Blood pressure control and prevention of stroke in adults with diabetes

Stroke is a major complication in patients with diabetes and hypertension. Patients should be made aware of the complications and the importance of stroke-prevention strategies. Patients with diabetes and hypertension should be treated intensively to achieve a target value of 130/80 mmHg or lower, since optimum blood-pressure goals are achieved in only 5% of patients with diabetes. Target blood pressure is achievable only by active participation of patients in their care, patients' education, involvement of multidisciplinary health workers in the community, and timely secondary-care input. Local guidelines on blood-pressure control should be implemented rigorously for stroke prevention and improved care.

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Stroke is a major health problem. WHO estimated that 5·5 million people died of stroke in 2001 and 15·5 million people had permanent residual deficit after stroke. It is the single largest cause of severe disability. Stroke results in long-term disability and can lead to lengthy hospital stays. Approximately 40% of people with stroke do not recover completely and many of them are transferred from hospital to care homes, because they require complex care.

Diabetes increases the risk of stroke by 1·5–3 fold. The risk of stroke is increased much further by associated hypertension. Diabetes and hypertension are independent risk factors for increasing incidence of stroke, as well as for stroke mortality. The association between diabetes and hypertension is common.[1] Hypertension is a common comorbid state affecting about 20–60% of patients with diabetes. 35–75% of diabetes-related complications can be attributed to hypertension.[2] It is a serious risk factor for cardiovascular disease in patients with diabetes[3] and the benefits of controlling blood pressure in patients with diabetes are well documented.[4]

The prevention of stroke should be given the highest priority to reduce its burden on the society.[5,6] People at risk of stroke should be identified at an early stage and treated in good time to prevent stroke and its sequelae. In this article, we will discuss control of blood pressure for prevention of stroke in patients with diabetes.

Evidence

We know that the incidence of stroke is increased in patients with hypertension and diabetes,[7,8] and that these patients also have high mortality. Improving control of blood pressure in patients with diabetes can significantly reduce the risk of major cardiovascular events;[7,9] tight control reduces the risk of stroke by 33–50%.[9]

Results of a population-based self-administered postal questionnaire showed a close relationship between diabetes, hypertension, and stroke.[10] The overall risk of stroke was similar in participants with and without diabetes, but it was higher in those who had both hypertension and diabetes. In many instances, when stroke occurred in a hypertensive patient, diabetes or glucose intolerance was detected for the first time.

In the United Kingdom Prospective Diabetes Study (UKPDS),[9] each 10 mmHg decrease in mean systolic blood pressure significantly improved the vascular complications of diabetes.[9] The risk of complications related to diabetes was reduced by 12%, and for diabetes-related death the risk decreased by 15%. The incidence of cerebrovascular disease declined by 33–42%. UKPDS data showed that patients with diabetes and lower blood pressure had fewer cardiovascular complications than did those with high blood pressure.[9,11] The mean pressure achieved in intensively treated patients was 154/80 mmHg.

Definitions of blood pressure have changed since UKPDS, although the target pressure achieved is within the range considered as hypertension by current definitions so the data are still useful clinically. UKPDS data showed no clear cut-off value for lower blood pressure, below which no further benefit is achieved. Clearly, lowering blood pressure by any degree is better than none. Additionally, patients included in the UKPDS trial had regular input from health-care professionals. This attention may have increased the patients' motivation, which could have had an effect on their adherence to treatment.

In a substudy of UKPDS, 1148 patients with hypertension and diabetes were randomised into two

groups on the basis of target blood-pressure control. The first group had a target of less than 150/85 mmHg with the use of either an angiotensin converting enzyme or a β-blocker. The other group had a target of less than 180/105 mmHg. In the tighter blood-pressure control group, the risk of stroke was reduced by 44% and diabetes-related deaths were reduced by 32%.[9] The study was powered to test the effect of blood-pressure control and diabetes-related endpoints, but it was not powered to test if one agent was superior to another.

A study of cognition and prognosis in elderly patients[12] also showed similar results with candesartan; treating high blood pressure was associated with reduced risks of stroke and non-fatal stroke. The heart outcomes prevention evaluation study[13] included patients with a history of vascular events and a high risk of further events, whose risk of stroke was reduced with ramipril. Additionally, data for 3577 diabetic patients confirmed that ramipril reduced the risk of stroke by 33%.[13] It was also noted that patients in the ramipril group had better control of their blood pressure compared with placebo.

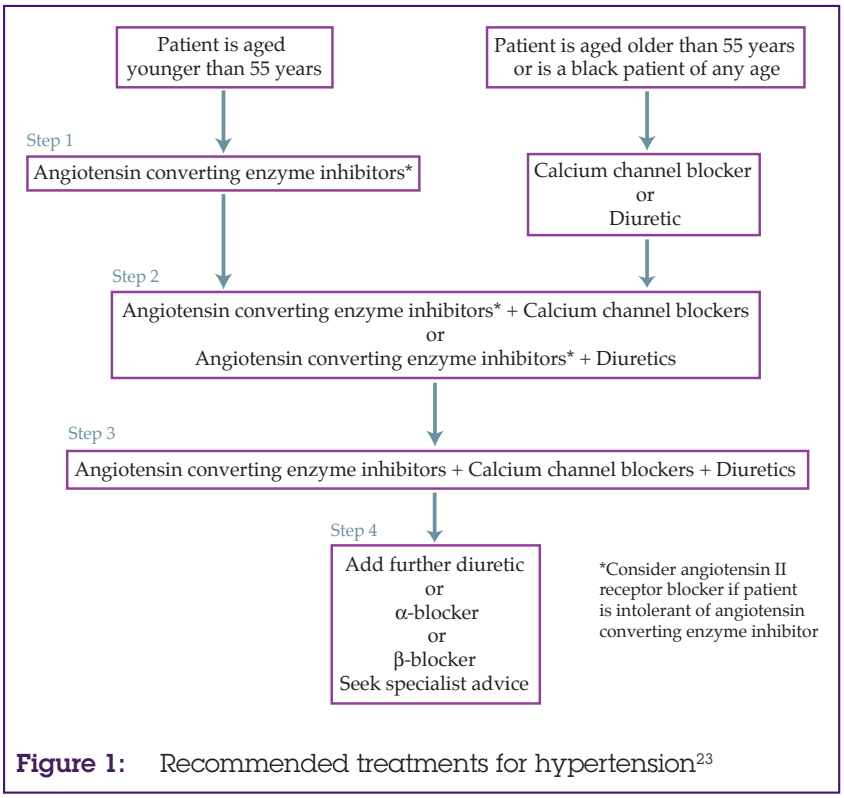

Figure 1: Recommended treatments for hypertension[23]

The hypertension optimal treatment trial[14] included 18,790 patients in 26 countries. The risk of a major cardiovascular event was reduced by 50% in the group that had a diastolic blood pressure of 80 mmHg or lower compared with 90 mmHg or less. Adequate control of blood pressure is essential for prevention of stroke. In a prospective cohort study[15] in Sweden in 27,396 participants aged 45–73 years, the relative risk of stroke in the untreated hypertension group was 2·55. On the basis of the whole population, an estimated 28% of strokes could be attributed to untreated hypertension, 9·2% to treated but uncontrolled hypertension, and 0·9% to treated controlled hypertension. Only 23% of participants were receiving treatment for high blood pressure, of which only 12% could achieve optimum target values.[15] This uncontrolled blood pressure was reflected by the high prevalence of stroke in the study population. The role of blood-pressure control is clear, but treatment is not offered to many patients, and optimum values are achieved in even fewer.

In an observational study, control of blood pressure was achievable in only 20% of the patients in the treatment group.[16] Blood-pressure control, with target values of 130/80 mmHg or lower, was difficult to achieve in patients with diabetes. This target was achieved in only 3% of patients, thus increasing the risk of cerebrovascular disease several times. Control of blood pressure is important for prevention of stroke, but is achievable in only a few patients. It is not clear from the study if this effect was due to vascular protective effects of specific drugs, or to direct blood-pressure lowering irrespective of the agent used. High blood pressure in patients with stroke may be a reflection of treatment not being offered at all.

The risk of hypertension, especially systolic hypertension, increases with age.[17] An isolated rise in systolic blood pressure increases the risk of stroke many times.[18] The systolic hypertension in the elderly programme[10] demonstrated a 36% reduction in incidence of stroke with antihypertensive therapy.[19]

Blood pressure targets in diabetes

There is strong evidence that blood-pressure control in patients with diabetes reduces the risk of stroke and mortality. Guidelines recommend aiming to achieve blood presure of 130/80 mmHg or lower, and suggest using drugs that help to reduce cardiovascular risk without exacerbating concomitant conditions. The American Diabetes Association suggests lowering blood pressure to 130/80 mmHg initially with an angiotensin converting enzyme inhibitor or an angiotensin receptor

blocker.[20] The Canadian Hypertension Society and the US Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure[21] have similar guidelines. The US Joint Committee recognised that people with hypertension and diabetes are at high risk of stroke, and might need two or more drugs to maintain their blood pressure at 130/80 mmHg.

Strategies for managing hypertension

Control of blood pressure is key to preventing stroke in people with diabetes. UK guidelines for treatment of hypertension were based on new hypertension guidelines from NICE and the British Hypertension Society.[22] Figure 1 shows a flow chart of the current recommendations from the joint British society for the management of hypertension.

Other risk factors should also be aggressively managed. All patients should receive advice regarding lifestyle changes such as increasing their physical activity, lowering their salt intake, and stopping smoking. They should be advised to reduce their weight, and eat a healthy diet with more fruits and vegetables and restrict sugar intake. Limiting their intake of alcohol is also advisable.

Monitoring is important for dose titration and for detection of the response to and efficacy of treatment, of compliance to treatment, and of side-effects. In a short consultation, clinicians need to address several issues, but often because of time constraints, one aspect of care has priority and the others are given less attention. Glycaemic control often takes precedence in people with diabetes. People with suboptimum blood-pressure control, the possibility of so-called white-coat hypertension should be eliminated by 24-hour ambulatory monitoring of blood pressure. These patients persistently show elevated blood pressure in the clinic but have normal readings in a more relaxed environment such as the home.[24]

In some cases control is not achieved because of lack of adherence to guidelines.[25] Additionally, many patients have poor concordance with treatment due to the adverse effects caused by medication.[26] The involvement of nurse practioners, setting up nurse-led clinics,[27] and use of fixed-dose combinations to reduce tablet counts are some measures for improving control of blood presure. The adherence of patients to their treatment regimen can be improved by taking a more detailed history, understanding their background, their social structure, and their behaviour and attitude. Involving patients in their care, for example, maintaining a record of blood pressure in a diary on a regular basis, educating patients on the correct use of the sphygmomometer, or enlisting the help of community health support workers are other options.[28] However, despite best efforts, the target blood pressure may not be achieved in some patients for many reasons (box 1).

Box 1: Factors for inadequate control of blood pressure

Factors for poor compliance under patients' control
- Poor educational background
- Little interest in knowledge about illness
- Communication barriers
- Memory problems
- Psychological barriers
- Socioeconomic problems

Factors not under patients' control
- Poor communication from doctor to patient
- Time constraints in doctors' consultations
- Transport problems to and from clinic
- Unstructured health organisation
- Resistant hypertension
- Hypertension secondary to another disorder

National Service Framework

The National Service Frameworks aim to provide structured care to reduce risks and improve quality of care for older people and people with diabetes. The National Service Framework for Older People[29] covers stroke separately because of the higher incidence, prolonged disability, and frequent complications of stroke. Stroke effects patients physically, emotionally, and financially, and may make patients dependent for their daily activities. The framework for older people recommends that people at risk of stroke should be identified and appropriate steps taken to prevent stroke, which is possible by treating modifiable risk factors such as blood pressure, diabetes, and hyperlipidaemia. As diabetes care moves into the community, provisions should be made to monitor these patients regularly.

Improving set up

The tight control of blood pressure in patients with diabetes saves lives;[9,20] suboptimum control is ineffective. The necessary steps to ensure tight control of diabetes and hypertension will make targets achievable and will

Box 2: Methods of encouraging patients to help with blood-pressure control

Information for patients
- Better verbal communication by doctors
- Leaflets
- Video and television media
- Internet sites
- Education about complications of diabetes and hypertension

Role of the treating clinician
- Good assessment and management plan
- Practice on basis of appropriate guidelines and evidence
- Modify treatment on the basis of patients' needs
- Forewarn about drugs' side-effects
- Stress compliance with medication regimen
- Involve multidisciplinary team
- Regular monitoring
- Audit treatment practices

Community support
- District nurses
- Community support workers
- Interpreter if required
- Psychological input (ie, relaxation techniques)

Department of health
- Provide necessary infrastructure
- Appropriate manpower
- Availability of medication
- Financial resources for further training of health workers
- Organising workshops and conferences to improve knowledge
- Regular national audit and assessment

provide positive reinforcement that may encourage a long-term adherence with treatment.[30] Patients' education is equally important. Some methods to encourage patients' empowerment in controlling their blood pressure are shown in box 2.

Role of the physician

Tight blood-pressure control prevents vascular complications and reduces mortality. The target of 130/80 mmHg or less can prevent many strokes and associated complications. Despite higher costs of medication and more health-care visits, it has great economic benefit. Economic analysis has clearly shown that money spent on controlling blood pressure is cost-effective.[31]

Clinicians' adherence to the latest guidelines is important. Clinicians should identify when they should refer patients to

secondary care, for example if patients have resistant or secondary hypertension. Primary-care physicians should feel comfortable in titrating medications in a stepwise fashion to achieve the optimum control of hypertension and diabetes, and in dealing with complex cases. They should feel confident in the use of 2–3 drugs to achieve the recommended blood-pressure targets.

Conclusion

Blood pressure should be tightly controlled in people with diabetes. Adequate blood-pressure control reduces the risk of stroke in people with diabetes and hypertension. Patients with diabetes and hypertension, should aim for a target of 130/80 mmHg or lower. Adequate blood pressure monitoring would help to ensure that blood pressure is sufficiently controlled and that reasons for failure to achieve these targets are addressed. The compliance with medication and adequate monitoring in primary or secondary care, or both, should help.

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