

The Relationship of Anger Expression and Alexithymia with Coronary Artery Stenosis in Patients with Coronary Artery Diseases

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This study examined the relationship between anger expression or alexithymia and coronary artery stenosis in patients with coronary artery diseases. 143 patients with coronary artery diseases (104 males and 39 females) were enrolled in this study. The severity of their coronary artery stenosis was measured by angiography. The Anger Expression Scale and the Toronto Alexithymia Scale were used to assess the level of anger expression and alexithymia. The more stenotic group (occluded by 75% or more) exhibited a significantly higher level of alexithymia than the less stenotic group (occluded by less than 25%). Multiple regression analysis on the extent of stenosis also revealed that regardless of gender and age, the coronary artery disease patients with higher alexithymia were likely to show a greater level of stenosis. However, no significant differences were found on either the anger-in or anger-out subscale scores between the two groups. These results suggest that alexithymia is associated with the severity of coronary artery stenosis in patients with coronary artery disease. However, both anger expression and anger suppression were not shown to be associated with the severity of coronary artery stenosis.

Key Words: Anger expression, alexithymia, coronary artery stenosis, coronary artery diseases

INTRODUCTION

Hypertension, hypercholesterolemia, diabetes mellitus, obesity and smoking are known as biological risk factors for coronary artery disease

(CAD). However, only certain individuals develop CAD in association with such factors.¹ Therefore, in addition to these risk factors for CAD, it is possible that other factors may be involved.

Jenkins² noted that, although the pathogenetic mechanisms for CAD are primarily biological, there are psychosocial factors that are also contributing causes: some of these factors are primarily behavioral. A number of studies have found that the type A behavior pattern was independently related to the severity of CAD.³⁻¹⁰ In contrast, the type A behavior pattern was not predictive of CAD in other studies.¹¹⁻¹⁶

After the initial enthusiasm for the global type A concept waned in the middle 1980s, hostility as a core component of the original type A concept has received considerable empirical support as a predictor of coronary heart disease outcomes. In our other previous studies, CAD patients showed higher levels of anger expression than did the healthy individuals¹⁷ and the anger level was significantly associated with the coronary calcification regardless of the classical risk factors. This suggests that anger plays an important role in the calcification of the coronary artery.¹⁸ Some studies^{8,9,11,15,19} found hostility to be related to the severity of CAD. It was also found that the severity of coronary artery disease was positively correlated with the expression of hostility, but that CAD severity was negatively correlated with the feeling of hostility.²⁰ In addition, it was reported that a high level of anger expression along with low social support is likely to increase the risk of disease progression for patients with coronary

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artery disease.²¹

The mechanism for the association between hostility and coronary disease has been explained by several physiological processes, such as reduced parasympathetic modulation of the heart rate, increased levels of circulating catecholamines, and the increased lipid concentrations during an interpersonal conflict. Low hostility is associated with a low coronary disease risk in studies focusing on workplace populations.²² However, other studies have not found that hostility is related to the CAD severity.²³⁻²⁵

A number of studies have suggested that alexithymia, defined as an impairment in identifying and expressing one's inner feelings, might somehow affect the course of various illnesses. It was also reported that alexithymia may be related to the increased reporting of symptoms. In addition, a positive association was found between alexithymia and a prior diagnosis of coronary heart disease in the general population. However, there is no evidence that alexithymia is associated with the pathophysiological indicators of the disease.²⁶

An anger syndrome such as Hwabyung is known to be associated with anger suppression in Korea.²⁷ Moreover, the suppression of emotions has been considered as highly respected trait in traditional Korean society, and middle-aged or older Koreans were taught to express as little emotion as possible. In other words, anger suppression and alexithymia can be considered to be a cultural phenomenon of traditional Korean society. However, the relationship between these traits and coronary artery diseases in Korea has attracted little interest. In addition, no studies regarding anger expression and alexithymia have been found for patients with coronary artery disease.

The aim of this study was to examine the relationship between anger expression or alexithymia and the severity of coronary artery diseases.

MATERIALS AND METHODS

Subjects

143 in-patients (104 males and 39 females) with coronary artery disease from the Department of

Cardiology were enrolled in this study. They included 97 patients with angina pectoris (86 patients with unstable angina; 11 those with stable angina) and 46 patients with myocardial infarction. The diagnoses were made on the basis of coronary angiography by the cardiologist. The patients' age ranged from 40 to 69 years. The patients were consecutively selected and interviewed. They were given a verbal and written explanation on the study outline. Only those patients who consented to the study were given questionnaires on topics that included sociodemographic characteristics and self-rating scales. All but 25 patients responded to the questionnaire.

Patients with other physical or psychiatric disorders were excluded from this study. Three patients with a combination of angina pectoris or myocardial infarction and valvular heart diseases, 7 patients with valvular heart diseases, 3 patients with cardiomyopathy and 11 patients with silent ischemic heart disease were excluded from the study. 10 patients had a previous history of coronary heart disease and they were being hospitalized for percutaneous transluminal coronary angioplasty (PTCA) or a coronary bypass graft surgery. They were also excluded from this study. In addition, 50 patients with PTCA, 4 patients with coronary bypass graft surgery and 3 patients with both PTCA and coronary bypass graft surgery were excluded.

Procedures

The severity of the coronary artery stenosis was measured by angiography. The extent of stenosis was expressed as a ratio (percentage) of the atherosclerosis thickness and the diameter of the coronary artery lumen that was most severely affected. Patients with coronary artery diseases were given beta-blockers such as atenolol or propranolol and a calcium channel blocker such as diltiazem during the study. These drugs are used for symptomatic treatment of coronary artery disease but they do not affect coronary artery stenosis. The patients were asked to respond to the questionnaire within one week of the coronary angiography. Most of them had undergone an

echocardiogram, a MIBI-SPECT (Single Photon Emission Computed Tomography), and a treadmill test as well as a chest PA and EKG before receiving the angiography.

The questionnaire included the Korean version²⁸ of the Anger Expression Scale²⁹ and the Korean version³⁰ of the Toronto Alexithymia Scale.³¹ The Toronto Alexithymia Scale is a 26-item self-rating instrument that was developed to assess the severity of alexithymia. The Anger Expression Scale is a 22-item self-rating instrument that was designed to assess the levels of anger expression (anger-out) and anger suppression (anger-in).

Data analysis

The levels of both anger expression and alexithymia were compared between the groups with the coronary artery occluded by 75% or more (the more stenotic group) and the group with the coronary artery occluded by less than 25% (the less stenotic group), using the Student's t-test. Pearson's correlation was used to determine the relationships between age, the level of education, income, duration of illness, and the psychometric measures such as anger expression and alexithymia. The relationship between alexithymia and anger expression in the coronary artery disease patients was also tested by the Pearson's correlation. A multiple regression analysis was computed to determine the effect by the sociodemographic variables; the dependent variable being the extent of stenosis and the independent variables being those sociodemographic characteristics confirmed as significantly influencing the extent of stenosis.

RESULTS

Sociodemographic data

The subjects' mean (SD) age was 56.2 (8.3) years, their mean (SD) length of education was 11.6 (4.4) years, and the mean (SD) monthly income was \$3100 (1100) dollars. 129 were married, and 11 were widowed. Their mean (SD) duration of illness was 9.8 (22.0) months. 88 subjects were smokers and 54 subjects were non-smokers.

The relationship between alexithymia and anger expression in coronary artery disease patients

For the patients with coronary artery disease, the total alexithymia scores were significantly correlated with each of the subscale scores on the anger expression scale (anger-out $r=.18$ $p=.03$; anger-in $r=.28$ $p=.001$; anger-total $r=.29$ $p=.001$).

The relationship between anger expression or alexithymia and the severity of coronary artery stenosis

For the patients with coronary artery disease, the more stenotic group scored significantly higher on the total alexithymia score than the less stenotic group. However, no significant differences were found in the scores of the anger-out, anger-in, and anger-total subscales between the two groups (Table 1).

For the coronary artery disease patients, a significant difference was found in the extent of stenosis between the male and female subjects

Table 1. Comparison of Anger Expression and Alexithymia between the Less Stenotic Group and the More Stenotic Group in Patients with Coronary Artery Diseases

	Less stenotic group (N=36 Mean \pm S.D.)	More stenotic group (N=33 Mean \pm S.D.)	t	df	p
Anger expression scale					
Anger-out	13.7 \pm 13.0	12.0 \pm 10.9	-.06	66	.57
Anger-in	8.0 \pm 5.7	10.7 \pm 10.7	-1.27	65	.21
Anger-total	22.1 \pm 14.1	22.7 \pm 18.5	-.15	65	.88
Total alexithymia score	63.5 \pm 6.2	68.3 \pm 8.2	-2.66	65	.01

(80.8 ± 18.9 vs. 73.0 ± 22.9 , $t=2.37$ $df=93$ $p=.02$) and age was also significantly correlated with the extent of stenosis ($r=.14$ $p=.04$). However, the duration of illness was not significantly correlated with the extent of stenosis ($r=-.01$ $p=.92$). No significant difference was also found in the extent of stenosis between smokers and nonsmokers (80.0 ± 19.5 vs. 76.5 ± 21.6 , $t=1.25$ $df=141$ $p=.21$). Therefore, a multiple regression analysis was conducted with the dependent variable being the extent of stenosis, and the independent variables being the alexithymia, gender, and age. It was discovered that regardless of the demographic variables, the coronary artery disease patients with a higher level of alexithymia were likely to show a greater level of stenosis ($R^2=.08$ $F=6.12$ $p=.001$; $\beta=.15$ $t=2.25$ $p=.03$).

The relationship between the sociodemographic variables and anger expression or alexithymia in the coronary artery disease patients

For the patients with coronary artery disease, the males scored significantly higher on the anger-in subscale than did the females (11.0 ± 8.8 vs. 6.8 ± 7.4 , $t=2.58$ $df=139$ $p=.01$), whereas the females scored significantly higher than the males on the anger-out subscale (9.8 ± 7.6 vs. 16.4 ± 14.4 , $t=-2.71$ $df=46.1$ $p=.009$). However, no significant difference was found in the anger-total subscale scores (20.7 ± 13.3 vs. 23.6 ± 17.9 , $t=-1.01$ $df=139$ $p=.31$) and the total alexithymia scores (65.6 ± 8.3 vs. 66.2 ± 6.2 , $t=-.49$ $df=91$ $p=.63$) between the males and the females. Age, the level of education, income, and duration of illness had no significant correlations with the scores of the anger-out ($r=-.002 \sim .02$ $p>.05$), anger-in ($r=.005 \sim .12$ $p>.05$), anger-total subscale ($r=-.01 \sim .07$ $p>.05$) and the total alexithymia score ($r=-.01 \sim .16$ $p>.05$).

DISCUSSION

In terms of the relationship between alexithymia and anger expression, the severity of alexithymia was found to have a significant positive correlation with the anger-in and anger-out subscale scores for patients with coronary artery diseases. In particular, the total alexithymia scores

showed greater significant correlations with the anger-in subscale scores than with anger-out subscale scores. The results suggest that alexithymia is more associated with anger suppression rather than anger expression.

This study found that for patients with coronary artery diseases, the levels of alexithymia were significantly higher in the more stenotic group (obstructed 75% or more) than in the less stenotic group (obstructed less than 25%). A multiple regression analysis was done on the extent of stenosis, and it also revealed that regardless of demographic variables such as gender and age, the coronary artery disease patients with a higher level of alexithymia were likely to show a greater level of stenosis. In contrast, it was reported that for men with CAD, an increasing alexithymia was associated with a less severe atherosclerosis.²⁶ In the latter, the carotid artery was used to assess the level of atherosclerosis instead of the coronary artery, and the extent of the atherosclerosis was measured by ultrasonography, not by angiography. In addition, there were a few reports from the relevant literature showing that alexithymia was not necessarily related to the presence or severity of coronary heart disease³² and that it was not associated with the classical cardiovascular risk factors.³³

In terms of the relationship between anger and the severity of angiographic CAD, hostility has already been found to be associated with the severity of CAD.^{8,9,11,19} Another study found that the severity of CAD was positively correlated with the expression of hostility, but that it was negatively correlated with feelings of hostility.²⁰ However, in this study, there were no significant differences in either anger expression or anger suppression between the more stenotic group and the less stenotic group in patients with CAD. In other studies, there was also no association between hostility and the CAD severity.²³⁻²⁵

With respect to the demographic factors and anger expression, it was interesting to discover that the males had higher anger-in (anger suppression) subscale scores than did the females, whereas the females had higher anger-out (anger expression) subscale scores than the males. These results suggest that there are some differences in the nature of anger expression between the male

and female CAD patient populations and that men are more susceptible to anger suppression than women.

In this study, definitive conclusions cannot be drawn as to whether alexithymia precedes or is a consequence of coronary artery disease, because of the cross-sectional nature of the data. Therefore, a future longitudinal study will be required to determine the causal relationship between alexithymia and coronary artery disease.

In conclusion, these results suggest that alexithymia is associated with the severity of coronary artery stenosis in patients with coronary artery disease patients. However, both anger expression and anger suppression were not shown to be associated with the severity of coronary artery stenosis.

REFERENCES

1. Rosenman RH. Relationship of the type A behavior pattern with coronary heart disease. In: Goldberg L, Breznitz S, editors. *Handbook of Stress: theoretical and clinical aspects*. 2nd ed. New York: The Free Press; 1993. p.449-76.
2. Jenkins CD. Epidemiology of cardiovascular diseases. *J Consult Clin Psychol* 1988;56:324-32.
3. Blumenthal JA, Williams RB, Kong Y, Schanberg S, Thompson L. Type A behavior and angiographically documented coronary disease. *Circulation* 1978;58:634-9.
4. Derby CA, Pearson TA. Type A behavior: associated with coronary disease or with arteriography. *Circulation* 1989;80 Suppl:611-3.
5. Frank KA, Heller SS, Kornfeld DS, Sporn AA, Weiss MD. Type A behavior pattern and coronary atherosclerosis. *J Am Med Assoc* 1978;240:761-3.
6. Friedman M, Rosenman R, Straus K, Wurm M, Kositchek R. The relationship of behavior pattern A to the state of coronary vasculature. *Am J Med* 1968;44:525-37.
7. Krantz DS, Sanmarco MI, Selvester RH, Matthews KA. Psychological correlates of progression of atherosclerosis in men. *Psychosom Med* 1979;41:467-75.
8. Williams RB Jr., Haney TL, Lee KL. Type A behavior, hostility, and coronary atherosclerosis. *Psychosom Med* 1980;42:539-49.
9. Williams RB Jr., Barefoot JC, Haney TL, Harrell FE, Blumenthal JA, Pryor DB. Type A behavior and angiographically documented coronary atherosclerosis in a sample of 2,289 patients. *Psychosom Med* 1988;50:139-52.
10. Zyzanski SJ, Jenkins CD, Ryan TJ, Flessas A, Everist M. Psychological correlates of coronary angiographic findings. *Arch Intern Med* 1976;136:1234-7.
11. Dembroski TM, MacDougall JM, Williams RB, Jr., Haney T, Blumenthal IA. Components of type A hostility, and anger-in: relationship to angiographic findings. *Psychosom Med* 1985;47:219-33.
12. Dimsdale JE, Hackett TP, Hutter AM, Block PC, Catanzo DM. Type A personality and extent of coronary atherosclerosis. *Am J Cardiol* 1978;42:583-6.
13. Dimsdale JE, Hackett TP, Hutter AM, Block PC, Catanzo DM. Type A behavior and angiographic findings. *J Psychosom Res* 1979;23:273-6.
14. Kornitzer M, Magotteau V, Degre V, Kittel F, Struyven J, van Thiel E. Angiographic findings and the type A behavior pattern assessed by means of the Bortner Scale. *J Behav Med* 1982;5:313-9.
15. MacDougall JM, Dembroski TM, Dimsdale JE, Hackett TP. Components of type A hostility and anger-in: further relationship to angiographic findings. *Health Psychol* 1985;4:137-52.
16. Scherwitz L, McKelvain R, Laman C, Patterson J, Yusim S, Lester J, et al. Type A behavior, self-involvement, and coronary atherosclerosis. *Psychosom Med* 1983;45:47-57.
17. Koh KB, Lee SH, Kim JW, Roh KS. The comparison of anger level between patients with coronary artery disease and healthy individuals. ABSTRACT of the 9th Annual Meeting of the Korean Psychosomatic Society 2001, June 30, Seoul, p18.
18. Koh KB, Choe KO, An SK. Anger and coronary calcification in individuals with and without risk factors of coronary artery disease. *Yonsei Med J* 2003;44:793-9.
19. Siegman AW, Dembroski TM, Ringel N. Components of hostility and severity of coronary artery disease. *Psychosom Med* 1987;49:127-35.
20. Siegman AW. The role of hostility, neuroticism, and speech style in coronary artery disease. In: Siegman A, Dembroski T, editors. *In Search of Coronary-prone Behavior: beyond type A*. Hillsdale (NJ): Lawrence Erlbaum; 1989.
21. Angerer P, Siebert U, Kothny W, Muhlbauser D, Mudra H, von Schacky C. Impact of social support, cynical hostility and anger expression on progression of coronary atherosclerosis. *J Am Coll Cardiol* 2000;36:1781-8.
22. Shapiro PA. Cardiovascular disorders. In: Sodock BJ, Sadock VA, editors. *Comprehensive Textbook of Psychiatry*, 7th ed. Baltimore (Maryland): Lippincott Williams & Wilkins; 2000. p.1797-803.
23. Helmer DC, Ragland DR, Syme SL. Hostility and coronary artery disease. *Am J Epidemiol* 1990;123:112-22.
24. Matsushima T, Doba N, Hinohara S, Williams RB Jr., Shinoda T. Studies on type A behavior pattern and hostility in Japanese male subjects with special reference to CHD. *Shinshin-Igaku* 1983;213:321-8.
25. Tennant CC, Langeluddecke PM, Fulcher G, Wilby J. Anger and other psychological factors in coronary

- atherosclerosis. *Psychol Med* 1987;17:425-31.
26. Kauhanen J, Kasplan GA, Cohen RD, Salonen R, Salonen JT. Alexithymia may influence the diagnosis of coronary heart disease. *Psychosom Med* 1994;56:237-44.
 27. Mezzich JE, Lin K-M. Acute and transient psychotic disorders and culture-bound syndromes. In: Kaplan HI, Sodock BJ, editors. *Comprehensive Textbook of Psychiatry*, 6th ed. Baltimore (Maryland): Williams & Wilkins; 1995. p.1049-59.
 28. Koh KB, Kim SJ. Comparison of anger between patients with essential hypertension and normal controls. *Korean J Psychosom Med* 1995;3:19-27.
 29. Spielberger CD, Johnson EH, Russell SF, Crane RJ, Jacobs GA, Worden TJ. The experience and expression of anger: construction and validation of an anger expression scale. In: Chesney MA, Rosenman RH, editors. *Anger and Hostility in Cardiovascular and Behavioral Disorders*. Washington: Hemisphere; 1985.
 30. Han J, Lee S, Lee S, Do K, Hong S, Kim E, et al. Development of Korean version of alexithymia scale: reliability and validity of Schalling-Sifneos personality scale and Toronto alexithymia scale. *Korean J Psychosom Med* 1995;3:147-58.
 31. Taylor GJ, Ryan D, Bagby RM. Toward development of a new self-report alexithymia scale. *Psychother Psychosom* 1985;44:191-9.
 32. Lumley M, Tomakowsky J, Torosian T. The relationship of alexithymia to subjective and biomedical measures of disease. *Psychosomatics* 1997;38:497-502.
 33. Valkamo M, Hintikka J, Honkalampi K, Niskanen L, Koivumaa-Honkanen H, Viinamaki H. Alexithymia in patients with coronary heart disease. *J Psychosom Res* 2001;50:125-30.