Stroke complicating adenosine perfusion imaging

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Summary

Pharmacologic stress-testing using adenosine is increasing in popularity. Side-effects have been limited to the infusion time and a brief recovery period. Long-lasting complications may, however, result rarely.

Keywords: stress testing, adenosine, stroke

Adenosine is a potent vasodilator which is now frequently used in combination with radio-nuclide perfusion imaging for the detection of coronary artery disease. Despite a high rate of transient side-effects, the drug's short duration of action has resulted in an excellent safety profile. Persistence of side-effects is unusual, and long-term sequelae have not been described. We report a patient who developed a cerebellar stroke immediately after the infusion of adenosine for cardiac diagnostic testing.

Case report

A 68-year-old woman with severe osteoarthritis underwent pharmacologic stress testing for evaluation of chest pain. Adenosine was administered by intravenous infusion (140 µg/kg/min). The heart rate rose from 83 to 115 beats/min (sinus rhythm) and the blood pressure declined from 150/90 to 120/90 mmHg during the infusion. During the second minute of the test, the patient reported headache, nausea and vertigo, which worsened progressively, necessitating termination of adenosine administration after 4 min 45 s.

The headache resolved after stopping the drug. Technetium sestamibi imaging was not indicative of myocardial ischemia. After the test, the patient continued to have recurrent nausea and vertigo, precipitated by head-turning to the right and complained of generalised weakness. No history of prior neurologic symptoms was elicited. There was diplopia on leftward gaze, but no nystagmus was noted. Slightly slower fine motor movement was found in the left arm, but there was no dysmetria noticed. Computed tomography of the brain was normal. Duplex ultrasonography demonstrated normal appearance and flow characteristics of the carotid arteries, and antegrade flow in the vertebral arteries. Magnetic resonance imaging (MRI) showed a signal abnormality in the medial aspect of the right cerebellar hemisphere suggestive of infarction, as well as probable lacunar infarctions in the right

pons and posterior limb of the left internal capsule. Magnetic resonance angiography was unremarkable. Erythrocyte sedimentation rate, prothrombin time, partial thromboplastin time and platelet count were normal; and transthoracic echocardiography revealed no potential source of thromboembolism. During six days of symptomatic treatment and physical therapy, the patient's symptoms resolved. A repeat MRI scan again demonstrated a small right cerebellar infarction and ischaemic abnormalities in the pons.

Discussion

Pharmacologic stress testing using dipyridamole or adenosine is now widely used for the evaluation of coronary artery disease. Adenosine is a potent vasodilator in most vascular beds.¹⁴ Its duration of action is short, and onset and termination of its effects are rapid. Pharmacologic actions of adenosine are mediated by activation of adenosine membrane receptors A1 and A2. Adenosine decreases the peripheral vascular resistance and blood pressure, while increasing the heart rate, stroke volume, cardiac output and pulmonary capillary wedge pressure.^{3,4} Other actions of this substance include depression of sino-atrial and atrioventricular nodes, reduced atrial and ventricular contractility, and attenuation of the catecholamine stimulatory effect on myocardium.⁵

Adenosine perfusion imaging is generally safe, although from 80 to 94% of patients may experience adverse effects, which are usually transient and well-tolerated.^{3,79} The ultrashort half-life of adenosine (less than 10 s) affords this high degree of safety.¹⁰ In the study by Coyne *et al*, all adverse effects resolved within 45 s of the end of infusion.⁸ Common adverse effects include flushing, chest pain, dyspnoea, nausea, headache, dizziness, atrioventricular block and ST-T abnormalities on electrocardiogram. Although headache, lightheadedness and dizziness are common, there have been no previous reports of cerebrovascular events following adenosine administration.

This patient had clinical and radiological evidence of a small cerebellar infarction. The temporal sequence of events strongly suggests a causal relationship between the administration of adenosine and the onset of our patient's problem. The demonstration of other areas of infarction suggests the presence of small vessel disease of the intracranial circulation. The most likely explanation of this acute event is that the vasodilatation with relative hypoten-

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sion produced by adenosine decreased perfusion to a compromised end-artery. Concomitant localised vascular steal may have contributed to regional hypoperfusion of the cerebellum, although any relationship between adenosine and neurologic abnormalities remains conjectural.

Learning point

Adenosine perfusion imaging is a useful diagnostic technique with a very low rate of significant adverse effects. Heightened suspicion for an ischaemic event is, however, warranted in patients with known or suspected vascular disease whose adverse symptoms do not resolve promptly

- 1 Wilson RF, Wyche K, Christensen BV, Zinuner S, Laxson DD. Effects of adenosine on human coronary arterial circulation. *Circulation* 1990; **82**: 1950–66.
- 2 Watt AH, Penny WJ, Sigh H, Routledge PA, Henderson AB. Adenosine causes transient dilatation of coronary arteries in man. *Br J Clin Pharmacol* 1987; **24**: 665–8.
- 3 Ogilby JD, Iskandrian AS, Untereker WJ, Reo J, Nguyen TN. Effect of intravenous adenosine infusion on myocardial perfusion and function. *Circulation* 1992; **86**: 887–95.
- 4 Belardinelli L, Linden J, Berne RM. The cardiac effects of adenosine. *Prog Cardiovasc Dis* 1989; **32**: 73–97.
- 5 Patterson RE, Kirk ES. Coronary steal mechanisms in dogs with one-vessel occlusion and other arteries normal. *Circulation* 1983; **67**: 1009–15.
- 6 Epstein SE, Cannon RO, Talbot TL. Hemodynamic principals in the control of coronary blood flow. *Am J Cardiol* 1985; **56**: 4E–10E.
- 7 Cerqueira MD, Verani MS, Schwaiger M, Heo J, Iskandrian AS. Safety profile of adenosine stress perfusion imaging: results from the Adenoscan Multicenter Trial Registry. *J Am Coll Cardiol* 1994; **23**: 384–9.
- 8 Coyne EP, Belvedere DA, Vande Streek PR, Weiland FL, Evans RB, Spaccavento LJ. Thallium-201 scintigraphy after intravenous infusion of adenosine compared with exercise thallium testing in the diagnosis of coronary artery disease. *J Am Coll Cardiol* 1991; **17**: 1289–94.
- 9 Gupta NC, Esterbrook DJ, Hillman DE, Mohiuddin SM. Comparison of adenosine and exercise thallium-201 single photon emission computed tomography myocardial perfusion imaging. *J Am Coll Cardiol* 1992; **19**: 248–57.
- 10 Klabunde RD. Dipyridamole inhibition of adenosine metabolism in human blood. *Eur J Pharmacol* 1983; **93**: 21–6.

Symmetrical Brodie's abscess

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Summary

Chronic recurrent multifocal osteomyelitis is often confused with symmetrical Brodie's abscess as it has a similar pathogenesis. We report an otherwise healthy 17-year-old boy presenting with a true symmetrical Brodie's abscess. We conclude that a symmetrical Brodie's abscess presenting in an otherwise healthy patient is a separate clinical condition with a different management protocol.

Keywords: tibia, Brodie's abscess, osteomyelitis

Brodie's abscess is defined as a centrally placed, sharply circumscribed, lytic lesion in the metaphysis adjacent to the growth plate. Sir Benjamin Brodie first described a subacute bone abscess in 1832. Chronic recurrent multifocal osteomyelitis is often given the name of symmetrical Brodie's abscess in error, although they have a similar pathogenesis. We report an otherwise healthy 17-year-old boy presenting with a true symmetrical Brodie's abscess.

Case report

An Asian boy aged 17 years attended orthopaedic out-patients complaining of pain in both lower legs. He located the pain to the distal end of both tibiae. The pain had become more severe recently, stopping him from participating in sporting activities. He de-

scribed the pain as dull in nature with no radiation, and troubling him at rest and at night. There was no history of trauma or foreign travel. There were no hereditary haematological disorders within his family.

On examination he was afebrile, there were no local signs of inflammation but there was marked tenderness over the distal end of both tibiae. There was full range movement of lower limb joints. He showed a normal gait, but walking or running caused discomfort. Blood tests revealed a raised erythrocyte sedimentation rate (ESR) (53 mm/h). Plain X-rays showed lytic lesions at the distal end of both tibiae (figures 1 and 2).

Under general anaesthetic, the lesions were explored under tourniquet control. Free fluid was evacuated from the lesions and sent for

Figure 1 X-ray of left ankle

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