

Concomitant Tricuspid Valve Surgery Does Not Increase Operative Risk During Robotic Mitral Valve Surgery

Gökhan Arslanhan¹, Murat Baştopçu², Zeynep Sıla Özcan¹, Şahin Şenay¹, Muharrem Kocyigit¹, Ahmet Umit Gullu¹, Ahmet Akyol¹, Cem Alhan¹.

¹Acibadem Mehmet Ali Aydinlar University School of Medicine, ISTANBUL, Turkey

²Dr. Siyami Ersek Thoracic and Cardiovascular Surgery Research and Training Hospital, ISTANBUL, Turkey

ABSTRACT

BACKGROUND: The aim of this study was to investigate the outcomes of robotic mitral valve surgery with and without concomitant tricuspid valve surgery.

METHODS: Patients who underwent robotic mitral surgery between March 2010 and September 2022 were included. Patients were grouped according to the presence of concomitant tricuspid interventions. The groups were compared for baseline factors, operative parameters, and early postoperative outcomes.

RESULTS: The study included 285 robotic mitral surgery patients. 59 patients underwent concomitant tricuspid interventions. In the concomitant tricuspid surgery group, cardiopulmonary bypass time (150.1 vs 128.4 min, p<0.001) and cross clamp time (99.2 vs 82.4 min, p<0.001) were longer. Prolonged intubation was more frequent in the concomitant tricuspid intervention group (5.2% vs 0.5%, p=0.029). The groups did not differ in terms of mortality, permanent pacemaker requirement, or other morbidities.

CONCLUSIONS:The robotic approach for mitral disease and coexisting tricuspid disease may offer a safe approach without an increased risk of mortality or morbidity.

INTRODUCTION

Tricuspid valve disorders often accompany mitral valve disease, with a coincidence reported up to 64% (1). Correction of tricuspid valve pathology has proven to have long-term benefits in terms of survival and quality of life. The addition of right-sided procedures can be safely performed during conventional mitral valve surgery (2). In this study, we report our early operative results with robotic mitral surgery, with and without additional tricuspid intervention.

METHODS

Patients who underwent robotic mitral surgery between March 2010 - September 2022 at Acibadem Maslak Hospital were included. The patients were grouped according to the presence of concomitant tricuspid interventions. The groups were compared for baseline, operative, and early postoperative results. The groups were then matched for age and gender, and compared for perioperative outcomes.

All procedures were completed by a single surgical team using the Da Vinci Robotic XI or SI systems. Peripheral cannulation was performed under ultrasound and echocardiography guidance (3). In patients with severe calcifications at the level of the ascending aorta, the operation was performed under hypothermic fibrillation without cross clamping.

A mini-thoracotomy, usually 4 cm, was performed at the right 4th intercostal space. The 3rd and 5th intercostal spaces are used for the insertion of left and right working ports, respectively. The commencement of CPB was followed by the opening of the pericardium, classically with an incision of 2 cm anterior and parallel to the phrenic nerve, and further fixation externally. The interatrial groove was dissected, left atriotomy was performed, and an atrial retractor was placed into the left atrium (LA). The LA was closed following the completion of mitral valve repair or replacement. In the case of right atrial (RA) pathology, the inferior and superior vena cavae were occluded with bulldog clamps, followed by right atriotomy and placement of an atrial retractor into the RA. The tricuspid valve was examined, the annulus was sized for prosthesis, and pledgeted sutures were implanted. The valve or ring was removed from its holder and deployed through the soft tissue retractor.

RESULTS

Patients who required concomitant tricuspid intervention were older (66.3 vs 53.9, p<0.001), more frequently female (86.4% vs 53.1%, p<0.001), more frequently had diabetes (30.5% vs 15.0%, p=0.006), chronic renal disease (20.3% vs 11.5%, p=0.015), AF (69.5% vs 19.9%, p<0.001), and a history of previous cardiac surgery (69.5% VS 19.9%, p<0.001). Echocardiographically, patients who required tricuspid intervention had lower ejection fractions (58.3 vs 59.9, p=0.009) and higher pulmonary arterial pressure (53.8 vs 45.6 mmHg, p<0.001). Additional cryoablation and LA appendix ligation procedures were performed more frequently in patients undergoing tricuspid intervention.

In patients who underwent concomitant tricuspid intervention, the CPB (150.1 vs 128.4 min, p<0.001) and CC times (99.2 vs 82.4 min, p<0.001) were longer. Prolonged intubation was more frequent in the concomitant tricuspid intervention group (5.2% vs 0.5%, p=0.029). The groups did not differ in terms of acquired AF and PPM requirements. Mortality and other early postoperative outcomes were similar between the groups. A comparison was made with age and gender matched groups for perioperative results. Mortality and morbidity, including permanent pacemaker requirement were similar between the groups with and without tricuspid intervention after matching.

CONCLUSIONS

Operative mortality and early adverse outcomes, did not increase with the addition of tricuspid intervention in our cohort of robotic mitral surgery patients. The robotic approach for mitral disease and coexisting tricuspid disease may offer a safe approach without an increased risk of postoperative PPM requirement.

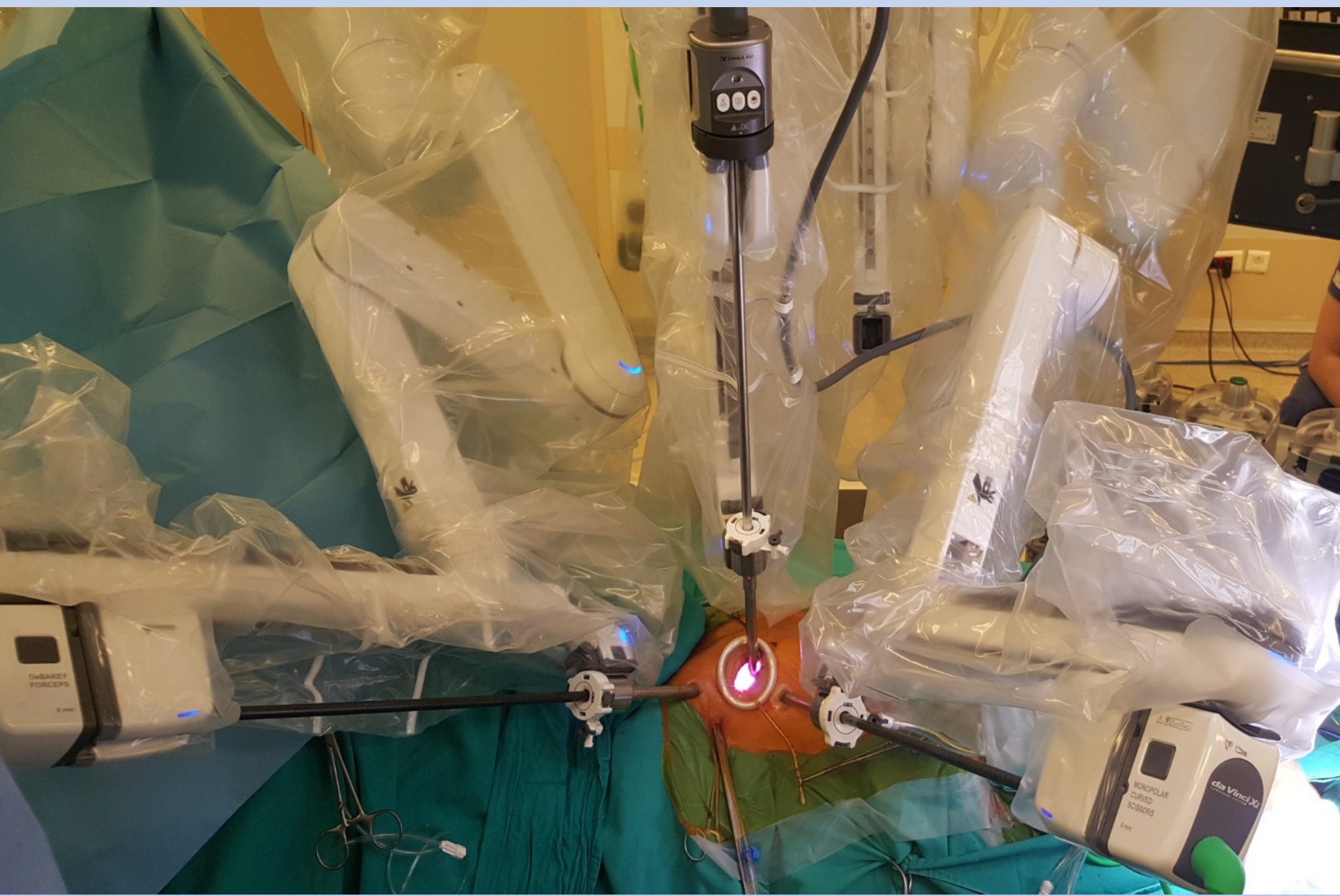
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Table. Comparison of age and gender matched groups

	Without tricuspid intervention (n=63)	With tricuspid intervention (n=34)	p
Baseline Parameters			
Age	61.4 ± 12.5	62.1 ± 12.5	0.776
Female Gender	50 (79.4%)	27 (79.4%)	0.996
Body Mass Index	27.7 ± 4.8	28.9 ± 6.5	0.306
Hypertension	28 (44.4%)	18 (52.9%)	0.424
Diabetes Mellitus	17 (27.0%)	11 (32.4%)	0.578
History of smoking	25 (39.7%)	11 (32.4%)	0.476
Chronic Obstructive Pulmonary Disease	3 (4.8%)	2 (5.9%)	0.812
Hyperlipidemia	17 (27.0%)	5 (14.7%)	0.168
Chronic Renal Failure	12 (19.0%)	8 (23.5%)	0.603
Previous Cardiac Surgery	9 (14.3%)	6 (17.6%)	0.662
Atrial Fibrillation	18 (28.6%)	24 (70.6%)	<0.001
Preoperative Laboratory and Echocardiography Results			
Creatinine (mg/dl)	0.88 ± 0.36	0.97 ± 0.29	0.269
Hematocrit (%)	37.9 ± 4.4	38.9 ± 5.2	0.282
Ejection Fraction	60.1 ± 7.0	57.3 ± 6.9	0.018
Ejection Fraction ≤ 60	40 (63.5%)	29 (85.3%)	0.024
LVEDD (cm)	5.13 ± 0.71	5.05 ± 0.57	0.548
LVESD (cm)	3.31 ± 0.67	3.37 ± 0.62	0.626
Pulmonary Artery Systolic Pressure (mmHg)	49.6 ± 14.4	50.7 ± 12.3	0.703
Primary Mitral Pathology			
Regurgitation	41 (65.1%)	25 (73.5%)	0.394
Stenosis	22 (34.9%)	9 (26.5%)	
Concomitant Procedure			
Cryoablation	21 (33.3%)	26 (76.5%)	<0.001
PFO/ASD closure	6 (9.5%)	2 (5.9%)	0.709
Left Atrial Appendix Ligation	21 (33.3%)	26 (76.5%)	<0.001
Perioperative Outcomes			
CPB Time (min)	128.0 ± 43.4	1580.4 ± 37.2	0.001
CC Time (min)	78.1 ± 26.7	99.8 ± 24.6	<0.001
Prolonged Intubation	0 (0%)	2 (5.9%)	0.128
Transfusion	9 (14.3%)	4 (11.8%)	>0.999
ICU Stay (h)	29.6 ± 39.6	29.3 ± 29.6	0.066
Reoperation	3 (4.8%)	1 (2.9%)	>0.999
Acute Renal Failure	0 (0%)	0 (0%)	
Cerebrovascular Event	0 (0%)	1 (2.9%)	0.351
Infection	0 (0%)	0 (0%)	
Mortality	3 (4.8%)	1 (2.9%)	>0.999
Postoperative Arrythmia			
Permanent Pacemaker Requirement	2 (3.2%)	1 (2.9%)	>0.999
New Onset AF (n=55)	7 (15.6%)	3 (30.0%)	0.365

ASD: Atrial Septal Defect, AF: Atrial fibrillation, CPB: Cardiopulmonary Bypass, CC: Cross Clamp, ICU: Intensive Care Unit, LVEDD: Left Ventricular End Diastolic Diameter, LVESD: Left Ventricular End Systolic Diameter, PFO: Patent Foramen Ovale



Figures 1 and 2: Operative set-up for the robotic approach to mitral and tricuspid valves