

Others

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Initial Single-Center Experience: Outcomes of Minimally Invasive Extracorporeal Circulation vs. Conventional Circuits in Cardiac Surgery

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Objective: This study aimed to present our early experience with minimally invasive extracorporeal circulation (MiECC) circuits and compare it with conventional cardiopulmonary bypass (cCPB).

Methods: Two hundred thirty-nine patient registries (169 males, 70 females; mean age: 63.5 years) who underwent surgery were retrospectively analyzed between June 2021 and February 2024. All patients were operated by the same surgical team with a restrictive blood transfusion protocol.

Results: Forty-five (18.8%) cases were identified as MiECC. Most of the operations were coronary artery bypass grafting. Significant differences were observed between those operated on with MiECC and cCPB regarding the transfusion of red blood cell (RBC) suspensions and the total amount of drainage. No significant differences were observed in the duration of intubation, incidence of postoperative acute kidney injury, and intensive care unit or hospital stay. In geriatric patients, transfusion of RBC suspensions and drainage was significantly lower. Duration of intubation and intensive care unit or hospital stay did not reach statistical significance. In patients with an ejection fraction ≤ 45 , transfusion of RBC suspensions were similarly low.

Table 1. MiECC vs cCPB			
	MiECC (n=45) (18.8%)	cCPB (n=195) (81.3%)	p
CABG*	31 (68.9%)	121 (62.1%)	
Valve surgery*	7 (15.6%)	29 (14.9%)	
Combined*	6 (13.3%)	42 (21.5%)	
Aort*	1 (2.2%)	3 (1.5%)	
Age**	63 (16)	64 (12)	0.380
CPB (min)**	113 (49)	115 (67)	0.465
Cross-clamp (min)**	77 (38)	78 (47)	0.747
EF ≤ 45 ***	5/45	46/195	
Age ≥ 60 ***	31/45	133/195	
Drainage (mL)*	300 (200)	400 (350)	0.001
Drainage ≥ 1000 mL (yes/no)	1/44	19/175	>0.05
RBC 0-1 st day (units)**	0 (1)	1 (3)	0.001
RBC total (units)**	1 (2)	2 (3)	<0.001
Entubation duration (hours)**	9 (6)	9 (9)	0.077
ICU stay (days)**	8 (2.5)	3 (2)	0.939
Hospital stay**	7 (5)	7 (4)	0.190
Postoperative AKI (yes/no)	15/30	64/127	>0.05
Hospital mortality (yes/no)	4/41	17/174	>0.05

* n (percentage); ** Median(IQR); *** (n/total).

Conclusion: The utilization of MiECC resulted in a reduction in transfusion of RBC suspensions and postoperative drainage. No significant differences were observed in intubation time, postoperative acute kidney injury, hospitalization, or mortality. Although intubation time was observed to be shorter, no statistically significant result could be reached. There is a potential for bias in patient selection due to the potential benefits of MiECC. We believe that with a larger number of blinded studies, the benefits of MiECC can be demonstrated in more detail, particularly in specialized populations such as geriatric patients and patients with low EF.

Keywords: Cardiopulmonary bypass, cardiac surgery, geriatric, low ejection fraction, MiECC.

Table 2. MiECC vs cCPB in geriatric patients

	MI ECC	cCPB	p
CPB (min)*	113 (51)	115 (63)	0.263
Cross-clamp (min)*	74 (40)	78 (41.5)	0.412
Drainage (mL)*	300 (200)	400 (425)	0.035
Drainage \geq 1000 mL (yes/no)	1/30	17/115	>0.05
RBC 0-1 st day (units)*	0 (1)	2 (3)	0.001
RBC total (units)*	1 (3)	3 (4)	0.002
Entubation duration (hours)*	9 (6)	11 (9)	0.05
ICU stay (days)*	3 (3)	3 (3)	0.954
Hospital stay*	7 (8)	7 (4.5)	0.611
Postoperative AKI (yes/no)	12/19	48/81	>0.05
Hospital mortality (yes/no)	4/27	15/114	>0.05

* Median (IQR).

Table 3. MiECC vs cCPB in patients with low ejection fraction

	MI ECC	cCPB	p
CPB (min)*	121 (66.5)	138 (50)	0.724
Cross-clamp (min)*	86 (29.5)	90 (37)	0.329
Drainage (mL)*	350 (225)	450 (225)	0.469
Drainage \geq 1000 mL (yes/no)	0/5	4/41	>0.05
RBC 0-1 st day (units)*	0 (0.5)	1.5 (3)	0.018
RBC total (units)*	1 (2)	3 (3.75)	0.020
Entubation duration (hours)*	10 (7.5)	12 (9.75)	0.199
ICU stay (days)*	3 (1.5)	3 (3.75)	0.911
Hospital stay*	7 (29)	7.5 (6.75)	0.936
Postoperative AKI (yes/no)	0/5	14/30	>0.05
Hospital mortality (yes/no)	0/5	6/38	>0.05

* Median (IQR).

References

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