Hypertension associated with atrial fibrillation

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Hypertension (1) and atrial fibrillation (2,3) both increase with age. Both hypertension and atrial fibrillation are associated with an increased incidence of stroke, heart failure, and mortality (1-3). Hypertension and left ventricular hypertrophy caused by hypertension are major risk factors for atrial fibrillation (1). Hypertension is present in more than 80% of patients with atrial fibrillation (4). At 44-month follow-up of 2,384 older patients, atrial fibrillation was a significant risk factor for new thromboembolic stroke with a risk ratio of 3.2, and left ventricular hypertrophy associated with hypertension was a significant independent risk factor for thromboembolic stroke with a risk ratio of 2.8 (5). At 36-month follow-up of 312 older patients with chronic atrial fibrillation, left ventricular hypertrophy associated with hypertension was a significant independent risk factor for thromboembolic stroke with a risk ratio of 2.8 (6). Hypertension is one of the risk factors for development of thromboembolic stroke in patients with atrial fibrillation in the $CHADS_2$ (7) and CHA_2DS_2-VASc (8) scoring systems for risk of stroke. Hypertension is present in 74% of patients with congestive heart failure and in 77% of patients with a first stroke (9). Atrial fibrillation was present in 37% of 355 patients, mean age 80 years, with prior myocardial infarction, congestive heart failure, and a reduced left ventricular ejection fraction and in 33% of 296 patients, mean age 82 years, with prior myocardial infarction, congestive heart failure, and a preserved left ventricular ejection fraction (10).

Hypertension is associated with left ventricular hypertrophy, impaired diastolic filling of the left ventricle, increased left atrial pressure, left atrial hypertrophy and enlargement, increased atrial fibrosis, increased atrial ectopic activity, and slowing of intra- and interatrial electrical conduction velocities (11). These changes in cardiac structure and physiology predispose to atrial fibrillation developing and increasing the risk of thromboembolic events (11). In patients who have atrial fibrillation, the presence of hypertension increases the incidence of stroke by an additional 2 to 3 times (12,13).

Adequate control of hypertension is indicated to reduce the risk of developing atrial fibrillation. A meta-analysis was performed in 11 randomized studies including 56,308 patients which investigated whether treatment with angiotensin-converting enzyme inhibitors or angiotensin receptor blockers reduced the development of atrial fibrillation (14). The studies included four trials of patients with congestive heart failure, three trials of patients with hypertension, two trials after cardioversion for atrial fibrillation, and two trials after myocardial infarction. Overall, the use of angiotensin-converting enzyme inhibitors significantly reduced the risk of developing atrial fibrillation by 28%, and the use of angiotensin receptor blockers significantly reduced the risk of developing atrial fibrillation by 29%. The prevention of atrial fibrillation by angiotensin-converting enzyme inhibitors or angiotensin receptor blockers seemed limited to patients with heart failure who had a 44% significant reduction in the development of atrial fibrillation and to patients with hypertension and left ventricular hypertrophy who had a 29% significant reduction in the development of atrial fibrillation (14). The angiotensin-converting enzyme inhibitors probably reduce the risk of developing atrial fibrillation by reversing changes in cardiac structure and function (14). Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers in animal models of heart failure have been demonstrated to reduce left atrial dilation, left atrial dysfunction, left atrial fibrosis, and shortening of the atrial refractory period, which should lead to a decrease

in the risk of atrial fibrillation (14,15).

In the Losartan Intervention for Endpoint (LIFE) trial, 8,851patients with hypertension and electrocardiographic left ventricular hypertrophy without atrial fibrillation were randomized to losartan or atenolol and followed for a mean duration of 4.8 years (16). Compared with atenolol, the incidence of atrial fibrillation that developed was significantly reduced by 33% despite similar blood pressure reduction by losartan and atenolol (16). The incidence of stroke in the patients who developed new-onset atrial fibrillation was also 51% lower in patients treated with losartan than in patients treated with atenolol (16). In the LIFE study, 342 patients with hypertension, left ventricular hypertrophy, and atrial fibrillation were randomized to losartan or to atenolol and followed up for 1,471 patient years (17). The primary composite endpoint of cardiovascular mortality, stroke, and myocardial infarction was significantly reduced by 42% in the patients treated with losartan in these patients with hypertension, left ventricular hypertrophy, and atrial fibrillation (17).

Another meta-analysis was performed in 11 randomized controlled studies which included 55,971 patients which investigated whether treatment with angiotensin-converting enzyme inhibitors or angiotensin receptor blockers reduced the risk of development of atrial fibrillation (18). In three hypertension studies including 26,084 patients, compared with other antihypertensive drugs, treatment with an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker significantly reduced the risk of developing atrial fibrillation by 23% (18). In three studies of 10,305 patients with congestive heart failure, treatment with an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker significantly reduced the risk of developing atrial fibrillation by 32% (18). In three studies of 317 patients after electrical conversion of atrial fibrillation, treatment with an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker significantly reduced the risk of developing atrial fibrillation by 51% (18). In two studies of 19,288 patients after myocardial infarction, treatment with an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker significantly reduced the risk of developing atrial fibrillation by 10% (18).

A third meta-analysis included ten randomized controlled trials in 42,892 patients with hypertension (19). In these trials, 20,491 patients were randomized to treatment with angiotensin-converting enzyme inhibitors or angiotensin receptor blockers and 22,401 patients to treatment with beta blockers or with calcium channel blockers. Treatment with ngiotensin-converting enzyme inhibitors or angiotensin receptor blockers significantly reduced the incidence of atrial fibrillation by 52% when compared to treatment with calcium channel blockers and by 61% when compared with beta blockers (19). Treatment with ngiotensin-converting enzyme inhibitors or angiotensin receptor blockers also significantly reduced the incidence of congestive heart failure by 14% when compared with treatment with calcium channel blockers or beta blockers but did not significantly reduce the incidence of new atrial fibrillation, cardiac death, myocardial infarction, and stroke when compared with treatment with calcium channel blockers or beta blockers (19).

Follow-up electrocardiograms were available for 25,332 of 33,357 patients (76%) randomized to lisinopril, chlorthalidone, or amlodipine in the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) (20). The incidence of new atrial fibrillation or atrial flutter did not differ significantly between patients treated with these three different antihypertensive drugs. However, the incidence of new atrial fibrillation or atrial flutter in 6,392 patients treated with doxazosin was significantly increased 1.3 times than in 11,695 patients treated with chlorthalidone (20).

In patients with hypertension, antihypertensive medications reduce the risk of stroke and of atrial fibrillation (1). Because patients with atrial fibrillation are at high risk for developing stroke, patients with atrial fibrillation and hypertension should especially have their blood pressure adequately controlled by antihypertensive drug treatment.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

References

1. Aronow WS, Fleg JL, Pepine CJ, et al. ACCF/AHA 2011 expert consensus document on hypertension in the elderly: a report of the American College of Cardiology Foundation Task Force on Clinical Expert Consensus Documents. Developed in collaboration with the American Academy of Neurology, American Geriatrics Society,

American Society for Preventive Cardiology, American Society of Hypertension, American Society of Nephrology, Association of Black Cardiologists, and European Society of Hypertension. J Am Coll Cardiol 2011;57:2037-114.
2. Aronow WS, Ahn C, Gutstein H. Prevalence of atrial fibrillation and association of atrial fibrillation with prior and new thromboembolic stroke in older persons. J Am Geriatr Soc 1996;44:521-3.
3. Aronow WS, Banach M. Atrial fibrillation: the new epidemic of the ageing world. J Atr Fibrillation 2009;1:154.
4. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS Guideline for the Management of Patients With atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm society. J Am Coll Cardiol 2014;64:e1-e76.
5. Aronow WS, Ahn C, Kronzon I, et al. Association of left ventricular hypertrophy and chronic atrial fibrillation with the incidence of new thromboembolic stroke in 2,384 older persons. Am J Cardiol 1999;84:468-9, A9.
6. Aronow WS, Ahn C, Kronzon I, et al. Risk factors for new thromboembolic stroke in patients > or equal 62 years of age with chronic atrial fibrillation. Am J Cardiol 1998;82:119-21.
7. Yang Y, Zhang Z, Ng CY, et al. Meta-analysis of CHADS2 score in predicting atrial fibrillation. Am J Cardiol 2015;116:554-62.
8. Olesen JB, Torp-Pedersen C, Hansen ML, et al. The value of the CHA2DS2-VASc score for refining stroke risk stratification in patients with atrial fibrillation with a CHADS2 score 0-1: a nationwide cohort study. Thromb Haemost 2012;107:1172-9.
9. Lloyd-Jones D, Adams R, Carnethon M, et al. Heart disease and stroke statistics-2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2009;119:e21-e181.
10. Aronow WS, Ahn C, Kronzon I. Prognosis of congestive heart failure after prior myocardial infarction in older persons with atrial fibrillation versus sinus rhythm. Am J Cardiol 2001;87:224-5, A8-9.
11. Healey JS, Connolly SJ. Atrial fibrillation: hypertension as a causative agent, risk factor for complications, and potential therapeutic target. Am J Cardiol 2003;91:9G-14G.
12. Tohgi H, Tajima T, Konno T, et al. The risk of cerebral infarction in nonvalvular atrial fibrillation: effects of age, hypertension and antihypertensive treatment. Eur Neurol 1991;31:126-30.
13. Predictors of thromboembolism in atrial fibrillation: II. echocardiographic features of patients at risk. The Stroke Prevention in Atrial Fibrillation Investigators. Ann Intern Med 1992;116:6-12.
14. Healey JS, Baranchuk A, Crystal E, et al. Prevention of atrial fibrillation with angiotensin-converting enzyme inhibitors and angiotensin receptor blockers. A meta-analysis. J Am Coll Cardiol 2005;45:1832-9.
15. Shi Y, Ducharme A, Li D, et al. Remodeling of atrial dimensions and emptying function in canine models of atrial fibrillation. Cardiovasc Res 2001;52:217-25.
16. Wachtell K, Lehto M, Gerdts E, et al. Angiotensin II receptor blockade reduces new-onset atrial fibrillation and subsequent stroke compared to atenolol: the Losartan Intervention For End Point Reduction in Hypertension (LIFE) study. J Am Coll Cardiol 2005;45:712-9.
17. Wachtell K, Hornestam B, Lehto M, et al. Cardiovascular morbidity and mortality in hypertensive patients with a history of atrial fibrillation. The Losartan Intervention for End Point Reduction in Hypertension (LIFE) study. J Am Coll Cardiol 2005;45:705-11.
18. Jibrini MB, Molnar J, Arora RR. Prevention of atrial fibrillation by way of abrogation of the renin-angiotensin system: a systematic review and meta-analysis. Am J Ther 2008;15:36-43.
19. Zhao D, Wang ZM, Wang LS. Prevention of atrial fibrillation with renin-angiotensin system inhibitors on essential hypertensive patients: a meta-analysis of randomized controlled trials. J Biomed Res 2015;29:475-85.
20. Haywood LJ, Ford CE, Crow RS, et al. Atrial fibrillation at baseline and during follow-up n ALLHAT (Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial). J Am Coll Cardiol 2009;54:2023-31.

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