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Hypertension in Elderly

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Abstract

The elderly, one of the fastest-growing segments of the population, have the highest prevalence of hypertension and account for a large proportion of persons seeking antihypertensive treatment. Arterial stiffness is increased by aging and this process is accelerated by hypertension. The effects of aging are seen almost exclusively in the central elastic arteries, principally the aorta. Systolic and pulse pressures are the major predictors of cardiovascular outcome in the elderly. Current recommendations suggest that both systolic and diastolic hypertension should be treated in elderly. Although individualization is necessary for patients older than 80 years of age the target should be to achieve systolic pressure of less than 140mmHg and diastolic pressure of less than 90 mm Hg. The focus should be on achieving blood pressure control, not initial therapy. Low-dose thiazide or calcium channel drugs are good as initial therapy. Multiple medications are usually required in older patients, and combinations should be based on concomitant diseases Drug dosing regimens should be adjusted for age- and disease-related changes in drug metabolism and potential drug-drug interactions Patients should be monitored for adverse effects and drug interaction. With all drugs, orthostatic hypotension should be avoided because of the increased risk of falling in older patients. Other concerns include postprandial hypotension, hypovolemia with diuretics, and hyperkalemia with angiotensin-converting enzyme, angiotensin receptor blocker, or aldosterone antagonists.

Key Words : effects of aging, arterial stiffness, systolic and diastolic hypertension, drug interaction

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Introduction

Longevity has been one of the greatest achievements of the 20th century. There are more older people today than ever before and their number is on the increase The world's population age 65 and older is growing by an unprecedented 800,000 people a month, according to a report from the U.S. Census Bureau and the National Institute on Aging. The report, "An Aging World: 2001," predicted that this phenomenon of global aging will continue well into the 21st century, with the numbers and proportions of older people continuing to rise in both developed and developing worlds. There are 77 million old people in India. This number is likely to rise to 177 million by 2025. Adults aged 65 and older are disproportionately affected by hypertension, dyslipidemia, and diabetes, which are established risk factors for cardiovascular disease (CVD). Although risk reduction strategies among older adults, including control of CVD risk factors, can lead to a decline in premature CVD morbidity and mortality, the prevalence of these risk factors has generally increased in the past decade among elders and risk factor control rates have been suboptimal (1). The prevalence of hypertension in elderly subjects (age greater than 60 to 65 years) is as high as 60 to 80 percent. The lifetime risk of developing hypertension in individuals aged 55 to 65 who do not have hypertension is approximately 90 percent. Systolic pressure rises and the diastolic pressure fall after age 60 in both normotensive and untreated hypertensive subjects.

Aging and arterial stiffness

Aging has a greater effect on arterial stiffening than any other process. The effects of aging are seen almost exclusively in the central elastic arteries, principally the aorta, which also dilates progressively with age. In a normal cohort of subjects in Sydney and Beijing, aortic PWV increased twofold between ages 15 and 70 years. Studies in communities where salt intake and prevalence of hypertension are low, has shown a far less increase in aortic wave velocity with age. These findings suggest that high salt intake and hypertension accelerate the aging process. Studies of arterial distensibility have shown the same marked difference between central elastic and peripheral muscular arteries with age. Other manifestations of arterial stiffening associated with aging include increases in brachial pulse pressure (by 60 to 100%

in the Framingham cohort between 35 and 80 years-as compared with a 3 to 10% increase in mean pressure), together with increases in radial, carotid, and aortic systolic pressure augmentation.

Concomitant increases in diameter and stiffness (2) of elastic arteries with age suggest a common cause. Aging is associated with fracture and fragmentation of the elastin fibres or lamellae within the media (3). Other remodeling changes including increases in collagen and glycosaminoglycans-appear to be secondary. It has been suggested that the changes in stiffness and caliber are due to fatigue and fracture of the elastic lamellae, with progressive dilatation of the aorta and recruitment of collagenous fibers within the arterial wall (4). The inert elastic fibers, whose half-life is measured in decades, fracture after multiple cycles of stretch, like rubber and other elastic materials (5). Calculations based on the properties of rubber indicate that elastic fiber, subject to 10% stretch over 800×10^6 cycles (approximately 25 years at heart rate 70/ min), will fracture, whereas elastic fibers in a peripheral artery that stretch less than 5% with each cycle will not fracture over 3000×10^6 cycles, i.e., in 100 years. This theory, which is well established in the physical sciences, explains observations for the aorta and central elastic arteries and the differences between the central arteries and the differences between the central arteries, where distension in early life is approximately 10% with each heartbeat, and the peripheral muscular arteries, where the pulsatile change in diameter is less than 5%. The theory also explains how damage to the elastic lamellae may be accelerated in aortic coarctation and in some other hypertensive states in which pulsatile aortic strain is increased (3).

Hypertension, Aging and Arterial Stiffness

Arterial stiffness is increased by aging and this process is accelerated by hypertension. Changes in arterial stiffness with age are apparent as an increase in pulse wave velocity. Studies in normotensive and hypertensive subjects have shown a relation between left ventricular hypertrophy and arterial stiffness (6). Progressive arterial stiffening with age is considered responsible for the progressive left ventricular hypertrophy in aging human subjects. Stiffness and characteristic impedance of the aorta and large elastic arteries

increase with elevation in arterial pressure. In the early stage of hypertension, compliance of peripheral muscular arteries may be paradoxically increased as a result of passive arterial dilatation. Changes are largely due to the physical effect of increased arterial pressure per se (increased stiffness at higher pressure) and are largely reversed by antihypertensive therapy. They are the same changes seen with aging-early return of wave reflection, greater augmentation of the central aortic and cartoid pulse, and shift of ascending aortic impedance curves upward and to the right. Increase in aortic augmentation is associated with increase in height of the secondary systolic pressure wave in the radial artery, causing it to be as high as or higher than the initial pressure peak. This was recognized by Mahomed in his sphygmographic studies of hypertension in 1874 as the most consistent feature of hypertension: "The tidal wave is prolonged and too much sustained" (7).

Arterial stiffening in hypertension may be increased by the structural degeneration caused by prolonged high arterial pressure. Arterial degeneration, medial necrosis, and aneurysm formation are accelerated by hypertension. In conditions such as aortic coarctation and hyperdynamic states, this can be explained on the basis previously proposed for aging change-greater pulsatile strain over hundreds of millions of cycles. Inhomogeneties in the arterial wall-as at bifurcations where a muscular coat is deficient-may allow greater stretch of elastin fibres and predispose to early fracture of elastin fibers and aneurysm formation. A study at PGIMER, Chandigarh showed that pulse wave velocity increased significantly in hypertensive patients as compared to controls and an increase in age and deranged lipid profile were associated with significant increase in pulse wave velocity (8).

Special issues in Elderly people with Hypertension

1. Isolated systolic hypertension (ISH): It has been generally defined as an elevated systolic pressure above 160 mmHg, with a diastolic pressure that is below 90 mmHg. However, the majority of experts believe (Seventh Joint National Committee report) that the systolic level of 140 mm Hg is the upper limit of normal at all ages and ISH accounts for 60 percent of cases of hypertension in the elderly. Furthermore, the

systolic and pulse pressures may be the major predictors of outcome in the elderly.

2. Pseudohypertension: This is a condition in which there is a major discrepancy between intra-arterial and arm-cuff blood pressures, such that cuff pressures are falsely high should be suspected in older patients who, despite high blood pressure measurements, have minimal vascular damage in the retina and who experience inordinate postural dizziness despite cautious therapy.

3. Variability of blood pressure: Blood pressure readings are far more variable in the elderly, so more readings should be taken initially than for patients in the general population.

4. Postural Hypotension: Blood pressure should be measured in both the sitting and standing positions since there is a high frequency (as much as 30%) of a 20 mm Hg or greater fall in blood pressure in patients with a systolic pressure over 160 mm Hg. Postural hypotension of greater than 20 mm Hg or 20 percent of systolic pressure is a risk factor for falls and fractures that carries significant morbidity and mortality. Elderly patients may have sluggish baroreceptor and sympathetic nervous responsiveness, as well as impaired cerebral autoregulation.

   Antihypertensive medications, anti-parkinsonian agents, antipsychotic agents and tricyclic antidepre-ssant drugs add to development of postural hypotension. In these circumstances standing blood pressure should be used to guide treatment decisions. Postural blood pressure changes should be assessed (after >5 minutes supine, immediately after standing, and 2 minutes after standing) in older patients, and volume depletion avoided. Side effects like dizziness and lightheadedness should alert the investigator of possible overtreatment. Postprandial declines in both systolic and diastolic blood pressure occur about 1 hour after eating, with blood pressure returning to fasting levels 3 to 4 hours after eating.

5. Comorbid conditions Hypertension is a common comorbidity in persons with diabetes mellitus,

and its prevalence increases with advancing age. Both diabetes mellitus and hypertension are independent risk factors for development in older persons of coronary artery disease, ischemic stroke, peripheral arterial disease, and of congestive heart failure. Presence of other comorbid conditions related to nervous, respiratory, cardiac, genitourinary and gastrointestinal systems are common and may make the treatment difficult and complex.

6. Vascular cognitive impairment (VCI): It is the modern term related to vascular burden of the brain, reflecting all encompassing effects of cerebrovascular disease (CVD) on cognition. VCI (9) encompasses mild deficits in one or more cognitive domains to a broad dementia like syndrome. Vascular risk factors include arterial hypertension, high cholesterol, and diabetes. In the Rotterdam Scan Study (10), current hypertension or established hypertension of 5- to 20-year duration were associated with significantly increased white matter lesions.

7. Diastolic Heart Failure- There has been growing recognition over the past two decades that a substantial proportion of patients who have heart failure, particularly the elderly, have preserved systolic left ventricular function (11). This condition has been presumptively termed diastolic heart failure. Several lines of evidence suggest that systemic hypertension plays an important role in the genesis of this clinical syndrome. Acute pulmonary edema in these patients most likely is because of an exacerbation of diastolic dysfunction caused by severe systolic hypertension.

Management

Despite numerous outcome trials demonstrating the benefits of BP lowering among older individuals with hypertension, rates of treatment and control are suboptimal. BP control is particularly difficult to achieve in older women. Recent data from the Framingham Heart Study show dramatic reductions in BP control (to goal levels < 140/90 mm Hg) with age among treated hypertensive patients, particularly among women, in whom control rates declined from 38% in those under the age of 60 years to 28% in those aged 60-79 years, and to 23%

in those over age 80. A number of possibilities have been suggested to account for the poor BP control rates in the elderly, including inadequate intensity of treatment, suboptimal drug regimens, and treatment resistance. The same general rules of treating hypertension apply to the whole hypertensive population. The benefits of treating hypertension in the elderly, including those over 80 are well documented (12,13).

Lifestyle modification

Before initiating drug therapy, non-drug therapies may provide significant benefits. The ability of lifestyle changes to lower BP in the elderly is well documented. In particular, dietary sodium should be moderately restricted to 100 to 120 meq/day, since the pressor effect of sodium excess and the antihypertensive efficacy of sodium restriction progressively increase with age. However, the elderly may ingest more sodium to compensate for a decrease in taste sensitivity.

Drugs

Randomized controlled trials leave little doubt that elderly patients benefit from antihypertensive treatment in terms of reduced cardiovascular morbidity and mortality, irrespective of whether they have systolic–diastolic or isolated systolic hypertension There is clear evidence of benefit in the treatment of hypertension in the elderly, including patients over the age of 80. Benefits in elderly patients have been shown with representative agents from several classes such as diuretics, beta-blockers, calcium antagonists, angiotensin-converting enzyme inhibitors and angiotensin receptor blockers. Emphasis here is on treatment: monotherapy is clearly inadequate for controlling BP and preventing cardiovascular disease outcomes and stroke in many elderly patients. Certain general issues need to be emphasized before considering the choice of antihypertensive drugs and the goal blood pressure.

1. Initial doses should be lower (approximately one-half that in younger patients) to minimize the risk of side effects.
2. Reduction in BP should be gradual to minimize the risk of ischemic symptoms; particularly in patients with postural hypotension. Even more caution is advised in the very old, although the benefits from careful

therapy probably outweigh the risks in these patients.

3. The trials on hypertension in the elderly have been performed in relatively fit patients. Greater caution should be applied to the therapy of frail patients, and treatment may be withheld if postural hypotension is a problem, found in as many as 30 percent of elderly patients with systolic hypertension. As a result, careful assessment and management of these problems must be provided before treatment of the hypertension

Diuretics

Low-dose thiazide therapy is the preferred initial treatment for elderly hypertensive and isolated systolic hypertension. It has the advantages of low cost, efficacy, and proven benefit .Low dose thiazide-type diuretics are chosen because of their efficacy in preventing stroke and cardiovascular events and their low cost (14,15). However, questions have been raised about dosing and about the long-term consequences of their adverse metabolic effects. Diuretic therapy increases the incidence of hypokalemia, insulin resistance, and type 2 diabetes.

Calcium channel Blockers (CCB)

The Syst-Eur trial (16), the STONE trial from Shanghai (17), and the Syst-China trial (18) suggest that long-acting calcium channel blockers are also effective in this group of patients. These agents have performed particularly well in preventing stroke in elderly hypertensives. CCBs are metabolically neutral and, except for peripheral edema, are relatively free of adverse effects. In principle, the lack of adverse metabolic effects may represent a major advantage of CCBs over diuretics for a population in which the metabolic syndrome/insulin resistance is becoming epidemic. On the basis of BP-lowering efficacy and outcomes data, CCBs are acceptable alternatives to diuretics for first-line treatment of hypertension in the elderly and may offer advantages in some patient groups, eg, those with the metabolic syndrome.

ACE Inhibitors and ARBs

These antihypertensive drug classes have outcome advantages for patients with concomitant cardiovascular diseases, diabetes with albuminuria, or chronic kidney disease, the "compelling indications" delineated in JNC 7 (14). When administered alone or in combination with other antihypertensive drugs,

ACE inhibitors and ARBs reduce the incidence of new-onset diabetes by about 25% compared with other active treatments, a clear advantage in the elderly. Further, except for ACE inhibitor-induced cough, they are better tolerated than other drug classes. However, these agents have less robust BP-lowering effects than CCBs and diuretics in the elderly, likely because of their volume-expanded/renin-suppressed state. They are most useful in combination therapy with a diuretic or CCB.

Other Drug Classes

Beta-blockers, adrenergic blockers, centrally acting agents, direct vasodilators, and mineralocorticoid (aldosterone) receptor antagonists are useful in lowering BP and in treating some forms of target organ damage/concomitant conditions in elderly hypertensives (15). However, these drug classes lack outcomes data to support their use as first-line treatment of uncomplicated hypertension in the elderly.

Effects of treatment on Dementia

A substudy of the Hypertension in the Very Elderly Trial (HYVET) and other studies (19-21) has reported a modest reduction in cases of incident dementia with blood-pressure lowering treatment. Also another important finding of HYVET-COG is that antihypertensive treatment did not increase the risk of dementia or cognitive decline (22). This contrasts with "the commonly held belief among many doctors that treatment of hypertension in the very elderly might have negative effects on brain function via a reduction in cerebral blood flow (23). In a press release related to the results of HYVET-COG, the UK Alzheimer's Society said that new research shows that hypertension is associated with a 6-fold increased risk of vascular dementia.

Goal blood pressure

Recommended general goals for the treatment of hypertension in the elderly include a diastolic pressure of 85 to 90 mm Hg in patients with diastolic hypertension, a systolic pressure <140 mm Hg except, perhaps, in patients with isolated systolic hypertension. Lower goals have been recommended in hypertensive patients with diabetes mellitus, chronic kidney disease, and coronary artery disease. A concern in elderly patients with isolated systolic hypertension has been that the low diastolic pressure after therapy may interfere with tissue perfusion and adversely affect outcome

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