

BRIEF COMMUNICATION

Personality and risk of cancer in men with coronary heart disease

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**ABSTRACT**

**Background.** There still is much debate with regard to the role of psychosocial factors in cancer. Evidence suggests that cancer and coronary heart disease (CHD) may have common causes. This study examined the role of pessimism, anxiety and personality in the development of cancer among men who had been diagnosed with CHD but were free of cancer at baseline.

**Methods.** Two hundred and forty-six men who were treated for CHD, but were free of cancer, filled out psychological scales at baseline. Patients and their families were contacted after 6–10 years to determine the incidence of cancer.

**Results.** At follow-up, 12 patients (5%) had been diagnosed with cancer (9 cancer deaths). Development of cancer was unrelated to cardiac pathology but was associated with age  $\geq 56$  years, poor exercise tolerance, pessimism and anxiety. The rate of cancer was  $8/60 = 13\%$  for men with a distressed personality (type-D) and  $4/186 = 2\%$  for non-type-D men ( $P = 0.002$ ); rate of cancer death was 10% and 2%, respectively ( $P = 0.007$ ). Type-D refers to the interaction between high negative affectivity and high social inhibition. Regression analysis yielded older age (odds ratio 4.6, 95% CI 1.5–14.3) and type-D (odds ratio 7.2, 95% CI 2.9–18.1) as independent prognostic factors for cancer.

**Conclusions.** Type-D personality was a prognostic factor for the development of cancer in men with established CHD. Psychosomatic research should take a broad enough view of the specific and the global psychosocial variables that may play a role in both cancer and CHD.

**INTRODUCTION**

Cancer refers to diseases that are characterized by unregulated growth causing the local disruption of normal tissue by tumour cells and the metastasis of tumour cells in distant organs. Although this is a controversial issue, there is some evidence to suggest that personality traits such as trait-depression (Persky *et al.* 1987) or being a 'loner' (Shaffer *et al.* 1987) are associated with development of cancer. Accordingly, pessimism (Schulz *et al.* 1996) and introversion (Hislop *et al.* 1987) have also been associated with a poor prognosis in patients who already

had been diagnosed with cancer. In addition, Type C coping has been proposed as a construct that refers to a cancer-prone personality. This Type C construct denotes a complex constellation of attitudes, cognitive and emotional proclivities, verbal and non-verbal expressive patterns, specific coping strategies, and more general character styles that have been studied in relation to cancer-proneness (Temoshok *et al.* 1985). In essence, Type C individuals are individuals who are cooperative and unassertive, who tend to suppress negative emotions (particularly anger), and who accept/comply with external authorities.

Evidence suggests that cancer and coronary heart disease (CHD) may have common causes so that risk factors for CHD also might promote cancer (Thom & Epstein, 1994). With reference

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to this issue, previous research identified a discrete personality type that may predispose patients with CHD to adverse health outcomes. That is, cluster analysis yielded a personality subtype of coronary patients who tended to experience negative emotions (i.e. high score on negative affectivity) and simultaneously tended to inhibit self-expression (i.e. high score on social inhibition) (Denollet & De Potter, 1992). By analogy with this empirically generated model, a median split on negative affectivity and social inhibition scales was used as a definition of this 'distressed' personality type or type-D (Denollet *et al.* 1995).

Hence, coronary patients with this type-D personality are characterized by the chronic suppression of a wide variety of negative emotions across time and situations. As a result, these patients are likely to experience difficulties in the areas of emotional and social health; they may report high levels of depressive symptomatology and psychological stress, and low levels of perceived social support (Denollet *et al.* 1995). Eventually, these emotional and social difficulties of type-D patients may result in hard medical endpoints, including long-term cardiac death (Denollet *et al.* 1996). The goal of the present study was to examine the role of type-D personality, pessimism and anxiety in the incidence of cancer among men with CHD.

## METHOD

Subjects were drawn from an original cohort of 303 patients with CHD (Denollet *et al.* 1996). Patients were eligible for the present study if: (a) they were free from cancer at baseline, i.e. were asymptomatic and had normal physical exams, other than for CHD; and (b) had no history of cancer prior to the coronary event. Patients who died from cardiac causes during follow-up ( $N = 24$ ) were excluded in the study; type-D has been shown to be an independent prognostic factor for cardiac death (Denollet *et al.* 1996). None of the 33 women in the remaining cohort developed cancer during follow-up; due to lack of statistical power, the subgroup of female patients with CHD was excluded from further analyses. Hence, the final sample in the present study consisted of 246 men with CHD, aged 31–79 years (mean = 55.2). These men participated in the Antwerp rehabilitation programme (Denollet

*et al.* 1996); medical care in the follow-up interval consisted of a routine cardiologic check-up every 6 months.

In order to control for cardiac pathology, left ventricular dysfunction (ejection fraction  $\leq 40\%$ ), great extent of CHD (three vessels with  $\geq 70\%$  reduction in internal diameter), and calcium-channel blocker or  $\beta$ -blocker therapy at discharge from the rehabilitation programme were included in the study. Standard risk factors for cancer included older age ( $\geq 56$  years), failure to quit smoking, and poor exercise tolerance (peak work load on an exercise stress test 6 weeks after the coronary event  $\leq 150$  watt for younger and  $\leq 130$  watt for older patients). At entry in the rehabilitation programme, patients filled out a number of psychological scales. A cut-off at the 60th percentile on the Pessimism scale of the Millon Behavioral Health Inventory (Millon *et al.* 1982) and the State Anxiety Scale (Van Der Ploeg *et al.* 1980) was used to classify patients as being high in pessimism ( $\geq 10$ ) and anxiety ( $\geq 43$ ), respectively. High scores on the Pessimism scale may affect the promotion of cancer (Goodkin *et al.* 1986).

The Trait Anxiety Scale (Van Der Ploeg *et al.* 1980) and the Social Inhibition scale of the HPPQ (Erdman, 1982) were used as measures of negative affectivity and social inhibition. As described previously (Denollet *et al.* 1996), type-D is defined by the interaction of these traits as indicated by test scores above the medians for both scales; 60 patients were classified as type-D (negative affectivity  $\geq 43$  and social inhibition  $\geq 12$ ) and 186 patients as not type-D. Social inhibition denotes the tendency to inhibit the expression of emotions and behaviors in social interaction. The six-item social inhibition scale that was used in this study: (a) was validated in a sample of 1649 cardiac patients; (b) is psychometrically sound; (c) is negatively correlated with extraversion ( $r = -0.46$ ); and (d) focuses on the interpersonal dimension of introversion, e.g. 'I am rather shy when I am in the company of strangers' and 'I often find myself taking charge in group situations' (Erdman, 1982). This scale does not tap the intrapsychic dimensions of extraversion (i.e. positive affect, energy and excitement seeking).

After 6–10 years (mean follow-up = 7.8 years) patients and their families were contacted to

determine the end points in this study; i.e. diagnosis of cancer and cancer death. Mortality data were derived from hospital records and discussed with the patient's attending physician. Chi-squared and Fisher's exact test were used to examine the association between differences in biomedical/psychosocial factors and development of cancer. Logistic regression analysis was used to determine the prognostic value of pessimism, anxiety and personality. Criteria for entry ( $P \leq 0.05$ ) and removal ( $P > 0.05$ ) were based on the likelihood ratio test.

**RESULTS**

There were no patients lost to follow-up. After 6–10 years, 12 patients (5%) had been diagnosed with cancer; there were nine cancer deaths and three cancer cases who were still alive. Site of cancer was gastrointestinal (3), blood/lymph (3), lung (3), prostate (2) and colon (1). The mean interval between entry in the study and the occurrence of cancer events was 4.1 years; only one patient developed cancer within the first year of the study. Hence, it is unlikely that cancer patients were developing the disease at the time they filled out the psychological scales.

Development of cancer was not associated with the severity of cardiac disease (LVEF  $\leq 40\%$ , three-vessel disease) or medical treatment (calcium-channel blockers,  $\beta$ -blockers). Devel-

opment of cancer was, however, associated with age  $\geq 56$  years ( $P = 0.04$ ) and pessimism ( $P = 0.03$ ) at baseline (Table 1), and marginally significant with poor exercise tolerance and anxiety. Cancer death was associated with poor exercise tolerance and pessimism ( $P < 0.05$ ). Type-D personality was also associated with cancer (Table 1); i.e. incidence of cancer was 8 out of 60 for type-D (13%) versus 4 out of 186 for non-type-D (2%) patients,  $P = 0.002$ . Rate of cancer death was 10% for type-D patients and 2% for non-type-D patients,  $P = 0.007$ .

A logistic regression model using biomedical and psychosocial factors (but not personality) yielded three independent predictors of cancer development: age  $\geq 56$  years ( $P = 0.01$ ), poor exercise tolerance ( $P = 0.05$ ) and pessimism ( $P = 0.007$ ). When type-D was added to this model, the final variables in the equation included age  $\geq 56$  years (odds ratio 4.6, 95% CI 1.5–14.3;  $P = 0.009$ ) and type-D personality (odds ratio 7.2, 95% CI 2.9–18.1;  $P < 0.0001$ ) but not pessimism. *Post-hoc* analyses indicated that type-D patients were higher in pessimism and anxiety than non-type-D patients,  $P < 0.00001$ . Hence, pessimism or anxiety did not add to the predictive power of personality regarding the development of cancer. Type-D was also an independent predictor of cancer death (odds ratio 5.5, 95% CI 1.9–16.1;  $P = 0.002$ ).

Table 1. Baseline characteristics according to development of cancer

Baseline characteristics	Health status at 6–10 years				P*
	Cancer-free survival (N = 234)		Development of cancer (N = 12)		
	%	(N)	%	(N)	
Cardiac pathology					
LVEF $\leq 40\%$	12	(29)	25	(3)	NS
Three-vessel disease	40	(93)	33	(4)	NS
Calcium-channel blockers	30	(70)	25	(3)	NS
$\beta$ -blockers	49	(114)	42	(5)	NS
Standard risk factors					
Age $\geq 56$	53	(124)	83	(10)	0.04
Smoking post-rehabilitation	24	(55)	17	(2)	NS
Poor exercise tolerance	47	(109)	75	(9)	0.05
Psychosocial factors					
Pessimism	43	(100)	75	(9)	0.03
Anxiety	39	(90)	67	(8)	0.05
Type-D personality	22	(52)	67	(8)	0.002

LVEF, left ventricular ejection fraction.

\* Univariate analysis; NS, not significant (i.e.  $P > 0.10$ ).

**DISCUSSION**

A striking result emerged from the present data, indicating that type-D personality and age  $\geq 56$  years were independent prognostic factors for the development of cancer among men with established CHD. Consistent with previous research (Schulz *et al.* 1996), pessimism was associated with development of cancer in univariate analysis. However, anxiety as well was marginally significant associated with cancer and multivariate analyses indicated that these specific psychosocial factors did not add to the predictive power of type-D personality.

Given the limited number of patients and events, these findings must be interpreted cautiously. Numbers of the individual cancers were too small to permit examination of any site-specific relations between cancer and personality. Furthermore, the present sample did not include

women, and the association between personality and cancer that was found in the present study may not be replicable in non-CHD populations. Finally, this association was based on findings drawn from a study that used total mortality as major endpoint (Denollet *et al.* 1996) and, therefore, needs to be replicated in confirmatory research.

The present findings are, however, consistent with previous reports suggesting that depression/pessimism (Persky *et al.* 1987; Schulz *et al.* 1996), introversion/being a 'loner' (Hislop *et al.* 1987; Shaffer *et al.* 1987) and suppressed emotions (Temoshok *et al.* 1985) are associated with cancer; i.e. type-D patients are prone to each of these psychosocial factors (Denollet *et al.* 1995, 1996). Although there exist some similarities between Type C coping and type-D personality, there are a number of conceptual differences between both constructs: (a) Type C coping has been proposed as the opposite of Type A behaviour (Temoshok *et al.* 1985) whereas type-D is basically unrelated to Type A (Denollet *et al.* 1996); (b) Type C reflects a conglomerate of psychosocial variables whereas type-D is based on the interaction of two global personality dispositions; and (c) Type C predominantly focuses on inhibited self-expression whereas type-D also focuses on the tendency to experience negative emotions.

The fact that type-D was associated with both cardiac (Denollet *et al.* 1996) and cancer death suggests that it represents a non-specific risk factor for poor health outcomes in general. This notion is at variance with the proposition that biobehavioural research should not focus on global psychological constructs but needs to focus on specific psychological phenomena such as pessimism (Schulz *et al.* 1996). However, this research needs to take a broad enough view by including both specific and global measures; accordingly, the present study focused on both specific (i.e. pessimism and anxiety) and global (i.e. type-D personality) constructs.

Little is known about the incidence of cancer in patients with CHD. The findings of the present study warrant more research on this issue. As noted earlier, there may be common risk factors for cancer and CHD (Thom & Epstein, 1994). There is some evidence to suggest that both cancer (Ader *et al.* 1995) and CHD (Kop, 1994; Libby, 1995) may be promoted by

dysfunctions in the immune system, and that psychosocial stress is related to changes in the immune system (Ader *et al.* 1995). Type-D patients – given their susceptibility to chronic stress – might be at risk for alterations in the immune system that may promote disease, but this is a very speculative point. There are a large number of other stress-related phenomena, including endocrine processes and unhealthy behaviours, that may act as possible mediators. However, evidence presented in this paper precludes any conclusions regarding the disease process; it only suggests that chronic psychosocial stress may promote carcinogenic processes.

The present findings are provocative because they are based on specific as well as global psychological measures, and a long-term follow-up interval. These findings suggest that emotional stress may promote the development of cancer in men with established CHD, and that type-D personality may account for this relation between emotional stress and cancer. Once again, these findings are preliminary and need replication. Recently, a 16-item scale was developed that allows for a quick, reliable assessment of type-D (Denollet, 1998). The present study showed that assessment of type-D may benefit research on cancer and CHD.

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