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Dutch guideline for the management of hypertensive crisis – 2010 revision

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ABSTRACT

Hypertensive crises are divided into hypertensive urgencies and emergencies. Together they form a heterogeneous group of acute hypertensive disorders depending on the presence or type of target organs involved. Despite better treatment options for hypertension, hypertensive crisis and its associated complications remain relatively common. In the Netherlands the number of patients starting renal replacement therapy because of 'malignant hypertension' has increased in the past two decades. In 2003, the first Dutch guideline on hypertensive crisis was released to allow a standardised evidence-based approach for patients presenting with a hypertensive crisis. In this paper we give an overview of the current management of hypertensive crisis and discuss several important changes incorporated in the 2010 revision. These changes include a modification in terminology replacing 'malignant hypertension' with 'hypertensive crisis with retinopathy' and reclassification of hypertensive crisis with retinopathy under hypertensive emergencies instead of urgencies. With regard to the treatment of hypertensive emergencies, nicardipine instead of nitroprusside or labetalol is favoured for the management of perioperative hypertension, whereas labetalol has become the drug of choice for the treatment of hypertension associated with pre-eclampsia. For the treatment of hypertensive urgencies, oral administration of nifedipine retard instead of captopril is recommended as first-line therapy. In addition, a section on the management of hypertensive emergencies according to the type of target organ involved has been added. Efforts to increase the awareness and treatment of hypertension in the population at large may lower the incidence of hypertensive crisis and its complications.

KEYWORDS

Hypertensive crisis, guideline, management, hypertensive emergencies, hypertensive urgencies, renal sufficiency

INTRODUCTION

Hypertensive crises are a heterogeneous group of hypertensive disorders characterised by severe hypertension and acute target organ damage. As a result of better treatment possibilities for hypertension in the population at large it might be anticipated that the incidence of hypertensive crisis would decline. Yet hypertensive crisis remains relatively common in the Netherlands, especially among young and middle-aged adults of sub-Saharan African descent.[1] This is also substantiated by the number of patients in need of renal replacement therapy because of 'malignant hypertension'. Between 1990 and 2000 a total of 205 patients started renal replacement therapy in the Netherlands (1.6% of the total number of patients starting renal replacement therapy) because of malignant hypertension compared with 289 patients (1.7%) between 2000 and 2010.[2] This shows that although the relative contribution of renal failure attributable to malignant hypertension has remained unchanged, the absolute number of patients with renal failure as a result of malignant hypertension has increased by 40% in the past two decades. The observation that hypertension was not detected in half of the patients presenting with a hypertensive crisis implies that awareness and treatment of hypertension still needs to be improved, especially among young and middle-aged persons from sub-Saharan African descent. Next to

continuing efforts to improve the control of hypertension, the relatively high prevalence of hypertensive crisis and its associated complications suggest that appropriate recognition and management of hypertensive crisis remains important.

The 2003 guideline on the management of hypertensive crisis was published with the aim to provide a standardised evidence-based approach for the treatment of patients with hypertensive crisis in the Netherlands.[3] Recently, the 2003 guideline on hypertensive crisis was updated. The scope of this paper is to give an overview of the current management of hypertensive crisis and to discuss several important changes included in the 2010 revision.

METHODS

In 2008, the Netherlands Society of Internal Medicine formed a working group to update the 2003 guideline on hypertensive crisis. A systematic search for articles on the management of hypertensive crisis was performed using Medline and the Cochrane Database (for a detailed description of search terms see the full version of the guideline). Literature was qualitatively assessed using standardised methods.[4] The result of the literature review was discussed during three working group meetings. After internal consensus, a concept version of the guideline was sent for internal and external review. A final version was approved by the members of the Netherlands Society of Internal Medicine on 18 November 2010. The definitive version of the revised guideline can be retrieved at www.internisten.nl/home/richtlijnen/definitief.

DEFINING HYPERTENSIVE CRISIS

In the literature, hypertensive crises are uniformly differentiated in hypertensive urgencies and hypertensive emergencies.[5] A hypertensive emergency refers to a situation where uncontrolled hypertension is associated with acute target organ damage to the brain, heart, kidney, retina or blood vessels, whereas a hypertensive urgency is used to denote the presence of uncontrolled hypertension without evidence of acute hypertensive organ damage. The diagnosis 'hypertensive urgency' may therefore be regarded as a diagnosis of exclusion. Although it is generally recognised that the rate of BP increase over time is more important for the development of acute organ damage than the absolute BP level, a hypertensive crisis usually develops when BP values exceed 120 to 130 mmHg diastolic and 200 to 220 mmHg systolic. In patients without pre-existing chronic hypertension, such as women with pre-eclampsia, a hypertensive emergency can develop at substantially lower BP values. Severe hypertension, defined as a BP between 180/110 mmHg and 220/130 mmHg without symptoms or acute target organ damage, is not considered a hypertensive urgency and is treated as a risk factor for cardiovascular disease.

HYPERTENSIVE EMERGENCIES

The diagnosis of hypertensive emergency is based on the presence of acute damage to the brain, kidney, heart, retina and blood vessels. Hypertensive emergencies are preferably treated with intravenous drugs on a ward with facilities for continuous haemodynamic monitoring such as a medium care, coronary care or intensive care unit. Patients with a hypertensive urgency can usually be treated with oral medication. The promptness of instituting medical therapy, type of medication and BP goal of a hypertensive emergency depends on the type of end organs involved. For example, a hypertensive crisis with acute congestive heart failure requires immediate BP reduction to (near) normal BP values (mean arterial pressure [MAP] 60-100 mmHg). Conversely, in patients with acute ischaemic stroke, immediate treatment is generally withheld. A summary of the treatment of hypertensive emergencies according to affected target organs is given in *table 1*. An overview of recommended drugs that are used for the treatment of hypertensive emergencies is listed in *table 2*.

Hypertensive crisis with retinopathy

Probably the most common type of hypertensive emergency is hypertensive crisis with grade III or IV retinopathy, where grade III points to the *bilateral* presence of flame-shaped haemorrhages of cotton wool spots, and grade IV to the presence of papilloedema. Apart from advanced retinopathy, microangiopathic haemolysis and renal dysfunction are frequently present.[6] The most common presenting symptoms and complications of hypertensive crisis with advanced retinopathy are listed in *table 3*. Labetalol, a combined α- and β-adrenergic-blocking drug, is preferred for the treatment of hypertensive crisis with retinopathy as it leaves cerebral blood flow relatively intact for a given BP reduction compared with nitroprusside.[7] Because of its long half-life (5.5 hours), hypotension may proceed after cessation of labetalol. In most cases, however, BP can be restored by intravenous administration of normal saline. Nitroprusside, nicardipine and urapidil, a combined α1-selective adrenoceptor blocker and 5HT agonist, can alternatively be used for this type of emergency.

Hypertensive encephalopathy

Hypertensive encephalopathy is present in 10 to 15% of patients presenting with hypertensive crisis and advanced retinopathy. However, vice versa, advanced retinopathy

Table 1. *Recommended treatment of hypertensive emergencies according to end organ involved*

	Time-line and target BP	1st line therapy	Alternative therapy	Recommended unit
Hypertensive crisis with retinopathy, micro-angiopathy or acute renal insufficiency	Several hours, MAP -20 to -25%	Labetalol	Nitroprusside Nicardipine Urapidil	Medium care/ ICU/ CCU
Hypertensive encephalopathy	Immediate, MAP -20 to -25%	Labetalol	Nicardipine Nitroprusside	ICU/ Medium care/ Stroke unit
Acute aortic dissection	Immediate, systolic BP <110 mmHg	Nitroprusside and esmolol	Labetalol	ICU
Acute pulmonary oedema	Immediate, MAP 60 to 100 mmHg	Nitroprusside (with loop diuretic)	Nitroglycerine Urapidil (with loop diuretic)	CCU/ICU
Myocardial ischaemia/infarction	Immediate, MAP 60 to 100 mmHg	Nitroglycerine	Labetalol	CCU
Acute ischaemic stroke and BP >220/120 mmHg*	1 hour, MAP -15%	Labetalol	Nicardipine Nitroprusside	Stroke unit/ICU
Cerebral haemorrhage and BP >180 systolic or MAP >130 mmHg	1 hour, systolic BP <180 mmHg and MAP <130 mmHg	Labetalol	Nicardipine Nitroprusside	Stroke unit/ICU
Acute ischaemic stroke with indication for thrombolytic therapy and BP >185/110 mmHg†	1 hour, MAP -15%	Labetalol	Nicardipine Nitroprusside	Stroke unit/ICU
Cocaine/XTC intoxication	Several hours	Phentolamine (next to benzodiazepines)	Nitroprusside	Medium care/ICU
Adrenergic crisis associated with pheochromocytoma or autonomic hyperreactivity	Immediate	Phentolamine	Nitroprusside Urapidil	Medium care/ ICU
Peri- and postoperative hypertension - during or after coronary bypass graft	Immediate	Nicardipine	Urapidil or nitroglycerine	Recovery or ICU
- during or after craniotomy	Immediate	Nicardipine	Labetalol	Recovery or ICU
Severe pre-eclampsia/eclampsia‡	Immediate, BP <160/105 mmHg	Labetalol (next to magnesium sulphate and oral antihypertensive therapy)	Ketanserin Nicardipine	Medium care/ ICU

MAP = mean arterial pressure; *for the treatment of patients with stroke we refer to the National guideline for the Diagnosis, Treatment, Therapy and Care for stroke patients, CBO 2008. †autonomic hyperactivity refers to a situation where hypertension is associated with endogenous catecholamine excess. Autonomic hyperactivity is observed in cases of clonidine-withdrawal, food products or medication that interact with monoamine-oxidase (MAO) Guillain-Barré syndrome, spinal cord injury and cerebral contusion; ‡for the management of patients with severe (pre)eclampsia, we refer to the guideline Hypertensive Disorders in Pregnancy of the Dutch Society of Obstetrics and Gynaecology (NVOG).

Table 2. *Overview of intravenous drugs for the treatment of hypertensive emergencies*

Drug	Onset of action	Half-life	Dose	Contraindications and adverse effects
Esmolol	1-2 min	10-30 min	0.5-1 mg/kg as bolus; 50-300 µg/kg/min as continuous infusion	2nd or 3rd degree AV block, systolic heart failure, COPD (relative); bradycardia
Phentolamine	1-2 min	3-5 min	1-5 mg, repeat after 5-15 min. until goal BP is reached; 0.5-1.0 mg/h as continuous infusion	Tachyarrhythmia, angina pectoris
Ketanserin	1-2 min	30-60 min	5 mg as bolus injection, repeat after 5 min (max 30 mg); 2-6 mg/h as continuous infusion	Prolonged QT interval, 2nd or 3rd degree AV block; bradycardia, hypokalaemia
Labetalol	5-10 min	3-6 hr	0.25-0.5 mg/kg; 2-4 mg/min until goal BP is reached, thereafter 5-20 mg/h	2nd or 3rd degree AV block; systolic heart failure, COPD (relative); bradycardia
Nicardipine	5-15 min	30-40 min	5-15 mg/h as continuous infusion, starting dose 5 mg/h, increase every 15-30 min with 2.5 mg until goal BP, thereafter decrease to 3 mg/h	Liver failure
Nitroglycerine	1-5 min	3-5 min	5-200 µg/min, 5 µg/min increase every 5 min	
Nitroprusside	Immediate	1-2 min	0.3-10 µg/kg/min, increase by 0.5 µg /kg/min every 5 min until goal BP	Liver/kidney failure (relative); cyanide intoxication
Urapidil	3-5 min	4-6 h	12.5-25 mg as bolus injection; 5-40 mg/h as continuous infusion	

Table 3. *Presenting symptoms and associated complications in patients with hypertensive crisis and advanced retinopathy*

	Percentage
Headache	63
Visual disturbances	59
Gastrointestinal symptoms (nausea, vomiting, weight loss)	49
Heart failure	30
Neurological sequelae (encephalopathy)	17
Left ventricular hypertrophy	86
Severe renal impairment (creatinine >300 μmol/l)	33
Mild to moderate renal impairment (115-300 μmol/l)	46
Microangiopathic haemolytic anaemia	28

may be lacking in up to 1/3 of patients.[8] Hypertensive encephalopathy is characterised by a reduced level of consciousness, delirium, agitation, stupor, seizures or cortical blindness in combination with a severe BP elevation. Focal neurological signs are uncommon and should raise the suspicion of an ischaemic stroke or cerebral haemorrhage. To verify the diagnosis additional CT or MRI imaging of the brain may be required. Cerebral oedema may be visualised as areas with increased signal density on MRI with T2 weighted or FLAIR imaging or as hypodense areas on CT or T1 weighted MRI imaging.[9,10] These areas are typically located in the posterior regions of the brain. The reason for this posterior predilection is likely the scarce innervation of the sympathetic nervous system in the supply area of the vertebral arteries resulting in a lower damping of BP oscillations as compared with the supply area of the carotid arteries. Hypertensive encephalopathy is also known as one of the causes of reversible posterior leucoencephalopathy syndrome (RPLS).[10] Besides hypertension, RPLS is also associated with thrombotic thrombocytopenic purpura (TTP), carotid endarteriectomy hyperperfusion syndrome, cytotoxic therapy (e.g. cyclosporine and tacrolimus) and administration of antiangiogenic and proapoptotic drugs, such as bevacizumab and bortezomib. In many of these situations hypertension is also present. Therefore, the cause of this syndrome appears to be multifactorial including, apart from hypertension, sudden increases in cerebral perfusion and endothelial damage. The cerebral white matter lesions that are observed on MRI imaging are in most cases reversible with timely institution of BP-lowering therapy and removal of other provoking factors (e.g. cytotoxic or antiangiogenic therapy).

In patients with hypertensive encephalopathy, antihypertensive treatment should be started immediately to lower BP in a controlled way in order to prevent further neurological deterioration and irreversible brain damage. Like hypertensive crisis with retinopathy, labetalol is preferred because cerebral blood flow is better preserved than with nitroprusside.[7] In case of seizures (temporary) anticonvulsant therapy should be instituted.[11] If neurological deterioration occurs during the initial BP-lowering phase the presence of a cerebral haemorrhage or ischaemic stroke should be considered. In these cases further BP lowering may adversely affect neurological outcome. Other causes for neurological deterioration are cerebral hypoperfusion caused by excessive BP reduction, nitroprusside toxicity and obstructive hydrocephalus due to compression of the cerebral aqueduct as a result of oedema.

Acute myocardial ischaemia or infarction

In patients with hypertensive crisis, the increase in afterload and myocardial oxygen demand may induce myocardial ischaemia. Oxygen supply may be further impaired by the presence of left ventricular hypertrophy decreasing coronary flow reserve.[12] In these patients therapy should be aimed at lowering BP without causing reflex tachycardia because this reduces diastolic filling time and increases myocardial oxygen demand. Both nitroglycerin or labetalol may safely reduce BP in patients with hypertension and acute myocardial ischaemia.[13,14] Additional β-blockade may be indicated for patients receiving nitroglycerin, especially if tachycardia is present. In comparison with nitroglycerin, sodium nitroprusside decreases regional blood flow in patients with coronary abnormalities and increases myocardial damage after acute myocardial infarction.[14-16] Urapidil may alternatively be used for the management of hypertensive crisis with myocardial ischaemia.[17,18]

Acute congestive heart failure

In patients with hypertensive crisis and acute congestive heart failure, nitroprusside is the drug of choice by its ability to immediately decrease ventricular pre- and afterload. Nitroglycerin may be a good alternative, although doses in excess of 200 μg/min may be required to achieve the desired BP-lowering effect. Compared with nitroglycerin, urapidil gives a better BP reduction and improvement of arterial oxygen content without reflex tachycardia.[19] Concomitant administration of loop diuretics decreases volume overload and helps to further lower BP.

Acute ischaemic stroke and cerebral haemorrhage

To limit the risk of acute hypertensive complications in patients presenting with ischaemic stroke, the BP is lowered if it remains >220/120 mmHg in the acute phase. In order to maintain perfusion of the penumbra and to prevent hypoperfusion of cerebral areas that suffer from impaired cerebral autoregulation, the goal is to lower MAP initially by no more than 15%.[20,21] In the event that an acute ischaemic stroke can be treated with thrombolytic therapy,

the BP needs to be lower than <185/110 mmHg. In case of an acute cerebral haemorrhage consensus dictates that systolic BP should be lowered to <180 mmHg and MAP <130 mmHg.[22] Whether a more vigorous BP-lowering strategy in the acute phase of a cerebral haemorrhage improves outcome is currently being studied in the second Intensive Blood Pressure Reduction in Acute Cerebral Haemorrhage Trial (INTERACT2). This trial started in 2008 and is expected to be completed in December 2011. For the management of hypertension in the acute phase of ischaemic stroke or cerebral haemorrhage labetalol is the drug of choice. If labetalol is contraindicated, nitroprusside and nicardipine are useful alternatives.

Acute aortic dissection

Patients presenting with an acute aortic dissection need immediate therapy to reduce BP to a systolic BP of 100 to 110 mmHg or the lowest tolerable value to prevent aortic rupture. To achieve a quick reduction in systolic BP without increasing heart rate, a combination of nitroprusside and esmolol – a rapidly acting β-blocking agent for intravenous use – or intravenous metoprolol is preferred.[23,24] Alternatively, bolus injections of labetalol can be used with the possible disadvantage that its long half-life prohibits immediate correction of BP in case of hypotension.

Adrenergic crisis

An adrenergic crisis refers to a situation where a hypertensive crisis is caused by endogenous (pheochromocytoma, clonidine withdrawal) or exogenous (XTC, cocaine or amphetamine abuse) excess of catecholamines. The treatment of choice includes either phenoxybenzamine, a non-competitive α-blocking agent, or phentolamine, a competitive α-blocking drug. In addition β-blocking agents can be added in case of tachycardia, but only after α-blocking therapy has been instituted. Next to phentolamine, both nitroprusside and urapidil are effective for the perioperative management of pheochromocytoma.[25,26] Labetalol has been associated with hypertensive bouts during surgery and is therefore less suitable for the treatment of pheochromocytoma during surgery.[27,28] In case of cocaine, XTC or other amphetamines, anxiolytic drugs are indicated first. Phentolamine can be added if hypertension persists after benzodiazepines have been given.[29] If myocardial ischaemia is present both nitroglycerin or verapamil can be used to induce coronary vasorelaxation.[30,31] To prevent secondary thrombosis resulting from ischaemia-reperfusion injury concomitant administration of aspirin is advocated.

Perioperative hypertension

Hypertension frequently complicates surgery either because of increased activation of the sympathetic nervous system (e.g. from pain or ischaemia), perioperative administration of vasoconstrictive agents, volume expansion or temporary cessation of BP-lowering drugs prior to the procedure. The risk associated with uncontrolled hypertension depends on the type of surgery, but is most prominent in patients subjected to cardiovascular surgery who are at risk of a vascular leak, or in patients who need brain surgery and are at risk of cerebral oedema as a result of an increase in intracranial pressure. Nicardipine, a calcium-blocking agent for intravenous use, is recommended for the treatment of postoperative hypertension after cardiac bypass surgery and for the treatment of BP during brain surgery. In case of tachycardia, β-blocking agents may be added to decrease myocardial oxygen demand.

Hypertensive crisis in pregnancy/ pre-eclampsia

In patients with severe pre-eclampsia or eclampsia, BP-lowering therapy is given next to administration of magnesium sulphate and/or labour induction. The consensus is to lower the BP <160/105 mmHg to prevent acute hypertensive complications (most notably cerebral haemorrhage) in the mother. Labetalol is the drug of choice if intravenous treatment is required.[32,33] Preferably, labetalol is combined with oral BP-lowering therapy consisting of α-methyldopa and nifedipine OROS to prevent foetal bradycardia. In any case, foetal heart rate should be monitored and the dose of labetalol should not exceed 800 mg/24 hours in the prenatal period. If labetalol is contraindicated or does not lower BP sufficiently, nicardipine can be used as an alternative.

HYPERTENSIVE URGENCIES

Hypertensive crisis without emergency symptoms can usually be treated with oral BP-lowering agents. Although evidence regarding the preferred time to reach goal BP and type of BP-lowering medication is limited, there is evidence that a steep decrease in BP, such as reported with sublingual nifedipine tablets, can lead to cerebral, cardiac and renal ischaemia.[34] Moreover, placebo-controlled trials have shown that BP decreases spontaneously in a substantial proportion of patients.

For hypertensive urgencies, the treatment of choice is oral nifedipine retard 20 mg. Sublingual nifedipine should be avoided because of the risk of uncontrolled hypotension. Other calcium blockers such as nifedipine OROS or amlodipine have a slower onset of action and are therefore less suitable for the treatment of a hypertensive urgency. Patients should be observed for at least two hours after taking nifedipine. BP should be measured with a maximal interval of 15 minutes between measurements. Before discharge, BP should be lower than <180/110

mmHg, but at least <200/120 mmHg. Although the risk is probably small, a steep or symptomatic decrease in BP can be treated with intravenous saline. Patients who are discharged should be seen by their general practitioner or at the outpatient department within three to five days for further treatment and analysis of their hypertension.

DISCUSSION

In comparison with the 2003 Dutch guideline on the management of hypertensive crisis several changes have been made. An outline of the most important changes incorporated in the 2010 revision is given in *table 4*.

In the 2010 revision the term 'malignant hypertension' has been replaced by 'hypertensive crisis with retinopathy'. The working group has decided on this change in terminology because the survival of patients with 'malignant hypertension' has considerably improved as a result of the advent of effective antihypertensive agents and renal replacement therapy. If, next to the presence of retinopathy, other target organs are involved they can be included to allow a more accurate description of this type of emergency which may also include hypertensive encephalopathy, microangiopathic haemolysis, pulmonary oedema and acute renal failure.

In line with other guidelines and the literature on hypertensive crisis, the working group has chosen to list patients with hypertensive crisis and retinopathy (with or without other signs of acute end-organ damage) under hypertensive emergencies in the revised guideline. Accidental lowering of MAP by >50% in patients with hypertensive crisis has been associated with an increased risk of ischaemic stroke and death.[35-37] In patients with hypertensive crisis and advanced retinopathy cerebral autoregulation is impaired,[38] putting them at risk of cerebral hypoperfusion when BP is lowered. In addition, the variations in volume status and renin-angiotensin system activation observed in patients with hypertensive crisis and advanced retinopathy may lead to unpredictable BP lowering responses.[39,40] Intravenous BP-lowering therapy allows controlled reduction of BP and minimises the risk of prolonged (unrecognised) hypotensive episodes. This means that patients with hypertensive crisis and retinopathy are preferably treated with intravenous drugs under continuous haemodynamic monitoring. Finally, hypertensive crisis with advanced retinopathy is frequently complicated by acute renal dysfunction suggesting that the ischaemic retinal lesions are a sign of ischaemic lesions within the kidney and elsewhere. Close BP monitoring and a timely response to excessive BP reductions may prevent further renal deterioration and facilitate recovery of renal function after the acute phase.

Table 4. *Most important changes included in the 2010 revision of the hypertensive crisis guideline*

1. Substitution of the term 'malignant hypertension' by hypertensive crisis with retinopathy
2. Classification of hypertensive crisis with retinopathy under hypertensive emergencies instead of hypertensive urgencies
3. Preference for nicardipine instead of nitroprusside or labetalol for the management of perioperative hypertension
4. Preference for labetalol instead of dihydralazine or ketanserin for the management of pre-eclampsia and hypertensive crisis in pregnancy
5. Preference for nifedipine retard instead of captopril for the treatment of a hypertensive urgency and limitation of the list of alternative BP-lowering agents

For the treatment of perioperative hypertension, the type of surgery and subsequent vulnerability of organs is important in determining the most suitable BP-lowering drug. In the revised guideline the management of perioperative hypertension has been adapted to the type of target organ involved. For coronary bypass surgery, BP should be lowered without compromising myocardial blood flow. Nicardipine appears to have a more favourable effect on maintaining stroke volume and myocardial perfusion than nitroprusside or nitroglycerin,[41,42] whereas urapidil and nicardipine are equally effective in maintaining myocardial function.[43] If hypertension complicates intracranial surgery, BP-lowering therapy should not increase intracranial pressure. Labetalol and nicardipine are equally effective in lowering BP without raising intracranial pressure.[44] In contrast, nitroprusside and urapidil have been shown to increase intracranial pressure during brain surgery and are therefore less suitable for this type of surgery.[45,46]

In the 2010 revision, labetalol has become the treatment of choice if intravenous therapy is required for the management of pre-eclampsia and hypertensive crisis in pregnancy. A meta-analysis of published randomised trials has shown that the use of dihydralazine is associated with adverse perinatal outcomes for both the mother and baby compared with labetalol, despite equal BP-lowering potential.[47] Ketanserin appears to be less effective in lowering BP, although it has been associated with a lower risk of HELLP syndrome in one study.[48] The choice for labetalol accords with the upcoming guideline of the Dutch Society of Obstetrics and Gynaecology on hypertension in pregnancy and the NICE guideline in the UK.[33]

When treating hypertensive urgencies, agents that have a rapid onset of action and predictable BP response with minimal side effects or contraindications are

preferred. Nifedipine retard lowers BP 15-30 minutes after intake with a maximal effect after 4-6 hours, whereas captopril has a maximal effect two hours after administration. Previous studies have shown that the BP response to dihydropyridine calcium antagonists such as nifedipine is relatively independent of volume status.[49,50] In contrast, the BP-lowering effect of ACE inhibitors (or other renin-angiotensin blockers) depends on intravascular volume status and activity of the renin-angiotensin system.[40] Because of the more gradual and predictable BP-lowering response of nifedipine and lack of contraindications for its use, the working group has changed its preference to nifedipine retard instead of captopril for the treatment of hypertensive urgencies whereas minoxidil and atenolol have been removed as a possible treatment option because of their slow onset of action and relative frequent occurrence of adverse effects.

PERSPECTIVES

Hypertensive urgencies and emergencies are a heterogeneous group of acute hypertensive disorders requiring prompt recognition and appropriate management to limit or prevent end-organ damage. In the 2010 revision, the working group has updated the evidence-based and, if evidence was lacking, reason-based approach towards the management of hypertensive crisis. Future research should be aimed at further delineating the discriminative value of diagnostic strategies in identifying patients at risk and by examining the optimal management of particular hypertensive urgencies and emergencies, especially with regard to the effectiveness and safety of oral medication. Despite the widespread availability of cheap and effective BP-lowering drugs, the incidence of hypertensive crisis has failed to diminish in large urban communities, especially among patients from sub-Saharan African descent. More importantly, the nationwide number of patients starting dialysis as a result of hypertensive crisis has increased in the past two decades. These complications are potentially preventable by timely recognition and treatment of hypertension, especially in young and middle-aged adults who are considered at low cardiovascular risk. Increased awareness and treatment of hypertension, also in persons who are otherwise considered at low cardiovascular risk, may decrease the incidence of hypertensive crisis and its associated complications.

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