

관동맥 우회로술 중 경식도 심초음파도로 관찰한 도부타민 투여후와 우회로술후의 좌심실 국소벽운동*

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김희열 · 김종진 · 윤호중 · 유기동 · 박지원 · 이길환
노태호 · 채장성 · 김재형 · 홍순조 · 최규보

= Abstract =

Intraoperative Low-dose Dobutamine Echocardiography Predicts the Post-pump Response of Dysfunctioning Myocardial Segments to Coronary Artery Bypass Grafting

Hee-Yeol Kim, M.D., Chong-Jin Kim, M.D., Ho-Jung Youn, M.D.,
Ki-Dong Yoo, M.D., Jee-Won Park, M.D., Gil-Hwan Lee, M.D.,
Tai-Ho Rho, M.D., Jang-Seong Chae, M.D., Jae-Hyung Kim, M.D.,
Soon-Jo Hong, M.D., Kyu-Bo Choi, M.D.

*Department of Internal Medicine, College of Medicine, The Catholic University of
Korea, Seoul, Korea*

Background : Low dose dobutamine echocardiography has recently been introduced for use in identification of viable myocardium in patients with acute myocardial infarction and prediction of the response of dysfunctioning myocardial segments to coronary angioplasty. The aim of this study was to evaluate whether this test could be used to predict the early response of dysfunctioning myocardial segments to coronary artery bypass grafting(CABG).

Methods : We studied in 23 patients with multi-vessel disease during CABG. Myocardial segments were monitored by intraoperative transesophageal echocardiography(TEE) in the transgastric short-axis view at papillary muscle level. The left ventricle was divided into five segments and sixty eight myocardial segments in 23 patients were analyzed. Percentage of systolic wall thickening(PSWT) was calculated in each segment for three times : at baseline(early after pericardiectomy) ; before bypass during dobutamine infusion(3 -5ug/kg/min) ; and after separation from cardiopulmonary bypass. Segments showing baseline PSWT $\geq 30\%$ were considered normal and those $<30\%$ were dysfunctional. Segments showing an increase in PSWT $\geq 10\%$ during dobutamine infusion were considered responders and those $<10\%$ nonresponders.

Results : At baseline, 24(36%) of 68 segments had PSWT $\geq 30\%$ (normal) and (44/68%) had

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PSWT <30%(dysfunctioning segments). During dobutamine infusion, 21(47.7%)among 44 dysfunctioning segments showed increase in PSWT 10%(from $12.3 \pm 7.2\%$ to $33.5 \pm 11.8\%$, $p < 0.01$; responder segments), and 23(52.3%) showed increase in PSWT <10%(from $14.7 \pm 6.5\%$ to $17.4 \pm 7.4\%$, $p = \text{NS}$; nonresponder segments). After CABG, responder segments showed a significant increase in PSWT in comparison with baseline values(from $12.3 \pm 7.2\%$ to $32.1 \pm 11.0\%$, $p < 0.01$). Segments not responded to dobutamine showed no significant changes in PSWT after CABG(from $14.7 \pm 6.5\%$ to $16.0 \pm 8.2\%$, $p = \text{NS}$). Twenty-four normal segments(PSWT $41.9 \pm 6.2\%$) showed a slight but significant reduction in PSWT both during dobutamine infusion($38.7 \pm 6.9\%$; $p < 0.05$) and after CABG($38.9 \pm 6.3\%$, $p < 0.05$), suggesting that compensatory hyperfunction was present at baseline. Estimation of clinical accuracy of low dose dobutamine TEE yielded to 69% sensitivity, 93.3% specificity, 95.2% positive predictive value, 60.9% negative predictive value, and 77.3% overall accuracy. In both responders and nonresponders of dysfunctioning segments, there was a correlation between PSWT during dobutamine infusion and that after CABG($r = 0.61$, $r = 0.63$, respectively).

Conclusion : Low dose dobutamine TEE test well predicts the early response of dysfunctioning myocardial segments to CABG.

KEY WORDS : Dobutamine echocardiography · Percentage of systolic wall thickening.

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1).

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연구방법

1. 대상환자

1996 1 7 가

23 . 가 14

63 (: 44 76) .

23 2 , 10 ,

11

4 -

4 . 10

3 ,

6 1 .

4 - 7) .

2. 수술전 처치 및 마취방법

ST 3

7.5F (Swan - Ganz ca -

theter, Arrow Co., U.S.A.)

12 - 13)

14 - 15) .

(Model 128XP, Acuson Co., U.S.A.) 35 40cm

1% lidocaine 22G (Model MS860, Medex Inc., U.S.A.) thermodilution 0.9% 10ml 5 3

midazolam() 2mg, pheniramine malate(Avil ,) 1mg/kg, fentanyl citrate(Fentanyl ,) 2mcg/kg, vecuronium bromide(, 가) 0.15mg/kg thiopental sodium 4mg/kg fentanyl 50 70mcg/kg, vecuronium, midazolam (Surgical 7000, Marquette Co., U.S.A.)

(Patient monitor, Model PM8014, Drager Co., Germany)

4chamber veiw off - line Simpson

2chamber veiw

3. 수술방법

(24 28) 가 20 30 4 59 (2.5 /) 43 16 20 , 17 22

4. 수술중 경식도 심초음파도 가

5MHz

5. 수축기 심근분절 벽두께 변화의 분석 가

5 (Fig. 1). 가 가 frame

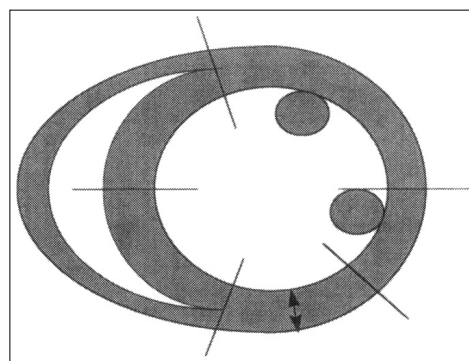


Fig. 1. Schematic transesophageal short-axis view at papillary muscle level. Left ventricle is divided into 5 segments according to anatomic blood supply. Wall thickening is measured in midportion of each myocardial segment.

(Fig. 2).

6. 통계방법

(percentage of systolic wall thickening, PSWT)

PSWT
p 0.05
가 paired Student t - test

$$\text{PSWT}(\%) = \frac{\text{PSWT}}{\text{PSWT}} \times 100$$

PSWT
Liebermann¹⁶⁾ Gallagher¹⁷⁾

PSWT가 30%
(dysfunctioning

연구결과

segments)

10% 가
가가 10%

PSWT가
, PSWT

1. 수술중의 혈역학적 수치

(Table 1).

PSWT

가 10% 가

가

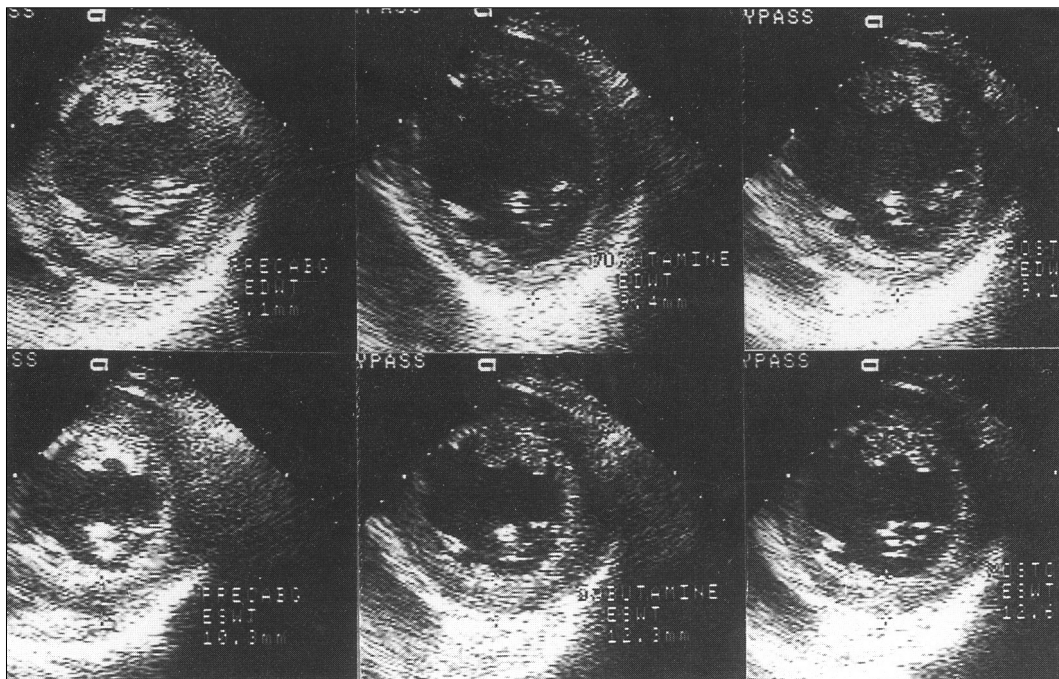


Fig. 2. Representative end-diastolic(top) and end-systolic(bottom) stop frame images of illustrative echocardiograms. Transgastric short axis scans of the ventricles at level of papillary muscles are shown. Left panel : pre-CABG(PSWT 11.7%), Middle panel : dobutamine infusion(PSWT 23.5%), Right panel : post-CABG(PSWT 27.7%).

가 14.2 ± 7.9%) .

21 PSWT가
가 (PSWT 12.3 ± 7.2% 32.1 ± 11.0% ; p<0.01, Fig. 3)

PSWT 가가 (PSWT 14.7 ± 6.5% 16.0 ± 8.2% ; p=NS, Fig. 4).

PSWT
가 r=0.61

r=0.63
PSWT
r=0.46 r=0.71

2) 정상분절
68 24 (36%)
PSWT가 41.9 ± 6.2%
PSWT 38.7 ± 6.9%(p< 0.05), 38.9% ± 6.3%(p<0.05)
(Fig. 5).

3) 임상 정확도
PSWT (Table 2)

1) 기능장애 분절
115 PSWT
가 68 68
44 (64%) PSWT가 30%
13
15 6 4 6
44 PSWT가
10% 가 (PSWT 12.3 ± 7.2% 33.5 ± 11.7% ; p<0.01) 21 (47.7%)
PSWT가 10 % 가 (PSWT 14.7 ± 6.5 17.4 ± 7.4% ; p=NS) 23 (52.3%)
44 29 (65.9%)
(PSWT 13.8 ± 6.7% 32.6 ± 10.5% ; p<0.01)
15 (34.1%) (PSWT 13.1 ± 7.4%

Table 1. Hemodynamic variables measured at the time of echocardiographic analyses

	Baseline	Dobutamine	After CABG
MABP(mmHg)	81.0 ± 13.1	103.2 ± 18*	81 ± 12
PCWP(mmHg)	9.5 ± 4.6	9.6 ± 4.2	9.8 ± 4.8
HR(min)	59.3 ± 7.7	60.6 ± 9.8	89.6 ± 13*
CI(L/m ² /min)	2.2 ± 0.4	2.7 ± 0.6*	3.0 ± 1.1*
EF(%)	49.0 ± 13.1	56.3 ± 11.5**	59.5 ± 12.1**

*p<0.01 vs baseline, **p<0.05 vs baseline
CABG : coronary artery bypass graft, MABP : mean arterial blood pressure, PCWP : pulmonary capillary wedge pressure, HR : heart rate, CI : cardiac index, EF : ejection fraction

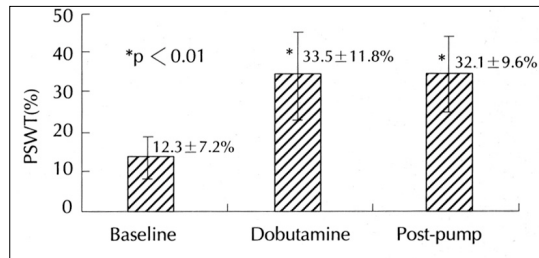


Fig. 3. Responder segments. Effect of dobutamine infusion and CABG on systolic wall thickening in segments responding to dobutamine. Improvement in function achieved during test is maintained after surgery.

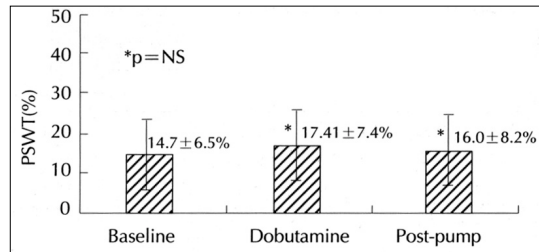


Fig. 4. Nonresponder segments. Effects of dobutamine infusion and CABG on systolic wall thickening in segments not responding to dobutamine. Negative response to dobutamine infusion predicts poor outcome after CABG.

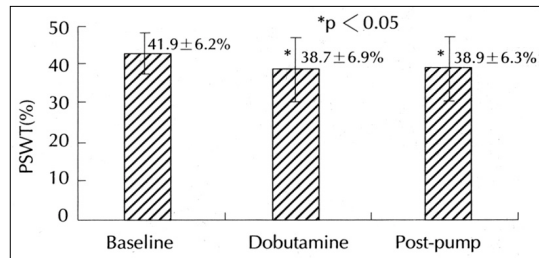


Fig. 5. Effect of dobutamine infusion and CABG on systolic wall thickening of normal segments. During dobutamine infusion and after CABG, there is slight reduction in PSWT.

Table 2. Segmental numbers of responders and non-responders during dobutamine infusion and post-CABG period in dysfunctional segments (n = 44)

	Post-CABG responders (n=29)	Post-CABG nonresponders (n=15)
Dobutamine responders(n=21)	20	1
Dobutamine nonresponders(n=23)	9	14

CABG : coronary artery bypass graft

95.2%, 77.3% . 69%, 60.9% 93.3%, 2 - 3) . 1970

4) 측정치의 정확도

가 15 PSWT 1 33) . Isop -
PSWT .
6.8 ± 4.2% 5.6 ± 3.5% roterenol 2
dopamine
norepinephrine 34) .
가
Rahimtoola가
가
1) .
가
18 - 21) 가
22 - 24) .
Nesto 25) 가가
가 가
36 - 38)

가 . 가

가 . 가

Positron emission tomog-
raphy(PET) Thallium scintigraphy . 가

39 - 40) . PET

47) .

[¹⁸F] fluorodeoxygl-
ucose

41) . ²⁰¹thallium imaging 48) .

²⁰¹Thallium

42) . 가 .

43) . 가

가 , translational and rotational changes

가

가

PSWT가 .

44 - 46) . 가 가

49) .

17 . Pierard 7)

가

PET 가

79% . PET, Thallium .

scan 가

가

가 가

가 가

10%

가 . 가

3) . , stop - frame 50% . 가 가 가 (perce - ntage of systolic wall thickening, PSWT) 가 결 과 : 1) 가 가 가 가 2) 68 44 (64%) PSWT가 30% 44 21 (47.7%) 23 (52.3%) 44 29 (65.9%) 15 (34.1%) 3) 21 PSWT가 가 PSWT 가가 PSWT 가 r = 0.61 0.63 4) 68 24 (36%) PSWT가 $41.9 \pm 6.2\%$ PSWT 5) 23 95.2%, 69%, 93.3%, 77.3% 60.9% 가 14

결 론 :

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