Right minithoracotomy for concomitant aortic valve replacement and right coronary artery bypass graft.

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Purpose of the study

Right anterior minithoracotomy (RAT) as an approach to aortic valve replacement (AVR) is extensively practiced.

8% of patients had combined valvulopathy and coronary artery disease (CAD) and among them some patient present isolated proximal right coronary disease.

Minimally invasive valve surgery is demonstrated to significantly improve postoperative course (reduced pain, blood transfusion, hospital lengths of stay) and to enhance postoperative recovery, when compared with median sternotomy.

So, for patients with isolated proximal right coronary (RC) stenosis associated with aortic valve disease we proposed a RAT approach to perform both AVR and right coronary artery bypass grafting (CABG).

We report our experience and outcomes using RAT on 14 patients in the surgery of combined aortic valve stenosis and right coronary artery disease.

Surgical technique :

AVR and RCABG through minimally invasive RAT

Method

The present study was a prospective single-center study that included collected data from 14 consecutive patients who underwent combined AVR and RCABG through RAT at our institution from January 2016 until February 2020.

We included patients with AS and isolated proximal RCA stenosis.

The postoperative assessment included a 2-months surgical consultation, a post rehabilitation stress test to evaluate CABG efficiency and TTE. We have collected data about the 30-days, 90-days, and 1-year all-cause mortality.



3 trocars, closed chest : 2nd, 4th, and 6th ICS on the anterior axillary line

RAT : 2nd or 3rd ICS

CPB : Femoral, percutaneous (Manta[1], Proglide[2])

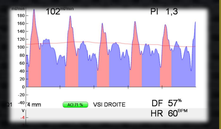
Del Nido cardioplegia

U-shaped pledged sutures 2/0 : knot pushers or Cor-Knot fasteners[3]

CABG : 3rd ICS, validate grafting results by ultrasonic flow measurements (MiraQ[4]) after CPB weaning.

Operative Characteristics	
Arterial cannulation	
Ascendant aorta, n (%)	1 (91.4%)
Femoral artery, n (%)	13 (8.6%)
Arterial cannulation approach	
Surgical, n (%)	7 (50%)
Percutaneous, n (%)	7 (50%)
Venous cannulation	
Femoral vein, n (%)	13 (92.8%)
Femoral + Superior vena cava, n (%)	1 (7.1%)
Venous cannulation approach	
Surgical, n (%)	4 (29%)
Percutaneous, n (%)	10 (71.4%)
Cardioplegia	
Custodiol, n (%)	3 (21.4%)
Cold blood, n (%)	3 (21.4%)
Cold crystalloids, n (%)	1 (7.1%)
Del Nido, n (%)	7 (50%)
Aortic valve	
Tricuspid, n (%)	8 (57.1%)
Bicuspid, n (%)	6 (42.8%)
Aortic prothesis	
Magna Ease', n (%)	4 (29%)
Trifecta valve', n (%)	2 (14.3%)
Perceval ', n (%)	4 (29%)
Edwards Intuity ', n (%)	1 (7.1%)
Trifecta GT ', n (%)	8 (57.1%)
Cor Knot ', n (%)	8 (57.1%)
Right coronary artery graft	
Saphenous vein, n (%)	9 (64.3%)
Right internal thoracic artery, n (%)	5 (35.7%)
Cross clamping time, Mean± SD, Range (min)	109±19 [76-150]
CPB time , Mean ±SD, Range (min)	145±30 [101-197]





Results

Mean skin incision was 60.2±11.8mm. No patient needed conversion to full sternotomy.

Mean flow rate was 41.6±31.7 ml/min [11–102], and the mean pulsatility index (PI) was 3.1±1. [1.3–4.6]. 2 patients experimented a second aortic clamping; one for a repositioning of a Perceval valve and the second one for coronary anastomosis repair because of a major anastomosis bleeding.

Complications : Atrial fibrillation for 3 patients, permanent pacemaker in 2 patients secondary to a complete AV block and 2 pulmonary complications; a pneumothorax and pneumonia. No neurological events, perioperative MI , acute renal injury or groin wound infections occurred. There was no vascular complication at the cannulation sites.

Clinical evaluation revealed a global improvement of NYHA and CCS status. Every stress test was negative, with no electrical or clinical sign of ischemia despite the high exercise level achieved by every patient.

Patient characteristics	
30-Days mortality, n (%)	0 (0%)
90-Days mortality, n (%)	0 (0%)
1-Year mortality, n (%)	1 (7%) [1]
Reoperation for bleeding or cardiac tamponade, n (%)	1 (7%)
Total RBC[2] units transfused, n (%)	
0	5 (35.7%)
≥ 2	10 (71.4%)
Mean± SD, Range	1.9±1.9 (0-6)
Perioperative acute kidney injury, n (%)	0 (0%)
Postoperative atrial fibrillation, n (%)	3 (21.4%)
Complete AV block, n (%)	2 (14.3%)
Postoperative pacemaker, n (%)	2 (14.3%)
Postoperative troponine peak (µg/L), Mean± SD, Range	10.2±15 [0.81-57]
Transient ischemic attack, n (%)	0 (0%)
Permanent stroke, n (%)	0 (0%)
Pulmonary complications, n (%)	2 (14.3%)
Infective complications, n (%)	
Sepsis	0 (0%)
Wound dehiscence or infection	0 (0%)
Thoracotomy	0 (0%)
Groin	0 (0%)
ICU [3] LOS[4] (days), Mean± SD, Range	2.1±1.4 [1-6]
Total hospital LOS (days), Mean± SD, Range	7.3±2.2 [5-13]

Parameters	Preoperative data	Discharged data	60Days data	Trends
LVEF (%)				N [1]
Mean	64±4.9	57.8±5.7	58.7±7.7	
Median	63.5	59	59	
Range	[55-71]	[45-67]	[50-70]	
Mean transaortic gradient (mmHg)				[2]
Mean	51.1 ±9.4	10.9 ±6.3	9.4 ±4	
Median	50.5	9.5	10	
Range	[36-60]	[5-25]	[2-16]	
Aortic insufficiency, n (%)				
0	0	12	12	
1	2	2	2	
2	3	0	0	
3	1	0	0	
4	0	0	0	
NYHA, n (%)				
1	0		10	
2	8		2	
3	6		1	
4	0		0	

Conclusion

Combined aortic valve replacement and right coronary artery bypass grafting through anterior right thoracotomy is reliable and reproducible in selected patients.

The technic can be even improved by smart devices: Cor Knot fasteners, mainly robotic-assisted internal thoracic artery harvesting.

[1]MANTA system (Essential Medical Inc., Malvern, Pennsylvania, USA). [2] ProGlide VCD (Abbott Vascular, Abbott Park, Illinois, USA). [3] Cor-Knot fasteners (LSI Solutions, Victor, NY, USA), . [4] MiraQ,(Medistim Deutschland GmbH, Deisenhofen, Germany)