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Anaesthesia for cardioversion in children

We would add four points about anaesthesia for cardioversion in children, to the excellent review article (*Anaesthesia* 1996; **51:** 565–70).

The first deals with the technique and electrical energy requirements. The size of paddles used for external cardioversion is 8 cm for children and 4.5 cm for infants. Open chest paddles have a diameter of 4 cm for children and 2 cm for infants. Firm contact pressure can decrease transthoracic resistance by up to 25% [1]. The optimal dose of energy is not conclusively established, but Gutgesell *et al.* [2] reported a dose of 2 Joules.kg^{-1}. When the atria only are affected, we start with between 0.5 and 2 Joules.kg^{-1}; if the first shock is unsuccessful, a second is applied at double the energy level. Each shock should be separated by 2 to 3 min because the risk of producing myocardial injury will be lower and delayed reversion to the arrhythmia can occur up to 2 min after electrical shock.

The second deals with cardioversion in the child who has been treated with antiarrhythmic drugs [3]. Lignocaine, phenytoin and amiodarone increase the defibrillation threshold, while bretylium, procainamide and quinidine have no effect on energy requirements. When the patient has a pacemaker, electrical countershock directly over the pacemaker and epicardial pacing wires should be avoided. Immediately after the procedure, the sensing and pacing circuits of the pulse generators should be assessed and the programmed mode should be reviewed. Sometimes electrical stimulation of the atrium or transoesophagal pacing may be used to terminate supraventricular tachycardia [4].

The third point concerns pre-operative fasting guidelines and the choice of induction agent. If the procedure is elective, we consider a period of fasting from milk and solids of between 4 (infants <6 months) and 8 h (children >36 months); any amount of clear liquids are offered up to 2 h prior to scheduled procedure (infants <6 months), or up to 3 h (children >6 months) [5]. Ranitidine 2 mg.kg^{-1} orally 2 h before induction reduces gastric fluid volume. For induction of anaesthesia we use ketamine (0.5–1 mg.kg^{-1} intravenously) [6] with an antisialagogue and also midazolam (0.1 mg.kg^{-1} intravenously). Contraindications are active upper respiratory infection and intracraneal hypertension.

The last point deals with fetal tachycardia. Cardioversion in pregnancy could lead to fetal arrhythmias. Fetal supraventricular tachycardia may cause hydrops and lead to congestive heart failure and fetal death (50–95%). Maternal administration of anti-arrhythmic drugs, e.g. digoxin, is the treatment of choice, but if the condition of the fetus deteriorates, we must be prepared to treat these high risk neonates after delivery by Cesarean section [7].

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Anaesthesia for cardioversion

I read with interest the review article by Stoneham on anaesthesia for cardioversion (*Anaesthesia* 1996; **51:** 565–70) which recommended that the electrical energy requirement for reversion of ventricular tachycardia were 'large' and that 200 Joules should be used initially. In my experience ventricular tachycardia requiring cardioversion responds promptly to 100 Joules. The American Heart Association in their 1992 Standards and Guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiac care (ECC) [1] recommend an initial energy of 100 Joules is used for the patient with ventricular tachycardia or atrial fibrillation requiring cardioversion. Their preceding 1986 guidelines [2] recommended low energy synchronous DC cardioversion commencing with 50 Joules. Prior to 1992 most patients treated in our Emergency Department were reverted successfully with 50 Joules. The patient with polymorphic ventricular tachycardia or pulseless ventricular tachycardia should be treated as for ventricular fibrillation (200 Joule asynchronous shock initially).

The literature and my experience suggest that ventricular tachycardia is sensitive to low energy cardioversion.

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A reply

I am grateful to Dr Banham for drawing attention to the energy requirements for synchronous DC cardioversion of ventricular tachycardia. According to the latest edition of the Advanced Cardiac Life Support handbook, published by the American Heart Association [2], this depends on the morphology of the rhythm. For haemodynamically stable ventricular tachycardia, the energy level should be started at 100 Joules, however, for polymorphic tachycardia 200 Joules should be used initially.

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Use of the 'AeroChamber' during induction of anaesthesia

A bright, 4-year old atopic boy with severe asthma, presented for a circumcision. Following the pre-operative visit, he was asked to use his salbutamol inhaler before coming to the operating theatre. With minimal supervision by his mother, he assembled his metered dose inhaler into an 'AeroChamber' which he used with remarkable efficiency, achieving an excellent seal between his face and the mask.

His mother, a nurse, had suggested to him that he might have an inhalational induction of anaesthesia and he was happy about this. After careful explanation and with the agreement of all involved, child, mother and 'AeroChamber' arrived in the anaesthetic room. With a little help, he attached a 'T' piece from the anaesthetic machine to the 'AeroChamber' which he held himself for a smooth induction with sevoflurane in nitrous oxide and oxygen. Mother, ward nurse, ODA and anaesthetist were impressed.

This technique can only be used in those children trained in the use of the equipment and who are old enough to understand and cooperate. It is therefore of limited application, but could be extended to other 'spacing' devices used by asthmatic children. The 'AeroChamber' has the advantage of an exhalation valve in the mask. It provides a further addition to the anaesthetic armamentarium and illustrates the value of lateral thinking.

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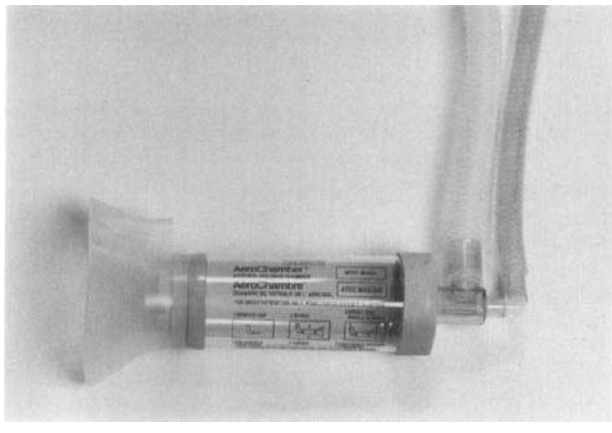

Fig. 1.