ADRENALINE = Epinephrine (rINN)

Use

'Bolus' doses of adrenaline are widely used during cardiopulmonary resuscitation in adults, but there has never been much evidence to support their use during neonatal resuscitation. Continuous infusions of adrenaline, or noradrenaline (q.v.), are increasingly used to treat cardiac dysfunction and septic shock.

Pharmacology

Adrenaline, first isolated in 1901, is the main chemical transmitter released by the adrenal gland. It has a wide range of α and β receptor effects, like noradrenaline. Metabolism is rapid, and the half life less than 5 minutes. It crosses the placenta. A ***low*** dose (less than 500 nanogram/kg per minute) usually causes systemic and pulmonary vasodilatation, with some increase in heart rate and stroke volume. A ***high*** dose causes intense systemic vasoconstriction; while blood pressure rises as a result, the effect on cardiac output depends on the heart's ability to cope with a rising afterload. Combined support with a corticosteroid may help, at least in the neonatal period. Adrenaline acts as a bronchodilator and respiratory stimulant; it also causes increased wakefulness, reduced appetite, and reduced renal blood flow (partly from juxtaglomerular renin release). Excessive doses cause tachycardia, hypertension and cardiac arrhythmia. Heart block and pulmonary hypertension have more frequently been controlled using isoprenaline (q.v.).

When ventricular fibrillation causes circulatory stand still (the commonest reason for "cardiac arrest" in an adult) intracardiac adrenaline should always be tried if cardiac massage on its own seems ineffective. However, when circulatory arrest due to respiratory failure (by far the commonest reason for "cardiac arrest" in infancy) proves unresponsive to immediate artificial respiration and cardiac massage, intracardiac THAM or sodium bicarbonate (q.v.) should be tried first before giving intravenous or intracardiac adrenaline (despite much published advice to the contrary). While adrenaline can be given down an endotracheal tube, the efficacy of this route remains unclear. It is however pointless to give *any* drug during resuscitation until oxygen has been got into the lungs and seldom necessary to give anything once it has because, once oxygenated blood gets into the coronary artery, the heart will nearly always recover by itself. Very few of the babies found to *require* drugs during resuscitation at birth survive, and most of those who do are disabled. Most reports to the contrary come from centres that use drugs so frequently that they must have often been given unnecessarily.

Treatment

Anaphylaxis: See the monograph on immunisation. *Never* give more than a 1 microgram/kg IV bolus.

Resuscitation:

The IV dose is 10 to 30 microgram/kg (0·1-0·3 ml/kg of 1:10,000 solution). Only a rough estimate of weight is needed. There is no evidence that a higher IV dose is better. Tracheal administration is of doubtful efficacy and should only be tried if IV access is unavailable - a higher dose (50 to 100 microgram/kg) is suggested.

Croup and bronchiolitis: Giving 3 ml of a 1:1000 solution through a nebuliser does very little to reduce symptoms in babies with bronchiolitis, but reduced the number admitted in one study. It provides 1–2 hours of symptomatic relief in croup, but an oral or IM dose of dexamethasone (q.v.) provides more sustained relief.

Cardiac dysfunction: Continuous IV infusions of 30 to 300 nanogram/kg per minute, made up as described below, can increase output without causing vasoconstriction; higher doses should only be used if facilities exist to monitor cardiac output, especially in the first day of life.

Compatibility

It can be added (terminally) to a line containing dobutamine and/or dopamine, doxapram, fentanyl, heparin, midazolam, milrinone, morphine or standard TPN (but not lipid).

Supply and administration

Stock 1 ml ampoules containing 1 mg of L-adrenaline (1:1000) cost 56p each. To give a 100 nanogram/kg per minute infusion, place 3 mg of adrenaline for each kilogram the baby weighs in a syringe, dilute to 50 ml with 10% glucose saline, and infuse at 0·1 ml/hour. 0·9% saline or a less concentrated glucose, or glucose saline, solution can be used. These solutions are stable and do not need to be prepared afresh every 24 hours. Protect ampoules from light and always check their strength, because 100 microgram/ml (1:10,000) ampoules also exist. Tissue extravasation can be dangerous. Treat as outlined in the monograph on hyaluronidase.

References

See also the relevant Cochrane reviews and UK anaphylaxis guideline © ⊗

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