Which vasopressor for caesarean section?

One of the longest running debates in obstetric anaesthesia surrounds the prevention and treatment of maternal hypotension during caesarean section. Anaesthetic techniques have evolved and maternal mortality and morbidity is markedly reduced, but hypotension remains a problem, particularly following neuraxial blockade. Despite over 30 years of research no definitive consensus has been reached on the best treatment strategy and particular controversy surrounds the use of vasopressive agents. This article explores the evidence relating to the three most commonly used agents in the UK: ephedrine, phenylepherine and metaraminol.

Ephedrine

Historically the preferred vasopressor in obstetric anaesthesia, use of ephedrine began following early findings in animal models. Subsequent human studies by Ayorinde et al (2001) and a Cochrane review by Cyna et al (2002) found ephedrine to be effective in both the prevention and treatment of maternal hypotension.

Literature relating to its prophylactic use has questioned the traditional view of ephedrine as the agent of choice. Rolbin et al (1982) showed intramuscular ephedrine to cause a higher incidence of neonatal acidaemia and persistent maternal hypertension when compared to placebo. Cyna et al (2002) also commented on ephedrine's tendency to cause tachycardia, hypertension and tachyphylaxis with repeated use.

Phenylepherine

Phenylepherine is the alpha-adrenergic agonist on which most research has been conducted in obstetric anaesthesia. It is effective in the prevention and treatment of maternal hypotension both intramuscularly and intravenously, and in the latter both as bolus therapy (Thomas et al, 1996) or continuous infusion (Ngan Kee et al, 2005).

A systematic review of randomized controlled trials in elective caesarean deliveries by Lee et al (2002) showed phenylepherine to be as effective as ephedrine. Phenylepherine has a tendency to cause maternal bradycardia, often requiring administration of an antimuscarinic agent, although there was no evidence of any detrimental influence on maternal cardiac output or neonatal outcome. Ngan Kee et al (2008) found phenylepherine to be safe and effective in non-elective caesarean sections. Unlike ephedrine, phenylepherine does not appear to adversely affect umbilical artery pH (Lee et al, 2002) and has been associated with a lower incidence of maternal nausea and vomiting (Cooper et al, 2002).

Metaraminol

Although one of the most popular vasopressors elsewhere in anaesthesia, metaraminol has been slow to gain favour in obstetric anaesthesia. There are conflicting data on its negative effect on uterine blood flow and concerns about its potent vasoconstricting properties. Compared to ephedrine, metaraminol has been associated with a lower incidence of neonatal acidosis and tighter control of maternal arterial pressure (Ngan Kee et al, 2001).

Discussion

The literature fails to prove any one vasopressor's superiority over another in treating maternal hypotension during caesarean section. Extrapolating conclusions from animal models may not be appropriate, and many of the human studies included relatively low numbers of patients.

The suggestion that alpha-adrenergic agonists, such as phenylepherine and metaraminol, reduce uterine blood flow appears unfounded. Their use has been associated with higher umbilical artery pH values than ephedrine, suggesting adequate maintenance of uterine blood flow. The mechanism for ephedrine causing neonatal acidosis is poorly understood but, along with maternal bradycardia caused by alpha-adrenergic agonists, no study has found these effects to be detrimental to neonatal outcome.

Some studies found better control of maternal arterial pressure with a titrated intravenous infusion of vasopressors, which seems logical and should perhaps be encouraged. There are definite roles for alternative treatments – particularly co-hydration with intravenous fluid – and the use of vasopressors alone can not be recommended.

Conclusions

The choice of vasopressor for caesarean section is less important than the effective use of any agent in managing hypotension, thus preventing maternal symptoms and preserving good neonatal outcome. BJHM

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