

## 심부전환자에서의 혈관내피세포의존성 혈관이완반응

조 주 희 · 김 철 호

## Endothelium-Dependent Vasodilation Responses in the Patients with Congestive Heart Failure

Joo-Hee Zo, MD and Cheol-Ho Kim, MD

Department of Internal Medicine, College of Medicine, Seoul National University, Seoul, Korea

## ABSTRACT

**Background** : Many studies reported that endothelium-dependent vasodilator response is impaired in patients with congestive heart failure. But the opposite results also were reported. The aim of this study was to determine the presence of endothelial dysfunction and its characteristics. **Methods and Materials** : Forearm blood flow was measured in 12 patients with congestive heart failure (7 males and 5 females, mean age  $53 \pm 11$  years old) and 10 normal control subjects (5 males and 5 females, mean age  $41 \pm 10$  years old) using strain-gauge plethysmography. The endothelium-dependent vasodilators were acetylcholine (7.5, 15, and 30  $\mu\text{g}/\text{min}$ ), which uses a pertussis toxin-sensitive signal transduction pathway, and bradykinin (100, 200, and 400  $\text{ng}/\text{min}$ ), which uses a pertussis toxin-insensitive signal transduction pathway to activate nitric oxide production. Sodium nitroprusside (0.8, 1.6, and 3.2  $\mu\text{g}/\text{min}$ ) was used as an endothelium-independent vasodilator. All drugs were infused into the brachial artery with random order. **Results** : The basal forearm blood flow was similar between both groups. The maximum flow in response to acetylcholine, bradykinin, and sodium nitroprusside was also similar in two groups. **Conclusions** : Patients with congestive heart failure showed normal endothelium-dependent vasodilator responses to both acetylcholine and to bradykinin. This finding indicates that the endothelial vasodilator function is normal in the patients with heart failure. (Korean Circulation J 1998;28(10):1755-1759)

**KEY WORDS** : Endothelium · Congestive heart failure · Nitric oxide · Bradykinin.

서 론

가

가

. <sup>1)2)</sup> 가

가

가

가

가

가

. <sup>3)</sup>

: 1998 10 12

: 1998 10 20

: , 156 - 012

2 395

: (02) 840 - 2413 · : (02) 831 - 0714

E - mail : jooheezo@plaza.snu.ac.kr

## 혈류량의 측정

가 . 가 23  
가 . 5% 1 ml .

가 strain  
gauge plethysmography(Hokanson EC -  
R5, Issaquah, Washington) .  
가 가 rapid cuff inflator(Hokanson E -  
10) .  
가  
5) 40 mmHg

가 nitric oxide 7 15 7  
(endothelium - de -  
rived relaxing factor, EDRF)

6)7) 가  
가  
가  
8) .  
9) .  
strain gauge pleth -  
ysmography  
(1)  
가 (2)

3 microinf -  
usion pump ac -  
etylcholine 7.5, 15, 30  $\mu$ g ,  
sodium nitroprusside 0.8, 1.6, 3.2  
 $\mu$ g , bradykinin 100, 200, 400 ng 5  
가 15  
0.25,  
0.5, 1 ml/min가  
2

## 분 석

## 대상 및 방법

Student - t test

ANOVA

연구대상

paired t - test

5 , 5  
41  $\pm$  10 , 99.7  $\pm$  6.6 mmHg .

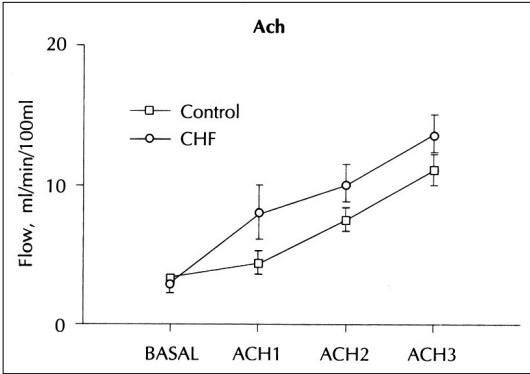
p 0.05

## 연구 성적

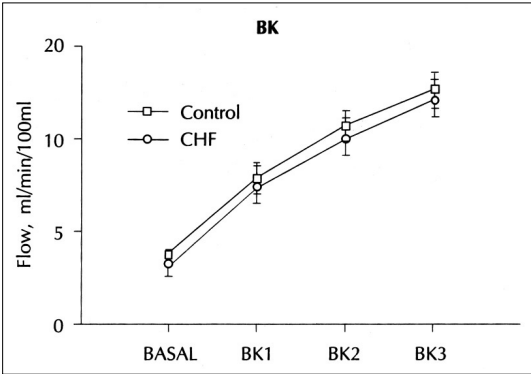
가  
7 5 53  $\pm$  11 .

**Table 1.** The clinical characteristics shows no differences between the two groups

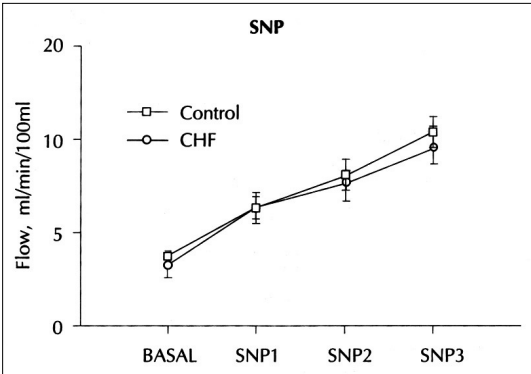
	Normal control subjects		CHF Patients	P
Age, yrs	41	±10	53 ± 11	NS
Sex, M/F	5/5		7/5	NS
MAP, mmHg	99.7	± 6.6	99 ± 16	NS
Cholesterol, mg/dl	187	±27.6	170 ± 33.2	NS
Serum K <sup>+</sup> , mEq/L	4.1	± 0.34	4.2 ± 0.44	NS
Serum Na <sup>+</sup> , mEq/L	142	± 1.6	141 ± 5.2	NS
Serum Cr, mg/dl	0.92	± 0.17	1.08 ± 0.21	NS
Glucose, mg/dl	101	±10.3	106 ± 19.3	NS



**Fig. 1.** The vasodilator response to acetylcholine is similar between the two groups.



**Fig. 2.** The vasodilator response to bradykinin is similar between the two groups.



**Fig. 3.** The vasodilator response to sodium nitroprusside is similar between the two groups.

(Table 1).  
3.36 ± 0.70 ml/min/100 ml 3.12  
± 1.77 ml/min/100 ml 가 (P=  
0.68). 가  
12.97 ± 6.69 ml/min/100 ml  
11.04 ± 2.46 ml/min/100 ml  
가 (P=0.37, Fig. 1).  
( 12.16 ± 4.58 vs 12.48 ± 1.92 ml/min/  
100 ml, P=0.83, Fig. 2) (  
9.80 ± 3.55 vs 10.51 ± 2.39 ml/min/100 ml, P=0.58,  
Fig. 3) 가

고 안

가 - 가  
4)  
가 II  
가 NO  
가 5)10 - 12)  
13)  
가 가

결 과 :

가

가 ( $3.36 \pm 0.70$  vs  $3.12 \pm 1.77$  ml/min/100 ml,  $P=0.68$ ).

가

가 ( 12.97 ±

가 6.69 vs  $11.04 \pm 2.46$  ml/min/100 ml,  $P=0.37$ ).

(12.16 ± 4.58 vs 12.48 ± 1.92 ml/100 ml, *P*=0.83) (9.

가

80 ± 3.55 vs 10.51 ± 2.39 ml/min/100 ml, *P* = 0.58)

가

가

## 결론 :

가 가

가 .

가

중심 단어 : . NO .

1996

## 요약

연구목적 :

방 법 :  
 12 ( 7 , 5 ; 53  
 $\pm 11$  ) 10 ( 5 , 5 ;  
 $41 \pm 10$  ) strain gauge pleth -  
 ysmography  
 (7.5, 15, 30  $\mu\text{g}/\text{min}$ )  
 (100, 200, 400  $\text{ng}/\text{min}$ )  
 (0.8, 1.6, 3.2  $\mu\text{g}/\text{min}$ )

## REFERENCES

- 1) Kannel WB. *Epidemiological aspects of heart failure. Cardiol Clin* 1991;7:1-9.
- 2) Ghali JK, Cooper R, Ford E. *Trends in hospitalization rate for heart failure in the United States, 1973-1986. Arch Intern Med* 1990;150:769-73.
- 3) Cohn JN, Rector TS. *Prognosis of congestive heart failure and predictors of mortality. Am J Cardiol* 1988;62:25A-30A.
- 4) Benedict CR, Phil D. *Neurohumoral aspects of heart failure. Cardiol Clin* 1994;12:9-23.
- 5) Drexler H, Hayoz D, Munzel T, Just H, Zelis R, Brunner HR. *Endothelial function in congestive heart failure. Am Heart J* 1993;126:761-4.
- 6) Gilligan DM, Guetta V, Panza JA, Garcia CE, Quyyumi AA, Cannon RO III. *Selective loss of microvascular endothelial function in human hypercholesterolemia. Circulation* 1994;90:35-41.
- 7) Panza JA, Garcia CE, Kilcoyne CM, Quyyumi AA, Cannon RO III. *Impaired endothelium-dependent vasodilation in patients with essential hypertension; Evidence that nitric oxide abnormality is not localized to a single signal transduction pathway. Circulation* 1995;91:1732-8.
- 8) Varin R, Mulder P, Richard V, Thuillez C. *Endothelial dysfunction in cardiac failure: Potential mechanism. Arch Mal Coeur Vaiss* 1997;90:29-34.
- 9) Nakamura M, Yoshida H, Arakawa N, Mizunuma Y.

- Makita S, Hiramori K. *Endothelium-dependent vasodilation is not selectively impaired in patients with chronic heart failure secondary to valvular heart disease and congenital heart disease. Eur Heart J* 1996;17:1875-81.
- 10) Kubo SH, Rector TS, Bank AJ, Williams RE, Heifetz SM. *Endothelium-dependent vasodilation is attenuated in patients with heart failure. Circulation* 1991;84:1589-96.
  - 11) Zelis R, Mason DT, Braunwald E. *A comparison of the effects of vasodilator stimuli on peripheral vasculature of patients with congestive heart failure. J Am Coll Cardiol* 1992;19:918-25.
  - 12) Katz SD, Schwarz M, Yuen J, LeJemtel TH. *Impaired acetylcholine-mediated vasodilation in patients with congestive heart failure. Role of endothelium-derived vasodilating and vasoconstricting factors. Circulation* 1993;88:55-61.
  - 13) Nakamura M, Chiba M, Ueshima K, Arakawa N, Yoshida H, Makita S, et al. *Effects of mitral and/or aortic valve replacement or repair on endothelium-dependent peripheral vasorelaxation and its relation to improvement in exercise capacity. Am J Cardiol* 1996;77:98-102.