

Efficacy of treatment methods for uncontrolled hypertension and its effects on atrial fibrillation: A systematic narrative review

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Introduction

Rationale

Hypertension (HTN) is the most common cardiovascular disease occurring in 20–50% of adults and the elderly in many countries.^[1,2] Major risk factors of HTN are diabetes, smoking, obesity alcohol consumption, and physical inactivity.^[2-5] These factors together with HTN increase the risk of cardiovascular diseases (stroke and coronary heart disease, diabetic nephropathy, and peripheral arterial disease).^[3,5,6] Atrial fibrillation (AF) is being recognized as a disease of public health importance.^[7,8] HTN increases the risk of AF development by 70%.^[9,10] This risk increases when the HTN is uncontrolled and is associated with several intermediate

ABSTRACT

Objectives: Uncontrolled hypertension is a main predisposing risk factor leading to chronic atrial fibrillation (AF). Although several treatment methods for patients with HTN and AF were developed in past decades, further investigations of their efficacies are needed. This systematic narrative review presents an overview of studies reporting treatment efficacies in patients with HTN and/or AF.

Methods: A narrative-based systematic review was performed using EMBASE, Medline, PubMed, Google Scholar, and the Cochrane Library searching for relevant papers published between October 2008 and October 2018. Out of 4481 studies, only 15 studies could be included following the inclusion criteria.

Results: Included studies reported treatment measures, measured outcomes, and efficacies in adult patients with HTN and AF with defined interventions and methodologies. Treatment methods with effective outcomes were administration of hydrochlorothiazide, losartan or atenolol, telmisartan or amlodipine, or general anti-hypertensive drugs. Treatment methods that showed the most effective outcomes (lowering AF recurrence and improving BP control) were those containing pulmonary vein (or antrum) isolation (PVI/PVAI) (6 studies) and/or in conjunction with renal denervation (RDN)(6 studies). Treatment methods showing the most effective outcomes were PVI/PVAI in conjunction with RDN.

Conclusion: The latest evidence shows that PVI (in conjunction with RDN in some instances) was more efficacious among patients suffering from HTN and/or AF.

Keywords: Atrial fibrillation, treatment methods, uncontrolled hypertension

changes in cardiac structure and function like atrial remodeling.^[8-10] Untreated or suboptimally treated HTN can lead to a wider pulse pressure and left ventricular hypertrophy (LVH), which in turn leads to AF.^[11,12]

For treating HTN among AF patients, the underlying cause responsible for precipitating HTN like hyperthyroidism needs to be identified first for its effective treatment and management.^[13] Studies have proven the positive impact of controlling HTN among AF patients by reversing the structural changes such as atrial remodeling and enlargement of left atrium.^[9,10]

Studies have shown that renin-angiotensin-aldosterone system (RAAS) blockers such as angiotensin receptor blockers

(ARBs), angiotensin-converting enzyme inhibitors (ACEIs), and mineralocorticoid antagonists (MRAs) are effective among patients with left ventricular dysfunction in reducing the incidence of both onset and AF recurrence.^[14-17] However, some of the meta-analysis reported inconsistent findings on the effectiveness of these agents in hypertensive subjects with AF.^[15,17,18] Furthermore, a recent meta-analysis has shown that clinical outcomes can be improved among AF patients undergoing catheter ablation through renal sympathetic denervation (RSDN).^[19]

Objective

Although there have been several new treatment methods adopted over recent decades alone or in combination with other measures for patients with HTN and AF, such as pulmonary vein (PV) isolation (PVI), it is imperative to further understand and investigate the efficacy of these latest treatment approaches. Therefore, the aim of this narrative review was to summarize the effectiveness of these measures on blood pressure (BP) control and its effects on incident or recurrent AF.

Research questions

What is the effect of latest treatment approaches of HTN on the BP control of individuals with HTN and AF?

What is the effect of these treatment approaches on the risk of developing AF or its recurrence among patients with HTN and AF?

Methods

Study design

A preliminary investigation of the literature revealed large heterogeneity among the studies in terms of study designs. Hence, we decided to conduct a narrative review instead of meta-analysis over a 10-year period from October 2008 to October 2018 by searching electronic databases to perform a systematic literature search over this period. Only studies published in English were included in the study.

Participants, interventions, comparators

The participants were adults with HTN and AF or history of AF involved in the clinical trial or prospective study whether or not the study indicated that specific treatment for AF was given. The interventions were specific treatments or treatment combinations aimed at reducing HTN, including antihypertensive medications, renal denervation (RDN), or PVI. The relevant comparators were either antihypertensive medications or RDN or PVI either alone or together.

Systematic review protocol

The databases searched were PubMed, Medline, EMBASE, Google Scholar, and the Cochrane Library. Relevant references of the included papers were also reviewed. The studies that were

selected included adult patients only (since no studies conducted on children were found) and had defined interventions and methodologies for patients who were diagnosed with HTN and AF. The studies also reported treatment measures and measured outcomes (such as diastolic and systolic BP [SBP]). The studies also indicated whether the treatments were effective or not.

Search strategy

The specific keywords used in the search were: “HTN and AF,” “treatment for uncontrolled HTN and AF,” and “medications for uncontrolled HTN and AF.” These broad search terms were used to increase the sensitivity of the strategy.

Data sources and data extraction

All the identified papers were initially screened based on their titles by the authors (SA and AS) to remove duplicates and irrelevant papers. In the second step, abstracts of only prospective or randomized controlled trial studies were reviewed to determine relevance. Finally, full papers which considered adults over the age of 18; conducted in any country, but written only in English; published from 2008 to 2018 in peer-reviewed journals presenting at least one of the following outcomes such as treatment measure, mean BP change, and/or the occurrence of new-onset or recurrence of AF were considered. The total number of articles related to the treatment of HTN and AF obtained in the review process is presented in Figure 1.

The main reasons for exclusion were: Studies conducted on animals, articles not written in English, conference papers, commentaries, editorials or review articles and studies of children or minors. In addition, a few studies had insufficient information on the relevant outcomes of the patients with HTN and AF and were excluded from the study.

Data analysis

A narrative synthesis of the studies was performed.

Results

Study selection and characteristics

Our search strategy yielded 4481 studies on treatment for UnHTN and AF. We identified 77 studies that included patients who developed or were diagnosed with UnHTN and/or AF. Based on the above exclusions, 15 studies from 11 countries on 4 continents that investigated patients with HTN and AF or with a history AF were included in the review [Table 1]. There were 6 prospective studies and 9 randomized clinical trials [Table 1].

Synthesized findings

In this narrative review of 15 studies on the efficacy of treatment and approaches to patients with HTN and

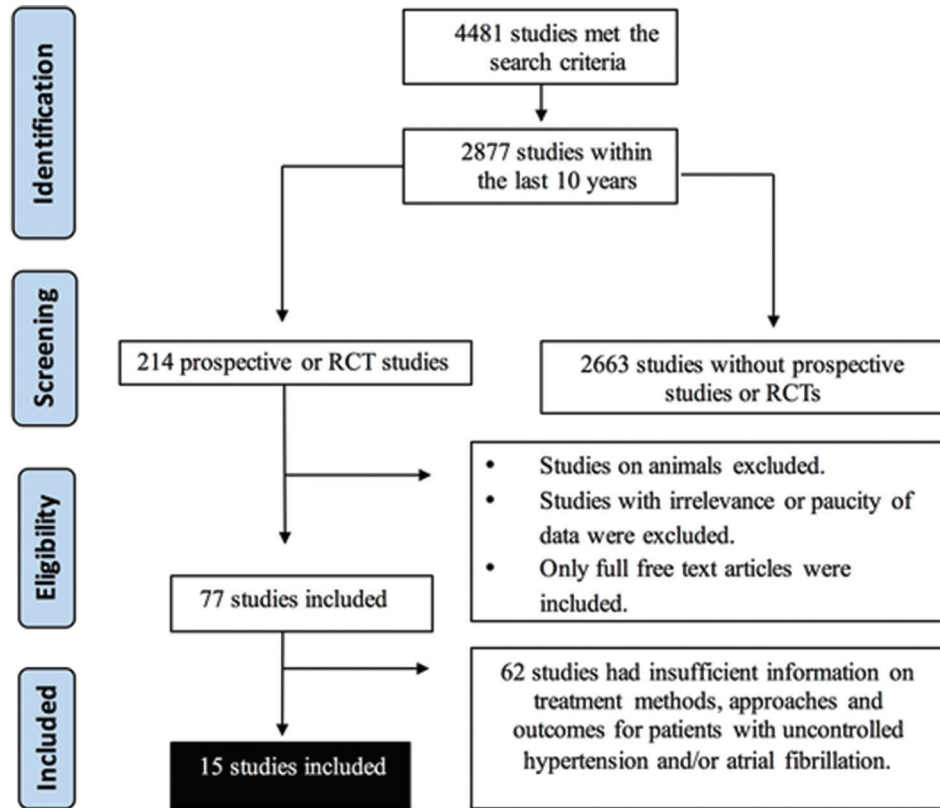


Figure 1: Flowchart of studies included in the narrative review according to PRISMA guidelines. RCT: Randomized controlled trial

Table 1: Study-based characteristics and hierarchical models described in 15 studies

Study characteristics	Studies (n=15)
Sample size	
1–50	1
51–100	2
101–1000	7
1001–10,000	2
10001–50,000	2
50001–300,000	1
Geographical region (some studies had more than one region)	
North America	6
Asia	6
Europe	5
South America	2
Development status of the countries where the study was conducted	
High-income economy	7
Upper middle-income economy	7
Lower middle-income economy	1

AF, we identified a variety of treatment options used in patients from different populations and geographical groups. The findings indicated that PVI (in conjunction with RDN in some instances) was more efficacious for

patients suffering from HTN and AF or with a history AF [Table 2]. Treatment methods that showed effective outcomes included combinations of ACEIs, ARBs, and BP control. Treatment approaches such as administration of hydrochlorothiazide, losartan or atenolol, telmisartan or amlodipine, or general anti-hypertensive drugs yielded less positive effect when compared to ACEIs or ARBs, monotherapy. Treatment methods that showed the most effective outcomes were those containing PVI/PVAI (6 studies) and/or in conjunction with RDN (6 studies).

Effect of the treatment measures on BP control

Kiuchi *et al.*,^[20] Higaki *et al.*,^[22] Kario *et al.*,^[24] Kim *et al.*^[25] Kiuchi *et al.*,^[26] Pokushalov *et al.*,^[31] and Romanov *et al.*,^[33] investigated the influences or effects of the treatment measures on BP control on patients with HTN and/or AF and reported similar results or effects.^[20,22,24-26,31,33] These are shown in Table 3 and a few are discussed below.

Kiuchi *et al.*^[20] compared the effects of RSDN to β -blocker usage among hypertensive patients with AF. They found that RDN was safe in the treatment of hypertensive patients with AF, it improved some cardiac parameters observed through echocardiography and lowered the heart rate when compared to a β -blocker, mainly at 6th month of follow-up.^[20] Another randomized trial by Kiuchi *et al.*^[26] showed that PVI + RDN superior to PVI + spironolactone for both BP control.^[26]

Table 2: Study characteristics and treatment measures for patients with HTN and AF

Author	Year	Sample	Location	Study design	Treatment	Effective for BP	Effective for AF
Kiuchi <i>et al.</i> ^[20]	2016	20	Brazil	Prospective longitudinal study	Renal denervation versus β -blocker use	Both	Yes
GISSI-AF Investigators <i>et al.</i> ^[21]	2009	1442	Italy	Prospective, double-blind multicentric, randomized, placebo-controlled trial	Valsartan versus Placebo	–	No
Higaki <i>et al.</i> ^[22]	2016	309	Japan	double-blind, randomized, parallel -group, active -control, Phase III trial	Telmisartan+amlodipine+h hydrochlorothiazide versus Telmisartan+amlodipine	Yes	–
Kamioka <i>et al.</i> ^[23]	2018	101	Japan	Three-arm parallel trial among normotensive, controlled HTN and uncontrolled HTN	PVI	–	Yes
Kario <i>et al.</i> ^[24]	2016	81	Japan	Multicentered, prospective, randomized, open -label clinical trial	Telmisartan+amlodipine at morning versus Telmisartan+amlodipine at bedtime	Yes	–
Kim <i>et al.</i> ^[25]	2015	262	Korea	Single-arm, prospective, open -label, all-comer registry	Renal denervation	Yes	Yes
Kiuchi <i>et al.</i> ^[26]	2018	69	Brazil	Prospective, single -center, randomized, double -blind trial	PVI+renal denervation versus PVI+spironolactone,	Yes	Yes
Marott <i>et al.</i> ^[27]	2014	277880	Denmark	Nationwide nested 1:1 matched registry (prospective) study	ACEis or ARBs monotherapy versus CCB or β -blocker, or diuretic	–	Yes
Okin <i>et al.</i> ^[29]	2015	8831	USA, Denmark, and Sweden	RCT	Losartan-based versus atenolol -based treatment	–	Yes
Parkash <i>et al.</i> ^[30]	2017	184	Canada	RCT: Randomized, parallel, open-label clinical trial	BP aggressive treatment and catheter ablation (PVI)	–	No
Pokushalov <i>et al.</i> ^[31]	2012	27	Netherlands, USA, and Russia	RCT	PVI+renal artery denervation versus PVI	Yes	Yes
Santoro <i>et al.</i> ^[32]	2015	531	USA	Prospective study	Renal denervation and PVAI	–	Yes
Romanov <i>et al.</i> ^[33]	2017	86	International	Prospective, multicenter, international, double -blind, RCT	PVI+Renal denervation+implantable cardiac monitor versus PVI+Implantable cardiac monitor	Yes	Yes
Qiu <i>et al.</i> ^[34]	2016	21	China	Prospective study	Renal sympathetic denervation	–	–

ACEI: Angiotensin-converting enzyme inhibitors, AF: Atrial fibrillation, ARB: Angiotensin receptor blockers, HTN: Uncontrolled hypertension, PVI: Pulmonary vein isolation, PVAI: Pulmonary vein antrum isolation, BP: Blood pressure, RCT: Randomized controlled trials, USA: United States of America

Similarly, Kim *et al.*^[25] prospectively investigated the effect of RDN in a cohort of hypertensive patients in two countries. The 6- and 12-month change in mean SBP was found to be statistically significant for both versus baseline thereby indicating a favorable safety profile.^[25]

Kario *et al.*^[24] conducted a study on the dose timing of an ARB/calcium channel blocker combination in hypertensive patients with paroxysmal AF. Telmisartan or amlodipine significantly reduced both morning and night time BP irrespective of the time of drug administration among the study population.^[24]

Higaki *et al.*^[22] conducted a randomized, double-blind study evaluating the effect of hydrochlorothiazide (12.5 mg; H12.5) in addition to the telmisartan (80 mg; T80)/amlodipine (5 mg; A5) combination for treating uncontrolled hypertensive patients. They suggested that administration of combination of the above three drugs for 8 weeks significantly reduced both SBP and diastolic BP and was well tolerated by patients as compared to those on standard hydrochlorothiazide therapy or on T80/A5 alone.^[22] Nasopharyngitis along with hyperuricemia was the common adverse effects in T80/A5/H12.5 group as compared to T80/A5 group.^[22]

Table 3: Main outcome of the treatment measures for patients with HTN and AF

Study author	Outcomes			Remarks
	New-onset AF	Recurrent AF	BP changes	
Kiuchi <i>et al.</i> ^[20]	–	–	Similar improvement in BP changes	RSD more effective for rate control and echocardiography changes
GISSI-AF Investigators <i>et al.</i> ^[21]	–	Not effective in lowering AF recurrence	–	valsartan did not reduce the recurrence of AF
Higaki <i>et al.</i> ^[22]	One case of new-onset AF	–	Effective for BP control	Overall, three-drug treatment significantly reduced systolic and diastolic blood pressure.
Kamioka <i>et al.</i> ^[23]	–	Lowered recurrence rate by about 50%	–	Uncontrolled BP is a major predictor of AF as it promotes atrial remodeling
Kario <i>et al.</i> ^[24]	–	–	Both timings were effective for BP control	Antihypertensive effect was similar irrespective of time of drug administration
Kim <i>et al.</i> ^[25]	–	Lowered recurrence of AF	Effective for BP control	Only three patients developed AF requiring hospitalization
Kiuchi <i>et al.</i> ^[26]	–	Lowered recurrence of AF	Effective for BP control	PVI+Renal denervation superior to PVI+spironolactone for both BP control and AF recurrence
Marott <i>et al.</i> ^[27]	Lowered risk of new-onset AF	–	–	ACEi and ARB both reduced the incidence of AF
Miyazaki <i>et al.</i> ^[28]	–	Lowered recurrence of AF	–	Patients with severe (>50 mm) and moderate dilatation (40–50 mm) had a significant increase in the risk of recurrent AF as compared to those with normal LA diameter (≤40 mm)
Okin <i>et al.</i> ^[29]	Lowered risk of new-onset AF	–	–	In-treatment SBP ≤130 mm Hg entered as a time-varying covariate was associated with a 40% lower risk (95% C.I. 18%–55%)
Parkash <i>et al.</i> ^[30]	–	Not effective in lowering recurrent AF	–	There was no significant difference in AF recurrence between the aggressive BP (61.4%) and standard BP (61.2%) treatment groups
Pokushalov <i>et al.</i> ^[31]	–	Lowered recurrence of AF	Effective for BP control	RDN reduces mean BP in patients with drug-resistant hypertension along with reducing the AF recurrences when combined with PVI
Santoro <i>et al.</i> ^[32]	–	Lowered recurrence of AF	–	Controlled HTN does not affect the AF ablation outcome than patients without HTN. By contrast, uncontrolled HTN confers higher AF recurrence risk and requires more extensive ablation
Romanov <i>et al.</i> ^[33]	–	Lowered recurrence of AF	Effective for BP control	RDN when added to PVI reduces AF recurrences, and mean BP
Qiu <i>et al.</i> ^[34]	–	Lowered recurrence of AF	–	Renal denervation could improve ventricular HR control in patients with persistent AF

Effect of the treatment measures on new-onset AF

In the study by Higaki *et al.* described above, one case of new-onset AF was reported among the participants who received the triple combination therapy.^[22]

Marott *et al.*^[27] conducted a nationwide study in Denmark on anti-hypertensive treatment and the risk of AF. They postulated that controlling activation of the RAAS in addition to controlling BP was associated with a reduced risk of new-onset AF.^[27] The hazard ratio of AF for ACEI and ARB monotherapy was 0.12 (95% confidence interval [CI]: (0.10–0.15) and 0.10 [0.07–0.14], respectively), compared with that of beta-blockers (0.51 [0.44–0.59] and 0.43 [0.32–0.58], respectively), diuretics

(0.97 [0.81–1.16] and 0.78 [0.56–1.08], respectively), and calcium channel blocker monotherapy. The use of ACEIs and ARBs was associated with a reduced risk of AF as compared to diuretics and beta-blockers, but not stroke. The retrospective design of this study warrants the conscious interpretation of the findings.^[27]

Furthermore, Okin *et al.*^[29] investigated the effect of losartan- or atenolol-based treatment in reducing “on-treatment” SBPs on the risk of AF among patients with HTN. They suggested that achieving an SBP ≤130 mmHg was associated with a lower risk of new-onset AF in patients with HTN and electrocardiogram (ECG) evidence of LVH.^[29] It was found that “in-treatment” SBP ≤130 mmHg was associated with a 40% lower risk and

similarly, “in-treatment” SBP of 131–141 mmHg had a 24% lower risk of new-onset AF as compared to “in-treatment” SBP \geq 142 mmHg.^[29]

Effect of the treatment measures on recurrent AF

Several of the studies investigated the effects of the treatment measures on the risk of recurrent AF. The studies by GISSI-AF Investigators *et al.*^[21] and Parkash *et al.*^[30] found that the interventions were not effective in lowering risk of recurrent AF, while others by Kamioka *et al.*,^[23] Kiuchi *et al.*,^[26] Miyazaki *et al.*,^[28] Pokushalov *et al.*,^[31] Santoro *et al.*^[32] Romanov *et al.*,^[33] and Qiu *et al.*^[34] found that the interventions could effectively reduce the risk of recurrent AF.

GISSI-AF Investigators *et al.*^[21] found that valsartan could not prevent the recurrence of AF as indicated by the following data.^[21] The sample size of the study was 1442; of these 722 patients were allocated to valsartan treatment and rest 720 were administered placebo. Their number of recurrence events was reported to be 371 and 375, respectively, in the intervention and placebo groups with the adjusted HR = 0.97(95% CI, 0.83–1.14; $P=0.73$). More than one episode of AF occurred in 194 and 201 patients, respectively, belonging to intervention and placebo arm (adjusted odds ratio, 0.89; 99% CI, 0.64–1.23; $P=0.34$).^[21]

Parkash *et al.*^[30] investigated the effect of aggressive BP control on the recurrence of AF after catheter ablation. They found that the duration of aggressive BP treatment in patients with AF undergoing catheter ablation did not result in a reduction of atrial arrhythmias after ablation^[30] (HR = 0.94; 95% CI, 0.65–1.38; $P=0.763$). In the pre-specified subgroup analysis of the influence of age, patients \geq 61 years of age had a lower symptomatic recurrence of AF event rate with aggressive BP control (HR = 0.58; 95% CI, 0.34–0.97; $P=0.013$). However, 26% individuals of this group required medication for hypotension due to aggressive BP control.^[30] Therefore, this study showed that instead of reducing the risk of recurrence of AF, it precipitated the episodes of hypotension.^[30]

Kamioka *et al.*^[23] investigated the impact of uncontrolled BP on the left atrial remodeling and clinical outcome after PVI in paroxysmal AF. A total of 101 symptomatic paroxysmal AF patients successfully treated with PVI were grouped as no HTN patients ($n=46$), HTN with controlled BP ($n=36$); and HTN with uncontrolled BP ($n=19$). After PVI, ECG was used to measure their left atrial dimensions before and after 6 months of procedure. Kaplan–Meier analysis revealed a significantly higher AF recurrence among individuals belonging to HTN with controlled BP group (52.6%).^[23]

Kiuchi *et al.*^[26] investigated whether a combination of PVI combined with RDN was superior to PVI with spironolactone lowering the risk of AF recurrence in individuals with HTN and AF.^[26] The study found that significantly more patients in the PVI + RDN (61%) than in the PVI + spironolactone group

(36%) were AF-free at the 12th month of follow-up, $P=0.0242$. Toward the end of the study, the mean AF burden was lower in the PVI + RDN group as compared to PVI + spironolactone group, at the 9th month: $\Delta = -10\%$ ($P < 0.0001$), and at the 12th month: $\Delta = -12\%$ ($P < 0.0001$), respectively.^[26]

Miyazaki *et al.*^[28] conducted long-term follow-up on pre-procedural predictors of AF recurrence following PVAI among patients with paroxysmal AF. They found that left atrium size could predict the recurrence of AF after single ablation in the patients with paroxysmal AF, even if they have relatively small left atrium.^[28] About 67.1% ($n=318$) individuals were in sinus rhythm without administering anti-arrhythmic drugs after a mean follow-up period of 30 ± 13 months of the single procedure. The patients with moderate (40–50 mm) and severe dilatation (>50 mm) had 1.30-fold ($P=0.0131$) and 2.14-fold ($P=0.0057$), respectively, increase in the probability of recurrent AF as compared to patients who had normal LA diameters (≤ 40 mm).^[28]

Pokushalov *et al.*^[31] also looked at PVI but conducted a randomized comparison of PVI with and without concomitant RDN in patients with refractory AF. They concluded that symptomatic AF and resistant HTN with RDN reduced the SBP and diastolic BP in patients with drug-resistant HTN and reduced AF recurrences when combined with PVI.^[31] Twenty-seven patients were enrolled, 14 were randomized to PVI only and 13 were randomized to PVI with RDN. At the end of follow-up, significant reductions in systolic (181 [8]–156 [5], $P < 0.001$) and diastolic BP (97 [6]–87 [4], $P < 0.001$) were observed in patients treated with PVI with RDN with no significant change in the PVI-only group. Nine of 13 (69%) patients treated with PVI with RDN were AF-free at the 12-month post-ablation follow-up examination versus four (29%) of 14 patients in the PVI-only group ($P=0.033$).^[26]

Santoro *et al.*^[32] investigated the effect of uncontrolled HTN on AF ablations. They found that controlled HTN did not affect AF ablation outcomes when compared to that in patients without HTN. By contrast, uncontrolled HTN conferred a higher AF recurrence risk and required more extensive ablations.^[32] Three groups differed in terms of left atrial size, non-PV triggers, and moderate/severe left atrial scar. Non-PV triggers were present in 94 (58.8%), 64 (33.3%), and 50 (27.9%) patients in Groups I, II, and III, respectively ($P < 0.001$). After 197.7 months of follow-up, 65 (40.6%), 54 (28.1%), and 46 (25.7%) patients in Groups I, II, and III, respectively, had recurrences (log-rank test, $P=0.003$). Among patients in Group I who underwent additional non-PV trigger ablations, 69.8% were subsequently free of AF/atrial tachycardia, which was similar to Groups II and III with respect to procedural success (log-rank $P=0.7$). After adjusting for confounders, uncontrolled HTN (Group I) (HR: 1.52, $P=0.045$), non-PV triggers (HR: 1.85, $P < 0.001$), and non-paroxysmal AF (HR: 1.64, $P=0.002$) demonstrated significant associations with arrhythmia recurrence.^[32]

Romanov *et al.*^[33] assessed the relationship between changes of mean BP and AF recurrences/AF burden after PVI combined with RDN. In this study, 43 patients each with HTN and AF were randomized into either the PVI + RDN + implantable cardiac monitor group or the PVI +implantable cardiac monitor group.^[33] The study found that concomitant RDN was associated with a significant reduction in both mean AF burden and mean BP. Reduction of 5–10 mmHg in mean BP was accompanied by a 7.0% reduction in mean AF burden, along with greater reduction (up to 20 mmHg) associated with on average 17.7% lower mean AF burden.^[33]

Discussion

Summary of main findings

The study found that individuals with HTN treated with a combination of three medications (telmisartan +amlodipine + hydrochlorothiazide) compared with individuals treated with (telmisartan +amlodipine only) had better BP control.^[22] However, another study showed that there were no significant differences in the level reduction of BP and effectiveness among individuals who received telmisartan + amlodipine in morning compared with those who received these medications at bedtime.^[24] Furthermore, the study found that measures that included PVI (PVAI) or RDN alone or in combination with each other or with oral medications were all superior in lowering BP in individuals with uncontrolled HTN.^[20,25,26,31,33]

Second, the study found that they use of ACEi and ARB monotherapy was both associated with lower incidences of new-onset AF compared with the use of diuretics, β -blockers or calcium channel blockers.^[27] Furthermore, another study among hypertensive patients randomly assigned to losartan- or atenolol-based treatments. Compared with in-treatment SBP ≥ 142 mmHg, patients having an in-treatment SBP ≤ 130 mmHg were associated with a 40% lower risk new-onset AF.^[29] In addition, among hypertensive subjects treated with a combination of three medications (telmisartan + amlodipine + hydrochlorothiazide) compared with individuals treated with (telmisartan + amlodipine only), one of the cases developed new onset AF.^[22]

Finally, the study found that there were no significant differences in the AF recurrence rates among hypertensive patients with AF treated using valsartan compared with those who were given placebo.^[21] Furthermore, another study found that aggressive reduction in BP was found not to be effective in lowering AF recurrence rates in individuals with HTN and AF.^[30] However, the study found that measures that included PVI (PVAI) or RDN alone or in combination with each other or with oral medications were all superior in lowering AF recurrence rates and AF burden.^[23,25,26,28,31-34]

Limitations

This study had several limitations. The included studies were very heterogeneous in their design, therefore, a formal meta-analysis was not feasible. Therefore, largely diverse studies with few study designs and categories for different diagnoses, definitions of HTN, and severity of illness were included in the study. In some cases, it was not possible to definitively extract from the published materials whether HTN was present at the start of the patient(s) admission for disease or treatment. Some studies with low sample sizes were also included since they met the criteria for patients with HTN and AF. Due to the limited number of studies included in the review, the findings from this study are not generalizable to a number of population groups, patient-based settings and need to be interpreted with caution. Finally, in most of the studies included in this review, it was not possible to determine whether specific management for rate control, rhythm control or anticoagulation was being given to the study subjects with AF or a history of AF.

Conclusion

Based on the above-outlined studies, although conventional and generic antihypertensive drugs are constantly in use, the latest evidence shows that PVI (in conjunction with RDN in some instances) has better efficacy among patients suffering from HTN and/or AF. Further studies are needed to ascertain this conclusively and to clarify whether these measures are useful alone or need adjunctive rate, rhythm, and anticoagulation therapy in the management of HTN and AF. Future research is required to understand and investigate the efficacy of treatment methods and approaches among patients with HTN and AF in Africa and Oceania.

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