



Original Research Article

Effect of specific yoga mudras on respiratory efficiency in asthma patients

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ABSTRACT

Introduction: Hastha Mudras involves hand gestures. The pressure exerted by the fingertips stimulates the peripheral nerve endings. This in turn sends signals to the central nervous system to bring about the specific response by modulating the autonomic nervous system, depending on the type of mudra performed. The effect of mudras in improving cardiovascular and neurological parameters was recorded in previous studies. The present study was done to find out the efficiency of lung specific mudras in improving respiratory parameters in stable asthmatics.

Materials and Methods: 50 Asthma patients in the age group of 20- 50years were divided randomly into study group (n=25) who practiced mudras for 30 minutes and control group (n=25) who did not do the intervention. Respiratory efficiency tests were measured before and after 30 minutes using peak flow meter, and mercury sphygmomanometer. The tests include Peak Expiratory Flow Rate (PEFR), Breath Holding Time (BHT), Sniders T est (ST), Expiratory Blast Test (EBT) and Respiratory Endurance T est (RET).

Results: Statistically significant improvement was seen in all the parameters except for sniders test. Control group showed no significant change.

Conclusion: Lung specific mudras could improve the respiratory function in asthma patients when practiced along with focused breathing.

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1. Introduction

Mudra means Gesture which may involve the whole body or simple hand position. It is a known fact that mudras help in communication. Mudras were also known to influence different body functions by enhancing connections with the cortex and influencing autonomic reflexes in these areas.^{1,2} The hand and the fingers, as they have numerous sensory receptors have a larger area of representation in the sensory (homunculus) cortex of brain. Pressure signals from fingers and hands stimulate corresponding areas of both cerebral cortex promoting cross lateralization and sensory motor integration.

Asthma is a chronic inflammatory disease of the airways with variable airflow obstruction characterized by recurrent episodes of wheezing, breathlessness, chest tightness and cough particularly at night or in the early morning that

is at least partially reversible either spontaneously or with treatment.³ Genetic determinants as well as environmental factors play a role in asthma. With increased severity and duration, airway remodeling occurs with smooth muscle hypertrophy, hyperplasia and mucous plugging resulting in fixed narrowing of the airway. Common precipitating factors for asthma include exercise, cold weather, exposure to air borne allergens and viral infections.

Asthma is also a stress related disorder.⁴ Stress by increasing the release of pro inflammatory cytokines precipitates asthma exacerbations. The inflammatory response is due to eosinophil infiltration, mast cell degranulation and lymphocyte activation resulting in airway hyper responsiveness. Both the components of Autonomic Nervous System (ANS) are essential for maintaining the airway caliber. Though there is no direct sympathetic innervation of the airway smooth muscle, stimulation α adrenergic receptors causes bronchoconstriction and

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stimulation of β_2 receptors in bronchial smooth muscle causes bronchodilation. In asthma, bronchoconstriction and increased glandular secretion is caused by increased activity of parasympathetic nervous system. To combat this, sympathetic activity increases to release Neuropeptide Y (NPY) which in turn could inhibit the release of acetyl choline. But it fails in its objective, since in asthmatic patients NPY nerves are reduced and direct sympathetic innervation of airway is negligible.⁵ These evidences suggest that asthma is characterized by abnormalities of both the components of ANS. It is also hypothesized that as mudras create subtle connections with emotional areas of the brain, stress & related disorders could be reduced by balancing autonomic nervous system.

In asthma, airflow obstruction occurs mainly during expiration, unless the disease is very severe. Respiratory efficiency tests employed in this study are simple bedside tests which help to assess mainly expiratory function of lungs. PEFr is the maximum rate in liters per minute with which air is expelled with maximum force after a deep inspiration. This test is generally used to assess larger airway obstruction and the normal value is 350-600L/minute. PEFr value is considered almost equally important with respect to forced expiratory volume in one second (FEV1) for diagnosing asthma.⁶ Peak flow meter values are almost identical with the PEFr values obtained by computerized spirometry in asthma patients.⁷ Breath holding time serves as a screening test for obstructive lung diseases and it is an index of onset and endurance of dyspnea. It also could be positively correlated with FEV1 and FVC in evaluating obstructive diseases.⁸

The overall prevalence of asthma in India is 2.05% in adults above 15 years.⁹ In spite of tremendous advances in medical treatment, morbidity and mortality still persists. Hence alternative non-pharmacological interventions like yogic pranayama techniques and meditation are tried to prevent or treat asthma along with chemotherapy.¹⁰

It is said that specific lung specific mudras or hand gestures can improve respiratory efficiency by producing broncho dilatation and reducing mucous congestion.¹ There were only few studies depicting the scientific importance of mudras on other systems.^{11,12} Since no other study has reported regarding this, present study was done to find out whether these yoga mudras really improve respiratory efficiency and if so, whether it can be used as an additive measure to treat asthma.

2. Aim & Objectives

To study the effect of specific Yoga Mudras on Respiratory Efficiency in Asthma patients.

1. To measure the effect of specific yoga mudras on peak expiratory flow rate, breath holding time, sniders test, expiratory blast test and respiratory endurance test in

study group before and after 30 minutes of mudra practice

2. To measure the peak expiratory flow rate, breath holding time, sniders test, expiratory blast test and respiratory endurance test values of control group before and after 30 minutes.
3. To compare the respiratory efficiency test values of the study group with that of the control.

3. Materials and Methods

The present interventional study was done in the department of Physiology of a private Medical College Hospital, Madurai after obtaining Institutional Ethical Clearance. Stable Asthma patients of both the genders, between the age groups of 20–50years, weight & height matched were enrolled for the study. Patients attending Respiratory Medicine O.P in July 2018 and hospital workers (especially housekeeping staff in the medical college campus) who were known asthmatics with disease duration of more than one year but not on routine drug treatment were included in the study. 50 asthma patients who were chosen randomly were assigned as control group (n=25) and study group (n=25) by using a randomization sequence generated in Microsoft Excel. Asthmatics were selected based on adult asthma questionnaire, hospital records & only patients with intermittent and mild persistent asthma were included.⁵ (WHO Global Initiative for Asthma guidelines 2006)

Patients with acute asthmatic exacerbations and not willing to participate were excluded from the study. Subjects with other types of lung diseases, mudra trained individuals, smokers, subjects with skeleto-muscular disorders, subjects suffering from cardiac diseases and on medication were also excluded.

3.1. Description of intervention

The subjects were instructed to refrain from caffeine, nicotine and alcohol. Subjects on loose clothing were instructed to relax for 10 minutes initially in the sitting posture on ground. Then the study group patients were taught to perform all hand mudras by a qualified yoga instructor, along with smooth and deep breathing. A common instruction was given to not to move their hands and put extra pressure on finger tips while doing hasta mudras.

The following were the mudras practiced in order, using both the hands¹ :

3.1.1. Atmanjali mudra

Join the palms together in Namaste position (5 minutes)

3.1.2. Bronchial mudra

Place the little finger at the base of the thumb, the ring finger on the upper thumb joint, and the middle finger on the pad

of the thumb. Extend the index finger (5 minutes).

3.1.3. Asthma mudra

Press the fingernails of both the middle fingers with other fingers extended. (5 minutes).

3.1.4. Brahmara mudra

Place the index finger on the base of the thumb. Place tip of your thumb on the side of your middle finger nail. Extend your ring and little finger. (7 minutes)

3.1.5. Linga mudra

Place both palms together and clasp your fingers. One thumb should remain upright; encircle it with the thumb and index finger of your other hand. (8 minutes). Mudra was practiced in standing up position coordinating inhalation and exhalation.

3.1.6. Data collection method & tools

The study was explained clearly to the participants and voluntary consent was obtained. Baseline data on all participants was collected using structured questionnaire. On day 1, between 10am-12 pm after recording vitals, all the respiratory efficiency tests were done for the control group(n=25). Then they were instructed to take rest in sitting posture while concentrating on breathing (8/min) for 30 minutes and immediately after 30 minutes all the tests were once again recorded.

On day 2, all these parameters were measured initially for the study group. Then all were taught lung specific yoga mudras by a certified yoga instructor till they understood the technique properly. From day 2-day 6, every day test values of 4 patients were recorded after the practice of mudras for 30 minutes. Respiratory efficiency tests include Breath holding time, Expiratory blast test, sniders test, respiratory endurance test and peak expiratory flow rate.

PEFR was measured with the help of mini wright's peak flow meter (Ishneel Healthcare private limited). Expiratory blast test and respiratory endurance test was measured with the help of mercury sphygmomanometer (Diamond agencies). All the parameters were measured in the following method:¹³

3.2. Breath holding time (BHT QI)

The subject was asked to sit quietly for a few minutes breathing normally. Ask the subject to pinch his nostrils with the thumb and index finger and to hold the breath after a normal inspiration and start the stop watch. The time duration for which the subject could hold the breath was noted. Three such observations at an interval of five minutes were recorded. Similarly, record the breath holding times after quiet expiration (BHT QE), deep inspiration (BHT DI) and deep expiration (BHT DE).

3.3. Expiratory blast test (EBT)

BP apparatus is required for this test. The rubber tube leading from the mercury reservoir to the cuff is disconnected. The subject was asked to take a deep inspiration and blow into the tube to raise the mercury column to the highest level possible. A normal subject can raise the mercury column to 55-100 mmHg or more during a single forceful expiration.

Snider's test (ST)

A normal adult should be able to blow out a burning match stick or candle held at 30 cms in front of his face, with a single forceful expiration

3.4. Respiratory endurance test (RET):

The subject was instructed to take a deep breath, close his nostrils and blow into the rubber tubing to raise the mercury column to 40 mmHg level in the manometer. He was instructed to maintain the mercury level at 40mmHg as long as possible. Normal person can hold it at the same level for 40-70 seconds or more.

3.5. Peak expiratory flow rate (PEFR)

The subject was instructed to take a deep breath and then to blow hard into the mouth piece of the flow meter forcefully with his nostrils closed. The reading on the dial is the PEFR in liters /min.

Values were recorded immediately after 30 minutes of yoga mudra training.

4. Results

4.1. Statistics

The data was entered into MS excel and analysed using SPSS v16.0. The readings of Peak expiratory flow rate, breath holding time, sniders test, expiratory blast test and respiratory endurance test before and immediately after 30 minutes were analyzed using Wilcoxon signed rank test & Mc Nemar test. P value < 0.05 was the cut off to determine statistical significance.

5. Discussion

In the study group, according to Table 2, there was a significant improvement in all the respiratory parameters immediately after 30 minutes of mudra practice except for the Sniders test (Table 5). No significant difference was observed in the control group for all the parameters (Tables 1 and 4)

As asthma is associated with expiratory difficulty, PEFR, Expiratory blast test, sniders test & respiratory endurance tests were mainly used to assess expiratory function. As decrease in PEFR indicates larger airway obstruction, the immediate improvement in PEFR value

Table 1: Comparison of pre and post intervention (after 30 minutes) values of all the parameters in the control group

		Mean	N	Std. Deviation	Std. Error Mean	p
Pair 1(PEFR)	Pre value	202.40	25	71.664	14.333	.922
	After 30 min	202.64	25	74.750	14.950	
Pair 2(BHT-QI)	Pre value	19.36	25	9.322	1.864	.546
	After 30 min	18.72	25	8.127	1.625	
Pair 3(BHT-QE)	Pre value	14.76	25	6.851	1.370	.085
	After 30 min	15.92	25	7.123	1.425	
Pair 4(DI)	Pre value	30.36	25	18.708	3.742	.861
	After 30 min	30.04	25	15.957	3.191	
Pair 5(BHT-DE)	Pre value	17.04	25	5.070	1.014	.485
	After 30 min	17.72	25	5.849	1.170	
Pair 6(EBT)	Pre value	37.76	25	16.179	3.236	.823
	After 30 min	38.20	25	16.462	3.292	
Pair 7(RET)	Pre value	9.96	25	9.235	1.847	.621
	After 30 min	10.48	25	8.954	1.791	

According to Table 1, in the control group, there was no statistically significant difference in the values after 30 minutes of rest.

Table 2: Comparison of values between pre and post intervention (after 30 minutes) in the study group

		Mean	N	Std. Deviation	Std. Error Mean	p
Pair 1 (PEFR)	Pre value	158.00	25	60.415	12.083	.000
	After 30 min	196.80	25	71.979	14.396	
Pair 2 (QI)	Pre value	14.34	25	8.315	1.663	.013
	After 30 min	18.42	25	11.227	2.245	
Pair 3 (QE)	Pre value	13.77	25	7.620	1.524	.001
	After 30 min	18.45	25	9.177	1.835	
Pair 4 (DI)	Pre value	15.39	25	8.663	1.733	.000
	After 30 min	21.74	25	11.481	2.296	
Pair 5 (DE)	Pre value	14.16	25	7.776	1.555	.001
	After 30 min	19.40	25	9.152	1.830	
Pair 6 (EBT)	Pre value	32.52	25	17.328	3.466	.000
	After 30 min	43.44	25	14.101	2.820	
Pair 7 (RET)	Pre value	8.05	25	8.354	1.671	.001
	After 30 min	11.89	25	11.060	2.212	

Table 2 shows a significant improvement in all the respiratory parameters after 30 minutes of mudra practice in the study group

Table 3: Comparison of values between the control and study group

Group Statistics	Control	N	Mean	Std. Deviation	Std. Error Mean	p
PEFR 30min	1	25	.2400	12.10124	2.42025	<0.001
	2	25	38.8000	40.65300	8.13060	
BHT- QI 30min	1	25	-.6400	5.21920	1.04384	0.014
	2	25	4.0788	7.64331	1.52866	
BHT-QE 30min	1	25	1.1600	3.22335	.64467	0.019
	2	25	4.6788	6.47341	1.29468	
BHT- DI 30 min	1	25	-.3200	9.01721	1.80344	0.006
	2	25	6.3540	7.31918	1.46384	
BHT- DE 30min	1	25	.6800	4.79340	.95868	0.008
	2	25	5.2400	6.64129	1.32826	
EBT 30 min	1	25	.4400	9.73858	1.94772	<0.001
	2	25	10.9200	9.26427	1.85285	
RET 30 min	1	25	.5200	5.19711	1.03942	0.028
	2	25	3.8380	5.13057	1.02611	

Table 3 shows the significant difference in the values between the control and the study group after 30 minutes.

Table 4: Sniders test after 30 minutes in control group

		not able		able	
		Count (no)	Row N %	Count	Row N %
Sni Pre	not able	17	100.0%	0	0.0%
	able	0	0.0%	8	100.0%

Table 5: Sniders test after 30 minutes in study group

		not able		able	
		Count	Row N %	Count	Row N %
Sni Pre	not able	22	100.0%	0	0.0%
	able	0	0.0%	3	100.0%

Tables 4 and 5 shows no significant change in the control as well as in the study group.

indicates the decrease in bronchoconstriction that had happened after mudra practice. An increase in the duration of breath holding time shows the decreased response of respiratory centers to CO₂. An increase in BH allows air to move fast behind the secretions and also reduces respiratory rate (reduces dyspnea) by desensitizing CO₂ response.¹⁴ Improvement in expiratory blast test and respiratory endurance test also indicates the decrease in bronchial smooth muscle tone and improved respiratory muscle efficiency.

In a study conducted by Nagarajan et al in 2017, out of 100 volunteers in 25-40 years age group who underwent mudra training for 2 months, 71 subjects agreed that they could feel the improvement in health after mudra training.¹¹ In a previous study done on the immediate effect (after 15 minutes) of mudras on cardiovascular and neurological function in heart patients, a significant decrease in heart rate, systolic blood pressure, diastolic blood pressure and blood viscosity was observed. Coronary perfusion pressure, myocardial blood perfusion volume and brain tissue blood supply had increased.¹²

Large part of the motor cortex of the brain is dedicated to hand movements. Sensory nerves from the fingers occupy a larger area in the homunculus on the lateral side of the contra lateral hemisphere. In the present study, Mudra practice started with performing atmanjali mudra to bring calmness and breath control. Pressing two palms together in Namaste position stimulates nerve endings in the palms which has abundant sensory receptors. Pressure in right palm will stimulate the left cerebral hemisphere, whereas pressure in the left palm will stimulate the right hemisphere. Equivocal stimulation of both the cerebral hemispheres balances the activity of sympathetic and parasympathetic components of the autonomic nervous system. May be this could be the reason why we hold our both hands tightly when tensed.

MRI studies had postulated the connection between asthma and emotion, as it is a known fact that stress aggravates asthma by releasing inflammatory mediators. Along with increased inflammatory signals in the lung

& airways with respect to allergens, there is also activation of emotional area of the brain i.e. anterior insular cortex.¹⁵ Asthma represents an imbalance of the autonomic nervous system. It was recorded in earlier studies that fronto insular cortex (ventral anterior insula), anterior and midcingulate cortices constitute the cortical autonomic control centers which respond to emotional stimuli.¹⁶ Fronto insular cortex acts as afferent and anterior cingulate as efferent centers. Left hemisphere activation predominantly affects parasympathetic function and right hemisphere activation sympathetic function. It is understood from this that lung specific hand mudras could have modulated the autonomic function to reduce bronchoconstriction and inflammation.

Linga mudras were known to remove the phlegm in the body by increasing body temperature especially in asthmatics and not in normal subjects. To confirm this, for 3 new asthma patients, body temperature was recorded before and after 20 minutes of performing linga mudra alone. A 3° F rise in body temperature was recorded. This mudra could help in exercise induced asthma too, where hyperventilation leads to excess heat loss from the airway epithelium.¹⁷

Along with direct effect of mudras, focused attention & regulated breathing (slow & deep) during mudra practice could also have modulated the activity of the ANS.¹⁸ It is an established fact that circadian rhythm exists for bronchial muscle tone. Previous studies had noted significant circadian variation especially for PEFV both in normal and asthmatic individuals.¹⁹ Hence it was ensured that all the tests were performed only at specific time of the day between 10am-12pm.

6. Strength of the study

This study is the first of its kind to measure the airway changes in asthma patients using mudras.

The cooperation was very good from the patient's side, as many showed interest in learning these simple techniques eagerly which were easy to perform.

7. Limitation

Pulmonary function test parameters especially FEV1 & PEFr could have been measured with computerized spirometer. Results would have been better with larger sample size and with long duration practice. Future studies should evaluate the role of mudras in assessing the function of all the other organ systems in the body.

8. Conclusion

Lung specific hasta mudras significantly increased PEFr, BHT, EBT, RET immediately after 30 minutes of practice except for sniders test. No significant change was observed in the control group. This simple, easy to practice anytime, anywhere, cost effective technique must be practiced regularly to produce beneficial effects. When practiced along with pranayama, not only will they serve as an adjunct to chemotherapy but by reducing stress and balancing ANS can help to improve all the body functions.

9. Source of funding

None.

10. Conflict of interest

None.

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