

be given to increase cardiac output. Dobutamine below is a peripheral vasodilator and is an alternative if hypotension is not significant.

Milrinone has both inotropic and vasodilatory effects and can be used when vascular resistance is high. Alternatively, glyceryl trinitrate or sodium nitroprusside (on specialist advice only) can be used to reduce vasoconstriction.

Hypovolaemic shock should be treated with a crystalloid or colloid solution (or whole or reconstituted blood if source of hypovolaemia is haemorrhage) and further steps to improve cardiac output and decrease vascular resistance can be taken, as in cardiogenic shock.

The use of sympathomimetic inotropes and vasoconstrictors should preferably be confined to the intensive care setting and undertaken with invasive haemodynamic monitoring.

See also advice on the management of anaphylactic shock in Antihistamines, allergen immunotherapy and allergic emergencies p. 174.

Vasoconstrictor sympathomimetics

Vasoconstrictor sympathomimetics raise blood pressure transiently by acting on alpha-adrenergic receptors to constrict peripheral vessels. They are sometimes used as an emergency method of elevating blood pressure where other measures have failed.

The danger of vasoconstrictors is that although they raise blood pressure they also reduce perfusion of vital organs such as the kidney.

Ephedrine hydrochloride p. 125 is used to reverse hypotension caused by spinal and epidural anaesthesia.

Metaraminol p. 125 is used as a vasopressor during cardiopulmonary bypass.

Phenylephrine hydrochloride p. 127 causes peripheral vasoconstriction and increases arterial pressure.

Ephedrine hydrochloride, metaraminol and phenylephrine hydrochloride are rarely needed in children and should be used under specialist supervision.

Noradrenaline/norepinephrine is reserved for children with low systemic vascular resistance that is unresponsive to fluid resuscitation following septic shock, spinal shock, and anaphylaxis.

Adrenaline/epinephrine is mainly used for its inotropic action. Low doses (acting on beta receptors) cause systemic and pulmonary vasodilation, with some increase in heart rate and stroke volume and also an increase in contractility; high doses act predominantly on alpha receptors causing intense systemic vasoconstriction.

SYMPATHOMIMETICS > INOTROPIC

Dobutamine

● **DRUG ACTION** Dobutamine is a cardiac stimulant which acts on beta₁ receptors in cardiac muscle, and increases contractility.

● INDICATIONS AND DOSE

Intropic support in low cardiac output states, after cardiac surgery, cardiomyopathies, shock

▶ BY CONTINUOUS INTRAVENOUS INFUSION

▶ Neonate: Initially 5 micrograms/kg/minute, then adjusted according to response to 2–20 micrograms/kg/minute, doses as low as 0.5–1 microgram/kg/minute have been used.

▶ Child: Initially 5 micrograms/kg/minute, then adjusted according to response to 2–20 micrograms/kg/minute, doses as low as 0.5–1 microgram/kg/minute have been used

● **CONTRA-INDICATIONS** Pheochromocytoma

● **CAUTIONS** Acute heart failure · acute myocardial infarction · arrhythmias · correct hypercapnia before starting and during treatment · correct hypovolaemia before starting and during treatment · correct hypoxia before starting and during treatment · correct metabolic acidosis before starting and during treatment · diabetes mellitus · extravasation may cause tissue necrosis · extreme caution or avoid in marked obstruction of cardiac ejection (such as idiopathic hypertrophic subaortic stenosis) · hyperthyroidism · ischaemic heart disease · occlusive vascular disease · severe hypotension · susceptibility to angle-closure glaucoma · tachycardia · tolerance may develop with continuous infusions longer than 72 hours

● **INTERACTIONS** → Appendix 1: sympathomimetics, inotropic

● SIDE-EFFECTS

▶ **Common or very common** Arrhythmias · bronchospasm · chest pain · dyspnoea · eosinophilia · fever · inflammation localised · ischaemic heart disease · nausea · palpitations · platelet aggregation inhibition (on prolonged administration) · skin reactions · urinary urgency · vasoconstriction

▶ **Uncommon** Myocardial infarction

▶ **Rare or very rare** Atrioventricular block · cardiac arrest · coronary vasospasm · hypertension · hypokalaemia · hypotension

▶ **Frequency not known** Anxiety · cardiomyopathy · feeling hot · headache · myoclonus · paraesthesia · tremor

● **PREGNANCY** No evidence of harm in *animal studies*—manufacturers advise use only if potential benefit outweighs risk.

● **BREAST FEEDING** Manufacturers advise avoid—no information available.

● **DIRECTIONS FOR ADMINISTRATION** Dobutamine injection should be diluted before use or given undiluted with syringe pump. Dobutamine concentrate for intravenous infusion should be diluted before use.

For *continuous intravenous infusion*, using infusion pump, dilute to a concentration of 0.5–1 mg/mL (max. 5 mg/mL if fluid restricted) with Glucose 5% or Sodium Chloride 0.9%; infuse higher concentration solutions through central venous catheter only. Incompatible with bicarbonate and other strong alkaline solutions.

▶ In neonates *Neonatal intensive care*, dilute 30 mg/kg body-weight to a final volume of 50 mL with infusion fluid; an intravenous infusion rate of 0.5 mL/hour provides a dose of 5 micrograms/kg/minute; max. concentration of 5 mg/mL; infuse higher concentration solutions through central venous catheter only. Incompatible with bicarbonate and other strong alkaline solutions.

● **MEDICINAL FORMS** There can be variation in the licensing of different medicines containing the same drug. Forms available from special-order manufacturers include: solution for infusion

Solution for infusion

EXCIPIENTS: May contain Sulfites

▶ **Dobutamine (Non-proprietary)**

Dobutamine (as Dobutamine hydrochloride) 5 mg per 1 ml Dobutamine 250mg/50ml solution for infusion vials | 1 vial [PoM] £7.50

Dobutamine (as Dobutamine hydrochloride) 12.5 mg per 1 ml Dobutamine 250mg/20ml concentrate for solution for infusion ampoules | 5 ampoule [PoM] £12.00-£29.25 | 10 ampoule [PoM] £52.50