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Adjunct treatment with yoga in chronic severe airways obstruction

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Tandon, M K (1978). *Thorax*, **33**, 514–517. **Adjunct treatment with yoga in chronic severe airways obstruction.** Eleven patients with severe chronic airways obstruction were given training in yogic breathing exercises and postures. A matched group of 11 patients were given physiotherapy breathing exercises. Both groups of patients were followed up at monthly intervals for nine months with pulmonary function tests, tests of exercise tolerance, and inquiry into their symptoms.

After training in yoga the mean maximum work increased significantly by 60·55 kpm; whereas no such rise occurred after training in physiotherapy. This objective improvement was associated with symptomatic improvement in a significantly higher number of patients given training in yoga.

Long-term treatment of patients with chronic severe airways obstruction is generally regarded as an unrewarding task. Physical training given to patients with chronic severe airways obstruction has been shown to produce improvement in exercise performance (Christie, 1968; Alpert *et al*, 1974). Several studies using physiotherapy breathing exercises have failed to show any significant objective improvement in such patients (Sinclair, 1955; McNeill and McKenzie, 1955; Emirgil *et al*, 1969). Udupa and Singh (1972) suggested that yoga has some beneficial effect on respiratory function of normal persons as after training in "Hatha Yoga" there was an increase in vital capacity, lowered respiratory rate, and increased tolerance to physical stress.

There are no studies on the effect of yoga among patients with chronic severe airways obstruction. This study was carried out to find if training in yogic breathing exercises and postures produces any improvement in pulmonary function results and tests of exercise tolerance in a group of patients with chronic severe irreversible airways obstruction when compared with another similar group of patients given training in physiotherapy breathing exercises and general exercises to improve stamina.

Patients and methods

Twenty-four male patients aged under 65 with severe irreversible airways obstruction were requested to take part in the study. The patients had to be in a stable phase of their condition, and all on clinical, radiographic, and physiological grounds were considered to have chronic bronchitis with or without pulmonary emphysema. None of the patients had any evidence of myocardial ischaemia or cardiac failure. The patients were randomly allocated to the yoga or the physiotherapy groups. So far as possible they were requested not to change their medications during the study period, and they did not change their smoking habits.

Before starting training in yoga or receiving physiotherapy breathing exercises, the following tests were carried out:

(1) Estimation of arterial oxygen tension (Pao_2) and arterial carbon dioxide tension ($Paco_2$) from a sample obtained from radial artery at rest and analysed in duplicate on a Corning EEL 165/pH/Blood gas machine.

(2) Forced expiratory volume in one second (FEV_1) and slow vital capacity (VC) on a water-filled bell type Godart Expirograph Spirometer.

(3) Progressive exercise test on a bicycle ergometer was carried out to assess maximal exercise tolerance. Starting work load was 200 kilopond meters (kpm), and every minute it was increased by 50 kpm until the individual patient could not go on because of shortness of breath. During the exercise test, the patients, with their noses clipped,

breathed through a low resistance, small dead space, one-way breathing valve.

The mean tidal volume and expired minute ventilation were continuously measured by means of a low resistance Fleisch pneumotachograph (diameter 4·3 cm) and an integrator, and were recorded on a four-channel recorder. After passing through a baffle mixing chamber, the expired air was pumped through a paramagnetic oxygen analyser to measure the oxygen uptake. The heart rate was obtained from a three-lead electrocardiographic tracing, which was continuously monitored on an oscilloscope. The results for minute ventilation, mean tidal volume, oxygen uptake, and heart rate reported here represent the readings for the last minute of the highest work load tolerated by the patients.

After initial assessment of all patients had been completed, both the physiotherapy and the yoga groups were given training in the various physiotherapy and yogic manoeuvres[1] by a trained physiotherapist and a yogic teacher under medical supervision. The physiotherapy exercises comprised relaxation exercises for accessory respiratory muscles, lateral costal and diaphragmatic breathing exercises, and general leg and trunk exercises to improve stamina. The yogic manoeuvres comprised breathing exercises aimed at full use of entire abdominal and thoracic muscles and ten yogic postures to produce improvement of respiratory system function. Both groups received training for one hour three times a week for the first four weeks, twice a week for the next four weeks, and once a week thereafter for a total of nine months.

All patients were encouraged to practise all the breathing manoeuvres at home. Soon after starting training one patient in the physiotherapy group asked to be withdrawn from the study because of chest pains and vertigo, which he attributed to the physiotherapy breathing exercises. One patient in the yoga group developed a cervical disc injury while practising a yoga posture at home, and was advised to stop yoga.

This study was carried out from 1 September 1975 to 31 May 1976. The patients were followed up at monthly intervals by a personal interview to record any changes in their chest symptoms. Lung function testing was carried out by a technician who was not aware of the subject's regimen, and symptom analysis was carried out by a medical officer who also did not know the subject's treatment. Patients were divided into three categories:
(*a*) "Yes"—those patients who claimed a significant improvement as a result of the treatment given.
(*b*) "Marginal"—those patients who felt that they had derived some benefit from the treatment given but were uncertain if it was significant.
(*c*) "No"—those patients who denied any significant benefit from the treatment given.

The results of the various objective tests, done on a monthly basis for the nine-month follow-up period for each patient, were totalled and an average after treatment obtained by dividing the total by nine.

The mean after-treatment results for the various parameters were calculated from these averaged results. This was done to eliminate any variations during follow-up and to get an estimate of the overall change after the two forms of treatment.

The base line pulmonary function state and exertion tolerance of the two groups was tested for any significant difference by one-way analysis of variance. Students "*t*" test for paired observations was used to assess statistical significance of changes after two forms of treatments from their control values. Changes in symptoms after treatment in the two groups were tested for significance by the exact test for contingency table.

Results

The mean and range of ages and the number of smokers and non-smokers in the control physiotherapy and the yoga groups were similar (table 1).

Table 1 *Clinical and pulmonary function data before therapy. (Figures in parenthesis represent the range)*

	Yoga	*Control physiotherapy*	*"F" Statistic**	P
No of patients	12	12		
Age	60 years (53–65)	60 years (52–64)		
Smokers	7	7		
Non-smokers	5	5		
FEV_1 (l)	0·965 (0·54–131)	0·835 (0·46–1·30)	1·515	NS
VC (l)	2·565 (3·73–1·83)	2·438 (3·27–1·7)	1·92	NS
Pao_2 (mm of Hg)	66·47 (55·5–81·0)	64·84 (53·0–81·0)	0·177	NS
$PaCO_2$ (mm of Hg)	41·63 (36·6–51·0)	38 (30·0–44·3)	4·212	NS
Maximum work (kpm)	345 (200–450)	290 (200–500)	3·556	NS
Minute ventilation (l/mt)	27·7 (16–27)	22·5 (17–35)	3·331	NS
Mean tidal volume (l)	1·012 (0·72–1·33)	0·858 (0·71–1·16)	3·048	NS
Oxygen uptake (l/mt)	1·161 (0·67–1·46)	1·015 (0·68–1·401)	1·025	NS
Heart beats per minute	115·7 (108–124)	113·5 (95–138)	0·155	NS

*Analysed by the one way analysis of variance.

[1]Details of yogic breathing exercises and postures and physiotherapy breathing exercises can be obtained on request from the author.

The mean pretreatment results of all the objective tests for the yoga and the physiotherapy groups were not significantly different.

There was no significant change from control values of FEV_1, VC, Pao_2, and $Paco_2$ after training in yoga or physiotherapy breathing exercises (table 2). After training in yoga the maximum work tolerance of patients in this group increased significantly by 60·55 kpm (table 3). This increased work tolerance was associated with a significant increase in heart rate. There was no significant increase in tidal volume. During the nine-month follow-up period the exercise tolerance of patients given physiotherapy deteriorated, although the deterioration was not statistically significant.

Table 2 *Changes from control in pulmonary function results after yoga and physiotherapy*

	Vital capacity (l)	*One second forced expiratory volume (l)*	*Pao_2*	*$Paco_2$*
Yoga				
Mean change	+0·072	+0·022	+0·63	−1·285
Standard error	0·17	0·0612	1·8	1·222
"t"	0·422	0·355	0·35	1·052
P	NS	NS	NS	NS
Physiotherapy				
Mean change	+0·1127	−0·0815	+1·367	+0·87
Standard error	0·052	0·048	2·5	0·657
"t"	2·167	1·55	0·546	1·324
P	<0·1>0·05	NS	NS	NS

Analysis of changes in symptoms after treatment given to the two groups showed that a significantly higher number of patients after training in yoga (*a*) had improved exertion tolerance, (*b*) recovered more quickly after exertion, (*c*) with the help of breathing exercises could control an attack of severe shortness of breath without having to seek medical help, and (*d*) claimed to have derived a definite improvement in their overall chest condition (table 4). The number of patients in the two groups who felt that the physiotherapy and yogic breathing exercises were helpful in easier evacuation of sputum were not significantly different.

Table 4 *Analysis of changes in symptoms after treatment given to the two groups*

	Yes	*Marginal*	*No*
Improved exertion tolerance (P<0·003)			
Yoga	8	2	1
Control physiotherapy	2	2	7
Quicker recovery after exertion (P<0·026)			
Yoga	10	1	0
Control physiotherapy	5	2	4
Easier control of severe dyspnoea attack (P<0·006)			
Yoga	8	0	3
Control physiotherapy	1	1	9
Overall improved chest condition (P<0·005)			
Yoga	9	2	0
Control physiotherapy	2	6	3
Easier sputum evacuation (P—NS)			
Yoga	9	0	2
Control physiotherapy	7	1	3

Discussion

Comparison of a group of patients treated by physiotherapy with a group of patients who received yogic training showed that after nine months of training the yogic group performed significantly better on objective tests of exercise tolerance. A conference on the scientific basis of respiratory treatment had recommended that in studies of breathing training emphasis should be placed on determining whether or not learnt breathing patterns are utilised under the stress of exercise (Proceedings of Conference on Scientific Basis of Respiratory Therapy, 1974). In this study patients with chronic severe airways obstruction given training in yoga appear to have utilised the

Table 3 *Changes from control in tests of exertion tolerance after yoga and physiotherapy*

	Mean max work load (kpm)	*Heart rate per minute*	*Tidal volume (l)*	*Minute ventilation (l/min)*	*Oxygen uptake (l/min)*
Yoga group					
Mean change from control	+60·55	+8·91	+0·172	+3·82	+0·055
Standard error	18·7	3·44	0·084	2·12	0·131
"t"	3·238	2·59	2·048	1·80	0·419
P	<0·01	<0·05	<0·1>0·05	NS	NS
Physiotherapy					
Mean change from control	−13·87	−8·67	−0·0012	−0·37	−0·147
Standard error	16·4	4·034	0·12	3·48	0·163
"t"	0·846	2·148	0·01	0·107	0·902
P	NS	<0·1>0·05	NS	NS	NS

learned breathing patterns because they performed significantly better during exercise than the physiotherapy group without any significant difference in FEV_1, VC, or arterial blood gases between the two groups. It may be argued that the significant objective improvement in tests of exertion tolerance in the yoga group was due to some physical training as a result of training in yoga postures, as physical training to these patients has been shown to improve their exercise tolerance (Alpert *et al,* 1974). This is unlikely, however, because the physiotherapy exercises given to the physiotherapy group to improve stamina failed to improve the exercise tolerance. After training in yoga the breathing pattern of the patients in the yoga group changed to a slower and deeper pattern, allowing them to tolerate higher work loads. On the other hand, patients in the physiotherapy group did not change their shallow rapid breathing pattern.

Symptomatic improvement among significantly higher numbers of patients given training in yoga further suggests that training in yoga is beneficial to patients with chronic severe airways obstruction. Of special importance is the observation that a significantly greater number of patients reported that, with the help of yogic breathing exercises, they could control an attack of severe shortness of breath without having to seek medical help. This was achieved by a more efficient pattern of yoga breathing and was not a form of psychological "denial."

In this study training in the yogic manoeuvres given to a limited number of elderly patients with chronic severe irreversible airways obstruction produced some objective and subjective improvement. Further studies, with larger numbers of younger patients with less severe airways obstruction, who may be able to carry out all the more difficult yoga postures and exercises, are necessary to establish whether or not yoga has a place in the management of patients with chronic airways obstruction.

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