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Yoga: An Old Discipline With a New Indication for Reducing Cardiac Arrhythmias

Abstract

Background: Cardiac arrhythmias are any abnormality or disruption of the normal activation sequence of the myocardium in the heart. Atrial fibrillation (AF) is the most common type of cardiac arrhythmia and is associated with increased mortality and morbidity. Patients with cardiac arrhythmias have a decreased quality of life (QoL) and an increased psychosocial burden. Yoga has demonstrated to be an effective tool in reducing blood pressure in patients with hypertension, reducing symptoms of depression, anxiety, and increasing QoL. Yoga as a treatment for patients with cardiac arrhythmias has yet to be investigated fully. Will yoga decrease the amount of cardiac arrhythmias in arrhythmia-prone individuals?

Methods: An exhaustive search of available medical literature was performed using Medline-OVID, CINAHL, PubMed, and Web of Science using the keywords: “yoga”, “arrhythmias, cardiac.” A search of the National Institute of Health (NIH) clinical trials website showed one related clinical trial currently recruiting.

Results: Two studies met inclusion criteria and were included in the systematic review. The first study is an observational pre-post cohort study that examined the impact of a structured 3-month yoga program on AF. Fifty two patients were enrolled and results showed dramatic decreases in the frequency of AF while in the yoga program compared to the control period. The second study is a retrospective observational cohort study to determine the effects of Pranayama, a type of yoga breathing exercise, on the QT dispersion (QTd) in patients with arrhythmias. Fifteen patients were enrolled in the analysis and results demonstrate a statistically significant decrease in the QTd as captured on electrocardiogram (ECG) over the course of the 12-week yoga-breathing program.

Conclusion: Yoga is a successful complementary and alternative treatment for cardiac arrhythmias. It can help lower blood pressure, stress, anxiety and depression that may trigger episodes of AF or other cardiac arrhythmias. The cost of yoga is much less than medications and has little to no adverse effects. Although clinical trials are needed to give more support to the evidence presented in these studies, Yoga should be implemented in therapy strategies for patients with cardiac arrhythmias.

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A.J. Sommers

Second Advisor

Saje Davis-Risen

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Yoga: An Old Discipline With a New Indication for Reducing Cardiac Arrhythmias

Duane J (DJ) Fenn



A Clinical Graduate Project Submitted to the Faculty of the

School of Physician Assistant Studies

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Faculty Advisor: Duc Vo, MD

Clinical Graduate Project Coordinator: Annjanette Sommers, PA-C, MS

Biography

DJ Fenn is a native of Arizona, where he received his Bachelor of Science degree in Health Administration from the University of Phoenix. After completing his degree, he worked as a Clinical Research Coordinator where he abetted in over 15 different clinical trials before entering Pacific University's PA Program. DJ enjoys all types of music and plays the guitar. He also enjoys tennis, and spending time with his wife and family.

Abstract

Background: Cardiac arrhythmias are any abnormality or disruption of the normal activation sequence of the myocardium in the heart. Atrial fibrillation (AF) is the most common type of cardiac arrhythmia and is associated with increased mortality and morbidity. Patients with cardiac arrhythmias have a decreased quality of life (QoL) and an increased psychosocial burden. Yoga has demonstrated to be an effective tool in reducing blood pressure in patients with hypertension, reducing symptoms of depression, anxiety, and increasing QoL. Yoga as a treatment for patients with cardiac arrhythmias has yet to be investigated fully. Will yoga decrease the amount of cardiac arrhythmias in arrhythmia-prone individuals?

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Results: Two studies met inclusion criteria and were included in the systematic review. The first study is an observational pre-post cohort study that examined the impact of a structured 3-month yoga program on AF. Fifty two patients were enrolled and results showed dramatic decreases in the frequency of AF while in the yoga program compared to the control period. The second study is a retrospective observational cohort study to determine the effects of Pranayama, a type of yoga breathing exercise, on the QT dispersion (QTd) in patients with arrhythmias. Fifteen patients were enrolled in the analysis and results demonstrate a statistically significant decrease in the QTd as captured on electrocardiogram (ECG) over the course of the 12-week yoga-breathing program.

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Keywords: Yoga • Arrhythmias, cardiac • Atrial fibrillation • Quality of life

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List of Abbreviations

AF	Atrial fibrillation
ACS	Acute Coronary Syndrome
ECG	Electrocardiogram
GRADE	Grading of Recommendations, Assessment, Development, and Evaluation
ICD	Implantable Cardioverter-Defibrillator
JTc	Heart rate-corrected JT interval
JTc-d	Heart rate-corrected JTd
JTd	JT dispersion
MS	Milliseconds
NIH	National Institute of Health
PAF	Paroxysmal atrial fibrillation
QoL	Quality Of Life
QTc	Heart rate-corrected QT interval
QTc-d	Heart rate-corrected QTd
QTd	QT dispersion
SAS	Zung self-assessment anxiety score
SDS	Zung self-assessment depression score
SF-36	Short Form 36

Yoga: An Old Discipline With a New Indication for Reducing Cardiac Arrhythmias

BACKGROUND

Cardiac arrhythmias are any abnormality or disruption of the normal activation sequence of the myocardium in the heart. Cardiac arrhythmias are fairly common, with the innocuous type causing only mild symptoms such as dizziness, palpitations, and syncope. More severe arrhythmias cause more significant consequences such as sudden cardiac death. It is these arrhythmias for which we are most concerned.¹ There are very many different types of cardiac arrhythmias, the most common being atrial fibrillation (AF). AF is associated with heart failure, stroke, impaired quality of life, increased healthcare costs, mortality, and morbidity.^{2,3} Ventricular arrhythmias are also a very lethal disease with a mortality rate of approximately 50% in patients with only a mild arrhythmia. With patients that suffer with severe arrhythmias 25% of deaths are sudden and unexpected.^{4,5} Andersson et al⁶ reported hospitalized patients with incidental AF compared with non-AF controls had a much higher relative risk of death.

Patients who experience paroxysmal cardiac arrhythmias also have a decreased quality of life (QoL). According to Dorian et al⁷ AF patients reported substantially worse QoL than healthy controls on measures of physical and social functioning, mental and general health. There is an imposed psychosocial burden on patients who suffer from cardiac arrhythmias especially AF, including depression and anxiety.²

Emotional stress has a correlation to triggering these episodes of cardiac arrhythmia. According to Ziegelstein⁸ acute emotional stress can produce transient disturbances of cardiac rhythms, left ventricular contractile dysfunction, and, even, myocardial ischemia. The consequences of these cardiac disturbances can be seriously damaging and even fatal. The diagnosis of AF and other arrhythmias includes an electrocardiogram (ECG) to verify its presence and is necessary to make the diagnosis. If AF is intermittent and not captured on routine electrocardiography, holter monitoring or event recorders can identify the arrhythmia. Current treatment strategies are individualized for each patient depending on the circumstances. These therapies typically include rate control strategies, antiarrhythmic or antithrombotic drug therapy, percutaneous catheter ablation, or other surgical procedures, which can be variable and suboptimal.⁹

Yoga has demonstrated to be effective in reducing systolic blood pressure in patients with hypertension.^{10,11} Yoga is a combination of coordinated physical exercises, breathing techniques, and meditation. The meditation and movements prepare the body and nervous system for stillness, allowing the mind to remain calm. It teaches individuals how to gain mastery over the mind, emotions, and spiritual growth. Along with reduction in blood pressure, yoga reduces symptoms of depression and anxiety, while improving QoL.¹² Furthermore, yoga has significantly fewer side effects and is less expensive than medications or surgery. The extensive impact of yoga for patients with cardiac arrhythmias has yet to been investigated completely. The purpose of this systematic review is to evaluate any beneficial effects yoga can have on patients with cardiac arrhythmias.

METHODS

An exhaustive search of available medical literature was performed using Medline-OVID, CINAHL, PubMed, and Web of Science using the keywords: “yoga”, “arrhythmias, cardiac.” The results were filtered to include only those in the English language and for relevance on the specific topic. Relevant sources were also sought from the references of these articles. Those articles with primary data evaluating arrhythmia frequency, or a change in predisposing factors for arrhythmia with yoga as treatment were included. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) was utilized to assess the quality of the remaining articles. A search of the National Institute of Health (NIH) clinical trials website showed one clinical trial currently recruiting: *Yoga and Rate and Duration of Inappropriate Sinus Tachycardia (IST) Episodes*.¹³

RESULTS

The initial search with the keywords described above resulted in eight articles for review. These articles were screened for the primary data points and two articles, an observational pre-post cohort study,¹⁴ and a retrospective observational study,¹⁵ met inclusion criteria see Table 1.

YOGA My Heart Study

This observational pre-post cohort study¹⁴ examined the impact of a structured 3-month yoga program on AF burden, QoL indicators, depression, and anxiety scores. Screening included evaluation of 103 patients with paroxysmal atrial fibrillation (PAF). The primary outcomes included change in symptomatic AF,

symptomatic non-AF, and asymptomatic AF episodes. Secondary outcomes included change in short form 36 (SF-36), QoL score, Zung self-assessment anxiety score (SAS) and Zung self-assessment depression score (SDS). Inclusion criteria was any individual with PAF between the ages of 18-80 that were willing to participate in the study. Patients with a history of AF ablation within 3 months, contraindications for yoga training, life expectancy <1 year, advanced heart failure, and patients who practiced any form of yoga in the preceding 6 months were excluded. Fifty-two patients met enrollment criteria and were enrolled into the study.¹⁴

The first three months of the study consisted of a control period followed by the yoga intervention phase for the following three months. Clinical characteristics, QoL, anxiety, and depression scores were assessed at baseline (Day 0), end of the control phase (Day 90) and end of the intervention phase (Day 180). Patients were monitored using cardiac nonlooping event monitors and a self-reporting symptom diary. Any AF lasting greater than 30 seconds was logged as an episode. Patients were asked to log episodes consistent with symptoms of AF and record if they didn't have any such symptoms. During the yoga intervention period all patients underwent a structured Iyengar yoga training at least twice weekly. A certified professional yoga instructor conducted the 1-hour yoga sessions in groups of 15-20 people in a yoga studio. Compliance was reinforced with biweekly phone calls. Educational DVDs were also provided to each participant in order to practice the yoga postures at home. At the end of the intervention phase, yoga significantly reduced the number of symptomatic AF (3.8 ± 3 vs. 2.1 ± 2.6 ; $p < 0.001$), symptomatic non-AF (2.9 ± 3.4 vs. 1.4 ± 2.0 ; $p < 0.001$), and asymptomatic AF

episodes (0.12 ± 0.44 vs. 0.04 ± 0.20 ; $p < 0.001$) (Figure 1). Eleven patients with documented AF during the control pre-yoga phase did not have any AF episodes during the interventional yoga phase.¹⁴

Yoga had a beneficial effect for the secondary outcomes also. SF-36, SDS, and SAS scores improved significantly. Reductions in systolic and diastolic blood pressures were also noted at the end of the intervention phase. No major adverse effects or complications were noted or reported due to yoga therapy during the entire study period. Based on the findings of the study yoga practice was shown to decrease symptomatic and asymptomatic AF burden, while improving anxiety, depression, resting heart rate, blood pressure, and the QoL in patients with PAF.¹⁴

Pranayama Study

In this retrospective observational cohort study¹⁵ the authors determined the effects of Pranayama, a type of yoga breathing exercise, on the QT dispersion (QTd) in patients with arrhythmias. The primary outcomes of the study were changes in QT and JT intervals as recorded on a 12-lead ECG. Changes in patient exercise capacity were also explored.¹⁵

The authors retrospectively evaluated 27 patients enrolled in Pranayama sessions. Patients were screened for inclusion criteria, which included the presence of a diagnosed arrhythmia with ejection fractions $<40\%$; the absence of active ischemia revealed by exercises testing; a stable medical regimen for at least 2 weeks prior to starting and during the study; the absence of any recent coronary revascularization procedures ≤ 3 months prior to enrollment; and no history of myocardial infarction in the 8 weeks prior to enrollment. Exclusion criteria were

class IA or III antiarrhythmic medications, the inability to complete the Pranayama session, the absence of sinus rhythm at entry or completion of session, and a complete bundle-branch block of either kind. A total of 15 patients met inclusion criteria and were evaluated in the analysis. The duration of the Pranayama program was 12-weeks consisting of a total of 36 sessions each lasting 45 minutes.¹⁵

Standard 12-lead ECGs were recorded at baseline and before and after each Pranayama session. All ECGs were examined by one observer blinded to the clinical status and the follow-up results. Measurements of QT, JT, and RR intervals were performed manually. Heart rate-corrected QT (QTc) and JT intervals (JTc) were calculated using Bazett's formula ($QTc=QT/RR^{-1/2}$).¹⁵ The ventricular repolarization dispersions were determined by calculating the difference between maximum and minimum QT or JT intervals in each ECG and they were termed QTd, heart rate-corrected QTd (QTc-d), JTd, and heart rate-corrected JTd (JTc-d).¹⁵

At the end of the Pranayama training there were statistically significant decreases in all intervals of the QTd, QTc-d, JTd, and JTc-d. The QTd decreased from 71 ± 11 ms to 59 ± 17 ms, QTc-d decreased from 82 ± 28 ms to 63 ± 17 ms, JTd decreased from 76 ± 19 ms to 57 ± 18 ms, and JTc-d from 84 ± 23 ms to 61 ± 18 ms. The results were further analyzed between two etiologies of heart failure, nonischemic dilated cardiomyopathy and ischemic, both groups showing statistically significant improvements. The results of the study showed that following a Pranayama training program, JTc-d decreased by an average of 23 ms, with other indices of ventricular repolarization dispersion significantly improving.⁴This may translate into substantial clinical benefits; however, the

authors were clear that more data in large-scale trials are needed to validate these findings and see if they translate into significant reductions in arrhythmias and thus major cardiac events.¹⁵

DISCUSSION

AF and other arrhythmias continue to be difficult conditions for clinicians to manage with the treatment options having an array of side effects. These two studies^{14,15} illustrate yoga as a reasonable complementary treatment option. The yoga my heart study¹⁴ showed significant reductions in the incidence of symptomatic AF during the yoga treatment period. The pranayama study¹⁵ suggests a decrease in AF and other arrhythmias with a reduction in QTd and JTd.

The exact mechanism in reducing cardiac arrhythmias with yoga remains unknown, however, it is thought to be through increasing vagal tone and reducing sympathetic tone.¹⁶ Autonomic imbalance including hyperactivation of the sympathetic nervous system has been known to be associated with occurrence of life threatening conditions including acute coronary syndromes (ACS) and may directly trigger dangerous arrhythmic events in arrhythmia-prone individuals.^{16,17}

Hyperactivation of the sympathetic nervous system is known to prolong the QT interval and impair heart rate variability. These may serve as markers of cardiac arrhythmia in susceptible patients. According to Yalta et al¹⁸ therapeutic strategies aiming at management of autonomic imbalance on top of conventional anti-arrhythmic therapy in arrhythmia-prone subjects have gain particular importance in recent years. However sympathetic ganglion blockage and beta-blockers

generally fail to induce central and constant alterations in the sympatho-vagal balance. This is why Yoga is such a great tool for patients with cardiac arrhythmias. Meditation and yoga have been suggested to have a deep impact on the autonomic nervous system including activation of parasympathetic responses. The exact mechanisms of autonomic regulation due to yoga still remain to be established.¹⁹

Episodes of acute emotional stress also play a significant role in heart adverse effects including disturbances of cardiac rhythm. Zeigelstein⁸ explains in a case study of 78-year-old man with an implantable cardioverter-defibrillator (ICD). This patient had a history of ischemic cardiomyopathy, left bundle-branch block and a ventricular ejection fraction of 20% to 25%. The patient and his wife got in an argument where they were yelling at each other due to a misunderstanding and soon after the patient's defibrillator fired. The ICD showed that a supraventricular tachycardia developed shortly after his wife began yelling which degenerated to atrial fibrillation with a rapid ventricular response, which was interpreted as a ventricular arrhythmia by the ICD. The response by the ICD occurred because the ventricular rate was within the ventricular tachycardia detection zone, resulting in a delivery of an ICD shock. Evidence indicates that asymmetric brain activity is particularly important in making the heart more susceptible to ventricular arrhythmias.⁸ Since emotional stress can lead to arrhythmias, yoga is particularly important in patients susceptible to cardiac arrhythmias. One of the foremost purposes of yoga is to calm the mind and reduce emotional stress.

These studies, although showing yoga as an efficacious treatment for cardiac arrhythmias, have limitations. Both studies have a very small sample size, which

equates to less confidence in the results. The quality of evidence is very low see table 1. Larger randomized clinical trials are needed to support the results found in these studies and provide further evidence that yoga can provide effective suppression of cardiac arrhythmias.

CONCLUSION

Yoga is a successful complementary and alternative treatment for cardiac arrhythmias. It can help lower blood pressure, stress, anxiety and depression that may trigger episodes of AF or other cardiac arrhythmias. The cost of yoga is much less than antiarrhythmic drugs and has little to no adverse effects. Yoga should be implemented in therapy strategies for patients with cardiac arrhythmias.

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Figure 1. Differences in Primary Efficacy Outcomes Measures Between the Control and Intervention Phase

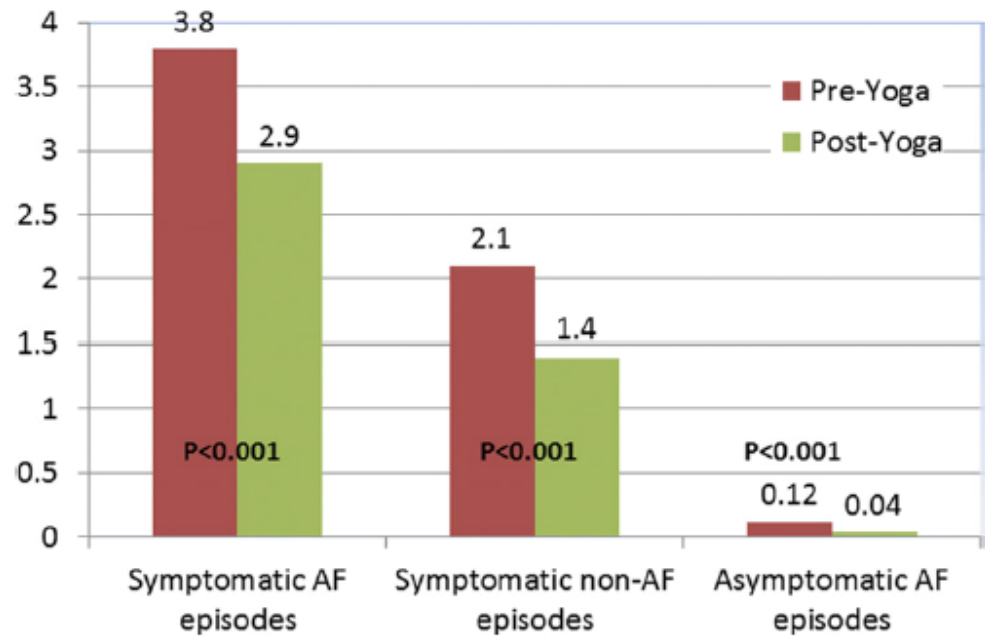


Figure 1 Differences In Primary Efficacy Outcomes Measures Between the Control and Intervention Phase

Values are mean ± SD.

Table 1. Characteristics of Reviewed Studies

Summary of findings							
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YOGA My heart Study	Pre-post cohort study ^a	Group	Number of patients	Symptomatic AF	Symptomatic non-AF	Asymptomatic AF	GRADE Quality	
		Pre-yoga	52	3.8	2.1	0.12	very low ^f	
		Post-yoga	49 ^c	2.9	1.4	0.04		
		Secondary outcomes						
		Group	SDS (depression)	SAS (Anxiety)	SF-36 (QoL)	Blood pressure		
		Pre-yoga	29.0 (24.0-35.0)	33.0 (31.0-36.5)	85.0 (70.0-93.8) ^d	133/78 ^e		
Post Yoga	27.0 (22.0-31.0)	25.0 (23.0-30.0)	90.0 (85.0-95.0) ^d	127/74 ^e				

Pranayama study	Retrospective cohort study ^b	Group	Number of Patients	QTd (ms)	QTc-d (ms)	JTd (ms)	JTc-d (ms)	GRADE Quality
		Before pranayama	15	71 ± 11	82 ± 28	76 ± 19	84 ± 23	very low ^f
		After Pranayama	15	59 ± 17	63 ± 17	57 ± 18	61 ± 18	
		<i>P</i> Value		<.02	<.01	<.002	<.0007	

^aSee reference 14

^bSee reference 15

^cThree patients did not complete the study

^dData for physical functioning of SF-36 only. p Value 0.017

^eAverages only. Statistically significant with a p value <0.05. Pre yoga: systolic ±6.2 diastolic ±6.5. Post yoga: systolic & diastolic ±6.7.

^fSmall sample size in both studies decreases GRADE quality