Review Article

A Review on Role of Yoga in the Management of Patients with Cardiac Arrhythmias

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Abstract

Evidence suggests that yoga is safe and effective in improving various risk factors, quality of life (QoL), and psychological burden that is related to arrhythmia. However, this is the first-ever systematic review performed to report the role of yoga in arrhythmia. We have performed a literature search using Cochrane Library, Medline/PubMed, Web of Science Core Collection, and IndMED electronic databases up to 3, January 2018. Of 240 articles, 6 potentially eligible articles were identified and included in the review. Results showed that yoga could be considered an efficient adjuvant in reducing arrhythmia (paroxysmal atrial fibrillation, ventricular tachyarrhythmia, and palpitation) related health problems; blood pressure, heart rate, depression and anxiety scores; and in improving health-related QoL of arrhythmia patients. However, there is a lack of randomized controlled trials and a clear mechanism behind the effect of yoga; studies had relatively a small sample size and different yoga protocols.

Keywords: *Arrhythmia, cardiovascular diseases, quality of life, yoga*

Introduction

Cardiac arrhythmia (irregular heart rhythm) is the incapability of the ventricles and atria to contract in a regular rhythm due to a malfunction of electrical signals in the heart.[1] Based on the resting heart rate (HR), the arrhythmia is classified as either tachycardia ([HR >100 beats/minutes] or bradycardia [HR <60 beats/minutes]). Types of arrhythmia: (1) supraventricular arrhythmias (e.g. paroxysmal supraventricular tachycardia, and atrial fibrillation/flutter [AF]), (2) premature beats, (3) bradyarrhythmias (4) ventricular arrhythmias ([e.g., ventricular tachycardia [VT] and ventricular fibrillation/flutter [VF]).[2] Cardiac arrhythmias are widespread, particularly in patients with heart diseases[3] and are known to have an impact on health-related outcomes, and healthcare costs. The efficiency of existing treatments, including anti-arrhythmic drugs, is quite variable[4] and limiting its scope due to its adverse effects, including decreased quality of life (QoL). Thus, an intervention which is safe and effective in improving risk factors of arrhythmia would be effective in treating patients with arrhythmias and might have a major public health impact.

Yoga, a mind-body medicine originated in ancient Indian philosophy[5] approximately 5000 years ago[6] and is currently becoming popular as a safe and effective treatment modality in the Western countries.[5] It consists of specific posture (asana), breathing techniques (pranayama), and meditation.[4] Patients with arrhythmia also frequently complain of depression and anxiety,[4,7] and impaired QoL.[6,7] Whereas, the yoga practice is not only effective in reducing the psychological burden (depression and anxiety) and in improving the QoL that are associated with arrhythmia,[4] but is also safe and effective in managing various arrhythmia risk factors including autonomic dysfunction,[8] oxidative stress,[9] obesity,[10] hypertension,[11] coronary artery disease,[12] and heart failure.[13] Thus, the practice of yoga is believed to be an important modality in patients with arrhythmia, as corroborated by multiple studies in the past few years. Moreover, this review was performed with the aim and objective to systematically assess the role of yoga on arrhythmia episode, electrocardiogram (ECG) changes, hemodynamic changes, exercise capacity,

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psychological burden, and health-related QoL in patients with arrhythmia.

Methods

Eligibility criteria

Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were used to carry out this review.[14] Experimental studies including randomized controlled trials (RCTs), crossover or self as control trials, single group pre-post trials, case series that are dealing with yoga practice (irrespective of a particular type, duration, and frequency) and arrhythmia (any type) with or without comparing with standard medical care and published in English were eligible. Observational studies, case reports without yoga intervention, review articles, surveys, and health news were not eligible.

Database and search strategies

To find the relevant articles in English, we have carried out a literature search using Cochrane Library, Medline/PubMed, Web of Science Core Collection, and IndMED electronic databases up to January 3, 2018. We used the following search terms "Yoga AND Heart rate OR Atrial fibrillation OR Arrhythmia OR Arrhythmias in Medline/PubMed and keywords "Yoga and cardiac arrhythmia, or yoga and arrhythmia" in the rest of the electronic databases. Articles available from the literature search (n = 240) were screened, and potentially eligible articles were recognized and incorporated (n = 6) in this review. The summary of the search strategy is given in Figure 1.

Data collection and analysis

Two authors independently screened the available literature using title and abstract to obtain the relevant articles. If the article seems to be eligible, then the full-text of that article was obtained and once again the eligibility was confirmed by those two authors independently. In the event of any discrepancy, third author was authorized to take a final decision after evaluating the article for eligibility. References of the eligible articles were cross-checked to find the other potentially eligible articles.

Data extraction

Data extraction was performed by two authors independently using a standard data extraction forms considering the study setup, study population, intervention performed, study duration, outcome variables, and results.

Risk of bias of the included randomized controlled trials

Two authors separately evaluated the included RCTs' risk of bias using Cochrane Collaboration modified tool for assessing the risk of bias for RCTs, Part-I and II. The following criteria were assessed: random sequence generation, selective reporting, allocation concealment, blinding of outcome assessment, blinding of participants and personnel, incomplete outcome data, and other sources of bias [Table 1].

Results

In the literature review, a total of 240 articles published were available. Of 240 articles, 15 duplicates were eliminated and the remaining 225 articles were screened. Of 225 articles, six articles that fulfilled the eligibility criteria were included in the review. Of 6 articles (2 RCTs, 2 self as control trials, 1 single group pre-test and post-test experimental study and 1 case series) included in the study, two articles (1 RCT and 1 self as control trial) were published in the journal as conference presentations. The characteristics and the findings of the included articles are provided in Tables 2 and 3.

Outcome measures and results

Atrial fibrillation episodes

Two studies have evaluated the effect of yoga on the occurrence of AF episodes in paroxysmal atrial fibrillation (PAF) patients.[4,15] AF (>30 s) was monitored using cardiac non-looping event monitors and a symptom diary during the study period. In order to differentiate between the asymptomatic and symptomatic AF episodes, patients were advised to record episodes whenever they had AF symptoms and if they did not have the symptoms, they were asked to record at least one recording per day. Asymptomatic AF, symptomatic non-AF episodes and symptomatic AF episodes were classified as the events coupled with AF on the monitor and no symptoms, the events coupled with no AF on the monitor and symptoms and events coupled with AF on the event monitor and symptoms respectively.[4] In these studies, the practice of yoga for 3 months has been shown to produce a significant decrease in the AF episodes ($P < 0.001$)[15] including asymptomatic-AF episodes ($P < 0.001$), symptomatic non-AF episodes ($P < 0.001$), and symptomatic-AF episodes ($P < 0.001$) in the yoga phase compared to the control phase. Moreover, (n = 11) i.e., 22% of patients those who had AF episodes in the control phase were not reported to have AF episodes in the yoga phase.[4]

Electrocardiogram findings

Two studies have evaluated ECG findings in patients with two different arrhythmias.[16,17] One study reported the effect of 3 months practice of yoga on QT dispersion (QTd) (a myocardial electrical instability marker), JT dispersion (JTd) (sudden death in myocardial infarction predictor), HR-corrected QT (QTc) and JT intervals (JTc) [derived using Bazett's formula ($QTc = QT/RR^{-1/2}$)] to determine ventricular repolarization dispersions in patients with ventricular tachyarrhythmia. According to the study, the practice of yoga, particularly pranayama (Bhastrika, Kapalbhati, Anilom-vilom, Bhramari, and Udgit pranayama) for 45-min/day, 3-days/week, for 3-months produced a significant reduction in the indices of

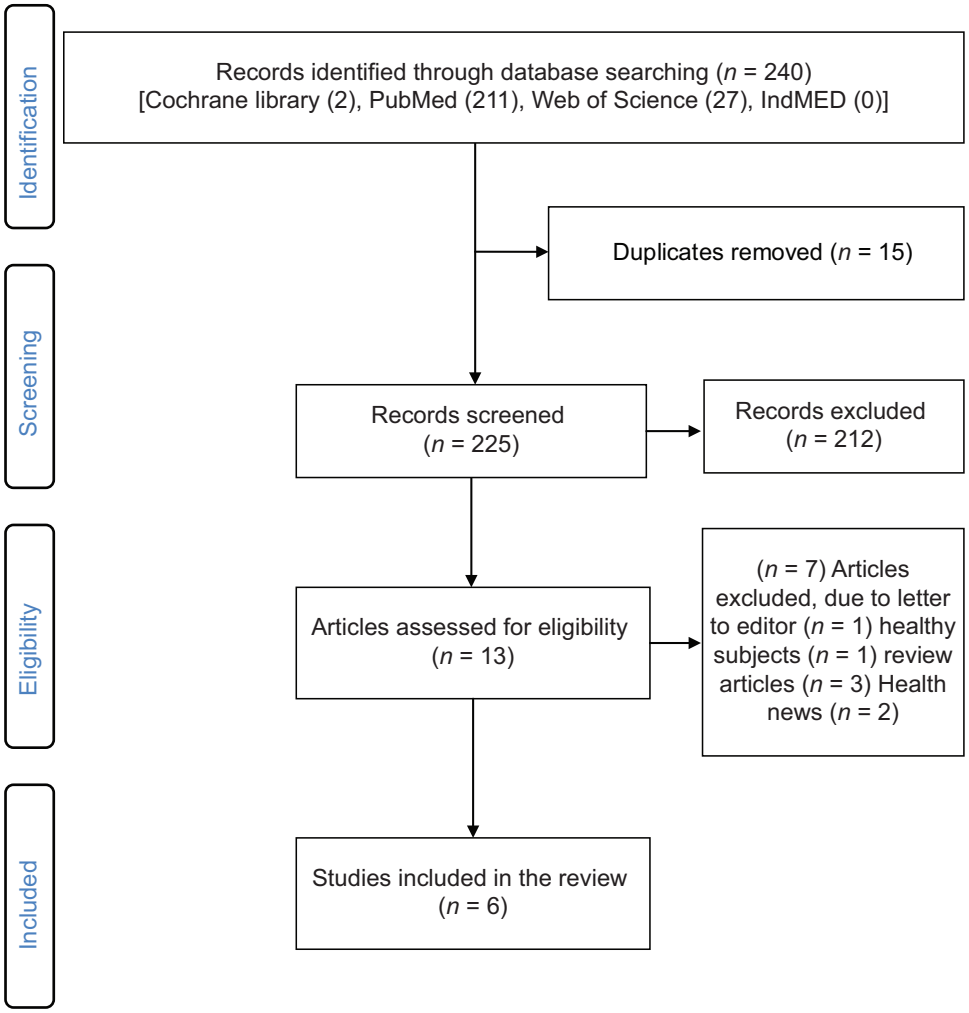

Figure 1: Details of the systematic review process

Table 1: Risk of bias assessment of included randomized controlled studies

Study	Author, year of publication	Selection bias		Reporting bias (Selective reporting)	Other bias (other source of bias)	Performance bias (blinding participants and personnel)	Detection bias (blinding outcome assessment)	Attrition bias (incomplete outcome data)
		Random sequence generation	Allocation concealment					
1	Nilsson *et al*., 2013	Low	Unclear	Low	Low	Unclear	Unclear	Unclear
2	Wahlstrom *et al*., 2017	Low	Low	Low	Low	High	Unclear	High

Risk of bias was assessed using Cochrane collaboration modified tool for assessing risk of bias for randomized controlled trials, Part-I and II

ventricular repolarization dispersion [i. e. mean values of QTd (from 71 ms to 59 ms; $P < 0.02$), QTc-d (from 82 ms to 63 ms; $P < 0.01$), JTd (from 76 ms to 57 ms; $P < 0.002$), and JTc-d (from 84 ms to 61 ms; $P < 0.001$)] in patients with ventricular tachyarrhythmia. The mechanism for this effect was proposed to be due to an improvement in the autonomic functions, such as an increase in parasympathetic activity and a reduction in sympathetic activity as measured by QTd and JTd in this study.[16]

Another study has reported the effect of 2 months of practice of yoga on premature ventricular complexes in patients with palpitation. In this study, the practice of yoga, particularly yogic breathing (six cycles/min) and relaxation in Shavasana, for 6 days/week for 2 months has been shown to produce a reduction in palpitations episodes, ectopic frequency during tilt and no ectopics in a 5-min ECG in patients with palpitation with premature ventricular complexes.[17]

Hemodynamic parameters

Three studies have evaluated the effect of yoga on hemodynamic parameters such as HR, systolic blood pressures (SBP), and diastolic blood pressures (DBP).[4,6,7]

Table 2: Summary of the literature review

Author, year of publication	Conducted in	Study design	Subjects	Sample size (*n*)	Groups	Intervention	Study period (months)	Assessments	Findings
Ravindra *et al*., 2006	India	Case series	Palpitation with PVC	2	Single group	Yogic breathing (6/min) and Shavasana, 6 days/week for 2 months	2	Palpitation episodes and frequency of PVC using ECG	Palpitations episodes↓ No ectopics in a 5 min ECG obtained during supine rest, and ectopic frequency during tilt ↓ from 7.5/min to 3.5/min
Dabhade *et al*., 2012	India	Single group pre-post study	VTA	15	Single group	45 min pranayama, 3 session/week for 12 weeks	3	QTd, QTc-d, JTd and JTc-d measured using 12-lead surface ECG Exercise capacity METs, Anaerobic threshold and VO_2-max	Significant improvements in QTd (P<0.02), QTc-d (P<0.01), JTd (P<0.002), and JTc-d (P<0.0007) and nonsignificant improvements in exercise capacity following Pranayama
Lakkireddy *et al*., 2013	USA	Self as controlled trial	PAF	52	Single group in 2 phase (CP and YP)	CP: SMC YP: 1 h yoga, twice a week for 3 months	CP: 0-3 and YP: 3-6	Compliance and safety, symptomatic AF, symptomatic non-AF, asymptomatic AF episodes, QOL (SF-36), anxiety (SAS), and depression (SDS)	Compliance to yoga was good (mean [range] 3 [2-7] sessions/week) and no major adverse effects due to yoga therapy Yoga ↓ number of symptomatic AF (P<0.001), symptomatic non-AF (P<0.001), and asymptomatic AF episodes (P<0.001). n=11 (22%) patients documented AF during CP did not have AF episode in YP QOL: CP- ↑General Health (SF-36) (P<0.05). YP- ↑physical functioning (P=0.017), general health (P<0.001), vitality (P<0.001), social functioning (0.019), and mental health (P<0.001) Anxiety and depression: ↓ in CP (P<0.05) with better ↓ in YP (P<0.001) BP and HR: ↓ in CP (P<0.05) with better ↓ in YP (P<0.001)

Contd....

Table 2: Contd...

Author, year of publication	Conducted in	Study design	Subjects	Sample size (*n*)	Groups	Intervention	Study period (months)	Assessments	Findings
Lakkireddy *et al*., 2013*	USA	Self as controlled trial	PAF	52	Single group in 2 phase (CP and YP)	CP: Regular exercise of patients' choice. YP: 45 min yoga, 3 times/week for 3 months	CP: 0-3 and YP: 3-6	Number of AF episodes, QOL (SF-36), anxiety (SAS), and depression (SDS)	↓ number of AF episodes in YP compared to CP (P<0.001). Yoga ↓ depression (P<0.001) and anxiety (P<0.001) and improved QOL in physical functioning (P=0.017), general health (P<0.001), vitality (P<0.001), social functioning (P=0.019), and mental health (P<0.001)
Nilsson *et al*., 2013*	Sweden	RCT	PAF	80 (40 YG and 40 CG)	2 groups: YG and CG	YG: SMC+Medical yoga (1 h session a week for 3 months). CG: SMC	3	BP, HR and QOL (EQ-5D VAS and SF-36 health survey)	↓ SBP (P=0.03), DBP (P=0.007), HR (P=0.02) and ↑ QOL in EQ-5D VAS (P<0.05) and physical (P=0.01) and mental (P=0.02) health related QOL in SF-36 in YG compared to CG
Wahlstrom *et al*., 2017	Sweden	RCT	PAF	80 (40 YG and 40 CG)	2 groups: YG and CG	YG: SMC+Medical yoga (1 h session a week for 3 months). CG: SMC	3	BP, HR and QOL (EQ-5D VAS and SF-36 health survey)	↓ SBP (P=0.033), DBP (P=0.001), HR (P=0.024) and ↑ QOL in SF-36 mental health domain (P=0.016) in YG compared to CG. But, though YG ↑ QOL in EQ-5D VAS- scale (P=0.001) no significant difference in between group. No change in SF-36 physiological health domain either within or between YG and CG

*Conference presentations. AF=Atrial fibrillation, PAF=Paroxysmal AF, YG=Yoga group, CG=Control group, SMC=Standard medical care, EQ-5D VAS=Euro-Qol 5 dimension visual analog scale, SF-36=Short form-36, CP=Control phase, YP=Yoga phase, SAS=Zung self-assessment anxiety score, SAD=Zung self-assessment, QTd=QT depression, QTc-d=Heart rate corrected QT depression, JTd=JT dispersion, JTc-d=Heart rate corrected JT depression, ECG=Electro cardiogram, METs=Metabolic equivalents, VO2 max=Maximal oxygen consumption, VTA=Ventricular tachyarrhythmia, PVC=Premature ventricular complexes, QOL=Quality of life, HR=Heart rate, BP=Blood pressure, SBP=Systolic BP, DBP=Diastolic BP

In the first study, a significant decline in HR, SBP, and DBP was reported both in the control phase (66.9 beats/min to 64.7 beats/min, 135 mmHg to 133 mmHg, and 80.9 mmHg to 78.2 mmHg respectively; $P < 0.05$ for all) and in the yoga phase. However, a better reduction was reported after the yoga phase (64.7 beats/min to 61.5 beats/min, 133 mmHg to 127.7 mmHg and 78.2 mmHg to 74 mmHg, respectively; $P < 0.001$ for all).[4] In the second study, the practice of yoga has been shown to produce a reduction in HR (64 beats/min to 60 beats/min), SBP (137 mmHg to 132 mmHg) and DBP (83 mmHg to 77 mmHg), while the control group (CG) has been shown to produce the opposite effect, i.e., an increase in HR (65 beats/min to 69 beats/min), SBP (138 mmHg to 141 mmHg), and DBP (84 mmHg to 87 mmHg). Moreover, there was a significant decline in HR ($P = 0.02$), SBP ($P = 0.03$) and DBP ($P = 0.007$) in the yoga group (YG) compared to the CG.[6] In third study, 12 weeks of yoga practice

Table 3: Details of the subjects and the interventions of the included studies

Author, year of publication	Subjects					Study period (months)	Intervention
	Patients	Selection criteria	Sample size (*n*)	Dropouts (*n*)	Completed (*n*)		
Ravindra *et al*., 2006	Palpitation with PVC	(*n*=1) 35 year old female with a 3 months history of anxiety and palpitations and one episode of syncope unrelated to exertion. There were frequent unifocal PVC in a lead II rhythm strip (*n*=1) 14 year old boy with frequent PVC and palpitations and an otherwise uneventful medical history	2	0	2	2	Yogic breathing (6/min) and Shavasana, 6 days/ week. Both patients were asked to practice the techniques daily at home
Dabhade *et al*., 2012	VTA	Arrhythmia with LEFT<40%, absence of active ischemia, a stable medical regimen for at least 2 weeks prior to starting session and during the session, absence of any recent coronary revascularization procedure (≤3 months), no history of myocardial infarction in the 8 weeks prior to enrolment were included. Patients with Class IA or III ADD, inability to complete the pranayama session, absence of sinus rhythm at entry or completion of session, a complete bundle-branch block of either kind were excluded	15	0	15	3	45-min pranayama (Bhastrika [10 min], Kapalbhati [10 min], Anilom-vilom [15 min], Bhramari [5 min], and Udgit pranayama [5 min]), 3 sessions/week
Lakkireddy *et al*., 2013	PAF	18-80 years of age and willing to participate in the study were included. Patients with a history of AF ablation within 3 months, contraindications for yoga, life expectancy <1 year, advanced HF, and who practiced yoga in the preceding 6 months were excluded	52	3 (During YP)	49	6 (CP: 0-3 and YP: 3-6)	YP: 60 min of structured Iyengar yoga training (10 min of pranayamas, 10 min of warm-up exercises, 30 min of asanas, and 10 min of relaxation exercises) at least twice/week in groups of 15 to 20 people. An educational DVD was also provided to each participant, and depending on the comfort level, patients were encouraged to practice these postures on their own at home on a daily basis. Compliance was reinforced with biweekly phone calls CP: SMC
Lakkireddy *et al*., 2013*	PAF	Patients with no physical limitations to participate in Yoga were included	52	3 (During YP)	49	6 (CP: 0-3 and YP: 3-6)	YP: 45 min of structured supervised Yoga program (breathing exercises, asanas (positions), meditation, and relaxation) 3 times/week CP: Regular exercise of patients' choice

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Table 3: Contd....

Author, year of publication	Subjects					Study period (months)	Intervention
	Patients	Selection criteria	Sample size (*n*)	Dropouts (*n*)	Completed (*n*)		
Nilsson *et al*., 2013*	PAF	Not available	80	0	80	3	YG: SMC+Medical yoga (focusing on deep breathing in movements) 1 h/session/week). CG: SMC
Wahlstrom *et al*., 2017	PAF	Early or newly diagnosed patients of PAF with medical treatment for PAF for at least 3 months were included. Patients with difficulties understanding Swedish language and multiple concurrent medical conditions (i.e., cancer, HF and RF with symptoms) or cognitive dysfunction were excluded	80 (40 YG and 40 CG)	11 (7 YG and 4 CG)	69 (33 YG and 36 CG	3	YG: SMC+Medical yoga (evolved from Kundalini yoga that consist of deep breathing, asana, meditation and relaxation) 1 h in a group of 10 participant once a week for 12 weeks. Participants were also encouraged to practice yoga at home CG: SMC

*Conference presentation. AF=Atrial fibrillation, PAF=Paroxysmal atrial fibrillation, AAD=Anti arrhythmic drug, YG=Yoga group, CG=Control group, SMC=Standard medical care, CP=Control phase, YP=Yoga phase, LEFT=Left ventricular ejection fraction, PVC=Premature ventricular complexes, VTA=Ventricular tachyarrhythmia, AF=Atrial fibrillation, HF=Heart failure, RF=Renal Failure, DVD=Digital Video Disc

has been shown to produce a significant reduction in HR (YG = 64 beats/min to 61 beats/min, CG = 65 beats/min to 70 beats/min; $P = 0.024$), SBP (YG = 137 mmHg to 132 mmHg, CG = 138 mmHg to 141 mmHg; $P = 0.033$) and DBP (YG = 84 mmHg to 77 mmHg, CG = 84 mmHg to 86 mmHg; $P < 0.001$) in the YG compared to the CG.[7]

Metabolic parameters and exercise capacity

Only one study has reported the metabolic changes, including maximal oxygen consumption (VO_2 max), metabolic equivalents (METs), and anaerobic threshold during the pranayama practice. The assessment was made through breath to breath online gas analysis by a metabolic cart. The study showed an increase in VO_2 max (from 15 mLO_2/kg/min to 16 mLO_2/kg/min) and exercise capacity (from 4 METs to 5 METs) after pranayama. However, the increase in VO_2 max and METs was insignificant, and no change has been reported in anaerobic threshold from 12 mLO_2/kg/min after pranayama in patients with ventricular tachyarrhythmias.[16]

Depression and anxiety

Two studies have evaluated the effect of yoga on depression and anxiety in patients with PAF. The level of depression and anxiety were assessed using the Zung self-assessment depression score and Zung self-assessment anxiety score, respectively. Both studies have reported a significant reduction in depression ($P < 0.001$) and anxiety ($P < 0.001$) scores after the yoga phase compared to after the control phase.[4,15]

Health-related quality of life

Four studies have evaluated the effect of yoga on QoL.[4,6,7,15] Of the 4 studies, 2 studies have used only the short form-36 (SF-36) health survey,[4,15] while another two studies have used a combination of the SF-36 health survey and the Euro-Qol-5 dimension visual analog scale (EQ-5D VAS) to evaluate the QoL.[6,7]

Of two studies that used SF-36 alone, one study has showed a significant enhancement in general health ($P < 0.05$) after the control phase,[4] while another study did not provide any information regarding the control phase.[15] However, both the studies have reported a significant improvement in physical functioning ($P = 0.017$), general health ($P < 0.001$), vitality ($P < 0.001$), social functioning ($P = 0.019$), and mental health ($P < 0.001$) after the yoga phase compared to after the control phase.[4,15]

Of two studies that used SF-36 with EQ-5D VAS, only one study has reported a significant improvement in both physical ($P = 0.01$) and mental ($P = 0.02$) health-related QoL in SF-36 and a significant improvement in EQ-5D VAS ($P < 0.05$) QoL in the YG compared to the CG.[6] Whereas, another study has been reported a significant improvement only in the mental health domain of SF-36 ($P = 0.016$) in the YG compared to the CG with a significant improvement in EQ-5D VAS-scale ($P = 0.001$) QoL in the YG ([only in the within-group analysis [$P = 0.001$] and not between-group analysis [$P > 0.05$]) and no significant change in the physiological health domain of SF-36 either in within or between the YG and the CG.[7]

Compliance and safety

Of six studies, only one study has reported the compliance to the yoga class (i.e., good compliance with the average

of three classes that was varied from two to seven classes/week) and also revealed that the number of classes was not associated with the degree of improvement.[4] Of 6 studies, number of subjects completed the study was not available; thus, 5 studies attrition rate was calculated using a formula ([number of subjects dropped out from the study/number of subjects enrolled in the study] × 100) and the retention rate was calculated using a formula (number of subjects completed the study/number of subjects enrolled in the study × 100). Results showed that the included studies attrition rate was varied from 0% to 13.75% (i.e.[*n* = 2] had 0%,[16,17] (*n* = 2) had 5.77%,[4,15] and (*n* = 1) had 13.75%[7]) and retention rate was varied from 86.25% to 100% (i.e., [*n* = 1] had 86.25%,[7] [*n* = 2] had 94.23, and [*n* = 2] had 100%). This suggests that compliance with the study is good among patients with arrhythmias. Of six studies, only one study[4] has stated that there were no major adverse effects due to yoga therapy. However, none of the studies have reported any adverse effects during the practice of yoga and the entire study duration due to yoga practices. This suggests that the practice of yoga could be considered as a safe modality among patients with arrhythmias.[4]

Discussion

Yoga practices provided to the participants: Of 6 studies, only 3 studies[4,16,17] have reported the list of individual yoga practices provided to their study participants, while the rest of the studies[6,7,15] reported the yoga practices in general such as breathing exercises, asanas, meditation, and relaxation. The details of the individual yoga practices provided in Lakkireddy *et al*., 2013 study are 60 min of structured Iyengar yoga training (at least twice/week for 3 months) consists of 10 min of pranayamas such as ujjayi (sounding breath), dirghapranayama (Complete or three-part or yogic breathing), and nadishodhana pranayama (alternate nostril breathing), 10 min of warm-up exercises, 30 min of asanas such as sukhasana (easy posture), bitilasana (cow posture), adhomukhavirasana (modified child posture), dandasana (stiff posture), janusirsana (modified head on knee posture), paschimottanasana (intense back stretch posture modified), tadasana (mountain posture), uttanasana (intense forward stretch posture, setubandha sarvangasana (full-bridge posture), sputa padangusthasana (reclining big toe posture), pavanamuktasana (wind relieving posture), and shavasana (corpse posture), and 10 min of relaxation and meditation in savasana.[4] The details of the individual yoga practices provided in Dabhade *et al*., 2012 study are 45 min (3 sessions/week for 3 months) of pranayama practices including 10 min of bhastrika, 10 min of Kapalbhati, 15 min of Anilom-vilom, 5 min of Bhramari, and 5 min of Udgit pranayama (OM chanting).[16] Moreover, the details of the individual yoga practices provided in Ravindra *et al*., 2006 study are yogic breathing (at the rate of 6 breath/min) and shavasana for 6 days/week for 2 months.[17]

In summary, the duration of the yoga practices was 45 min[15,16] to 60 min[4,6,7] a day, one day[6,7] to 6 days[17] a week for a period of 2 months[17] to 3 months.[4,6,7,15,16] Pranayama or deep breathing practices were most commonly provided in all the studies. Next to pranayama, relaxation and meditation were provided in all the studies except one study.[16] Next to relaxation and meditation, asanas (simple practices modified as per the need of the patients)[4,7,15] or light movements[6] were provided to the study participants.

Summary of evidence

The practice of yoga was safe[4] and effective in reducing the number of AF episodes[4,15] (i.e., asymptomatic-AF, symptomatic non-AF, and symptomatic AF episodes),[4] SBP, DBP, HR,[4,6,7] depression and anxiety scores and in improving some aspects of health-related QoL in patients with PAF.[4,15] The practice of yoga has been shown to produce a significant reduction in mean values of QTd, JTd, QTc-d, and JTc-d suggestive of a decline in the ventricular repolarization dispersion indices with an insignificant increase in exercise capacity and VO_2 max in patients with ventricular tachyarrhythmia.[16] Similarly, yoga has been shown to produce a reduction in palpitations episodes, ectopic frequency during tilt, and ectopics in palpitation patients with premature ventricular complexes.[17]

In a review article, lifestyle modifications, including yoga have been reported to be beneficial in reducing the incidence of AF in inducing more AF remission and also in producing successful ablation outcomes.[18] In another review, yoga has been reported to be associated with reductions in AF burden and symptoms. This suggests that the findings of this review are consistent with the findings of the other review articles.[19]

Limitations

Of six articles included in the review, two articles[6,15] (1 RCT[6] and one self as control trial[15]) were published in the journal as conference presentations. These two articles[6,15] looks similar in terms of subjects, sample size, and study design to two other articles[4,7] that were included in this review. However, they were different in terms of either duration of the intervention[4,15] or the outcome results.[6,7] Of the six articles included, only two studies[6,7] (including one conference presentation)[6] are RCTs. In contrast, another four studies[4,15-17] were non-randomized experimental studies including 2 self as control trials[4,15] (including 1 conference presentation),[15] 1 single group pre-test and post-test trial[16] and 1 case series.[17] This suggests that there is a lack of RCTs in exploring the role of yoga in patients with arrhythmias. Even though there are two RCTs,[6,7] none of the studies reported the effect of yoga on AF episodes or ECG changes in patients with PAF.

And, they have reported only two domains of SF-36 health-related QoL, i.e., physical and mental leaving the rest of the domains. Moreover, the reason for not including those health domains was not discussed in the articles.[6,7]

Of 6 studies, only three studies[4,16,17] have reported the list of individual yoga practices provided to their study participants, while the rest of the studies[6,7,15] reported the yoga practices in general. It is limiting the application of the yoga practices provided in those studies in a clinical set-up. In one study, though the total duration of the intervention was mentioned, the session durations followed every day were not been mentioned, which limits its application in clinical practice.[17] Of three studies that reported the role of yoga on BP and HR[4,6,7] only one study has reported how the BP was measured (i.e., using automated BP meter [OMRON], after 5 min of rest in sitting posture). However, how the HR was assessed (either manually or using the same automated BP meter) was not clearly mentioned.[7] Of six studies, yoga intervention was given for 3 months in five studies,[4,6,7,15,16] while it was given for only 2 months in one study[17] and none of the studies have followed the subjects for a longer duration. Thus, all of these studies have reported only the short-term effect of yoga without exploring the long-term effects associated with it. The studies had a relatively small sample size and that the yoga protocol and frequency were not standardized enough to make a significant effect.

Even though there are various types of arrhythmias,[2] studies have evaluated the role of yoga only on few types of arrhythmias including PAF (n = 4),[4,6,7,15] ventricular tachyarrhythmia (n = 1)[16] and premature ventricular complexes (n = 1) and not on the other types of arrhythmias.[17] This is limiting the data on the application of yoga in all types of arrhythmias. Although autonomic dysfunction,[20] inflammation,[21] and oxidative stress[2] play important roles in the development of arrhythmias, and the practice of yoga has been shown to be effective in improving autonomic functions[13] and in reducing inflammation[22] and oxidative stress,[9] none of the studies reported the effect of yoga on autonomic functions, inflammatory markers or oxidative stress markers in patients with arrhythmias. The clinical significance of the studies reviewed was not performed due to the heterogeneity of the studies. This suggests that further studies and exploration needs to be undertaken to fully understand the mechanism that leads to the reduction of symptoms in patients with arrhythmia in the practice of yoga.

Future directions

Long-term well-planned RCTs in patients with various types of arrhythmias are required to enhance the understanding of yoga's effect with a precise mechanism.

Conclusion

Based on the available literature the review suggests 45–60 min of the following yoga practices at least 3 days/week to reduce arrhythmia burden: (1) Joint (warm-up) exercise (10 min), (2) Asanas such as sukhasana, bitilasana, adhomukhavirasana, dandasana, janusirsana, tadasana, uttanasana, pavanamuktasana and shavasana (15–25 min), (3) pranayamas such as slow and deep breathing or dirghapranayama, nadishodhana, bhramari, ujjayi and udgit pranayamas (OM chanting) (10–15 min) and (4) Relaxation in shavasana and meditation (10 min). However, it is always better to learn the techniques and practice under the supervision of institutionally qualified yoga experts in a clinical set-up to avoid untoward effects.

Results of this review suggest that yoga could be considered an efficient adjuvant in reducing arrhythmia burden in patients with PAF, ventricular tachyarrhythmia and palpitation; in reducing BP, HR, anxiety and depression scores; and in improving some aspects of health-related QoL especially mental health. However, there is no improvement in exercise tolerance in patients with tachyarrhythmia and a lack of a clear mechanism behind the effect of yoga. Thus, more studies are necessary to warrant the role of yoga in various types of arrhythmias with possible mechanisms.

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Conflicts of interest

There are no conflicts of interest.

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