

SCA 92

EVALUATION OF LEFT VENTRICULAR VOLUME WITH THREE-DIMENSIONAL TRANSESOPHAGEAL ECHOCARDIOGRAPHY DURING OFF-PUMP CORONARY ARTERY BYPASS GRAFTING

Nagasawa C, Nomura M, Mukai S, Yasunaka H, Sugino Y, Ozaki M, Hashimoto T, Sato Y

Tokyo Women's Medical University, Shinjuku-Ku, Tokyo, Japan

Introduction: Mechanical displacement of the heart by cardiac stabilization devices during off-pump coronary artery bypass grafting (OPCAB) can cause significant hemodynamic instability. Due to complex geometric changes of bilateral ventricles caused by the mechanical displacement, quantitative assessment of ventricular volume using a conventional two-dimensional echocardiography during OPCAB is extremely challenging. The purpose of this study was to quantitatively assess left ventricular volume using three-dimensional transesophageal echocardiography (3D-TEE) during OPCAB.

Methods: Following IRB approval, 13 patients scheduled for OPCAB were studied. 3D-TEE was performed using 4-7MHz probe (ATL HDI5000 : Philips medical systems: Netherlands). LVEDVI, LVESVI, and LVEF were calculated with the average rotation method using off-line Tom Tec 4D Cardio view USE1200 (Tom Tec Imaging Systems.GmbH :Germany). Hemodynamic parameters were also recorded. Data were obtained 1) preincision (baseline), 2) before left anterior descending artery anastomosis (pre-LAD), 3) during LAD anastomosis (LAD), 4) before left circumflex artery anastomosis (pre-LCX), 5) during LCX anastomosis (LCX), 6) before posterior descending artery anastomosis (pre-PDA), 7) during PDA anastomosis (PDA), 8) the end of operation. Data were analyzed by repeated measures ANOVA and presented as mean +/- standard deviation. Statistical significance was taken at $P < .05$.

Results: Heart displacement and stabilization caused significant changes in hemodynamic and 3D-TEE parameters compared with baseline (fig1,table1).LVEDVI was decreased by $62.7 \pm 8.9 \%$, $64.3 \pm 11.7 \%$, and $61.4 \pm 12.2 \%$ during LAD, LCX and PDA anastomosis. LVEF was decreased by $79.4 \pm 20.1 \%$ and $85.4 \pm 19.4 \%$ during LAD and PDA anastomosis. CI was decreased by

$85.8 \pm 22.3 \%$ and $73.7 \pm 15.4 \%$ during LCX and PDA anastomosis. MAP was decreased by $86.1 \pm 20 \%$ and $85.4 \pm 10.4 \%$ during LAD and PDA anastomosis. On the other hand, mPAP was increased by $129.7 \pm 32 \%$ and $84.9 \pm 53.6 \%$ during LCX and PDA anastomosis. RAP was also increased by $54.6 \pm 13.6 \%$ and $46.3 \pm 23.6 \%$ during LCX and PDA anastomosis.

Conclusion: In this study, we have quantitatively assessed left ventricular filling during OPCAB. Mechanical displacement of the heart during anastomosis resulted in approximately 40 % reduction of LVEDVI. 3D-TEE is a useful method to quantitatively assess left ventricular filling in the heart with complex geometric changes.

References:

1. Mathison M, Edgerton JR et al.: *Ann Thorac Surg*; 2000 ; 70 :1355-61
2. Porat E. Shaeony R et al : *Ann Thorac Surg*; 2000 ; 69 :1188-91

	baseline	during LAD anastomosis	during LCX anastomosis	during PDA anastomosis
HR (bpm)	59.2±5.4	82±10.9 b	77.1±13.6 b	79.5±7.5 b
CI (L/min/m ²)	2.9±0.6	2.5±0.6	2.3±0.4 a	2.1±0.6 a
MAP (mmHg)	82.2±14.1	69.8±11.2 a	77±15.1	70.5±10 a
mPAP (mmHg)	15.8±4.9	20.1±8.6	22±4.5 a	22±10.7 a
RAP (mmHg)	6.4±3.9	8.7±5.3	12.7±3.8 b	15.2±11.4 b
LVEDVI (ml/m ²)	58.3±8.0	35.9±5.2 b	37.4±8.5 b	34.6±6.2 b
LVEF (%)	56.9±6.2	45.0±10.3 b	51±9.6	48.4±10.7 a

Values are shown as mean ± standard deviation. a : $p < 0.05$ vs baseline, b : $p < 0.01$ vs baseline
HR=heart rate; CI=cardiac index; MAP= mean arterial pressure; mPAP=mean pulmonary arterial pressure
RAP=right atrial pressure; LVEDVI=left ventricular end-diastolic volume
LVEF=left ventricular ejection fraction

