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Pranayama- A Spirotherapy

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Abstract: *Standard treatments with bronchodilator for chronic obstructive Pulmonary Disease (COPD) though reduce the degree of airway obstruction to a certain extent is totally insufficient to relieve completely the symptom and their physical capacity.COPD patients have reduced respiratory muscle endurance and so are not able to tolerate the respiratory work loads. Pranayama practiced as a specific training programme for respiratory muscles traditionally in olden days of India has been ignored by the present generation due to negligence and ignorance. An attempt was made to reintroduce the same to COPD patients in this study and the effects of improvement in ventilator capacity and exercise tolerance in these patients were documented. The present study support the findings that pranayamic breathing strengthen the respiratory muscles and increases the naturally occurring endurance power of these muscles. The aim of the study is to bring about the importance of this spirotherapy in public and acceptance of this technique in the management of COPD universally. The article describes the technique of pranayama and its rehabilitatory effect on COPD.*

I. Introduction

COPD patients must expend more energy to breathe as they have limited exercise tolerance (1,2 ,3). Their ventilator capacity decreases in proportion to their degree of airway obstruction. COPD Patients are treated with bronchodilators to relieve the airway obstruction and clearance of secretion by mucolytic agents and inflammation of respiratory passages by steroids, and anti inflammatory drugs. But the symptoms are recurrent. This leads to the study of respiratory muscle training techniques to patients with severe COPD.

Respiratory muscle dysfunction is usually the result rather than the cause of respiratory failure in COPD (4). The functional abilities of these patients can be improved by increasing the strength and power of endurance of inspiratory muscles (4) Usually two type of training regemen are advocated namely inspiratory muscle resistive training technique and isocapnoeic exercises for strengthening the respiratory muscles, and to improve the functional abilities of these patients.(5,6). Pranayama has all the principles followed by the above techniques.The present study was conducted for the functional evaluation of pranayama. In the present study patient volunteers were trained by the technique of pranayamic breathing exercises to strengthen their inspiratory muscles on 8 weeks duration and the improvement in ventilatory function was assessed by spirometry.

The art of pranayama is vast and has technique to make respiratory organs to move and expand intentionally, rhythmically and intensively. It has a long sustained subtle flow of inhalation (puraka) exhalation (rechaka) and retention of breath (kumbhaka). (4).

Puraka to stimulate the system, rechaka throws out vitiated air and toxins, kumbhaka distribute energy throughout the body. PRANAYAMA helps abundant intake of O2 by its disciplined act of breathing and prove to be a naturally occurring specific exercise technique for management of COPD (5).

II. Materials And Methods

10 male patient volunteers with age varying from 35-47 years, height from 162-178cms, weight from 55-81 kgs who were with chronic airflow limitation who had chronic productive cough, dyspnoea on exertion with poor objective improvement with bronchodilators, with minimal evidence of reversibility of airway obstruction by history and pulmonary function studies but free from other disabling diseases were recruited for the study. They were clinically stable during the period of study. Conventional spirometry was performed and ventilatory parameters were obtained for all these subjects.

They were mentally prepared for learning pranayamic breathing by trained yoga therapist. All were taught first how to sit comfortably for doing pranayama (siddhasana – a posture usually maintained by any while sitting on floor) with their back erect.The main aim in this training is to sit straight & steady with spine upright, back and ribs firm& alert.

The height of the spinal column to be kept the same through out the practice .The buttucks and pelvis are to be kept firm as this is the foundation for correct sitting. The following precautions to be observed before starting pranayamic breathing exercises. 1.The bladder and bowels are to be emptied before practice. 2. Practice to be done as for as possible at a fixed time each day and with the same posture 3 clear airy secluded place free

from insects, musqutoes, to be selected 4. it is advised to do the practice during quite hours (early morning) preferably before sun rise when industrial pollution is at the lowest and body and brain are fresh. Or in the evening when the air is cool and pleasant. A minimum of 15 mints per day is essential for practice. The subject was taught to sit correctly.

The body is positioned in such a way that the center of the head the chin, bridge of the nose the supra sternal notch, the chest, the naval and pubic symphysis are in alignment. Eye brows, ear and tops of shoulders, collar bones nipple and floating ribs, pelvic bones and hip joints are kept parrel to each other and the acromian process is perpendicular to sacrum to avoid body tilt. This posture with the back kept erect from base of the spine to neck with one leg folded over the lap is described as Siddhasana.. Pins and needles developed in the beginning will subside in course of practice. The eyes are to be kept closed gently. The head has to be kept down without undue discomfort and without constricting the throat or straining the neck muscles The jaws are not to be clenched If the sitting posture is correct firm and steady and evenly balanced the emotions are held in check.

The subjects were taught to exhale (rechaka) slowly and completely without losing grip over the abdomen. This is followed by deep inhalation (puraka) and abdomen not to be inflated while inhaling as this prevents the lung from expanding fully. Breathing in and out must be neither forcible nor quick. Deep inspiration and slow expiration are to be practiced many times before going for breath holding (kumbhaka) After practicing slow inspiration & expiration many times the subjects can adjust the flow, rhythm and resonance of breath by narrowing or widening the nasal passages by delicate fingering applied over the root of the nostrils.. By folding the fore and middle fingers into the hollow of the palm, the thumb has to be rested on the right side of the nose and ring and little finger over the left side of the nose while the wrist is placed centrally. Inhalations and exhalations are to be practiced on both sides of the nostrils partially closing them by narrowing the nasal passages through digital pressures. During inspiration the digital pressure is applied over the root of the left nostril and blocked and air is drawn inside through right nostril. During exhalation the right nostril is closed by thumb and air comes out through left nostril.Thus using the fingers to regulate and control the flow of breath through nose is called Digital Pranayama. Breath holding (kumbhaka) is taught in slow degrees after mastering inhalation and exhalation through one nostril, by firmly keeping grip over the diaphragm and abdominal organs. Breath was held in the beginning for only few seconds retaining precise inner grip over the intercostals muscles and diaphragm. The trunk has to be kept firm and head, arms and legs to be relaxed throughout. Time to be given after every attempt before going for the next for the lungs to revert to normal.

Pranayama is practiced thus. . Each cycle starts after exhalation (rechaka) followed by slow deep inspiration (puraka) by right nostril and breath holding (kumbhaka) and slow and complete expiration by left nostril with the ratio of the duration of three phases in 1:1:1 secs. Pranayama done with same duration of 3 phases is known as samvritti pranayama . In course of time the duration of phases will be increased by practice with out exceeding the capacity of the patient. Pranayama not to be practiced under following conditions.

1. When the body and mind are dull and depressed, neither in haste nor when the lungs are congested.2.internal retention not to be performed in agitation or in emotions, Headache, worry, anxiety and restlessness. pranayama to be practised 4-6 hrs after food but food can be taken half an hour after practise. It took 12-15 days for patients to learn the technique and after complete training patients practiced pranayama daily at the rate of 8-10 breaths per minute for about 30 mints for a period of 8 full weeks. Routine pulmonary function tests were performed before and 8 weeks after completion of training using Spirometer. Ventilatory prameters such as forced vital capacity (FVC) and Forced expired volume for first sec(FEV1) and its percentage (FEV1%) Forced expiratory flow rate for 25-75 %(FEFR25-75%) and Maximum voluntary ventilation (MVV) and ventilatory equivalent for O2(VEO2)to evaluate their functional debility before training and improvement after training were measured. Also Blood samples were withdrawn to study the Pco2, Po2, pH levels and % saturation of O2 for pre and post training period. The Effort tolerance was estimated by determining the duration of time walked by the subjects without distress at a speed of 180 steps. /mint.

Also the subjective improvement of sense of wellbeing was assessed by close conversation with the subject before and after training.The results were statistically analysed.

III. Results And Observation

The subjective improvement and effort tolerance could be well appreciated in all 10 COPD patients($P<0.01$).(Table.1).There is a fall in Pco2 and pH shifts to normal level from slight acidosis (Table2). ventilatory volumes and flow rates were significantly increased uniformly in all patients ($p<0.01$) (Table 3). There is significant improvement in MVV ($p<0.001$) reflecting the increased exercise performance of respiratory muscles. VEO2 had also improved significantly ($P<0.05$) for every individual after pranayamic exercise with observable reduction in Pco2 and increase in PO2 and % saturation.

IV. Discussion

Patients with COPD have their ventilatory capacity decreased in proportion to their degree of airway obstruction (7). Their respiratory strength is characteristically reduced.(8,9). Their respiratory muscles show atrophy (10). Respiratory muscles like any other skeletal muscles can be strengthened and their endurance can be improved by appropriate training regimens(11, .12 ,4, 13,) Therefore the functional abilities of COPD patients can be improved by respiratory muscle training (8, 14,5) Pranayama becomes one such respiratory muscle training programme(12). "Prana" means "breath" or "energy". Ayama means "stretch". Pranayama thus means prolongation of breath and its restraint (15). The phase of "puraka" exercises the inspiratory muscles and "rechaka" exercises the expiratory muscles and retention of breath in" kumbhaka" is to improve the endurance of inspiratory muscles(16).

Widely practiced Respiratory muscle training programme in western countries are of two types. 1 .inspiratory muscle Resistive training Technique(IRT) and 2.Isocapnoeic exercises(IC)(6).

The principle applied in IRT includes "repeated short secessions of mildly fatiguing respiratory exertions separated by short resting periods becomes the most effective inspiratory muscle endurance programme"(14). Practicing the cycle of pranayama 3-4 times daily satisfies this statement.The second technique of IC insists in maintaining a slightly increased level of CO2 during exercise to increase efficiency of respiratory muscles (12). The retention of breath in "kumbhaka" for short period after deep inhalation in pranayama brings about a slight increase in pco2 levels as observed in isocapnoic exercises. The increase in MVV observed in the present study due to pranayamic breathing corresponds to the MVV results obtained by Leith and Bradley with isocapnoic hyperventilation studies (12). IRT exercises are performed using devices such as artificial inspiratory orifices of varying diameters for breathing through, proved to have been effective for COPD (5) Digital pranayama described in the present study of regulating the diameter of both nostrils is similar to the above study and is superior to it as it is naturally occurring controlled breathing technique for endurance training and improves exercise performance tremendously in COPD than shown by previous authors(15). The subjective improvement such as the sense of wellbeing,freshness and lightness in breathing, relief from dyspnoea

and improvement in active status, effort tolerance and increased work performance established in each individual by this technique makes us realize the therapeutic benefits of this technique to be added to our regular regimen of rehabilitation therapy for patients with COPD (15,16,17).

Thus Pranayama teaches the act of disciplined breathing, It educates the science of breathing (17, 18) and opens a new horizon to medicine and therapeutics by forming a spirotherapy.(17)

Table—1
Subjective Improvement

PRETRAINING SYMPTOMS	NO OF SUBJECTS	POST TRAINING SYMPTOMS	NO OF SUBJECTS
1. DYSPNOEA			
At rest +	5	NIL	ALL
On exertion++	10	NIL	8
2. WORRY++	10	SENSE OF WELLBEING	10
3 CONFUSION OF THOUGHTS++	6	clear mind+++	10
4. feeling heavy++	7	feeling light	9
5. DULL++	4	ACTIVE +	10
LOSSS OF MEMORY	3	MEMORYIMPROVED	3
EFFORT TOLERENCE2-4 MINTS	8	EFFORT TOLERENCE 4-12 MINTS	10

Table 2
Blood Gas Indices Before And After Pranayama

INDICES	NO OF PATIENTS																			
	1		2		3		4		5		6		7		8		9		10	
PRANAYAMA	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
PAo2mmHg	70	79	73	82	65	80	79	83	80	84	81	87	79	83	76	86	76	87	80	88
pCo2mmhg	46	40	45	40	49	39	46	40	48	40	45	39	44	40	40	41	47	41	42	40
pH decimal	40	44	39	40	38	42	39	40	31	41	36	42	39	44	40	41	47	42	40	42
%saturation	78	88	69	89	72	89	77	85	77	81	79	83	81	88	82	88	79	87	80	88

B ---Before Pranayamic Training A—After pranayamic Breathing

pH—and Decimals given above

Table 3
Ventilatory Indices Before And After Pranayamic Training In Copd

NO	AGE		PEFR	FVC	FEV1	FEV1%	FEFR25-75%	MVV	VEO2
1	35M	B	104	3.20	2.43	76	102	62	0.69
		A	255	3.95	3.48	88	192	100	0.81
2	38M	B	125	3.30	2.11	64	98	32	0.70
		A	324	3.85	3.43	89	152	97	0.84
3	36M	B	160	4.10	2.30	56	96	30	0.66
		A	410	4.20	3.36	80	148	110	0.75
4	40M	B	100	3.0	1.47	49	100	42	0.68
		A	330	3.65	2.52	69	122	83	0.73
5.	42M	B	85	1.95	0.86	44	96	85	0.72
		A	255	2.34	1.60	68	195	120	0.81
6.	43M	B	90	2.44	1.46	60	103	86	0.70
		A	230	3.65	3.21	88	220	134	0.83
7.		B	220	1.99	0.995	50	88	67	0.71
		A	410	2.89	2.23	77	138	110	0.82
8.		B	200	3.71	2.30	62	115	80	0.70
		A	395	3.85	2.96	77	234	110	0.80
9.47M		B	< 60	1.80	0.86	48	97	78	0.75
		A	200	2.93	2.08	71	185	120	0.85
10.		B	130	2.21	1.59	72	120	55	0.72
		A	380	3.21	2.82	88	220	135	0.83

B—BEFORE TRAINING A—AFTER TRAINING

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