

주최·주관 대한심장혈관흉부외과학회

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제56차 추계학술대회

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High-Sensitivity Cardiac Troponin I for Predicting Adverse Outcomes After Mitral Valve Surgery

주최·주관 : 대한심장혈관흉부외과학회, 사단법인흉부외과미래포럼

- **No consensus and limited evidence** regarding threshold levels of high-sensitive cardiac troponin I (hs-cTnI) for diagnosing perioperative myocardial infarction or clinically significant periprocedural myocardial injury after mitral valve surgery
- **Objective**
 - To assess the **prognostic value** of postoperative **hs-cTnI** for predicting **adverse outcomes** after mitral valve surgery

- **Retrospective Study, Single Center Study**
- **Study Population:** Patients who underwent mitral valve surgery between April 2019 and December 2022
- **hs-cTnI Measurements :** at **0, 6, 12, 24, 36, and 48 hours** after surgery
- **Primary Outcome :** **30-day mortality** and **postoperative low-cardiac output syndrome(LCOS) requiring mechanical circulatory support(MCS)**
- **Relationship between hs-cTnI and primary outcome was explored**

Table 1. Baseline Patient Characteristics

Variables	All Patients (N = 1023)
Patient Characteristics	
Age – yr (mean ± SD)	61.68 ± 11.22
Male sex – no. (%)	504 (49.3)
BMI – kg/m ² (mean ± SD)	24.11 ± 3.44
Hb – g/dL (mean ± SD)	12.87 ± 1.75
Albumin – g/dL (mean ± SD)	3.80 ± 0.41
DM (%)	142 (13.9)
HTN (%)	345 (33.7)
CVA (%)	68 (6.6)
Dyslipidemia (%)	168 (16.4)
eGFR (mean ± SD)	73.83 ± 21.00
CKD (%)	238 (23.3)
Rhythm (%)	
Normal sinus rhythm – no. (%)	552 (54.0)
AF without surgical ablation – no. (%)	23 (2.2)
AF with surgical ablation – no. (%)	362 (35.4)
Echocardiographic Data	
LVIDs – mm (mean ± SD)	34.98 (7.51)
LVIDd – mm (mean ± SD)	53.87 (8.59)
LA diameter – mm (mean (SD)	51.49 (11.04)
EF – % (mean ± SD)	60.09 (9.23)
Mitral hemodynamics	
Predominant MS (%)	141 (13.8)
Mixed MSR (%)	159 (15.5)
Predominant MR (%)	459 (44.9)
Aortic hemodynamics	
Predominant AS (%)	128 (12.5)
Mixed ASR (%)	400 (39.1)
Predominant AR (%)	72 (7.0)
TR pressure gradient – mmHg (mean ± SD)	2.86 (0.58)
Tricuspid regurgitation (%)	
None-to-trivial	363 (35.5)
Mild	252 (24.6)
Moderate	287 (28.1)
Severe	121 (11.8)
Operative procedures	
TV surgery (%)	347 (33.9)
TVP (%)	340 (33.2)
TVR (%)	7 (0.7)
MV surgery (%)	826 (80.7)
Tissue valve replacement (%)	134 (13.1)
Mechanical valve replacement (%)	323 (31.6)
Mitral valvuloplasty (%)	369 (36.1)
Type of prostheses for AVR (%)	406 (39.7)
Tissue valve replacement (%)	223 (21.8)
Mechanical valve replacement (%)	183 (17.9)
CABG (mean ± SD)	66 (6.5)
Aortic surgery (%)	19 (1.9)
Surgical ablation (%)	491 (48.0)
ASD closure (%)	53 (5.2)
MICS (%)	477 (46.6)
Redo open-heart surgery (%)	44 (4.3)
LAA resection (%)	162 (15.8)

Table 2. Postoperative Outcomes

Variables	N (%)
Mortality	7 (0.7)
Morbidity	69 (6.7)
Stroke	28 (2.7)
Reoperation	2 (0.2)
Pacemaker insertion	11 (1.1)
Bleeding complication	18 (1.8)
Pneumonia	6 (0.6)
Ventricular Tachycardia	3 (0.3)
Ischemic colitis	3 (0.3)
LCOS requiring MCS	13 (1.3)
Adverse Postoperative Event (Mortality + LCOS requiring MCS)	17 (1.7)
Postoperative hs-cTnI	
Immediate postoperative hs-cTnI (pg/ml)	71878.82 (95442.29)
Postoperative 6 hour hs-cTnI (pg/ml)	50524.96 (62108.73)
Postoperative 12 hour hs-cTnI (pg/ml)	21599.06 (29258.18)
Postoperative 24 hour hs-cTnI (pg/ml)	22785.35 (32548.12)
Postoperative 36 hour hs-cTnI (pg/ml)	13646.18 (16640.07)
Postoperative 48 hour hs-cTnI (pg/ml)	20729.43 (39781.03)

Values are n (%) or mean ± standard deviation.
LCOS, low cardiac output syndrome; hs-cTnI, high-sensitivity cardiac troponin I; MCS, mechanical circulatory support; CI, confidence interval.

Table 3. Univariate and Multivariate Logistic Regression Analysis of hs-cTnI to Adverse Postoperative Events

Postoperative hs-cTnI	Univariate		Multivariate	
	Odd Ratio (95% CI)	P-value	†Odd Ratio (95% CI)	P-value
Immediate postoperative hs-cTnI	1.03 (0.99-1.07)	0.111		
Postoperative 6 hour hs-cTnI	1.02 (0.95-1.10)	0.614		
Postoperative 12 hour hs-cTnI	1.12 (1.02-1.24)	0.021	1.14 (1.01-1.28)	0.035
Postoperative 24 hour hs-cTnI	1.14 (1.00-1.31)	0.0496	1.50 (1.02-2.19)	0.040
Postoperative 36 hour hs-cTnI	1.27 (1.05-1.54)	0.014	1.33 (1.08-1.65)	0.0008
Postoperative 48 hour hs-cTnI	1.22 (0.95-1.56)	0.121		

hs-cTnI, high-sensitivity cardiac troponin I; CI, confidence interval.
†Adjusted covariates : Prosthetic mitral valve, Prosthetic aortic valve, MVR, TV Surgery, Aortic valve replacement, Coronary artery bypass graft, Maze operation, Redo open heart surgery, Age, Male, Body mass index, Hemoglobin, estimated glomerular filtration rate, Diabetes Mellitus, Hypertension, Chronic obstructive pulmonary disease, Dyslipidemia, Cerebrovascular accident, Hemodialysis, Preoperative atrial fibrillation, Systolic left ventricular dysfunction, Diastolic left ventricular dysfunction, Left atrium diameter, Ejection fraction, Hemodynamic aortic valve, Hemodynamic mitral valve, Tricuspid regurgitation, Tricuspid regurgitation velocity

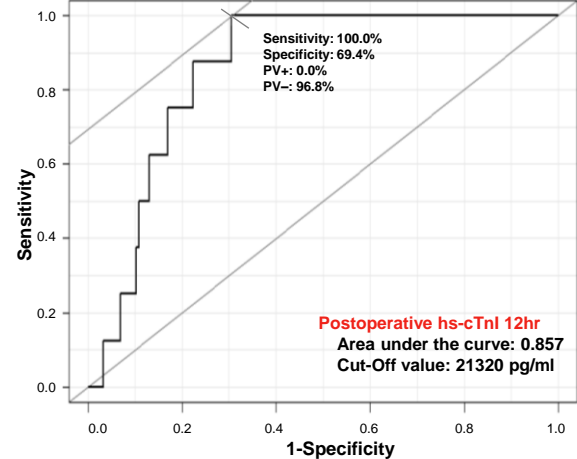
Values are n (%) or mean ± standard deviation.
BMI, body mass index; Hb, hemoglobin; DM, diabetes mellitus; HTN, hypertension; CVA, cerebrovascular accident; HD, hemodialysis; ESRD, end-stage chronic kidney disease; CKD, chronic kidney disease; LVD, left ventricle diameter; LA, left atrium; EF, ejection fraction; AS, Aortic stenosis; ASR, aortic stenosis and regurgitation; AR, aortic regurgitation; MR, mitral regurgitation; TR, tricuspid regurgitation; TVP, tricuspid valvuloplasty; TVR, tricuspid valve replacement; CABG, coronary artery bypass graft; AF, atrial fibrillation; LAA, left atrium auricle; ASD, atrial septal defect; MICS, Minimally invasive cardiac surgery; SMD, standardized mean difference.

Total Patients –n : 1023

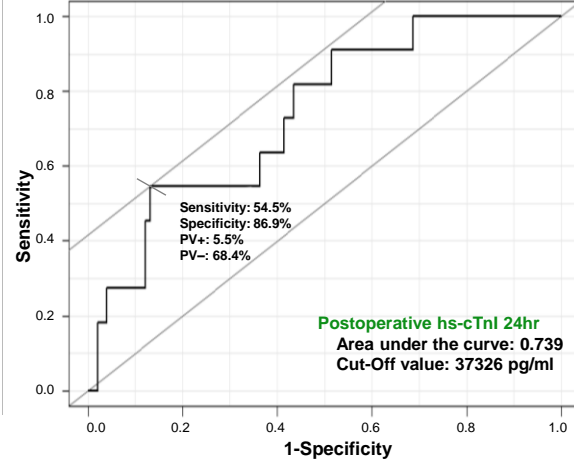
Adverse Events –n(%) : 17(1.7%)

hs-cTnI 12, 24, and 36 hours after mitral valve surgery showed a correlation between adverse postoperative events

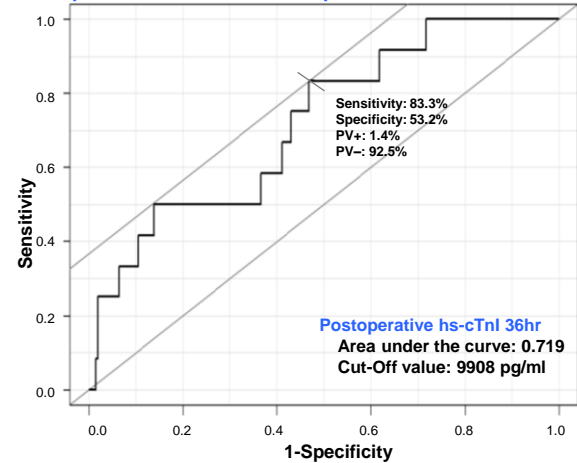
Postoperative hs-cTnI 12hr as a predictor of adverse events



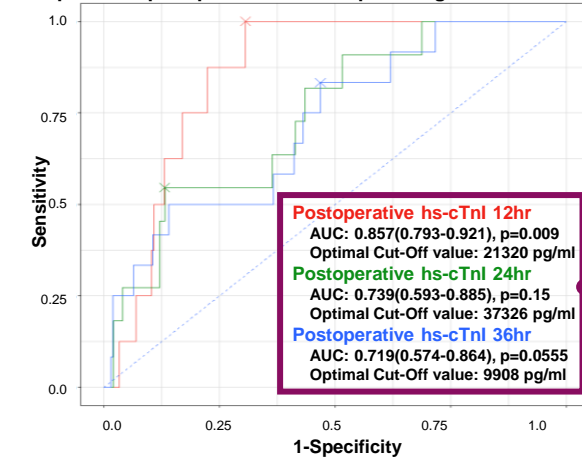
Postoperative hs-cTnI 24hr as a predictor of adverse events



Postoperative hs-cTnI 36hr as a predictor of adverse events



Comparison of postoperative hs-cTnI in predicting adverse events



- Postoperative hs-cTnI 12 hour
 - **Highest area under the curve**
- ↓
- **Postoperative hs-cTnI 12 hour most accurately** predicted adverse outcomes after mitral valve surgery
 - A cut-off value of **21320 pg/mL** was suggested

Figure 1. Predictive accuracy of high-sensitivity cardiac troponin I (hs-cTnI) for adverse events after mitral valve surgery.

Receiver-operating-characteristic curves and the corresponding areas under the curve for hs-cTnI according to the time after mitral valve operation

- **Elevated hs-cTnI 12, 24, and 36 hours after mitral valve surgery** is associated with a **higher 30-day mortality** and **postoperative LCOS requiring MCS**
- **Postoperative hs-cTnI 12 hour**, especially, may be useful as **predictors of mortality and postoperative LCOS requiring MCS** after mitral valve surgery