CLINICAL RESEARCH

Effect of attitudes and beliefs on exercise tolerance in chronic bronchitis

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Abstract

In 50 patients with chronic bronchitis the relation was assessed between exercise tolerance and pulmonary function and psychological factors, including subjective perception of exertion, mood, general psychiatric disturbance, and the attitudes and beliefs held by patients concerning themselves, their illness, and its treatment. Ventilatory capacity was significantly correlated with but a poor predictor of exercise tolerance. Subjective perception of exertion was most closely correlated with exercise tolerance. The distance walked in a 12-minute exercise test was significantly correlated with measurements of mood and with several attitudes and beliefs. Attitudes and beliefs greatly outweighed measurements of mood and ventilatory capacity as components in a multiple regression predicting distance walked in 12 minutes.

This method of psychological assessment emphasises the importance of attitudes and beliefs in respiratory disability and may have useful applications in rehabilitation in other chronic diseases.

Introduction

Chronic bronchitis with emphysema is a major cause of disability in the United Kingdom, and assessment of patients' disability is a common task for physicians.^{1,2} Measurement of pulmonary function is important in all cases, but in some patients other factors seem to contribute to their disability. Previous surveys

of patients with chronic bronchitis have shown a greater than expected degree of psychiatric morbidity,^{3,4} and patients considered to have bronchitis and disproportionate breathlessness who were referred to Burns and Howell⁵ displayed features of both psychiatric disturbance and personality disorder. We previously used the 12-minute walking test as a useful test of everyday disability in patients with chronic bronchitis^{6,7} but noted that its correlation with ventilatory capacity was not strong. Factors affecting effort and motivation must also be important, and we have therefore examined mood and general psychiatric disturbance, together with patients' beliefs and attitudes concerning their illness, to see whether such factors are related to physical performance.

Patients and methods

Patients were selected from those attending several respiratory clinics. All had chronic bronchitis fulfilling criteria laid down by the Medical Research Council⁸ together with airway obstruction and dyspnoea of Medical Research Council grades 3-5. They had not been referred on account of disproportionate breathlessness, gave no history of psychiatric illness, and were not taking antidepressant or anxiolytic drugs. We excluded patients who also had other medical conditions, such as cardiovascular or locomotor disorders, that would limit exercise tolerance. All patients who were approached agreed to participate.

Forced expired volume in one second and forced vital capacity were measured using a water-filled spirometer. The 12-minute walking distance⁶ was measured twice, with a rest of 20 minutes between tests, the better result being used in analysis. At the end of each walk the patients were asked to estimate their effort using Borg's scale of perceived exertion.⁹ Arterial blood was drawn from the brachial artery under local anaesthesia and analysed with Radiometer electrodes. Arterial samples were taken on the day of the tests from most patients, or within the preceding week from some who had recently been inpatients and were in a stable state.

Psychological assessments were of two kinds. In the first, mood disturbance was assessed with the multiple affect adjective checklist.¹⁰ Before walking the patients were asked to describe their feelings by selecting appropriate words from a list of 132 adjectives, from which numerical scores for anxiety, depression, and hostility were then derived. General psychiatric disturbance was assessed with the general health questionnaire, which provides a measure of non-specific psychiatric morbidity.¹¹ Secondly, attitudes and beliefs were measured by means of the semantic differential.¹² The patients were asked to consider certain beliefs and concepts about themselves, their illness,

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and its treatment; the concepts were set out as headings, below each of which was a set of pairs of adjectives of opposite meaning lying at each end of seven-point scales. The patients responded by marking an appropriate point on the scale between each pair, thus providing a numerical score. The concepts devised by Rutter¹³ were adapted for this study and are listed in table I, together with an example of the pairs used.

Values are given as means $\pm$ 1 SD wherever appropriate. Correlation and multiple regression analysis were carried out using the SCSS system.¹⁴

TABLE I—Semantic differential, showing concepts used and example * of adjective scales (after Rutter¹³)

What I think my treatment will be like: The treatment I receive will be successful*
My bronchitis: My bronchitis is a long-term condition
Myself: Myself as I would like to be
My family: The effect of my bronchitis on my family
Physical exercise: Physical exercise is good for me
Smoking: My general health

*Patients marked off an appropriate point between each pair of adjectives:

Unlikely	—	—	—	—	—	—	Likely
Possible	—	—	—	—	—	—	Impossible
Improbable	—	—	—	—	—	—	Probable
True	—	—	—	—	—	—	False

Results

Fifty patients (38 men, 12 women) took part in the study; their ages ranged from 42 to 70 years (mean 60.5 ± 6.8 years). A wide range of ventilatory impairment was represented, with forced expired volume in one second ranging from 0.25 to 3.5 l (mean 0.97 ± 0.6 l) and forced vital capacity from 1.1 to 5.2 l (mean 2.59 ± 0.96 l), both measured at body temperature, pressure, and saturation. The range of arterial oxygen pressure was from 10.4 to 6.4 kPa (78 to 48 mm Hg) (mean 8.4 ± 1.1 kPa (63 ± 8 mm Hg)) and arterial carbon dioxide pressure from 4.4 to 7.2 kPa (33 to 54 mm Hg) (mean 5.5 ± 0.8 kPa (41 ± 6 mm Hg)). The 12-minute walking distance ranged from 205 to 1460 m (mean 794 ± 290 m).

As in previous studies^{6,7} a significant correlation was found between ventilatory capacity and 12-minute walking distance, but the correlation coefficients for forced expired volume in one second ($r=0.26$, $p<0.05$) and forced vital capacity ($r=0.29$, $p<0.02$) were lower than previously reported. Of the variables studied, perceived exertion correlated most strongly ($r=-0.49$, $p<0.001$) with 12-minute walking distance and was not itself significantly correlated with either forced expired volume in one second or forced vital capacity. Arterial oxygen and carbon dioxide pressures were not significantly correlated with the 12-minute walking distance.

PSYCHOLOGICAL FACTORS

A score greater than four out of 30 on the general health questionnaire has been taken to indicate the presence of general psychiatric disturbance,¹¹ and 39 of the 50 patients had scores greater than this. Despite this evidence of psychiatric morbidity the individual scores did not correlate significantly with the distance walked. In contrast, scores for disturbances of mood assessed with the multiple affect adjective checklist in 49 patients showed significant negative correlations of increasing strength with anxiety ($r=-0.28$, $p<0.05$), hostility ($r=-0.38$, $p<0.02$), and depression ($r=-0.43$, $p<0.001$). When beliefs and attitudes were analysed many beliefs held by the patients, particularly fear of exercise and negative attitudes towards treatment, correlated negatively with walking distance. Positive attitudes, with confidence in the value of treatment and taking exercise, correlated positively with exercise tolerance (table II).

We performed stepwise multiple regression analysis in 46 cases as some data from the semantic differential were missing in four. The analysis was carried out on all the factors that correlated significantly with walking distance, and permitted identification of those factors having independent effects and removal of those that were inter-correlated. Many factors including the scores obtained with the multiple affect adjective checklist, which describe mood, were thus eliminated. The remaining independent factors that contributed significantly ($p<0.05$) to variance in the 12-minute walking test were: perceived exertion (percentage variance 27%); "treatment 'will cure me'" 14%; "my bronchitis 'is bad'" 14%; "myself as I would like

TABLE II—Correlations between walking distance and attitudes and beliefs measured by semantic differential

Concept	Patient's belief	r	p
My treatment	"Unsafe"	-0.3	<0.02
	"Unsuccessful"	-0.31	<0.02
	"Likely to be successful"	0.31	<0.02
	"Probably successful"	0.32	<0.02
	"Will cure me"	0.39	<0.01
My bronchitis	"Is very bad"	-0.27	<0.02
	"Causes financial worries"	-0.3	<0.02
Myself as I would like to be	"Delicate"	0.46	<0.001
Effect of my bronchitis on my family	"Bad"	0.25	<0.05
	"Small"	0.27	<0.05
Physical exercise	"Dangerous"	-0.3	<0.02
	"Good"	0.3	<0.02
Smoking	"Awful"	0.29	<0.05

to be—'delicate'" 13%; "my treatment 'will be successful'" 4% forced vital capacity 4%; and "smoking is awful" 3%. (The percentage variance accounted for by each variable is the contribution of that variable once any variable higher in the list has been accounted for.) Thus subjective perception of exertion was the factor that accounted for the largest proportion of the variance in distance walked. The remaining psychological factors all represented attitudes and beliefs derived from the semantic differential and accounted for a substantial proportion of variance. Of the measurements of pulmonary function, only forced vital capacity remained in this analysis, and it accounted for only a small proportion of variance. The multiple regression equation read as follows: predicted 12-minute walking distance (m) = $561.5 - 36 \times$ perceived exertion + $52 \times$ "treatment will cure me" - $8 \times$ "bronchitis is bad" + $67 \times$ "wish to be delicate" + $49 \times$ "treatment will be successful" + $0.6 \times$ forced vital capacity + $28 \times$ "smoking awful" (multiple $r=0.89$, $p<0.001$).

Discussion

Ventilatory capacity is a poor predictor of exercise tolerance in chronic bronchitis, whether estimated by the patient¹⁵ or measured by a walking test.⁷ The wide prevalence of non-specific psychiatric disturbance in patients with chronic bronchitis is also well established.³ Our results indicate that impairment of everyday physical performance is more closely related to mood, especially depression, than to the non-specific disturbance estimated by the general health questionnaire. When attitudes and beliefs are measured by techniques familiar in applied psychology they in turn appear to be of greater importance than disturbances of mood or measurements of ventilatory capacity in predicting everyday exercise tolerance in chronic bronchitis. In almost every instance (the exception being the wish for oneself to be delicate) these measurements quantify what many physicians believe intuitively. Measurement of attitudes and beliefs should therefore be of particular value in other types of chronic disability in which organic and psychological factors interact. Conditions such as angina pectoris, intermittent claudication, and chronic arthritis would seem particularly suitable for investigation. Measurement of beliefs should also accompany objective measurements of performance in the investigation of any type of disability, and both deserve to be given a more prominent place in the traditional clinical history and examination than they have in the past.

In recent studies we noted that the 12-minute walking distance was improved after administration of bronchodilator drugs but that combined bronchodilator treatment producing further bronchodilation did not lead to a further increase in walking distance.^{16,17} The present study helps to explain these findings by showing how small a part ventilatory capacity seems to play in predicting 12-minute walking distance. It also emphasises the importance of the patient's own estimate of the severity of exercise in determining his performance. The findings also suggest that in chronic bronchitis, when limitation of airflow may be only partially relieved by bronchodilators,

greater emphasis should be given in rehabilitation to attempts to alter attitudes and beliefs. Structured supportive counselling, aimed at increasing confidence and reducing fear, may provide a means of considerably reducing disability.

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Low phospholipid arachidonic acid values in diabetic platelets

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Abstract

Platelet aggregation is enhanced in diabetes mellitus, and platelets may be implicated in the pathogenesis of diabetic angiopathy. Increased platelet aggregation is probably mediated by the production of the proaggregatory prostaglandin thromboxane, which is synthesised from arachidonic acid (C20:4) by the action of the platelet enzymes cyclo-oxygenase and thromboxane synthetase.

The fatty acid composition of platelet phospholipid was measured in 20 normal controls, 10 insulin-treated diabetics with no or minimal retinopathy, and 10 insulin-treated diabetics with proliferative retinopathy. The percentage of arachidonic acid was significantly higher in controls (mean 22.6%) than in the diabetics with no or minimal retinopathy (mean 18.5%; $p < 0.025$) and the diabetics with proliferative retinopathy (mean 14.6%; $p < 0.001$). The percentage of linoleic acid was lower in controls (mean 8.9%) than in the diabetics with no or minimal retinopathy (mean 12.6%; $p < 0.01$) and diabetics with proliferative retinopathy (mean 13.1%; $p < 0.001$). The mean percentage of linolenic acid was significantly lower in the diabetics with proliferative retinopathy (2.7%) than in the normal control group (4.4%; $p < 0.01$). A significant negative correlation was found between the percentages of arachidonic acid and

glycosylated haemoglobin ($R_s = -0.58$; $p < 0.001$). A significant positive correlation was found between linoleic acid and the percentage of glycosylated haemoglobin ($R_s = 0.51$; $p < 0.01$).

The reciprocal correlation between percentages of arachidonic acid and glycosylated haemoglobin suggests that diabetic control may influence thromboxane release and platelet activity directly and that low percentages of arachidonic acid reflect the increased degree of in-vivo activation.

Introduction

The control of platelet aggregation is influenced by two conflicting prostaglandins. Thromboxane A_2 is synthesised and released by platelets and promotes aggregation,¹ while prostacyclin is produced by vascular endothelium and is antiaggregatory.² Disturbed metabolism of either of these has been suggested as the cause of increased platelet aggregation in diabetes.^{3,4}

Raised circulating concentrations of thromboxane B_2 (the metabolite of thromboxane A_2) have been shown in diabetics with retinopathy, though thromboxane production by platelets in vitro was low or normal.⁴

We have studied the phospholipid fatty acid composition of platelets from diabetics with minimal background or severe proliferative retinopathy because arachidonic acid represents the crucial substrate for production of thromboxane A_2 . We also studied the relation between glycaemic control and altered composition of platelet fatty acids.

Patients and methods

We studied three groups of subjects: 20 normal controls, 10 insulin-treated diabetics with no or minimal retinopathy, and 10

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