Management of postpartum hypertension

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Introduction

There is an extensive literature discussing the pathophysiology and management of hypertension in the antenatal and intrapartum period, however, comparatively little evidence to guide clinicians treating postpartum hypertension. Poorly managed postpartum hypertension frequently causes unnecessary concern for the patient and her carers, delays discharge from hospital, and will occasionally place women at risk of significant complications. This overview seeks to describe the normal postpartum changes in blood pressure and then consider which patients should be more closely monitored and treated. The evidence for different antihypertensive agents will be considered along with the associated implications for the mother and her new baby.

Blood pressure and pre-eclampsia in the puerperium

Following uncomplicated pregnancy most women will experience increased blood pressure during the postpartum period such that systolic and diastolic measurements are increased by an average of 6 mmHg and 4 mmHg, respectively, over the first 4 days.1 Furthermore, up to 12% of patients will have a recorded diastolic pressure greater than 100 mmHg. This is due to the resolution of the cardiovascular adaptations to pregnancy, in particular, mobilisation of fluid accumulated in the extra vascular space during pregnancy.

A third of women who have had pregnancy induced hypertension or pre-eclampsia will have sustained hypertension in the postnatal period although they are commonly normotensive in the early postpartum period, possibly reflecting depleted intravascular volumes following labour. Women particularly at risk of postnatal hypertension are shown in Table 1. The largest group of women with postpartum hypertension are those who have developed hypertension in the antenatal period, however it is

<table>
<thead>
<tr>
<th>Women at risk of developing postnatal hypertension</th>
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<tr>
<td>Preterm delivery triggered by maternal hypertensive disease</td>
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<td>Hypertension requiring antenatal treatment</td>
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<tr>
<td>Severe antenatal hypertension (&gt;160/100 mmHg)</td>
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<tr>
<td>Antenatal pre-eclampsia (proteinuric hypertension)</td>
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Acknowledged that hypertension can occur de novo following delivery.

Matthys et al. described the outcomes of 151 women readmitted in the postnatal period (up to day 24) who received a diagnosis of pre-eclampsia. The incidence of complications was high: 16% eclampsia, 9% pulmonary oedema and one maternal death. Smaller retrospective studies indicate that women who develop postpartum severe pre-eclampsia or eclampsia after being normotensive at delivery are more likely to report headaches and nausea than patients with intrapartum eclampsia. Similarly, Chames et al. found that of 29 women presenting with postpartum eclampsia, almost all reported at least one prodromal symptom. In this study 23 (79%) patients had seizures after 48 hours, likewise Lubarsky et al. reported a series of 334 cases of eclampsia with 16% of seizures occurring in the postnatal period and over half of these later than 48 hours following delivery. Together these data emphasise the need for prolonged vigilance in the postpartum period and the importance of investigating reported symptoms in such women. In the current climate of early postnatal discharge both hospital and community teams need to have referral and management guidelines in place.

The potential complications of pre-eclampsia in the postpartum period are largely similar to those in the antenatal period with the obvious exception of fetal complications. There is increasing recognition that systolic severe hypertension (>160 mmHg) as well as elevated mean arterial pressures (MAPs) should prompt urgent treatment to prevent cerebral haemorrhage. In the most recent UK Maternal Mortality Confidential Enquiry there were nine maternal deaths following cerebral haemorrhage associated with pre-eclampsia. As in the previous triennium, the inadequate treatment of systolic hypertension was a recurring theme.

Consideration of antihypertensive agents

The ideal antihypertensive agent to be used in the postnatal period will reliably and effectively control blood pressure without diurnal peaks and troughs, will have minimal maternal side effects, be safe for breastfeeding infants and be effective with once-daily dosing to maximise compliance at a time that is often somewhat chaotic for patients. Due to the paucity of data, it is difficult to recommend one antihypertensive agent over another and this should be addressed in future research. In the absence of such data the clinician should be aware of the pros and cons of available agents (Tables 2 and 3). Perhaps the most important concern is that hypertension should be recognised and effectively treated to prevent severe hypertension and to avoid unnecessary delays in discharge.

β-blockers

The most common agents used are labetalol and atenolol. As well as the β2 receptor effect of peripheral vasodilation, β1 receptors in cardiac tissue modulate the sympathetic response whilst renal receptors mediate changes in renin synthesis. This modest decrement in renin synthesis may contribute to the overall antihypertensive effect in some patients. β-blockers may exacerbate asthma and cardiac failure and should be avoided in patients with pre-existing disease. Individuals who describe respiratory symptoms after commencing a β-blocker (symptoms may not be apparent for several days) should be changed to an alternative agent.

Atenolol has the advantage of only requiring a single daily dose thus increasing compliance in women who find multiple dosing regimens difficult. The high lipid solubility of the drug means that it is concentrated in breast milk and concerns have previously been raised about transfer to the neonate, however, only a single case of neonatal β-blockade has been reported.
despite extensive use of the drug in breastfeeding women. The risks in routine clinical practice are therefore minimal.

**Calcium channel blockers**

These agents act by inhibiting \( \text{Ca}^{2+} \) influx into vascular myocytes thereby inhibiting vasoconstriction and reducing vascular resistance. It has minimal effects on cardiac conduction and heart rate but may be associated with more headache than \( \beta \)-blockers. There is minimal excretion into breast milk.\(^{10}\) Nifedipine (slow release [SR]) is the most commonly prescribed calcium channel blocker and can initially be prescribed at a dose of 10–20 mg twice daily. Once control is established, prescriptions may be converted to a sustained release preparation (MR) of 30–60 mg daily. A second-line alternative is amlodipine 5–10 mg once daily.

**Methyldopa**

The most common antihypertensive agent used in the antenatal period is methyldopa because of its well established safety record with regard to fetal toxicity.\(^{11}\) It is a centrally acting \( \alpha \) adrenergic agonist, which brings about reduced systemic vascular resistance via decreased sympathetic vascular tone. Whilst methyldopa remains a safe option for treatment of hypertension in the postnatal period, particularly in women who have had good antenatal control with the agent, most authorities advise that it should be discontinued because of its maternal side-effects, in particular, sedation, postural hypotension and postnatal depression.\(^{12}\)

**Angiotensin converting enzyme (ACE) inhibitors**

ACE inhibitors (such as enalapril) are commonly used outside of pregnancy to treat hypertension, particularly that associated with renal disease and proteinuria. Their mechanism of action is to inhibit angiotensin converting enzyme (ACE) and therefore decrease production of angiotensin II (AII) reducing AII mediated vasoconstriction. They can be associated with adverse fetal outcomes when used in the antenatal period but there are reassuring data concerning their safety in breastfeeding infants. Enalapril can be prescribed as a twice-daily dose of 5–20 mg. Although generally well tolerated, patients can experience profound hypotension. Due to their association with renal impairment they should be used with caution in patients who have recent deterioration of renal function.

**Diuretics**

Diuretics are rarely used as antihypertensive agents in the postnatal period with the exception of management of pulmonary oedema. Although they are safe, postnatal women are more susceptible to postural hypotension. Furthermore, mothers who are breastfeeding may experience excessive thirst and the associated volume contraction may interfere with successful breastfeeding.

**Treatment of acute episodes of hypertension**

Acute episodes of hypertension in the postnatal period should be managed in the same manner as antenatal or intrapartum episodes. The agents of choice are labetalol (oral or intravenous), nifedipine (oral) or hydralazine (intravenous). Labetalol has the advantage that an oral dose can be given before intravenous access is established then further intravenous doses can be given if required. Hydralazine, is effective although its use as a first-line drug has been questioned.\(^{12}\) It more commonly causes precipitous drops in blood pressure and although the concerns about placental perfusion are no longer relevant, the associated symptoms are unpleasant for women.

**Management of ongoing postnatal hypertension**

**Patients with existing hypertension (Figure 1a)**

In situations where hypertension predates the pregnancy it is advisable to stop methyldopa following delivery and switch to the prepregnancy dose of the patient’s usual agent/s. Where newer drugs have been prescribed and mothers are wishing to breastfeed, pharmaceutical advice should be sought before delivery. All of the antihypertensive drug groups have examples of preparations where there is reassuring experience with breastfeeding. Women who were previously using diuretics should consider an alternative while they are breastfeeding.

**Hypertension arising during pregnancy or in the puerperium (Figure 1b)**

In patients who were normotensive before pregnancy, one of the most difficult problems is deciding which women should

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**Table 3. Use of antihypertensive agents in breastfeeding women**

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<thead>
<tr>
<th>Antihypertensive agents with no known adverse effects on infants receiving breast milk:</th>
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<tbody>
<tr>
<td>Labetalol</td>
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<tr>
<td>Nifedipine</td>
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<td>Enalapril</td>
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<tr>
<td>Captopril</td>
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<tr>
<td>Atenolol</td>
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<td>Metoprolol</td>
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<tr>
<th>Antihypertensive agents with insufficient evidence on infant safety to recommend for use in breastfeeding mothers:</th>
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<tr>
<td>Angiotensin receptor blocking agents</td>
</tr>
<tr>
<td>Amlodipine</td>
</tr>
<tr>
<td>Angiotensin converting enzyme inhibitors other than enalapril and captopril</td>
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Adapted from National Institute of Health and Clinical Excellence\(^{16}\)
Management of postpartum hypertension

(a) Essential hypertension treated in pregnancy

- Restart pre-pregnancy medication
- Observe as inpatient for 48 hours
- Record BP daily

- Aim to keep BP <140/90

Discharge to community: communicate plans to GP and CMW

- Alternate day BP check until stable

- >160/110, asymptomatic
  - Check compliance, arrange medical review within 24 hours

- >150/100, symptoms of pre-eclampsia
  - Same day obstetric medical assessment

(b) Pregnancy-induced hypertension / pre-eclampsia

- High risk: e.g. antenatal hypertensives post-term delivery
  - BP persistently >150/100
  - Prescribe regular antihypertensives e.g. atenolol 25–100 mg daily nifedipine SR 10–20 mg bid Or continue antenatal medication if not methyl dopa
  - Observe as inpatient 72 hours
  - Record BP QDS
  - <150/100
    - Discharge to community: communicate plans to GP and CMW
  - >150/100
    - Increase dose or prescribe additional agent

- Not high risk
  - Not high risk
  - Measure BP within 6 hours
  - <150/90
    - Discharge to community: inform woman of symptoms to report: headaches, visual disturbance, nausea or vomiting within 72 hours of delivery

Figure 1. (a) Algorithm for the management of postnatal hypertension in women with chronic hypertension. (b) Algorithm for the management of postnatal hypertension in women without chronic hypertension
have antihypertensives prescribed following delivery. From Table 1, it might be suggested that women who have required antihypertensives in the antenatal period, women who have been delivered before 37 weeks of gestation because of hypertension and women who have had severe hypertension are most likely to benefit. The perceived advantages of starting treatment in the early postnatal period are that episodes of severe hypertension will be reduced and discharge to the community will not be delayed unnecessarily. Balanced against this is the possibility of unnecessary treatment and side effects of medication. A suggested regimen might be labetalol (providing there is no history of asthma) with second and third-line agents of calcium antagonist and an ACE inhibitor (such as enalapril).

The recently published NICE guidance for postpartum care indicates that blood pressure should be measured within 6 hours of delivery. Furthermore, at the first postnatal contact, all women should be made aware of the symptoms of pre-eclampsia (headaches within 72 hours of delivery accompanied by visual disturbance, or nausea or vomiting) along with the need to urgently contact an appropriate health professional.

It is not clear what thresholds should be used to instigate treatment in women who present with de novo hypertension in the postnatal period having previously been normotensive. Current NICE postnatal guidance recommends medical review if the diastolic pressure is >90 mmHg and is associated with any symptoms of pre-eclampsia or if this level of diastolic hypertension is sustained over 4 hours. No systolic thresholds are suggested but extrapolation from the subsequent hypertension guidelines would indicate that pre-eclampsia should be excluded when systolic pressure is >150 mmHg. Newly presenting patients should have a history and examination taken to exclude impending eclampsia and have full blood count, electrolytes and liver function checked.

Regardless of whether antihypertensive agents are prescribed immediately following delivery, all women should be closely monitored with regular recordings made of blood pressure and fluid balance. It is anticipated that the introduction of modified obstetric early warning system (MOEWS) charts might facilitate the detection of women who require further medical review. The frequency of measuring haematological and biochemical indices will need to be tailored to individual patients. A minimum of once-daily testing may be required initially in cases where there is concern about thrombocytopenia or renal compromise, thereafter frequent sampling is unlikely to change management in the absence of other clinical triggers. Furthermore, unnecessary concern may arise if normal patterns of resolution are not appreciated, if, for example, ALT reaches peak serum levels 5 days postnatally in normal pregnancy. NICE guidance recommends that the platelet count, transaminases and serum creatinine are checked 48–72 hours after birth, or step down from Level 2 care, and only repeated thereafter if abnormal or clinically indicated.

Given that up to 44% of eclamptic fits occur in the postnatal period, usually within the first 48 hours following delivery, women with pre-eclampsia should be encouraged to delay discharge until day 3. Blood pressure at the time of discharge should be <150/100 mmHg. It is crucial that the community team receive adequate and prompt documentation regarding the inpatient management and the plans for follow-up.

Follow-up

Once discharged, the community midwife should measure blood pressure on alternate days for the first 2 weeks and refer for medical review if two measurements >150/100 mmHg are obtained more than 20 minutes apart. Local experience and facilities will dictate if this review should be by the GP or the hospital maternity assessment unit. Hospital review will be required if patients report symptoms of pre-eclampsia or if blood pressure (BP) is >160/100 mmHg. Most women who commence postnatal antihypertensives will require treatment for at least 2 weeks and some women, particularly women with early onset or severe disease may need to continue beyond 6 weeks. Medication should be reduced when BP is measured at 130–140/80–90 mmHg and medical review sought if the patient remains on medication at 2 weeks. If medication is required beyond 6 weeks then further medical review should be arranged to investigate the possibility of an underlying cause. It has recently been reported that up to 13% of women initially thought to have a diagnosis of pre-eclampsia or pregnancy-induced hypertension will have underlying disease not suspected antenatally.

The 6-week postnatal visit is an opportunity to establish the diagnosis and to discuss implications for future pregnancies. All women who have had a diagnosis of pre-eclampsia should have their blood pressure measured and the urine tested for proteinuria. The importance of ensuring that renal impairment detected in hypertensive pregnancies is indeed attributable to pre-eclampsia has been highlighted by Fischer et al. Renal biopsies taken in the postpartum period in 176 women who had been diagnosed in pregnancy as having renal complications of pre-eclampsia established an alternative diagnosis in a third of cases overall, and this was increased to almost two thirds in multiparous patients.

The risk of pre-eclampsia in a subsequent pregnancy depends on the presentation in the index pregnancy. Severe, early onset pre-eclampsia has a recurrence rate up to 40% in future pregnancies, although generally the onset of problems is 2–3 weeks later and it is less severe than in the first pregnancy. Women who present with milder disease, nearer to term have a risk of recurrence nearer to 10%.
Women at increased risk should be offered low-dose aspirin and increased blood pressure surveillance during a future pregnancy. Future research should establish the role, if any, of second trimester uterine artery Doppler assessment. Finally, it is increasingly recognised that pre-eclampsia is a risk factor for developing cardiovascular disease in later life and patients should be made aware of this so that they have the opportunity make lifestyle choices to minimise their risk.

Conflict of interest
None declared.

References