



Retrospective Single-surgeon Study Of Outcomes After Minimally Invasive Coronary Surgery For Elderly Patients

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Introduction

MICS-CABG (Minimally Invasive Cardiac Surgery-Coronary Artery Bypass Grafting), performed via a small intercostal incision, offers potential benefits over conventional sternotomy including reduced postoperative pain and bleeding risk¹. Additionally, its minimally invasive nature may facilitate faster recovery process and early return to daily activities¹. These advantages are particularly significant for patients with increased complication risk, such as the elderly or those with comorbidities. However, data regarding MICS-CABG outcomes in ultra-elderly patients (80 years and older) remain scarce.

This study analyzes the **surgical outcomes of MICS-CABG in ultra-elderly patients and investigates its feasibility** in this patient population.

Methods

This observational case-control study was designed to analyze patients who underwent MICS-CABG performed by a single surgeon across multiple facilities (including Yamato Seiwa Hospital, Wuhan Asia Heart Disease Hospital, Ichinomiya Nishi Hospital, Yuai Medical Center (formerly Tomigusuku Chuo Hospital), and Tokyo Bay Urayasu Ichikawa Medical Center) between January 2012 and April 2022. Patients were stratified into two groups based on age: those 80 years or older (**ultra-elderly group**) and those under 80 were (**non-elderly group**). Evaluated outcomes included:

- **In-hospital mortality**
- **Length of hospital stay**
- **Length of ICU stay**
- **Incidence rates of postoperative complications** (Re-exploration for bleeding, postoperative atrial fibrillation, wound infection (inclusive of graft harvesting sites), stroke, initiation of dialysis and pneumonia)

Results

A total of 222 patients were included in this study, with 27 patients in the ultra-elderly group and 195 patients in the non-elderly group. The two groups demonstrated significant differences in terms of BMI, the prevalence of COPD and current smoking (**Table 1**).

Table.1 Characteristics of the Study Population

	Overall	Non-elderly	Ultra-elderly	p-value
Baseline Characteristics				
Age	65.8 (± 11.4)	63.5 (± 10)	83.2 (± 2.7)	-
Sex (Male)	157 (70.7%)	139 (71.3%)	18 (67%)	1
BMI	24.2 (± 4.6)	24.8 (± 4.0)	21.2 (± 6.1)	0.003
Emergent Operation	4 (1.8%)	3 (2%)	1 (4%)	0.407
Post-PCI	45 (20%)	38 (19%)	7 (26%)	0.447
LVEF	57 (± 9.6)	57 (± 9.6)	58 (± 9.7)	0.482
Prevalence of Comorbidities				
Dyslipidemia	135 (60.8%)	120 (61.5%)	15 (56%)	0.675
Hypertension	164 (73.9%)	141 (72.3%)	23 (85%)	0.241
Diabetes	99 (45%)	85 (44%)	14 (52%)	0.536
Current smoking	75 (34%)	71 (36%)	4 (15%)	0.03
COPD	6 (3%)	3 (2%)	3 (11%)	0.025
Renal Impairment	37 (17%)	30 (15%)	7 (26%)	0.174
Dialysis	13 (59%)	13 (6.7%)	0 (0%)	0.376
Stroke	42 (19%)	37 (19%)	5 (19%)	1
Cardiovascular Disease	13 (6%)	11 (6%)	2 (7%)	0.662

Data presented as mean (± standard deviation) or n (%). BMI, body mass index; PCI, percutaneous coronary intervention, LVEF, left ventricular ejection fraction, COPD, chronic obstructive pulmonary disease.

There were no cases of in-hospital mortality in the ultra-elderly group while one case (0.5%) in the non-elderly group. The **length of hospital stay** was significantly longer in the ultra-elderly group (11 [9-14] vs. 13.5 [10.25-18] days, p=0.017). However, there was no significant difference in the length of ICU stay and incidence rates of major postoperative complications between the two groups (**Table 2**).

Surgical characteristics revealed no differences in the number of diseased vessels (**Table 3**). However, the ultra-elderly group had a **lower number of grafts targeting coronary arteries and a reduced total number of anastomoses (Fig.1)**. While not statistically significant, the **operative time was slightly shorter** in the ultra-elderly group (270 [202-324] vs. 242 [207-282] minutes, p=0.118) (**Fig.2**).

Table.2 Outcome Measures in the Study Population

	Overall	Non-elderly	Ultra-elderly	p-value
Mortality	1 (0.5%)	1 (0.5%)	0	1
Length of Hospital Stay	11 [9-14]	11 [9-14]	13.5 [10.25-18]	0.017
Length of ICU Stay	2 [2-4]	2 [2-4]	2 [2-4]	0.931
Re-exploration for Bleeding	7 (3%)	7 (3%)	0	1
POAF	36 (16%)	39 (15%)	7 (26%)	0.153
Wound Infection†	6 (3%)	4 (2%)	2 (7%)	0.149
Stroke	1 (0.5%)	1 (0.5%)	0	1
Initiation of Dialysis	2 (0.9%)	2 (1%)	0	1
Pneumonia	2 (0.9%)	1 (0.5%)	1 (4%)	0.222

Data presented as mean (± standard deviation) or median [interquartile range].

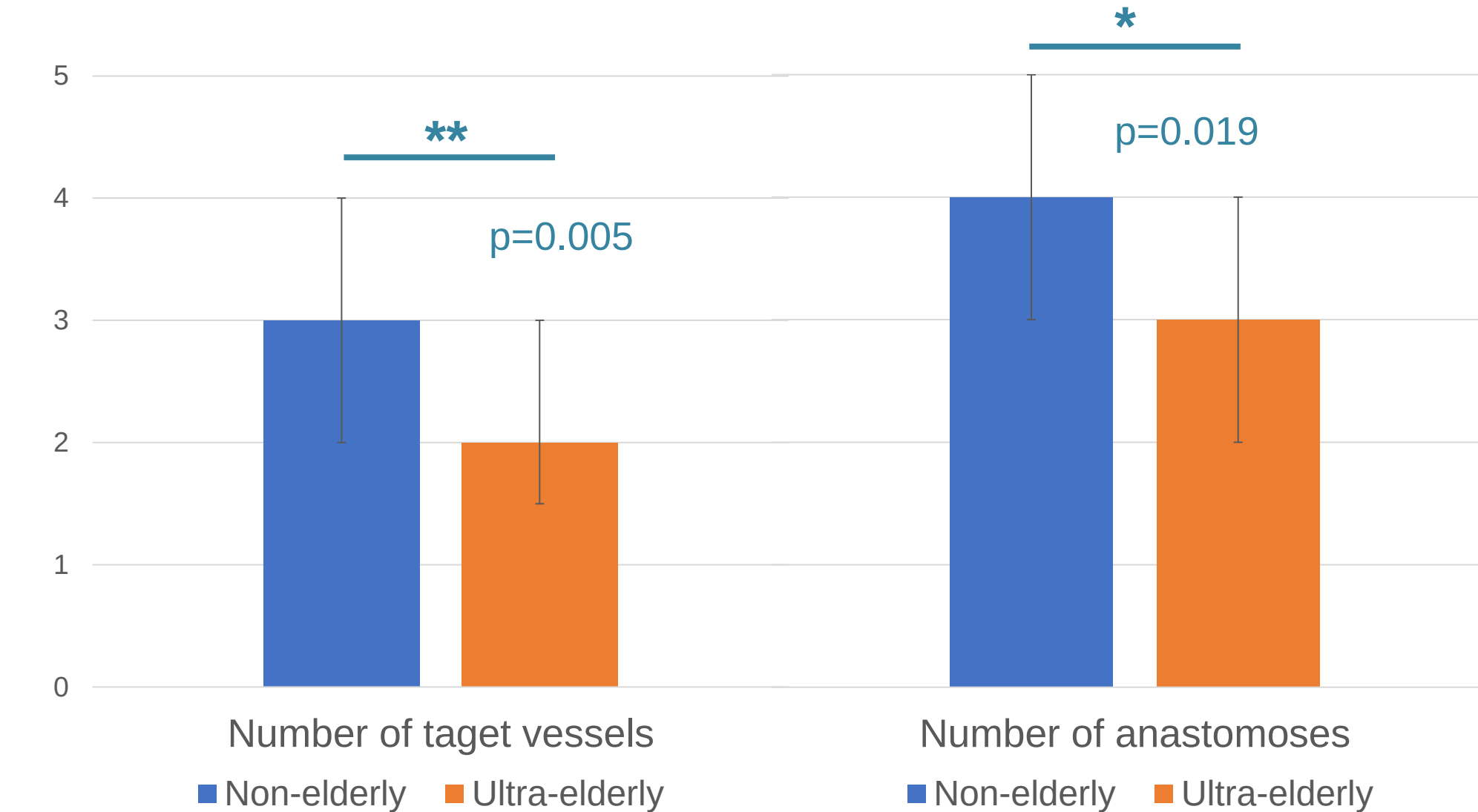
POAF; postoperative atrial fibrillation. † Including graft harvesting sites

Table.3 Characteristics of Coronary Artery Disease

	Overall	Non-elderly	Ultra-elderly	p-value
LMT	57 (26%)	49 (25%)	8 (30%)	0.641
Single-vessel Disease	34 (15%)	30 (15%)	4 (15%)	1
Two-vessel Disease	58 (26%)	47 (24%)	11 (41%)	0.099
Three-vessel Disease	129 (58.1%)	117 (60.0%)	12 (44%)	0.147

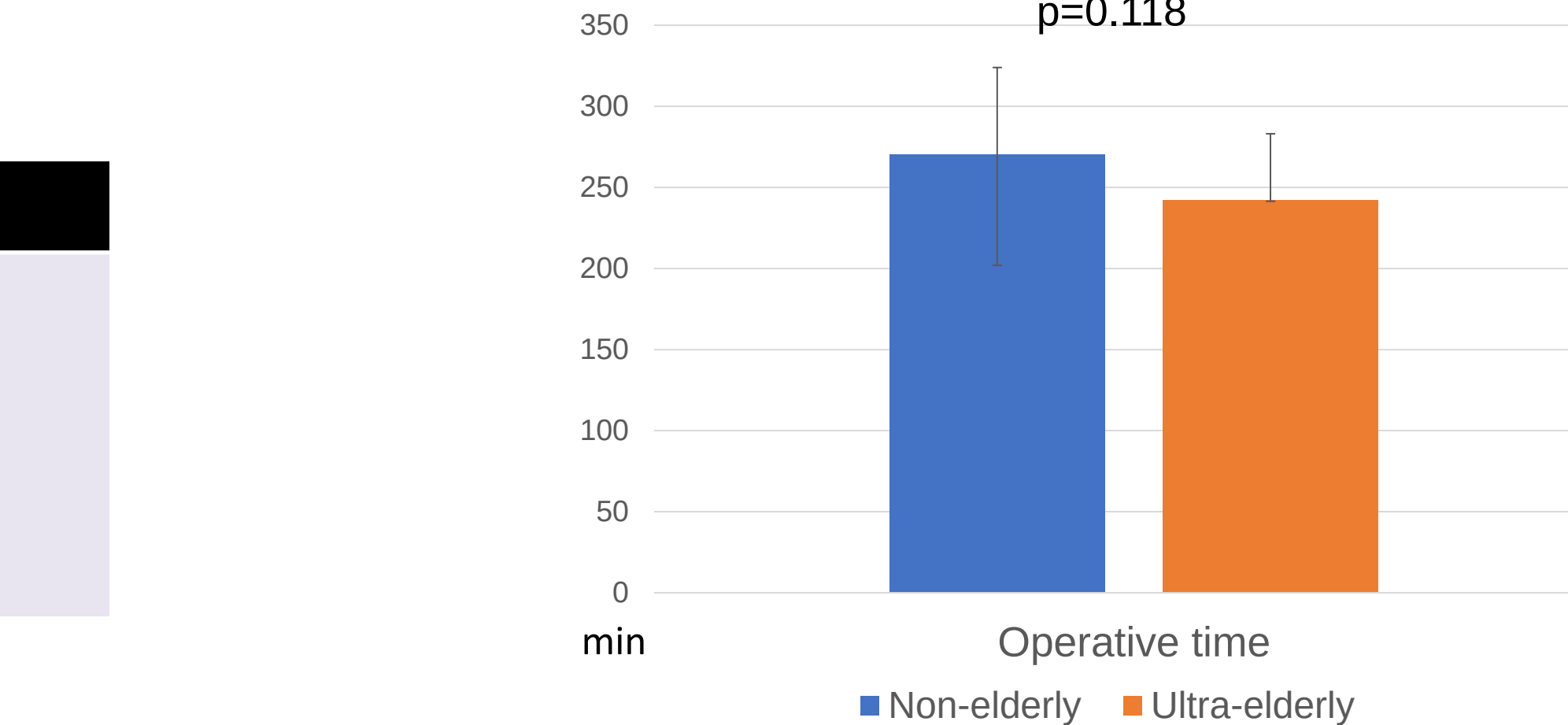
Data presented as n(%).

Fig.1 Number of target vessels and anastomoses



Data presented as median and interquartile range. *, p <0.05, **, p <0.01

Fig.2 Operative time



Discussion

In the ultra-elderly patients, despite the presence of lower BMI and a higher prevalence of comorbidities, short-term surgical outcomes, except for an extended length of hospital stay, were favorable. This suggests that ultra-elderly patients can benefit from the minimally invasive nature of MICS-CABG. The surgical strategy of a simplified graft design may have contributed to the reduction in operative time and further enhanced these benefits.

Reference

Kikuchi K, Chen X, Mori M, Kurata A, Tao L. Perioperative outcomes of off-pump minimally invasive coronary artery bypass grafting with bilateral internal thoracic arteries under direct vision. Interact Cardiovasc Thorac Surg. 2017;24(5):696-701.

Conclusion

MICS-CABG demonstrates good feasibility even in patients aged 80 and above, and favorable surgical outcomes can be achieved through careful surgical strategy and consideration for preventing complications.