Etomidate *vs* thiopentone for rapid sequence induction in critically ill patients

Etomidate and thiopentone are two of the most commonly used induction agents for rapid sequence induction (RSI) in critically ill patients. The use of etomidate infusions for sedation on intensive care has been abandoned following data showing an alarmingly increased mortality in multiply injured trauma patients compared with those managed otherwise (77% *vs* 28%, $P<0.0005$) (Watt and Ledingham, 1984). However, the use of etomidate for induction has persisted, despite more recent evidence demonstrating adrenocortical suppression even after single dose administration. Both thiopentone and etomidate are acknowledged to produce quick onset anaesthesia appropriate for emergency RSI, thus it is suggested that the choice between these two agents should be made on their perceived disadvantages rather than advantages.

Disadvantages of thiopentone

Of thiopentone's various side effects, hypotension, resulting from reduction in both systemic vascular resistance and cardiac output, is of foremost concern: one study demonstrated that over 60% of the mortality associated with induction of anaesthesia was a result of cardiovascular upset (Arbous et al, 2001) (although this study population was not limited to critically ill patients). Gill and Scott (1992) demonstrated that thiopentone-induced cardiodepression may slow circulation time of subsequently administered muscle relaxants when compared to etomidate. They found a significant negative correlation between mean arterial pressure and onset of neuromuscular blockade, although the clinical relevance of this is unproven.

Disadvantages of etomidate

Etomidate originally gained popularity because of its relative cardiostability compared with other induction agents. It has some minor yet troublesome side effects, such as pain on injection and pro-emesis, but its effect on the adrenocortical axis is of most concern. A number of studies have demonstrated that adrenocortical suppression occurs after a single dose of etomidate, but it is only recently that evidence of adverse outcome has emerged.

Data from Annane and Bellissant's 2002 study showed that 94% of patients with septic shock who received etomidate for induction were found to be non-responders to a corticotrophin stimulation test (CST) 2–12 hours later. The 77 etomidate-treated patients required significantly greater intravenous fluid ($P=0.049$) and vasopressor support ($P<0.001$) the day after etomidate administration compared to 177 patients induced with other agents. The study also found that in the etomidate group, patients who subsequently received 7-day steroid replacement therapy had a significantly reduced 28-day mortality compared with those who received placebo (55% *vs* 76%; $P=0.03$) (Annane, 2005). These data add support to those who advocate abandoning the use of etomidate in the emergency setting.

Devil's advocate

Annane's data suggest that the deleterious effects of etomidate in septic shock patients are offset by the administration of steroid replacement therapy. Therefore, one approach would be to advocate the routine administration of steroids in septic shock patients induced with etomidate. Given that low dose steroids is recommended in vasopressor-dependent septic patients, even in the absence of a supporting CST, there would appear to be little argument against this strategy.

One should also consider that patients with problems other than sepsis are also anaesthetized in the emergency setting. No outcome data exist comparing the use of etomidate with other induction agents for patients with traumatic brain injury. Such patients also have disruption of their hypothalamic–pituitary–adrenal axis as a result of the primary insult, but this steroid dysfunction has not been shown to be a cause of adverse outcome. The cardiostable induction of anaesthesia is paramount in head-injured patients in order to prevent secondary ischaemic injury, favouring the use of etomidate in the absence of evidence showing adverse outcome. Similarly there are no outcome data comparing use of different anaesthetic agents for RSI of patients with cardiogenic shock, but again, it may be supposed that thiopentone, known to be negatively inotropic (Gelissen et al, 1996), may be deleterious to patients in this situation.

Conclusions

A single induction dose of etomidate causes adrenocortical suppression, leading to adverse outcome and significantly increased mortality in patients with septic shock. However, the mortality effect is offset by the routine administration of steroids in this setting. There is no evidence of adverse outcome associated with etomidate induction in patients with traumatic head injury or cardiogenic shock and, as such, many proponents may continue to use it in this setting because of its cardiostable properties. **BJHM**

Dr SR Moonesinghe *is Specialist Registrar in the Intensive Care Unit, University College Hospital, London NW1 2BU*

Annane D (2005) Etomidate and intensive care physicians. *Intensive Care Med* **31:** 1454

Annane D, Sebille V, Charpentier C et al (2002) Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock. *JAMA* **288**(7): 862–71

Arbous MS, Grobbee DE, van Kleef JW et al (2001) Mortality associated with anaesthesia: a qualitative analysis to identify risk factors. *Anesthesia* **56:** 1141–53

Gelissen HP, Epema AH, Henning RH, Krijnen HJ, Hennis PJ, den Hertog A (1996) Inotropic effects of propofol, thiopental, midazolam, etomidate and ketamine on isolated human atrial muscle. *Anesthesiology* **84**(2): 397–403

Gill RS, Scott RPF (1992) Etomidate shortens the onset time of neuromuscular block. *Br J Anaesth* **69:** 444–6

Watt I, Ledingham IM (1984) Mortality amongst multiple trauma patients admitted to an intensive therapy unit. *Anesthesia* **39:** 973–81

Anaesthetic and critical care dilemmas are coordinated by Dr Natasha Curran and Dr Ramani Moonesinghe, Research Fellows at the Centre for Anaesthesia, UCL, London

Ideas for future dilemmas can be sent to Rebecca Linssen bjhm@markallengroup.com