

## Evaluation of Intima Media Thickness of Carotid Arteries in 40-60 Years Old Persons with Type D Personality and its Comparison with Normal Ones

Fariborz Khorvash, Marzieh Rahimi, Reza Bagherian-Sararoudi<sup>1</sup>, Sayed Ali Mousavi, Alireza Ebnesahidi<sup>2</sup>, Afshin Amirpour<sup>1</sup>, Mansoureh Alsadat Mirabdollahi<sup>3</sup>

Isfahan Neurosciences Research Center, Isfahan University of Medical Sciences, Isfahan, Iran,

<sup>1</sup>Isfahan University of Medical Sciences, Isfahan, Iran, <sup>2</sup>Isfahan neurosciences research center, Isfahan, Iran <sup>3</sup>Department of Biology, Payam Noor University, Tehran, Iran

### Correspondence to:

Dr. Mansoureh Alsadat Mirabdollahi,  
Department of Biology, Payam  
Noor University, Tehran, Iran.  
E-mail: mirabdollahi@yahoo.com

**Date of Submission:** Feb 23, 2013

**Date of Acceptance:** Feb 23, 2013

**How to cite this article:** Khorvash F, Rahimi M, Bagherian-Sararoudi R, Mousavi SA, Ebnesahidi A, Amirpour A, *et al.* Evaluation of intima media thickness of carotid arteries in 40-60 years old persons with type D personality and its comparison with normal ones. *Int J Prev Med* 2013;Suppl 2: S250-5.

### ABSTRACT

**Background:** In some studies, the involvement of dangerous psychological and behavioral factors in etiology and physiotherapy of vascular disturbances have been shown. In other studies, the relationship between the personality type and increase in cardiovascular disease has been demonstrated. The type D personality is defined as having two characteristics of negative affect and social inhibition. It is thought that individuals with type D personality are at increased risk of carotid artery intima-media thickening which predisposes them to vascular disease that is one of the most important factors for the stroke. In this study, we try to determine whether type D personality is a contributing factor to an increase in the intima-media of the carotid artery. This study was done in 2012 in the teaching hospital of Alzahra in Isfahan Iran.

**Methods:** This is a case/control study which is done at Alzahra hospital in Isfahan in 2011-12. The statistical population in this study is composed of individuals who do not have any risk factors for stroke and are randomly selected among the hospital staff or the patient's family members who accompanied the patient at the hospital. They filled out a questioner that would assist in detecting type D personality. A carotid Doppler ultrasound that measures the intima-media thickness in the selected individuals was performed. The information obtained from the study was evaluated by Statistical Product and Service Solutions (SPSS) software and the intima-media thicknesses were compared in two groups of patients.

**Results:** The average thickness of intima media in two groups, consist of placebo and patients, was  $0.739 \pm 0.12$  and  $0.759 \pm 0.14$  millimeter, respectively. There was no meaningful difference between the two groups based on *t*-test values ( $P = 0.19$ ). It is important to note that based on the results, 22.9% of placebos and 48.6% of individuals with type D personality presented with abnormal thickness. The difference between the two groups were meaningful based on Chi-Squared test ( $P = 0.001$ ).

**Conclusions:** We conclude that type D personality increases the risk of cardiovascular diseases specially the stroke and myocardial infarction due to the higher prevalence of hormonal imbalances leading to arterial

vasospasm and atherosclerotic disease. As a result, it is necessary to evaluate and treat these patients due to increased risk of atherosclerotic diseases, stroke, and myocardial infarction.

**Keywords:** Cardiovascular events, carotid artery, intima media thickening, stroke, type D personality

## INTRODUCTION

In some studies, the role of psychological, social, and behavioral factors in etiology and pathophysiology of vascular disturbances has been considered. In some of these studies, the relationship between personality types and increase in cardiovascular diseases has been proved.<sup>[1]</sup>

In recent years, a new personality type known as type D personality has been postulated. It is defined as negative affect and social inhibition. Negative affect is the tendency to experience negative feelings. On the other hand, social inhibition refers to abstinence from negative feeling manifestations in social relationships with others.

The main theory describes that type D personality through different mechanisms, such as immune mechanism result in increased risk of vascular and cardiac problems.<sup>[1]</sup> In the past, type A personality with its complex behavioral and emotional components has been associated with increased levels of blood cortisol. The relation between the high levels of serum cortisol and clinical manifestation of cardiovascular disease in type A personality has been compared to type B personality.<sup>[1,2]</sup>

The psychological and physiologic destructive role of type D personality is based on negative affect and the social inhabitation. The negative affect is tendency of an individual to experience negative feelings in different social settings. In social inhibition, the individual abstains from showing negative feelings in the social gatherings.<sup>[1-3]</sup> Type D personality is characterized by decrease in social interaction, depressed mood, anxiety, and anger. Individuals with type D personality do not enjoy life and have negative feelings towards themselves and others. They present with somatoform disorders, and are very sensitive to external stimuli.<sup>[4,5]</sup> In type D personality anger threshold is very low, and positive thinking is rarely seen. These individuals due to the fear of being left alone restrain from expressing their true feelings toward others.<sup>[1,6]</sup>

The tendency to experience negative feelings, and holding from expressing those feelings are two characteristics that result in destructive outcomes on the individual's health.<sup>[7]</sup> The manifestation of social inhibition, as one of the characteristics of type D personality, is decrease in energy levels, quietness, risk taking inability, and lack of motivation in interpersonal relationships.

The social isolation in combination with influence of negative excitement has synergistic and adverse effects on the individual's health. For instance, the risk of mortality in myocardial infarction (MI) patients, who are under a lot of stress and socially isolated is four-fold greater than MI patients with lower stress levels.<sup>[1,8]</sup> In some studies, it is shown if these patients develop cardiovascular and carotid artery disease, their prognosis is not as favorable of patients who are socially active.<sup>[9,10]</sup>

The prevalence of this type of personality in the public population is between 13% and 32%. It is reported that the prevalence of type D personality among patients suffering from cardiovascular disease is between 26% and 53%.<sup>[11,12]</sup>

In some studies, it has been shown that the combination of negative thinking and social withdrawal, which are characteristics of type D personality, are influenced by genetic factors.<sup>[1,5,13]</sup> Patients with vascular disease and type D personality compared with placebos had lower quality of life.<sup>[14]</sup>

In diabetic patients with type D personality, the depressive sign after coronary angioplasty is meaningfully predicted. In one study, this personality was determined to be an independent factor in MI occurrence in addition to unfavorable prognosis and high mortality and morbidity among the patients. In the same study, type D personality is considered as an independent factor for recurrence of atherosclerotic coronary artery disease after percutaneous coronary intervention (PCI) and bypass surgery in ischemic heart disease patients.<sup>[2,15]</sup>

There are numerous evidence showing that type D personality is an important risk factor in predicting variety of conditions such as ischemia,<sup>[16]</sup> chronic heart disease,<sup>[17]</sup> four-to-eight fold increase in heart attack<sup>[8,18]</sup> and hypertension.<sup>[5,16]</sup> In general individuals with type D personality have higher levels of cortisol in their blood;<sup>[1]</sup> consequently,

increase in cortisol is a risk factor for cardiovascular disease, dyslipidemia, and insulin resistance.<sup>[1]</sup> A disturbance in the immune system is another probable mechanism that is found in type D personality and is an etiology for cardiovascular disease.<sup>[6]</sup> In general, all these factors increase the risk of stroke and other vascular complications in individuals with type D personality.

In addition to the factors mentioned above, it is known that increase in thickness of carotid artery is a strong risk factor for the stroke occurrence. Type D personality is an important factor in increase thickness of carotid artery Intima media. As a result, the goal of this study is to compare the Intima Media thickness of the carotid artery in individuals between the ages of 40-60 years old, who have type D personality with the ones who do not have it.

## METHODS

This is a case/control study which is done at Alzahra hospital in Isfahan in 2011-12. The statistical population under study composed of a group of individuals with type D personality and a normal group. The inclusion criteria to enter the study included individuals with type D personality, subject satisfaction to participate in the study. Other inclusion criteria composed of non-smokers, negative history of hypertension, diabetes mellitus, psychological and autoimmune diseases, hypothyroidism, hyperlipidemia, and lack of cardiovascular diseases. The age distribution was between 40 and 60 years old. Subjects, with a history of greater than 3 months of corticosteroid use and individuals with the BMI equal or greater than 25, were excluded from the study. The sample was 70 in each group.

Individuals, who did not have a stroke risk factor and met the inclusion criteria, were randomly

selected from the hospital staff or patients' family members who accompanied the patient at the hospital. Permission from the participants was obtained and a carotid Doppler ultrasound to measure the thickness of Intima media was done. A questionnaire designed for type D personality (DS-14) was completed and according to the findings in the questionnaire the individuals with type D personality was placed in one group and the ones without it were placed in a different group. The average thickness of intima media were compared in two groups. Afterwards, the average thickness of intima media was compared in two groups.

The information related to each patient was gathered by a special check list that was designed for such activities. At the end, the study data was analyzed by Statistical Product and Service Solutions (SPSS) 20 third edition software.

## RESULTS

In this study, 70 subjects with type D personality and 70 without type D personality were analyzed. The average age range of healthy participants and subjects with type D personality was  $48.7 \pm 7.1$  and  $48 \pm 6.8$ , respectively. There was no meaningful differences between the two groups ( $P = 0.65$ ). The age distribution of the patients in two groups is shown in Table 1.

In terms of age distribution, in two groups of placebo and patients, 64 males and 76 females existed. There was no meaningful difference between the two groups ( $P = 1$ ). The average age range in the males and females under the study was  $49.4 + 7.1$  and  $47.5 + 6.7$ , respectively. There was no difference between the genders based on T score ( $P = 0.24$ ).

The average thickness of intima media in two groups, consist of placebo and patients,

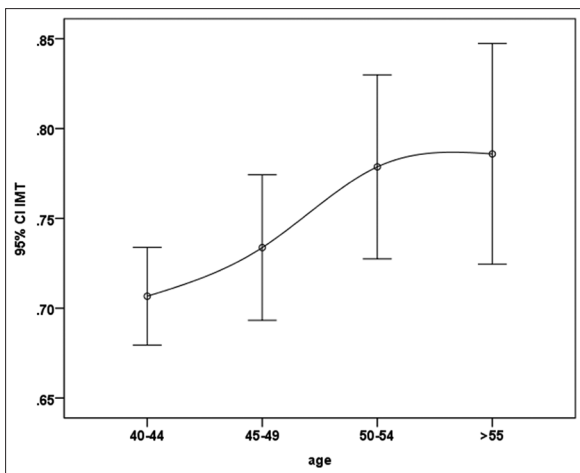
**Table 1:** Age distribution in two groups

Group age	Control placebo		Type D personality		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
40-45	26	37/1	34	48/6	60	42/9
45-49	10	14/3	6	8/6	16	11/4
50-54	14	20	16	22/9	30	21/4
Or older 55	20	28/6	14	20	37	24/3
Total	70	100	70	100	140	100

$P=0.65$

was  $0.739 \pm 0.12$  and  $0.759 \pm 0.14$  millimeter, respectively. There was no meaningful difference between the two groups based on *t*-test values ( $P = 0.19$ ). It is important to note that based on the results, 22.9% of placebos and 48.6% of individuals with type D personality presented with abnormal thickness. The difference between the two groups were meaningful based on Chi-Squared test ( $P = 0.001$ ) [Table 2].

The intimal thickness in patients in the age range of 40 to 44 years determined to be  $0.71 \pm 0.11$  mm. It was  $0.73 \pm 08$  mm in individuals between 45-49 years of age;  $0.78 \pm 0.14$  mm in 50-54 years old patients; and greater than  $0.79 \pm 0.18$  mm in 55 years old or older patients. Based on the one way analysis of variance, there was a meaningful relation between age group and intima media thickness ( $P = 0.016$ ). In Figure 1, the mean and confidence interval of intima thickness is shown based on the age group. Furthermore, the Pearson correlation test showed a 35% direct correlation between age and intima thickness. The result is statistically meaningful ( $P = 0.003$ ). The correlation between the age and intima thickness is shown in Figure 2.



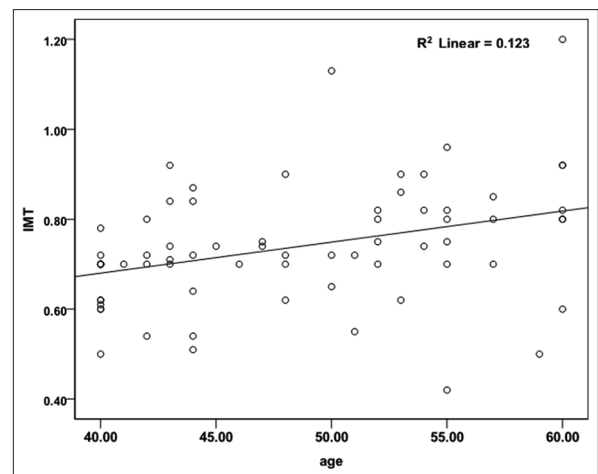
**Figure 1:** Mean and confidence interval of intima thickness based on the age

The average intima thickness in males and females under study was  $0.74 \pm 0.14$  and  $0.73 \pm 0.13$ , respectively. There was no meaningful difference between the genders based on *t*-test score ( $P = 0.84$ ).

## DISCUSSION

The main purpose of this study is to compare the intima-media thickness in individuals between the age of 40-60 years old with typed personality and the ones without type D personality. In this study, a group of patients, based on personality questionnaire, was determined to have type D personality. The thickness of intima media in this group was compared with the normal group. There was no meaningful age difference between the two groups, and consequently the influence of age and gender, which both affect the thickness of carotid artery, was eliminated. As a result, the changes observed in carotid artery thickness were probably due to the influence of type D personality.

Based on the obtained results the average thickness of intima-media in two groups of placebo and patients were  $0.739 \pm 0.12$  and  $0.759 \pm 0.14$  mm, respectively. There was no meaningful difference between the two groups.



**Figure 2:** Correlation between age and intima thickness

**Table 2:** Frequency distributions of IMT in case and control groupss

Groups IMT thickening	Control		Type D personality		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Normal	54	77/1	36	51/4	90	64/3
Abnormal	16	22/9	34	48/6	50	35/7
Total	70	100	70	100	140	100

IMT=Intima media tickness

22.9% of placebos and 48.6% of individuals with type D personality had abnormal intima thickness. The observed difference between the two groups was meaningful. In various studies, it is shown that type D personality adversely affects the thickness of intima-media due to higher blood cortisol level.<sup>[1]</sup> The increase in cortisol level is a factor that increases intima thickness. The risk of cardiovascular disease, dyslipidemia, and insulin resistance also increases in these individuals.<sup>[1]</sup> In two different studies done by Yan and Denollet in 1995 and 2003, it is shown that type D personality is an independent factor in MI occurrence in addition to unfavorable prognosis and high morbidity and mortality among cardiac and post bypass surgery patients. Type D personality is also a predictor of coronary artery re-occlusion after PCI in patients with ischemic heart disease (IHD).<sup>[2,15]</sup> There are number of evidences showing that type D personality is an important predictor of ischemic diseases<sup>[16]</sup> congestive heart failure,<sup>[17]</sup> a 4 to 8 fold increase in heart attack mortality,<sup>[8,18]</sup> and hypertension.<sup>[5,16]</sup>

In addition to personality type, other factors such as dyslipidemia, psychological disorders, genetic factors, and other diseases contribute to increase in carotid artery thickness. It is difficult to distinguish the influence of each factor separately on the population with similar social and genetic back rounds. Therefore, more studies and higher volume of participants are required to determine the rule of each and every factor that may contribute to increase in carotid artery thickness. Sher and associates, in a study in 2005, found out that personality type increases the risk of cardiovascular diseases. They also concluded that individuals with a stressful life and the ones who are more sensitive to stressful situations are at a higher risk of developing cardiovascular diseases. The increase in catecholamine and cortisol level leads to arterial vasospasm, especially in the coronary and cerebral arteries and consequently the increase in the risk of MI and stroke.<sup>[1]</sup>

It is important to note that some patients with psychological disorders and individuals with type D personality and personalities associated with negative affect are susceptible to recurrent psychosomatic disorders, in addition to coronary artery disease. There are no specific pathologic findings in these patients and physicians tend to relate these diseases

to psycho affective conditions.<sup>[4]</sup> These patients are discharged from hospitals due to lack of evidence for cardiovascular diseases. However, patients with negative personalities such as type D personality present with hormonal imbalance that over a period of time predisposes them to hypertension, angina, vascular related headaches and even subarachnoid hemorrhage (SAH). Therefore ignoring the important role of psychological diseases in cardiovascular diseases and cerebral accidents could result in poor outcome in these patients. On the other hand, when there is no pathological finding in cardiovascular diseases and psychological origin as the contributing factor is considered, many patients do not seek treatment for their psychological conditions. In general, type D personality and stress is not considered as one of the risk factors for cardiovascular diseases. However, the long term effect of these conditions could adversely affect the patient's cardiovascular health. On the other hand, individual with negative attitude toward life, present with higher prevalence of psychiatric problems, stress, palpitation, higher blood pressure and psychosomatic symptoms. These factors consequently lead to increase in stress level and a vicious cycle forms. The combination of hypertension, palpitation, dyspnea in one hand and increase in stress level and psychological factors on the other hand have an synergistic effect an adversely influence the patient well-being.<sup>[1,6,19]</sup> There is an increase in tobacco addiction and illicit drug abuse In individuals with type D personality due to the presence of anxiety and decreased stress tolerance threshold. Tobacco smoking and illicit drug s are important risk factors for cardiovascular and atherosclerotic diseases. We conclude that type D personality increases the risk of cardiovascular diseases specially the stroke and Myocardial infarction due to the higher prevalence of hormonal imbalances leading to arterial vasospasm and atherosclerotic disease. As a result, it is necessary to evaluate and treat these patients due to increased risk of atherosclerotic diseases, stoke, and MI.

## REFERENCES

1. Sher L. Type D personality: The heart, stress, and cortisol. *Q J Med* 2005;98:323-9.
2. Yan LL, Liu K, Matthews KA, Daviglius ML, Ferguson TF, Kiefe CI. Psychosocial factors and risk of hypertension:

- The coronary artery risk development in young adults (CARDIA) study. *JAMA* 2003;290:2138-48.
3. Denollet J. DS14: Standard assessment of negative affectivity, social inhibition, and Type D personality. *Psychosom Med* 2005;67:89-97.
  4. Denollet J. Type D personality. A potential risk factor refined. *J Psychosom Res* 2000;49:255-66.
  5. Habra ME, Linden W, Anderson JC, Weinberg J. Type D personality is related to cardiovascular and neuroendocrine reactivity to acute stress. *J Psychosom Res* 2003;55:235-45.
  6. Bagherian R. An Exploratory Investigation of Predictors of Depression Following Myocardial Infarction. Tehran: University of Tehran; 2007.
  7. Denollet J, Sys SU, Stroobant N, Rombouts H, Gillebert TC, Brutsaert DL. Personality as independent predictor of long-term mortality in patients with coronary heart disease. *Lancet* 1996;347:417-21.
  8. Pedersen SS, Lemos PA, van Vooren PR, Liu TK, Daemen J, Erdman RA, *et al.* Type D personality predicts death or myocardial infarction after bare metal stent or sirolimus-eluting stent implantation: A rapamycin-eluting stent evaluated at rotterdam cardiology hospital (RESEARCH) registry substudy. *J Am Coll Cardiol* 2004;44:997-1001.
  9. Matthews KA, Owens JF, Kuller LH, Sutton-Tyrrell K, Jansen-McWilliams L. Are hostility and anxiety associated with carotid atherosclerosis in healthy postmenopausal women? *Psychosom Med* 1998;60:633-8.
  10. Graves PL, Mead LA, Wang NY, Liang KY, Klag MJ. Temperament as a potential predictor of mortality: Evidence from a 41-year prospective study. *J Behav Med* 1994;17:111-26.
  11. Kupper N, Denollet J, de Geus EJ, Boomsma DI, Willemsen G. Heritability of type-D personality. *Psychosom Med* 2007;69:675-81.
  12. Conraads VM, Denollet J, De Clerck LS, Stevens WJ, Bridts C, Vrints CJ. Type D personality is associated with increased levels of tumour necrosis factor (TNF)-alpha and TNF-alpha receptors in chronic heart failure. *Int J Cardiol* 2006;113:34-8.
  13. Pedersen SS, Schiffer AA. The distressed (Type D) personality. A risk marker for poor health outcomes in ICD patients. *Herzschrittmacherther Elektrophysiol* 2011;22:181-8.
  14. Aquarius AE, Denollet J, Hamming JF, De Vries J. Role of disease status and Type D personality in outcomes in patients with peripheral arterial disease. *Am J Cardiol* 2005;96:996-1001.
  15. Denollet J, Sys SU, Brutsaert DL. Personality and mortality after myocardial infarction. *Psychosom Med* 1995;57:582-91.
  16. Pedersen SS, Denollet J. Is Type D personality here to stay? Emerging evidence across cardiovascular disease patient groups. *Curr Cardiol Rev* 2006;2:205-13.
  17. Schiffer AA, Pedersen SS, Widdershoven JW, Hendriks EH, Winter JB, Denollet J. The distressed (type D) personality is independently associated with impaired health status and increased depressive symptoms in chronic heart failure. *Eur J Cardiovasc Prev Rehabil* 2005;12:341-6.
  18. Denollet J, Vaes J, Brutsaert DL. Inadequate response to treatment in coronary heart disease: Adverse effects of type D personality and younger age on 5-year prognosis and quality of life. *Circulation* 2000;102:630-5.
  19. Pedersen SS, Denollet J. Type D personality, cardiac events, and impaired quality of life: A review. *Eur J Cardiovasc Prev Rehabil* 2003;10:241-8.

**Source of Support:** Nil, **Conflict of Interest:** None declared.