

심부전환자의 기능수행능력 평가시 NT-proBNP의 유용성

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김성해 · 김제상 · 백경기 · 양정채 · 성지동 · 전은석 · 이상훈 · 홍경표 · 박정의

Role of NT-proBNP in Evaluation of Functional Status in Congestive Heart Failure

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ABSTRACT

Background and Objectives : NT-proBNP, a sensitive and specific marker of congestive heart failure (CHF), is also useful in monitoring the effectiveness of treatment and in predicting prognosis. However, the usefulness of NT-proBNP for measuring the functional capacity as a component of the quality of life (QoL) in patients with CHF remains to be discovered. The Korean Activity Scale/Index (KASI) is a Koreanized tool for measuring the functional capacity in patients with cardiac diseases during daily activities, thus representing the physical domain of the QoL. The purpose of this study was to evaluate the relationship between NT-proBNP and the KASI. **Subjects and Methods :** Between July, 2003 and September, 2003, the NT-proBNP levels were measured in 76 patients with CHF that visited the OPD or who were hospitalized. They were asked to fill out a self-administered questionnaire, from which their KASI scores were obtained. NYHA Fc and Heart Failure scores were also obtained from a history taking and physical examination conducted by the investigator. **Results :** The level of NT-proBNP increased with increasing NYHA Fc ($p < 0.001$ by Kruskal-Wallis test). The Spearman correlation coefficient between NT-proBNP and the KASI score was -0.730 ($p < 0.001$), which was higher than that between the HF and KASI scores ($\rho = -0.557$, $p < 0.001$). The level of NT-proBNP also had a positive correlation with the HF score ($\rho = 0.706$, $p < 0.001$). **Conclusion :** The level of NT-proBNP has a strong negative correlation with the KASI score, reflecting the functional capacity during daily activities. This suggests that NT-proBNP is useful in measuring the functional capacity as an element of the QoL in patients with CHF. (Korean Circulation J 2004;34(9):894-899)

KEY WORDS : Activity scale index ; Brain natriuretic peptides ; Heart failure.

서 론

(functional status)

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1)

1-3)

2) New York Heart Association Functional Class⁴⁾

Canadian Cardiovascular Society Functional Class⁵⁾

가 KASI ACEI ARB(62%), (42%), digoxin (21%) 21 (27.6%) 20 (26.3%), 17 (22.4%) . 76 65 가 43 ± 17%, 43 ± 14 mm, 58 ± 14 mm NYHA class ; 55 ± 12%, ; 45 ± 17%, ; 42 ± 16%, ; 28 ± 12% NYHA class NT - proBNP ; 140 ± 27.7, ; 1262 ± 262, ; 6019 ± 1361, ; 13229 ± 6049 pg/mL , KASI ; 69.0 ± 3.5, ; 44.3 ± 2.5, ; 32.8 ± 4.3, ; 12.0 ± 5.6 , NYHA Class가 NT - proBNP 가 (p<0.001), KASI score (p<0.001) (Table 2)(Fig. 1). NT - proBNP KASI score Kruskal - Wallis test . p 0.05

결 과

76 가 43 (56.6%) 33 가 54 (71.1%) 22 58 ± 15 NYHA class ; 12 ; 43 , ; 16 , ; 5 132 ± 12 mmHg, 75 ± 18

Table 2. NT-proBNP and KASI score according to NYHA Fc

NYHA Fc	NT-proBNP (pg/mL)	KASI score
I	140 ± 27.7	69.0 ± 3.47
II	1262 ± 262	44.3 ± 2.52
III	6019 ± 1361	32.8 ± 4.3
IV	13229 ± 6049	12.0 ± 5.6

The level of NT-proBNP increased with increase NYHA Fc (p<0.001), but KASI score decreased (p<0.001). NT-proBNP: N-terminal pro-B-type natriuretic peptide, KASI: Korean Activity Scale/Index, NYHA Fc: New York Heart Association functional class

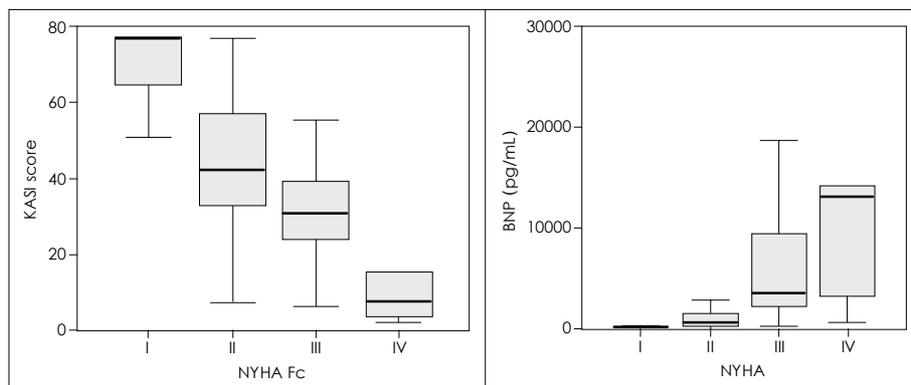


Fig. 1. NT-proBNP and KASI score according to NYHA Fc. NT-proBNP: N-terminal pro-B-type natriuretic peptide, KASI: Korean Activity Scale/Index, NYHA Fc: New York Heart Association functional class, BNP: brain natriuretic peptide.

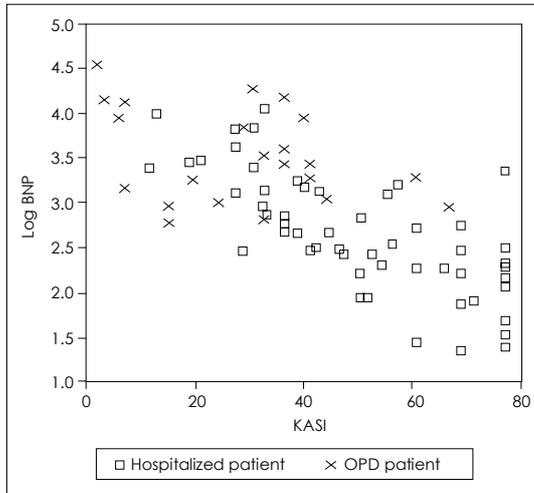


Fig. 2. Correlation between KASI score and NT-proBNP (Spearman correlation coefficient= - 0.730, p<0.001). KASI: Korean Activity Scale/Index, NT-proBNP: N-terminal pro-B-type natriuretic peptide, BNP: brain natriuretic peptide, OPD: the out-patient department.

Table 3. Correlation between KASI score and NT-proBNP and heart failure score (rho=Spearman correlation coefficient)

	KASI score	NT-proBNP	Heart failure score
KASI score (Rho)		- 0.730	- 0.557
NT-proBNP (Rho)	- 0.730		0.706
Heart failure score (Rho)	- 0.557	0.706	

All p<0.001. KASI: Korean Activity Scale/Index, NT-proBNP: N-terminal pro-B-type natriuretic peptide

(rho= - 0.730, p<0.001) 가 (Fig. 2), Heart failure score KASI score

(rho= - 0.557, p<0.001), NT - proBNP

가 . NT -

proBNP Heart Failure Score

가 (rho=0.706, p<0.001)(Table 3).

NT - proBNP

가 , Heart Failure Score , KASI score

NT - proBNP KASI score

가 (rho= - 0.734, p<0.001),

p=0.053).

(rho= - 0.255,

고 찰

BNP(Brain Natriuretic Peptide)

가

가 ,

NYHA Fc

8-16) NT - proBNP

17-21)

BNP가

가

13)14)

NT - proBNP NYHA Fc 가

가 가

, NT - proBNP가

가

가

가

NT - proBNP가

가

가

proBNP KASI NT - KASI Table 1

가

NT - proBNP KASI

NT - proBNP가

proBNP 가 가 . NT -

Score KASI

NT - proBNP가

Heart failure score

NT - proBNP

가 , NT - proBNP 가 KASI score 가 , NT - pro-

BNP 가 Duke Activity Status Index KASI score Korea Activity Scale/Index(KASI)가 , NT - proBNP KASI 가 NT - proBNP

가 , 방 법 : 76 가 , 가 15 가 KASI

KASI score가 Score . NT - proBNP NYHA class CHF score 가 가 , 3 가

가 , 가 KASI 76 43 (56.6%), 58 ± ; 5 . NYHA class NT - proBNP ; 140, ; 1262, ; 6019, ; 13229 pg/

가 KASI 가 0.706 (p<0.05), NT - proBNP KASI score Spearman - 0.730

KASI 가 (p<0.001) HF score KASI score - 0.557(p<0.001)

가 NT - proBNP Heart Failure Score KASI 가

가 , 중심 단어 : NT - proBNP ; Korean Activity Scale/Index ;

가 NT - proBNP **요 약**

배경 및 목적 : NT - proBNP

REFERENCES
 1) Cohn JN, Johnson GR, Shabetai R, Loeb H, Tristani F, Re-
 ctor T, Smith R, Fletcher R. *Ejection fraction, peak exercise
 oxygen consumption, cardiothoracic ratio, ventricular arr-
 hythmias, and plasma norepinephrine as determinants of
 prognosis in heart failure. Circulation 1993;87:VI5-16.*
 2) Mancini DM, Eisen H, Kusssmaul W, Mull R, Edmunds LH

- Jr, Wilson JR. *Value of peak exercise oxygen consumption for optimal timing of cardiac transplantation in ambulatory patients with heart failure. Circulation* 1991;83:778-86.
- 3) Stelken AM, Younis LT, Jennison SH, Miller DD, Miller LW, Shaw LJ, Kargl D, Chaitman BR. *Prognostic value of cardiopulmonary exercise testing using percent achieved of predicted peak oxygen uptake for patients with ischemic and dilated cardiomyopathy. J Am Coll Cardiol* 1996;27:345-52.
 - 4) Harvey RM, Doyle EF, Ellis K. *Major changes made by the Criteria Committee of the New York Heart Association. Circulation* 1974;49:390.
 - 5) Campeau L. *Grading of angina pectoris. Circulation* 1976;54:522-3.
 - 6) Hlatky MA, Boinequ RE, Higginbotham MB, Lee KL, Mark DB, Califf RM, Cobb FR, Pryor DB. *A brief self-administered questionnaire to determine functional capacity (The Duke Activity Status Index). Am J Cardiol* 1989;64:651-4.
 - 7) Sung JD, On YK, Kim HS, Chae IH, Sohn DW, Oh BH, Lee MM, Park YB, Choi YS, Lee YW. *Development of Korean Activity Scale/Index (KASI). Korean Circ J* 2000;30:1004-9.
 - 8) Wenger NK, Mattson ME, Furberg CD, Elinson J. *Assessment of quality of life in clinical trials of cardiovascular therapies. Am J Cardiol* 1984;54:908-13.
 - 9) Morrison LK, Harrison A, Krishnaswamy P, Kazanegra R, Clopton P, Maisel A. *Utility of a rapid B-natriuretic peptide assay in differentiating congestive heart failure from lung disease in patients presenting with dyspnea. J Am Coll Cardiol* 2002;39:202-9.
 - 10) Maisel AS, Krishnaswamy P, Nowak RM, McCord J, Hollander JE, Duc P, Omland T, Storrow AB, Abraham WT, Wu AH, Clopton P, Steg PG, Westheim A, Knudsen CW, Perez A, Kazanegra R, Herrmann HC, McCullough PA. *Rapid measurement of B-type natriuretic peptide in the emergency diagnosis of heart failure. N Engl J Med* 2002;347:161-7.
 - 11) McCullough PA, Nowak RM, McCord J, Hollander JE, Herrmann HC, Steg PG, Duc P, Westheim A, Omland T, Knudsen CW, Storrow AB, Abraham WT, Lamba S, Wu AH, Perez A, Clopton P, Krishnaswamy P, Kazanegra R, Maisel AS. *B-type natriuretic peptide and clinical judgment in emergency diagnosis of heart failure analysis. Circulation* 2002;106:416-22.
 - 12) Troughton RW, Frampton CM, Yandle TG, Espiner EA, Nicholls MG, Richards AM. *Treatment of heart failure guided by plasma aminoterminal brain natriuretic peptide (N-BNP) concentrations. Lancet* 2000;355:1126-30.
 - 13) Kruger S, Graf J, Kunz D, Stickel T, Hanrath P, Janssens U. *Brain natriuretic peptide levels predict functional capacity in patients with chronic heart failure. J Am Coll Cardiol* 2002;40:718-22.
 - 14) Koglin J, Pehlivanli S, Schwaiblmair M, Vogeser M, Cremer P, von Scheidt W. *Role of brain natriuretic peptide in risk stratification of patients with congestive heart failure. J Am Coll Cardiol* 2001;38:1934-41.
 - 15) Davis M, Espiner E, Richards G, Billings J, Town I, Neill A, Drennan C, Richards M, Turner J, Yandle T. *Plasma brain natriuretic peptide in assessment of acute dyspnoea. Lancet* 1994;343:440-4.
 - 16) Lee SC, Stevens TL, Sandberg SM, Heublein DM, Nelson SM, Jougasaki M, Redfield MM, Burnett JC Jr. *The potential of brain natriuretic peptide as a biomarker for New York Heart Association class during the outpatient treatment of heart failure. J Card Fail* 2002;8:149-54.
 - 17) Song BG, Jeon ES, Kim YH, Kang MK, Doh JH, Kim PH, Ahn SJ, Oh HL, Kim HJ, Song JD, Lee SC, Gwon HC, Kim JS, Kim DK, Lee SH, Hong KP, Park JE, Lee SY, Lee JK. *Correlation between levels of n-terminal pro-b-type natriuretic peptide and degrees of heart failure. Korean J Med* 2004;66:33-40.
 - 18) Davidson NC, Coutie WJ, Struthers AD. *N-terminal proatrial natriuretic peptide and brain natriuretic peptide are stable for up to 6 hours in whole blood in vitro. Circulation* 1995;91:1276-7.
 - 19) Davidson NC, Naas AA, Hanson JK, Kennedy NS, Coutie WJ, Struthers AD. *Comparison of atrial natriuretic peptide B-type natriuretic peptide and N-terminal proatrial natriuretic peptide as indicators of left ventricular systolic dysfunction. Am J Cardiol* 1996;77:828-31.
 - 20) Murdoch DR, Byrne J, Morton JJ, McDonagh TA, Robb SD, Clements S, Ford I, McMurray JJ, Dargie HJ. *Brain natriuretic peptide is stable in whole blood and can be measured using a simple rapid assay: implications for clinical practice. Heart* 1997;78:594-7.
 - 21) Hobbs FD, Davis RC, Roalfe AK, Hare R, Davies MK, Kenkre JE. *Reliability of N-terminal pro-brain natriuretic peptide assay in diagnosis of heart failure: cohort study in representative and high risk community populations. BMJ* 2002;324:1498.