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제55차 추계학술대회 & APELSO 2023

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Off-pump versus On-pump Coronary Artery Bypass Grafting in Patients with Left Ventricular Dysfunction



- The optimal strategy regarding the use of cardiopulmonary bypass(CPB) during coronary artery bypass grafting (CABG) has rarely been addressed for patients with left ventricular (LV) dysfunction.
- We aimed to evaluate the early and long-term clinical outcomes between patients with LV ejection fraction (EF) $\leq 35\%$ who underwent off-pump and on-pump CABG.

- Inclusion Criteria
 - From January 2000 to June 2023
 - Age ≥ 18 years old
 - Patients with LVEF $\leq 35\%$ who underwent first time isolated CABG
- Exclusion Criteria
 - Single vessel bypass
 - Preoperative cardiogenic shock or cardiac arrest \pm mechanical circulatory support (MCS)
 - On-pump beating heart CABG as a primary strategy
- Comparative risks of adverse outcomes between the two groups were assessed after adjustments with inverse-probability-of-treatment weighting (IPTW) based on the propensity score.

Study Population Flow Chart

First time isolated CABG in Patients with LVEF \leq 35%
between January 2000 to June 2023 (N=693)

Exclusion

- Single vessel bypass (N=28)
- Preoperative cardiogenic shock or cardiac arrest (N=47)
- Primary on-pump beating heart (N=85)

Study Population (N=533)

OPCAB (intention-to-treat)
(N=386)

As-treated
#1. OPCAB (N=356)
#2. On-pump beating heart (N=29)
#3. On-pump CABG (N=1)

On-pump CABG
(N=147)

Table 1. Baseline characteristics

	Unadjusted (N=533)		IPTW-adjusted		P value
	Off-pump (intention-to-treat) (N=386)	On-pump (N=147)	Off-pump (intention-to-treat) (N=386)	On-pump (N=147)	
Age (years), mean \pm SD	63.39 \pm 10.31	63.12 \pm 9.15	63.39 \pm 10.24	64.05 \pm 9.09	0.489
Female, n (%)	72 (18.7)	31 (21.1)	75.6 (19.6)	29.8 (20.3)	0.866
Hypertension, n (%)	232 (60.1)	80 (54.4)	226.7 (58.7)	88.3 (60.1)	0.785
Diabetes mellitus, n (%)	226 (58.5)	90 (61.2)	229.0 (59.3)	89.0 (60.5)	0.815
Dyslipidemia, n (%)	146 (37.8)	28 (19.0)	126.0 (32.6)	47.3 (32.2)	0.928
COPD, n (%)	18 (4.7)	6 (4.1)	17.4 (4.5)	6.2 (4.2)	0.883
Chronic kidney disease, n (%)	67 (17.4)	24 (16.3)	66.6 (17.3)	30.3 (20.6)	0.440
dialysis, n (%)	32 (8.3)	11 (7.5)	31.0 (8.0)	12.1 (8.2)	0.944
Prior stroke, n (%)	47 (12.2)	19 (12.9)	47.9 (12.4)	18.8 (12.8)	0.911
PAOD, n (%)	22 (5.7)	7 (4.8)	21.4 (5.5)	8.2 (5.6)	0.976
Prior PCI	78 (20.2)	20 (13.6)	71.3 (18.5)	28.3 (19.3)	0.855

SD, standard deviation; COPD, chronic obstructive pulmonary disease; PAOD, peripheral arterial occlusive disease; PCI, percutaneous coronary intervention

Table 2. Early outcomes (unadjusted)

Variable	Intention-to-treat		As-treated	
	Off-pump (N=386)	On-pump (N=147)	Off-pump (N=356)	On-pump (N=177)
Early death, n (%)	10 (2.6)	8 (5.4)	4 (1.1)	14 (7.9)
Low cardiac output syndrome, n (%)	15 (3.9)	8 (5.4)	10 (2.8)	13 (7.3)
Stroke, n (%)	13 (3.4)	6 (4.1)	11 (3.1)	8 (4.5)
Bleeding requiring exploration, n (%)	5 (1.3)	10 (6.8)	3 (0.8)	12 (6.8)
AKI requiring hemodialysis, n (%)	23 (6.0)	7 (4.8)	18 (5.1)	12 (6.8)
Surgical wound infection, n (%)	9 (2.3)	5 (3.4)	8 (2.2)	6 (3.4)

AKI, acute kidney injury

Table 3. Comparative risks of adverse outcomes after adjustments with IPTW

Variable	Intention-to-treat			As-treated		
	*OR	95% CI	P value	*OR	95% CI	P value
Early death, n (%)	2.16	0.81-5.60	0.111	7.56	2.66-26.98	<0.001
Low cardiac output syndrome, n (%)	1.42	0.56-3.35	0.432	2.74	1.18-6.55	0.0193
Stroke, n (%)	1.22	0.42-3.15	0.692	1.48	0.57-3.74	0.404
Bleeding requiring exploration, n (%)	5.56	1.94-18.12	0.002	8.56	2.68-37.93	<0.001
AKI requiring hemodialysis, n (%)	0.89	0.42-1.77	0.76	0.76	0.37-1.49	0.443
Surgical wound infection, n (%)	1.47	0.45-4.34	0.493	1.53	0.50-4.46	0.44

*Reference (1.00) is off-pump group.

CI, confidence interval; OR, odds ratio; AKI, acute kidney injury

- The rate of conversion to on-pump CABG, 30 (7.8%)
- A median follow-up of 5.5 years (inter-quartile range, 2.2 to 10.2 years)
- Overall death
 - 264 patients: 159 in the off-pump and 105 on-pump groups
 - no significant difference in the risk of death (P=0.173)

- In patients with $LVEF \leq 35\%$ undergoing CABG, the use of CPB was associated with an increased risk of bleeding.
- Despite a significant conversion rate to on-pump, the off-pump strategy appears to yield clinical benefits on an as-treated basis.