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ENDGAMES

PICTURE QUIZ

Headache, flashing lights, and blurred vision

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A 35 year old white man presented to eye casualty with a seven day history of severe headache, blurred vision, and flashing lights in both eyes. The severity of his headache was reported as 9/10, and he described it as spreading from his occipital region frontally. It was not worse on waking and he had no focal neurological signs. His medical history included chronic headaches since childhood, with frequent exacerbations of migraine, for which he took sumatriptan. He denied taking ergotamine. The current episode was characterised by the headache being more severe and the visual changes more prolonged than usual. He also had chronic back pain, for which he took daily paracetamol and codeine, was obese, and used continuous positive airways pressure for obstructive sleep apnoea.

Ophthalmic assessment showed visual acuities of 6/12 in both eyes, which corrected to 6/9 with pinhole. Intraocular pressure was 10 mm Hg (reference range 10-21) in both eyes and he had no relative afferent pupillary defect. His anterior segment examination was normal. His blood pressure was 165/117 mm Hg but he could not recall any previous blood pressure readings for comparison. Dilated fundoscopy showed abnormal changes in the posterior pole of both eyes (fig 1), which were largely symmetrical. Blood tests were sent for inflammatory markers and serology requested for possible infectious causes.

His general practitioner was contacted and ambulatory blood pressure monitoring set in place. No acute antihypertensive drugs were started. On review in clinic one week later, his blood pressure was 230/140 mm Hg.

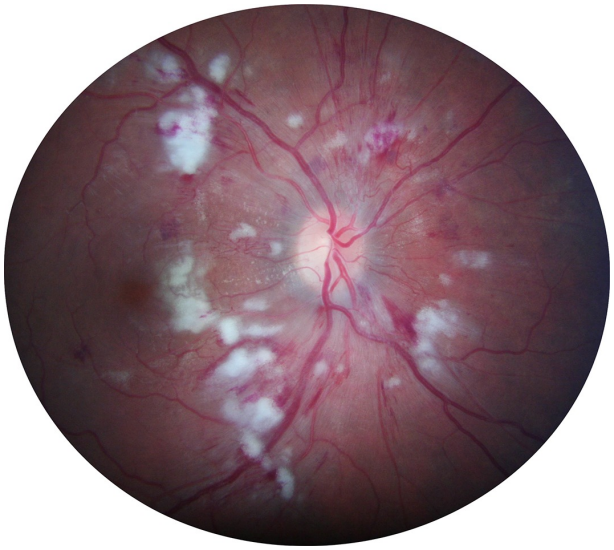

Fig 1 Colour fundus photograph of the patient's right eye at presentation

Questions

1. What is the most likely underlying diagnosis?
2. What abnormal retinal changes are seen?
3. What is the grading classification for this condition?
4. Does this patient need further investigations?
5. How should this condition be managed?

Answers

1. What is the most likely underlying diagnosis?

Short answer

Hypertensive crisis with acute hypertensive retinopathy (previously known as malignant hypertension). This is a hypertensive emergency defined by severe hypertension

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(>180/120 mm Hg) with evidence of end organ damage and disc swelling on fundoscopy.[1]

Long answer

Severe symptomatic hypertension, also known as hypertensive crisis, can be classified as either hypertensive urgency or a hypertensive emergency.

Hypertensive urgency occurs when severe hypertension is present (>180/120 mm Hg) but there is no evidence of end organ damage or dysfunction.

When severe hypertension (>180/120 mm Hg) is present and there is evidence of end organ damage or dysfunction, the condition is known as a hypertensive emergency.[2] Traditionally, hypertensive emergencies were separated into two groups: accelerated hypertension and malignant hypertension. If disc swelling was seen on fundoscopy, the term "malignant hypertension" was used. If no disc swelling was present then the term "accelerated hypertension" was used. A recent shift in classification and terminology has meant that these two categories are now generally grouped together under the term "hypertensive emergency."

It is important to note that, in certain people, a blood pressure of less than 180/120 mm Hg may still cause end organ damage. Therefore, patients with hypertension (even if <180/120 mm Hg) and unexplained end organ damage or dysfunction still need to be managed as potentially having a hypertensive crisis.

About 1% of patients with essential hypertension will experience a hypertensive emergency,[3-5] so these emergencies are an important and common problem. The reasons why some patients with essential hypertension progress to a hypertensive emergency are not fully understood. More commonly, underlying renal and renovascular disease can precipitate a hypertensive emergency. If a patient does develop a hypertensive emergency, early detection is crucial because urgent treatment is needed to preserve end organ function and to prevent serious morbidity and mortality.

2. What abnormal retinal changes are seen?

Short answer

The fundal photograph shows cotton wool spots, flame haemorrhages, and disc swelling, which are abnormal signs that are characteristic of acute severe hypertensive retinopathy associated with a hypertensive emergency. All three changes are caused by disease of the inner nerve fibre layer of the retina.

Long answer

Hypertensive retinopathy is characterised by a spectrum of retinal vascular signs, which are visible on fundoscopy in a patient with hypertension.[6]

In mild-moderate chronic hypertension, hyalinisation and sclerosis of vessel walls gradually develops. These changes result in specific retinal signs seen on fundoscopy, such as arteriolar narrowing, that may progress slowly over many months to years (also known as copper and silver wiring). However, in an acute hypertensive emergency, fibrinoid necrosis of the retinal arteriolar vessel walls occurs. Fibrinoid necrosis can rapidly destroy and weaken arteriolar walls, resulting in the formation of microaneurysms and retinal haemorrhages. This is often followed by thrombosis and occlusion of the lumen of affected vessels, which results in retinal ischaemia. In addition, disruption of the blood-retinal barrier occurs through damage to endothelial tight junctions and pericyte loss.[7] This leads to vessel leakage, which in turn causes retinal oedema and the formation of hard exudates.

The key abnormal retinal changes characteristic of acute severe hypertensive retinopathy shown in fig 2 are:

- Cotton wool spots
- Flame haemorrhages
- Disc swelling.

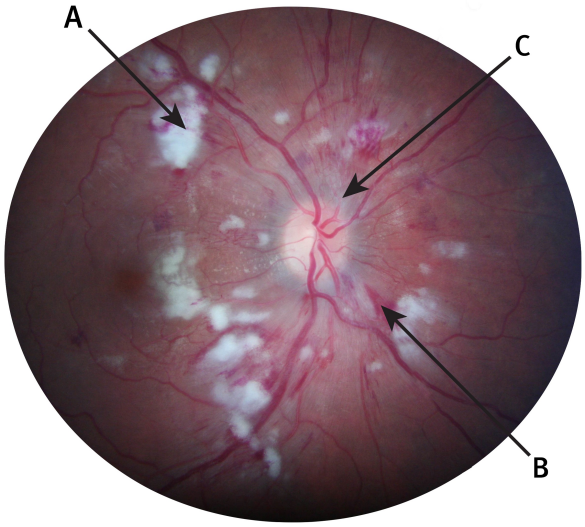

Fig 2 Labelled fundal photograph of the right eye indicating a cotton wool spot (A), flame haemorrhage (B), and disc swelling (C)

Cotton wool spots are whitish, ill defined fluffy lesions. They form when retinal ischaemia disrupts normal retinal neuronal function, leading to impaired axoplasmic flow and the accumulation of axonal debris. Cotton wool spots occur in the inner nerve fibre layer of the retina.[8 9]

Flame haemorrhages are seen scattered in the posterior pole focused around the optic disc. These haemorrhages result from the rupture and leakage of superficial damaged pre-capillary arterioles that run in the nerve fibre layer. They have a characteristic large, diffuse, flame shaped appearance.[10]

Disc swelling occurs in the most severe cases of acutely raised systemic blood pressure. This is usually bilateral and is characterised by a loss of definition of the disc margins and obscurations of the blood vessels emerging from the disc. This is caused by leakage from the retinal arterioles and capillaries in the superficial layers of the retina, which results in oedema of the nerve fibre layer.

Prompt and accurate detection of acute retinal changes in a patient with severe hypertension, as seen in this case, is crucial to prevent long term visual and systemic morbidity and mortality.[11] In asymptomatic patients with hypertension, the detection of arteriolar narrowing in the absence of the acute retinal changes mentioned above can help differentiate chronic hypertension from an acute hypertensive episode.

3. What is the grading classification for this condition?

Short answer

Although many grading scales are available, the Keith-Wagener-Barker classification, which categorises hypertensive retinopathy into four grades, is the most widely used. Grades 1 and 2 describe mild to moderate chronic

arteriolar narrowing, whereas grades 3 and 4 reflect more acute destructive changes—retinal haemorrhage, ischaemia, and disc swelling.[12]

Long answer

The original classification for hypertensive retinopathy was created by Keith, Wagener, and Barker in 1939. In their classification, hypertensive retinopathy was categorised into four grades: grades 1 and 2 represented mild to moderate changes typically found in patients with chronic systemic hypertension. Grades 3 and 4 represented more serious, often acute, retinopathy secondary to a hypertensive emergency (box).[12]

Since this classification was proposed, there has been much criticism regarding its relevance to clinical practice and the difficulty in differentiating between the milder grades. Many alternative grading systems have been proposed. One of the most notable alternatives is the Scheie classification, which was published in 1953. Scheie attempted to classify arteriosclerotic and hypertensive retinal changes separately.[13] In 1996, Dobson and colleagues produced a simplified classification of hypertensive retinopathy with just two groups: malignant and non-malignant hypertension.[14] Recent studies showing the prognostic value of detecting hypertensive retinopathy in patients with systemic hypertension, independent of other risk factors,[15 16] have led to the development of classifications focused on clinically useful categorisation. One such classification group changes into three grades related to the future risk of end organ compromise, such as stroke and congestive cardiac failure.[6]

4. Does this patient need further investigations?

Short answer

Hypertensive crisis associated with acute hypertensive retinopathy is a hypertensive emergency and requires immediate management and investigation. The aims of undertaking further investigations are to assess for evidence of end organ damage and to determine any possible secondary cause of the hypertension.

Long answer

A patient experiencing a hypertensive emergency requires a rapid and comprehensive work-up. A detailed history and systemic examination should focus on elucidating evidence of end organ damage or dysfunction. The main systems at risk are the cardiovascular, renal, and neurological systems, and this is reflected in the typical presenting symptoms. Hypertensive emergencies most commonly present with chest pain (27%), dyspnoea (22%), and headache (22%).[17] A careful drugs history is crucial in light of the many possible triggers of such an episode (such as monoamine oxidase inhibitors, ergot preparations, oral contraceptives, and α agonists). Recent withdrawal of any drug (for example, β blockers or clonidine) should be carefully explored.

Bedside tests should include:

- Electrocardiography (for evidence of cardiac strain, dilatation, hypertrophy)
- Urine analysis (to look for protein, haematuria, casts)
- 24 hour urine collection (to look for metanephrines).

Laboratory tests should include:

- Full blood count and haemoglobin
- Creatinine and electrolytes
- Thyroid function tests
- Metanephrines, renin, and aldosterone.

Other investigations may include:

- Computed tomography angiography or magnetic resonance angiography of the kidneys
- Computed tomography or magnetic resonance imaging of the brain.

5. How should this condition be managed?

Short answer

Patients presenting with a hypertensive emergency require inpatient admission for acute control of blood pressure, support of any potentially failing organ systems, and investigation of possible causes. The initial aim is to reduce blood pressure by no more than 25% over the first hour, often through intravenous labetalol or nitroprusside.[2]

Long answer

Patients who present with a hypertensive emergency need to be treated and investigated as soon as possible. A careful, controlled, and monitored reduction in blood pressure is essential. Too rapid a reduction in blood pressure can result in organ hypoperfusion and complications such as stroke. Any secondary causes of hypertension should be identified and treated accordingly. Supportive treatment may be needed for any failing organ systems.

The goal of treatment is to reduce blood pressure by a maximum of 25% over the first hour.[2] This often requires intravenous drugs under constant blood pressure monitoring. Intravenous labetalol is the first line treatment in most cases, with the vasodilator nitroprusside a commonly used second line agent. In patients with renal dysfunction or failure, fenoldapam should be considered. Recent studies have shown that certain calcium channel blockers may be more effective than intravenous labetalol and a safe alternative.[2 18]

During pregnancy, hypertensive emergencies, such as pre-eclampsia, should be controlled with hydralazine. Phentolamine is the preferred choice in a pheochromocytoma crisis.[2]

Patient outcome

The patient was admitted for acute management of his hypertensive emergency and for further investigation. A good reduction in his blood pressure was achieved with intravenous labetalol, and this was followed by resolution of his headache and flashing lights. His blurred vision slowly improved over the next few weeks. After the initial reduction of blood pressure, we performed computed tomography of the brain, which identified a lesion in his left cerebellar hemisphere in keeping with a small old infarct. All other investigations were normal and no underlying cause for his hypertensive emergency was identified. His blood pressure is now controlled with oral agents and he has been advised to lose weight.

Although the patient's initial blood pressure fell below that typically quoted in international guidelines defining hypertensive crises, on reflection antihypertensive treatment could have been started at the first presentation, while he was being investigated for other possible diagnoses. This highlights the importance of the clinical context as opposed to pre-defined blood pressure thresholds.

Keith-Wagener-Barker classification of hypertensive retinopathy

Grade 1: Mild to moderate generalised arteriolar narrowing

Grade 2: Moderate to severe generalised arteriolar narrowing with focal arteriovenous nicking

Grade 3: Signs seen in grade 2 disease plus retinal haemorrhages, exudates, or cotton wool spots

Grade 4: Signs seen in grade 3 disease plus bilateral disc swelling

Competing interests: We have read and understood BMJ policy on declaration of interests and declare the following interests: None

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Patient consent obtained.

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