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Effect of Yogic Breathing techniques on Cardio autonomic function in patient with Right Bundle Branch Block- A case report

Yogapriya Chidambaram[1], Venugopal.V[2], Deenadayalan Boopalan[1], Akila Anandhan[3], Poornima Ravi[4], Maheshkumar Kuppusamy[5]

1 PG scholar, Department of Naturopathy, Govt. Yoga & Naturopathy Medical College & Hospital, The Tamilnadu Dr.MGR Medical University, Department of Naturopathy, Chennai- 600106, TamilNadu, India.

2 Assistant Medical Officer/Lecturer Grade-II, Department of Yoga, Govt. Yoga & Naturopathy Medical College & Hospital, The Tamilnadu Dr.MGR Medical University, Department of Physiology, Chennai- 600106, TamilNadu, India.

3 PG scholar, Department of Naturopathy, Govt. Yoga & Naturopathy Medical College & Hospital, The Tamilnadu Dr.MGR Medical University, Department of Acupuncture & Energy Medicine Chennai- 600106, TamilNadu, India.

4 CRRI, Govt. Yoga & Naturopathy Medical College & Hospital, The Tamilnadu Dr.MGR Medical University, Chennai- 600106, TamilNadu, India.

5 Assistant Medical Officer/Lecturer Grade-II, Department of Physiology, Govt. Yoga & Naturopathy Medical College & Hospital, The Tamilnadu Dr.MGR Medical University, Department of Physiology, Chennai- 600106, TamilNadu, India

Corresponding Author

Dr. Maheshkumar Kuppusamy, BNYS, MSc, Ph.D

Department of Physiology,

Govt. Yoga & Naturopathy Medical College & Hospital, Department of Physiology, Chennai- 600106, TamilNadu, India.

Email: doctor.mahesh1985@gmail.com

Abstract

Background: Pranayama is an important component of Yoga beneficial in improving physical and mental health. Scientific studies had explored the physiological effects of various pranayamas. However, there is no documented evidence on the beneficial effects of yogic breathing practices on cardio-autonomic variable in Right Bundle Branch Block (RBBB). This case report, aimed to show immediate effect of various yogic breathing techniques on cardio-autonomic variable on patient with RBBB

Case details: A 55 years old male diagnosed with RBBB approached the outpatient department with complaints of increased sweating, palpitation, and restlessness. His electrocardiogram (ECG) report showed RBBB and he also presented with other complaints such as left atrial enlargement, mild diastolic dysfunction and 61% ejection fraction by echocardiography. Yogic breathing practice of Nadi shodana pranayama (NSP) with retention, without retention and Bhramari pranayama were given as intervention. Each

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pranayama was given on separate days for a duration of five minutes sitting in a comfortable position. Heart Rate Variability (HRV) was recorded before and immediately after the individual pranayama practice.

Results: HRV findings showed that both Bhramari and Nadi shodana pranayama had an impact on the cardio autonomic function and increased parasympathetic domination in the patient with RBBB. Bhramari pranayama produced more changes in HRV when compared to other two breathing techniques.

Conclusion: We document the beneficial effect of yogic breathing techniques in improving parasympathetic dominance in a patient with RBBB, mild diastolic dysfunction and hypertension, through the autonomic nervous system.

Keywords: Yoga, Pranayama, Yogic breathing, Right bundle branch block, Nadi shodana pranayama, Bhramari pranayama

Background

Right bundle branch block (RBBB) is generally considered as a benign finding and its prevalence is known to rise with age, especially in patients with diabetes and hypertension (1). A recent study shows that 8% of population had RBBB which is more prevalent in male and elderly people (2). Some studies show association of RBBB with cardiovascular diseases such as cor pulmonale, myocarditis, acute myocardial infraction, pulmonary thromboembolism and congenital diseases (3). Major complications of RBBB could sometimes lead to third degree of (complete) atrio-ventricular block and sudden cardiac death (4). Prognosis of RBBB was good in the absence of cardiovascular diseases but poor when they were present (5). Complementary and alternative medicine (CAM), as defined by World Health Organization is a broad set of health care practices that are not part of our tradition and are not integrated into the dominant health care system (6). When practiced efficiently, yoga brings about physical, mental and emotional wellbeing. Pranayama and yoga are inseparable (7). The physiological effect of pranayama on neurocognitive, psychophysiological, respiratory and biochemical functions has been well explored (8). A systematic review of Bhramari pranayama found to have parasympathetic predominance resulting in reduction of blood pressure and heart rate (9). Previous studies demonstrated that, Nadi shodana pranayama can modulate ventricular performance by increasing parasympathetic activity (10,11). Still there is lack of evidence showing the direct effect of yogic breathing on patient with RBBB. This case report aims to show the immediate effect of yogic breathing on cardio-autonomic function in a patient with RBBB.

Case description

A 55 years old male diagnosed with RBBB came to outpatient department with the presenting complaint of increased perspiration, palpitation, and restlessness. He was a known case of hypertension and on medication for the same for the past eight years. He had a past history of surgical intervention on the right leg for chronic varicose veins. His height was 171 Centimeters, weight- 103.7 kilograms and Body Mass Index-35.7 kg/m^2 (grade-III) obesity. On vital data assessment, his blood pressure (132/78 mmHg), pulse rate 84 beats/minute, and respiratory rate 14 cycles/minute. His ECG showed right bundle branch block and also

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possible left atrial enlargement, echocardiography revealed mild diastolic dysfunction and ejection fraction was 61%.

Intervention details

Before starting the intervention, procedure of the pranayamas were explained to the patient and a written informed consent was obtained. Numerical counting and instruction were provided by a qualified Yoga and Naturopathy physician.

Bhramari pranayama (Humming bee breath):

Patient was asked to sit in upright position with eyes closed, and instructed to plug both ears with index fingers and other fingers folded. After relaxing while observing few breathes, the patient is asked to inhale deeply through both the nostrils and when exhaling asked to produce "MMM" sound for a period of 5 minutes. This causes mild vibration in the laryngeal wall and inner wall of nostrils.

Nadi shodana pranayama (Alternate nostril breathing):

Practice 1: (without breath retention) [1:1 Ratio]

Patient was asked to sit in an upright position comfortably and eyes closed, adopt Nasagra mudra in right hand and chin mudra in left hand. After relaxing while observing few breathes, the patient is instructed to inhale through the left nostril for 10 counts slowly, exhale through the right nostril for 10 counts, again to inhale through the right nostril for 10 counts and exhale through the left nostril for 10 counts.

Practice 2: (with internal breath retention) [1:1:1 Ratio]

Patient was asked to sit in an upright position comfortably and eye was closed, adopted Nasagra mudra in right hand and chin mudra in left hand. After relaxing while observing few breathes, the patient is instructed to inhale through the left nostril for 10 counts, retain breath for 10 counts, and exhale through the right nostril for 10 counts, again to inhale through the right nostril for 10 counts, retain the breath for 10 counts and exhale through the right for 10 counts.

Outcome measures:

Heart rate variability (HRV) was assessed using 16 channel polygraph (MP160, BIOPAC System) before and immediately after respective breathing techniques. The Ag/AgCl pre gelled electrodes were placed according to the standard limb lead II configuration for recording electrocardiogram. Data acquired at the sampling rate of 2000Hz. Time domain and frequency domain analysis of baseline and post-intervention HRV data performed using HRV analysis software (Kubios-HRV version 2.0) developed by the Biomedical Signal Analysis Group (University of Kuopio, Finland). The time domain HRV variables such as (1) the mean of the intervals between adjacent QRS complexes or the instantaneous HR (RRI), (2) standard deviation of RR intervals (SDNN), (3) HR, (4) the square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD), (5) the number of interval differences of successive NN intervals greater than 50 ms (NN50) and (6) the proportion derived by dividing NN50 by the total number of NN intervals (pNN50) analyzed. Similarly, the frequency domain of HRV such as low frequency (LF) band (0.04–0.15 Hz) and high-frequency (HF) band (0.15–0.4 Hz) in normalized units and LF/HF ratio analyzed.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 03, 2023

Results and discussion

This case report shows changes in HRV variables such as RR interval (ms), HR (bpm), RMSSD (ms), SDNN (ms), pNN50%, LF (n.u.), HF (n.u.) and LF/HF ratio after the practice of Bhramari and Nadi shodana pranayama in a patient with RBBB.

When compared to all three yogic breathing techniques, Bhramari pranayama had more impact on the HRV variable changes (see Table: 1). Considering NSP with retention and without retention, NSP with retention had better results. It has been hypothesized in a previous study that voluntary, slow, and deep breathing can reset autonomic nervous system by stimulating slow adopting stretch receptors (SARS) and stretching of fibroblasts around the lungs [12]. Stimulation of SARS and stretching of fibroblast has an inhibitory effect on sympathetic nervous system, resulting in parasympathetic dominance [13]. Therefore, yogic breathing practices can modulate the autonomic functions and also improves sympathovagal balance [14]. Ventricular activity was greatly influenced by autonomic nervous system, HRV being a non-invasive tool to assess the cardio autonomic function. HRV is one of the most sensitive and also accessible measure of sympathetic, parasympathetic activity and autonomic regulation [14]. HRV analysis in the time domain indicates parasympathetic outflow, while HRV analysis in the frequency domain reflects overall autonomic balance [15]. Previous studies showed that practice on Bhramari pranayama showed a significant improvement in both RMSSD in time domain and HF power (n.u) in frequency domain parameters [16-18]. Even in the current patient with RBBB the practice of Bhramari pranayama had similar results. NSP increases parasympathetic activity and lowers sympathetic activity, which had been demonstrated to improve ventricular performance [19]. Moreover, slow breathing practices increases HR fluctuations in LF band with simultaneous increase in HR [20]. Our study showed that NSP with retention has a significant improvement in SDNN, RMSSD and HF after practice. In addition, stress was considered to be the major factor that disrupts autonomic balance, practice of pranayama effectively manages stress which is in turn reflected in increase in high frequency band and decrease in low frequency band [21]. In the current case report, we observed that even in patient with bundle branch block, mild diastolic dysfunction, and chronic hypertension, the practice of yogic breathing establishes parasympathetic dominance by influencing the autonomic nervous system.

Conclusion

Yogic breathing techniques produces significant changes in heart rate variability (HRV) and also influences autonomic nervous system, brings about parasympathetic system in patient with RBBB, mild diastolic dysfunction and chronic hypertension.

Conflicts of Interest

None

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Table 1: Effect of yogic breathing on HRV

HRV variables	**Day1**		**Day2**		
	Baseline	**Bhramari**	**Baseline**	**Nadi Shodana (1:1)**	**Nadi Shodana with internal retention (1:1:1)**
RRI (ms)	596	613	576	570	576
HR bpm	101	98	104	105	104
RMSSD (ms)	93.9	128.5	61.1	54.8	66.7
SDNN (ms)	56.2	75.5	36.7	32.8	39.8
pNN50 %	34.78	45.15	25.75	17.39	28.14

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LF (n.u.)	30.00	5.08	28.28	24.18	15.43
HF (n.u.)	69.85	94.79	70.78	74.15	84.44
LF/HF ratio	0.429	0.054	0.400	0.326	0.183

Note: *RRI=The intervals between adjacent QRS complexes or the instantaneous heart rate; SDNN = standard deviation of RR intervals; HR =Heart rate; RMSSD= The square root of the mean of the sum of the squares of differences between adjacent NN intervals; pNN50=Proportion derived by dividing NN50 by the total number of NN intervals; LF =Low frequency; HF =High frequency; LF/HF ratio =Ratio of low frequency to high frequency.*