 (27.9)	15 (18.3)	0.124	0.229	59.6 (20.1)	53.5 (19.1)	0.025
Hypertension, n (%)	128 (70.3)	46 (56.1)	0.026	0.298	209.6 (70.8)	199.6 (71.2)	0.008
Diabetes, n (%)	38 (20.8)	15 (18.3)	0.741	0.062	58.2 (19.6)	52.5 (18.7)	0.022
Obese, n (%)	38 (20.8)	19 (23.2)	0.747	0.058	67.9 (22.8)	64.5 (23.0)	0.003
BPCO, n (%)	15 (8.1)	9 (11.0)	0.685	0.199	31.1 (10.4)	30.3 (10.8)	0.012
EF, median (IQR)	58 (50, 62)	60 (51, 65)	0.172	0.174	58 (55, 61)	57 (51, 63)	0.006
Drug use, n (%)	6 (3.3)	7 (8.5)	0.119	0.223	19.5 (6.6)	19.0 (6.8)	0.008
Redo, n (%)	118 (64.5)	12 (14.6)	<0.001	1.185	130.1 (43.8)	120.0 (42.8)	0.020
Peripheral Artery Disease, n (%)	28 (15.3)	6 (7.3)	0.077	0.254	31.1 (10.5)	29.4 (10.5)	<0.001
Neoplasm, n (%)	25 (13.7)	9 (11.0)	0.692	0.082	40.4 (13.6)	39.4 (14.0)	0.013
Neurologic disease, n (%)	36 (19.7)	18 (22.0)	0.742	0.056	73.0 (24.6)	71.1 (25.4)	0.018
Shock, n (%)	14 (7.7)	1 (1.2)	0.043	0.316	14.7 (5.0)	11.7 (4.2)	0.037
Heart failure, n (%)	52 (28.4)	20 (24.4)	0.552	0.091	78.7 (26.5)	71.4 (25.4)	0.024
MI, n (%)	3 (1.6)	4 (4.9)	0.208	0.183	4.2 (1.4)	4.2 (1.5)	0.008
Preoperative Intubation, n (%)	16 (8.9)	3 (3.7)	0.198	0.217	19.1 (6.5)	17.1 (6.1)	0.016
PAPs > 50 MmHg, n (%)	8 (4.4)	0 (0.0)	0.061	0.302	8.0 (2.7)	0.0 (0.0)	0.235
Dialysis, n (%)	6 (3.3)	4 (4.9)	0.51	0.078	9.1 (3.1)	9.0 (3.2)	0.007
Pacemaker, n (%)	20 (10.9)	2 (2.4)	0.028	0.345	22.6 (7.6)	19.4 (6.9)	0.026

Results

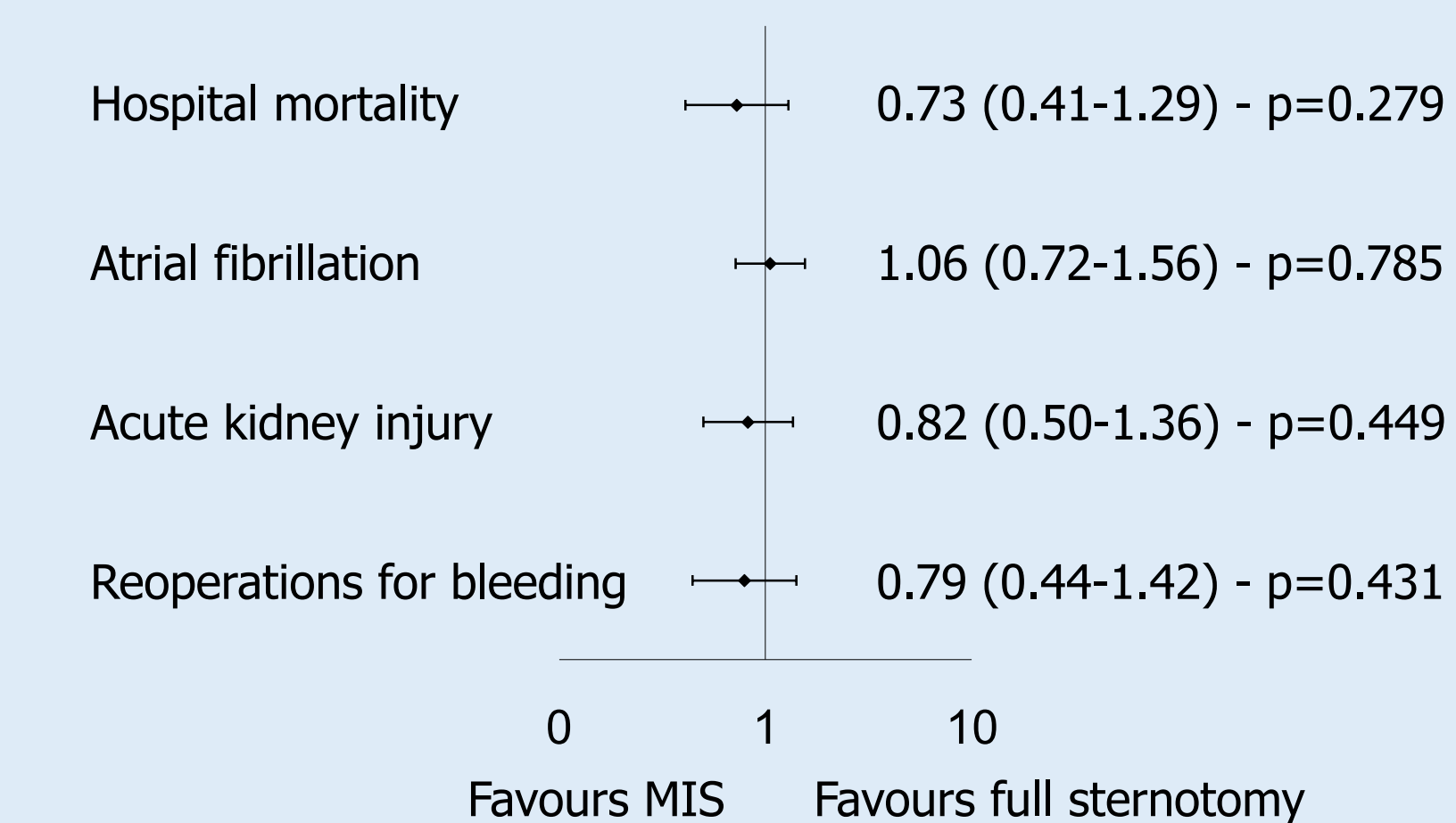
Patients in the sternotomy group had significantly higher preoperative risk profiles, including older age ($p<0.001$), a higher proportion of reoperations ($p<0.001$), and more frequent presentation in shock ($p=0.043$). Consequently, they exhibited significantly elevated additive and logistic EuroSCOREs (both $p<0.001$).

Operative data

	Before IPW				After IPW		
	Full stern.	MIS	p	SMD	Full stern.	MIS	SMD
N / sum of weights	183	82			297.2	280.5	
Add EuroSCORE, median (IQR)	11.0 (9.0, 14.0)	7.0 (6.0, 9.8)	<0.001	1.002	10.0 (7.0, 13.0)	9.60 (7.0, 14.0)	0.095
Log EuroSCORE, median (IQR)	28.0 (12.8, 51.6)	8.7 (5.1, 16.6)	<0.001	0.914	19.7 (8.1, 37.3)	16.73 (8.2, 46.2)	0.040
vegetations, n (%)	146 (81.1)	72 (87.8)	0.214	0.186	255.0 (86.7)	228.3 (81.4)	0.145
Leaflet perforation, n (%)	17 (9.4)	10 (12.2)	0.515	0.089	31.9 (10.8)	17.9 (6.4)	0.159
Prosthesis detachment, n (%)	45 (25.0)	6 (7.3)	0.001	0.495	48.1 (16.4)	47.2 (16.8)	0.013
Days of IE, median (IQR)	20 (13, 33)	23 (14, 50)	0.069	0.309	21 (13, 30)	22 (16, 33)	0.227
CPB minutes, median (IQR)	98 (73, 126)	63 (54, 84)	<0.001	0.736	92 (65, 115)	77 (60, 96)	0.172
Clamping minutes, median (IQR)	79 (59, 101)	54 (46, 70)	<0.001	0.702	75 (51, 94)	67 (48, 85)	0.068

After adjustment for baseline differences, the MIS group demonstrated shorter ventilation times ($p=0.031$), reduced intensive care unit stays ($p<0.001$), reduced length of stay ($p<0.001$). There were no significant differences in hospital mortality ($p=0.279$), atrial fibrillation ($p=0.785$), acute kidney injury ($p=0.449$), or reoperations for bleeding ($p=0.431$).

In-hospital outcomes



MIS vs full sternotomy

Ventilation time, hours	-32.6% (-62.2%, -3.1%) $p=0.031$
Intensive Care Unit, days	-0.535 (-0.620, -0.452) $p<0.001$
Length of stay, days	-0.195 (-0.252, -0.138) $p<0.001$

Conclusions

Minimally invasive approaches for AVR in infective endocarditis appear to offer comparable safety and efficacy to sternotomy, with added benefits of reduced blood loss and shorter intensive care stays. These findings highlight the potential advantages of MIS in this challenging population. However, prospective studies are warranted to confirm these results and establish guidelines for its broader application.