CASE REPORT

Use of IABP in contrast media-induced anaphylactic shock: the ultimate lifesaver

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rajibalam17@yahoo.co.uk**SUMMARY**

Anaphylactic reaction to contrast media during selective coronary angiography is a rare occurrence. It can be occasionally resistant to medical treatment leading to cardiovascular collapse and death. The use of intra-aortic balloon pump (IABP) counter-pulsation when the supportive medical treatment fails during anaphylactic shock is not well documented in the literature. We report a case of a severe contrast media-induced anaphylactic shock which failed to respond to the supportive medical management and the timely insertion of IABP for further circulatory support that prevented death in a patient who had an elective diagnostic coronary angiography. The clinical diagnosis of anaphylaxis was challenging at the onset of shock as the typical rash developed after a few minutes.

BACKGROUND

Contrast media-related life-threatening anaphylactic reactions are rare (according to Lange,¹ a life-threatening reaction related to contrast during diagnostic catheterisation is 0.2%). Sometimes these life-threatening situations may pose diagnostic uncertainty as there may be a delay in the appearance of a typical rash. During cardiac catheterisation, the contrast media used can cause anaphylaxis (or anaphylactoid reactions) leading to severe cardiovascular collapse and shock. Most of these cases can be managed successfully with fluid resuscitation and drugs,² which include steroids, H1 receptor blockers (antihistamines), adrenaline and potent vasoconstrictors (metaraminol or vasopressin when adrenaline is ineffective). However, the use of intra-aortic balloon counter pulsation in anaphylaxis-induced cardiogenic shock is not well documented apart from isolated case reports.^{3 4} We describe a case of a severe contrast-induced anaphylactic shock during elective diagnostic coronary angiography (figure 1), which did not respond to the conventional medical therapy, while a prompt recognition of the anaphylactic shock (before the typical rash appeared) and insertion of the intra-aortic balloon pump (IABP) prevented death.

This case report will increase the awareness that mechanical circulatory support with IABP counter-pulsation can be a life-saving adjunctive treatment in anaphylactic shock when other treatment fails.

CASE PRESENTATION

The patient was a 72-year-old man with a history of exertional chest pain and equivocal exercise tolerance test. His cardiovascular risk factors included a history of smoking in the past and

Figure 1 Severe spasms of the left coronary arteries due to anaphylaxis.

hypercholesterolaemia. His other medical history included mild asthma. His drug history included possible allergic reaction to lactulose with rashes and facial swelling. He came for elective diagnostic coronary angiography, which was performed through right radial artery access under local anaesthesia (1% lignocaine) with a 5F sheath and a radial cocktail (2.5 mg of verapamil, 250 µg of isosorbide dinitrate along with 2500 IU of unfractionated heparin-injected intra-arterially to prevent spasm).

Figure 2 The patient's left coronaries appeared normal prior to the spasm.

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Figure 3 The patient's right coronary artery appeared normal prior to spasm. Note that the patient had left dominant system.

The baseline ECG showed a sinus rhythm with a heart rate of 71 and his blood pressure was recorded at 140/71. A Judkins left 3.5 and Judkins right 4 diagnostic coronary catheters, both 5 Fr (Boston Scientific, UK), were used for selective coronary angiography. The contrast used was Niopam 300 (iopamidol, a non-ionic, low osmolar iodinated medium). On a left dominant system, he had a minor coronary artery disease only (figures 2 and 3). At the end of the procedure, there was a slight drop in blood pressure (BP) without any significant change in the heart rate. Initially, it was thought to be a vasovagal response (possibly related to a radial spasm) and intravenous atropine (maximum 3 mg) along with fluid resuscitation (2 L) was given. But when the systolic BP continued to fall rapidly, 1 mg intravenous adrenaline (from the resuscitation trolley) was administered along with the continuing fluid resuscitation. There was no bronchospasm or rash noted. No significant ST, T wave changes were seen in the ECG. However, as the blood pressure continued to drop, 10 mg intravenous chlorpheniramine and 100 mg intravenous hydrocortisone were administered on the basis of a presumed diagnosis of anaphylactic shock secondary to contrast. An intravenous infusion of metaraminol was started. The BP continued to drop and the patient went into brief

Figure 4 Typical rash appeared on the abdomen. These rashes appeared late.

Figure 5 Typical rash appeared on the legs. These rashes appeared late.

cardiorespiratory arrest; hence, cardiopulmonary resuscitation was started and the airway was supported by ventilation (bag and mask) and high-flow oxygen. At this stage, an IABP 35 cc (Teleflex, USA) was promptly inserted through the right femoral artery approach for mechanical circulatory support. The cardiac output was restored with the IABP. A mean augmented BP of 70–80 mmHg has been achieved. Soon spontaneous respiration returned. Subsequently, the typical rash of the anaphylaxis developed in the trunk (figure 4) and quickly spread to the lower limbs (figure 5). The definitive diagnosis was initially uncertain as the rapid cardiovascular collapse preceded the appearance of the typical erythematous rashes by a few minutes. Transient ST elevation in the inferior-lateral leads developed immediately after resuscitation and gradually started to resolve after the IABP insertion. A further left coronary angiography image confirmed resolution of the spasm (figure 6) and the stasis in the dominant left circumflex artery and the subsequent return of TIMI III flow in the coronaries. With further fluid resuscitation in the catheter laboratory, the haemodynamic stability was achieved. An echocardiogram was performed that ruled out pericardial tamponade and demonstrated preserved left and right ventricular function. The patient was transferred

Figure 6 Relief of the spasm of the coronaries. Note the inflated balloon of the IABP (outline marked with arrows).

to the coronary care unit where his condition continued to improve and the IABP was removed after 24 h. Mast cell tryptase levels at 1, 6 and 12 h were 86, 131 and 57 µg/L (elevated), which confirmed the diagnosis of anaphylactic shock. He was discharged after 3 days and referred to an immunologist for review.

OUTCOME AND FOLLOW-UP

The patient remained asymptomatic at 3 months' follow-up with normal ECG and echocardiography.

DISCUSSION

The use of iodinated contrast media may cause untoward side effects. They are usually mild-to-moderate and transient in nature. However, severe and life-threatening reactions have been reported.^{3–4} In patients with rapid cardiovascular collapse and shock, the initial definitive diagnosis may be uncertain until the typical erythematous rash develops.

A life-threatening, contrast-associated allergic reaction is rare, approximately 0.2%.¹ Anaphylaxis (IgE mediated) or anaphylactoid reactions (non-IgE mediated) are clinically indistinguishable from each other and manifest as a multisystem disorder involving the skin (urticaria, angioedema), respiratory system (bronchospasm) and cardiovascular system (hypotension secondary to systemic vasoplegia, myocardial ischaemia owing to a severe coronary spasm). A comprehensive review⁵ of the pathophysiology of anaphylaxis suggests that the immediate changes are caused by degranulation of basophil and mast cells, which liberate preformed and de novo synthesised lipid mediators like histamine, tryptase, chymase and platelet activating factor. Cytokines such as tumour necrosis factor-α, interleukin (IL)-4, IL-6 and IL-13 released later play a role in biphasic or protracted anaphylaxis. The cardiovascular manifestation of this condition often determines the outcome. The mast cells are found in abundance in the adventitia of the large coronary arteries. They release histamine, a platelet activating factor, cysteinyl leukotrienes, which depress myocardial contractility causing cardiogenic shock, and chymase, renin, etc, which cause severe coronary vasospasm leading to myocardial ischaemia. Further, the renin initiates the activation of the local renin-angiotensin system with consequent stimulation of the adrenergic system, which may play a role in arrhythmia associated with anaphylaxis.

Haralambos⁶ comprehensively summarised in a review the mechanism of IABP. In anaphylaxis, the increased airway and intrathoracic pressure secondary to bronchospasm leads to a drop in coronary perfusion. Hence, Yeguiayan *et al*⁷ postulated in their case report that the use of IABP in these circumstances may produce additional benefit by augmenting the diastolic pressure and thereby improving coronary perfusion.

In confirming the diagnosis of anaphylaxis, serial measurements of a mast cell tryptase are preferable to a single measurement.

In patients who had a severe systemic and contrast-related anaphylactic reaction or shock previously, the use of gadolinium chelates in place of a conventional iodinated contrast, dye-free intravascular ultrasound-guided PCI procedure⁸ and considering referral to specialist immunology clinics for desensitisation are some of the possible available options.

Learning points

- ▶ Contrast-associated anaphylactic shock should be considered as a differential in all hypotensive episodes associated with coronary catheterisation.
- ▶ In patients with initial diagnostic uncertainty, when a cardiovascular collapse and shock precedes the typical rash, early recognition of anaphylaxis (when other causes are excluded) and initiation of prompt treatment can be life-saving.
- ▶ When other supportive medical treatments fail, the use of IABP for mechanical circulatory support could stabilise hypotension, improve coronary perfusion and prevent death in severe anaphylactic shock with cardiovascular collapse.

Contributors The procedure was carried out by RAN. The literature search and manuscript preparation was performed both by RAL and RAN.

Competing interests None.

Patient consent Obtained.

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