Epidural top-up solutions for emergency Caesarean section: a comparison of preparation times†

D. N. Lucas, P. J. Borra and S. M. Yentis*

Magill Department of Anaesthesia, Intensive Care and Pain Management, Chelsea and Westminster Hospital, 369 Fulham Road, London SW10 9NH, UK
*Corresponding author

We compared the preparation times of three solutions commonly used for epidural top-up for emergency Caesarean section. Twenty-two anaesthetists were asked to prepare fresh solutions in random order as quickly as possible: 0.5% bupivacaine 20 ml (B); 2% lidocaine 20 ml with 1:200 000 epinephrine (LE); and 0.5% bupivacaine 10 ml and 2% lidocaine 10 ml with 1:200 000 epinephrine and 8.4% sodium bicarbonate 2 ml (BLEB). Preparation times for B were approximately half of those for LE, which in turn were approximately half of those for BLEB (P<0.0001). If local anaesthetic solutions with additives such as epinephrine or bicarbonate are prepared just before emergency Caesarean section, any possible reduction in onset time that they might afford may be offset by the additional preparation time required.

Br J Anaesth 2000; 84: 494–6

Keywords: anaesthetic techniques, epidural

Accepted for publication: December 8, 1999

Epidural analgesia in labour may be extended for emergency Caesarean section with a variety of solutions. We have recently demonstrated that there is no difference in the time taken for the sensory block to reach T4 when labour epidural analgesia is extended for emergency Caesarean section with either 0.5% bupivacaine, 2% lidocaine with 1:200 000 epinephrine, or a 50:50 mixture of 0.5% bupivacaine and 2% lidocaine with 1:200 000 epinephrine.1 It has been suggested that the addition of sodium bicarbonate may improve the speed of onset of local anaesthetic solutions in the epidural space.2 Because of concerns about the instability of previously mixed preparations of local anaesthetic and additives such as epinephrine and bicarbonate,3 these solutions are usually made up immediately before use. There is therefore the potential for delay while such solutions are prepared.

The aim of this study was to compare the preparation times of three commonly used epidural top-up solutions: 0.5% bupivacaine 20 ml (B); 2% lidocaine 20 ml with 1:200 000 epinephrine (LE); and 0.5% bupivacaine 10 ml and 2% lidocaine 10 ml with 1:200 000 epinephrine and 8.4% sodium bicarbonate 2 ml (BLEB).

Methods and results

The solutions were presented in random order to 22 volunteers from the anaesthetic department. The time taken for anaesthetists to prepare the three solutions was recorded, starting from when the first syringe packet was opened to when the study solution was ready in a 20 ml syringe. The solutions were presented for preparation in the standard form that they appear at our hospital:

B: two 10 ml plastic ampoules of 0.5% bupivacaine;
LE: one 20 ml ampoule of 2% lidocaine plus a 1 ml ampoule of 1:1000 epinephrine (0.1 ml to be added to lidocaine 20 ml using a 1 ml syringe);
BLEB: one 10 ml ampoule of 0.5% bupivacaine, one 10 ml ampoule of 2% lidocaine, a 1 ml ampoule of 1:1000 epinephrine and a 50 ml Minijet® syringe containing preservative-free 8.4% bicarbonate (2 ml to be added to the 20 ml solution).

Subjects were also provided with 20 ml, 2 ml and 1 ml syringes and 21 G hypodermic needles. Data were analysed using the Friedman statistic for repeated measures; P<0.05 was taken as significant.

Twenty-two anaesthetists participated: eight consultants, 10 specialist registrars and four senior house officers. Preparation times for B were less than those for LE, which in turn were less than those for BLEB (P=0.0001; Fig. 1).

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represents a second invasive procedure and also risks causing an excessively high block. The problems of emergency general anaesthesia in the parturient are well established.

With the exception of the Minijet® syringe, clinically available bicarbonate solutions contain preservatives. The Minijet® syringe contains 50 ml of sodium bicarbonate; to use this routinely has implications with regard to cost, or sterility if the same syringe is used repeatedly.

We did not address if preparation times might have improved with practice and our numbers were too small to permit analysis between different grades of anaesthetist. The majority of volunteers who took part in our study regularly work on the labour ward and all except one had more than 1 yr of training in anaesthesia.

Comment

We found that addition of epinephrine alone or epinephrine and sodium bicarbonate to local anaesthetic solutions increased the time taken to prepare the mixture.

Although carbonated local anaesthetic solutions have been advocated for reducing epidural onset times, the evidence supporting this is conflicting. Furthermore, the additional preparation time we have demonstrated could offset any potential benefit. The BLEB mixture has been found to have mean onset times for sensory blockade to T4 of 13.12 and 12.73 min when used for epidural anaesthesia for elective Caesarean section. However, this mixture has not been studied for extending labour epidural analgesia for emergency Caesarean section and its potential to reduce onset time in this scenario is unknown. We have recently compared 0.5% bupivacaine, 2% lidocaine with epinephrine and a bupivacaine–lidocaine–epinephrine mixture for extending low-dose epidural analgesia for emergency Caesarean section, and found median onset times for sensory blockade to T4 of 14, 10 and 12 min respectively. These differences were not statistically significant. In the absence of direct comparisons for emergency Caesarean section, we cannot estimate what the benefit of the BLEB mixture might be, but suggest it is likely to be no more than a few minutes. Given that its preparation may delay topping-up an epidural by up to 4 min, we believe more evidence is needed before BLEB is recommended for extending epidural analgesia for emergency Caesarean section.

Differences in preparation time may not always be clinically significant since not all emergency Caesarean sections are true ‘emergencies’. However, in a truly urgent case such differences can be important. Spinal or general anaesthetics are alternative techniques; however, in the presence of a functioning epidural, a spinal block represents a second invasive procedure and also risks causing an excessively high block. The problems of emergency general anaesthesia in the parturient are well established.

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The more complex the mixture, the greater the potential for errors during preparation, especially when in a hurry. Uncertainty over any clinical advantage of the BLEB mixture, the requirement for four separate drugs and the potential for error are reasons why this solution is not used in our unit. Other hazards of mixing solutions include the possibility of bacterial contamination and drug incompatibility; for example adding bicarbonate to local anaesthetic solutions to 0.5% bupivacaine causes instant precipitation. Another consideration is the variation possible when mixing very small quantities of drugs, the final concentration being affected by the deadspace of the instrument used for aspiration and the presence of air bubbles in very small volumes of injectate.

While preparation and onset times are important considerations when assessing an epidural top-up solution, the quality of analgesia provided is also important. Fernando and colleagues demonstrated improved analgesia when bicarbonate was added to epidural solutions for elective Caesarean section. Whether this also applies to emergency Caesarean section would need examination in a randomized controlled trial.

In conclusion, we have demonstrated that addition of sodium bicarbonate or epinephrine to local anaesthetic to extend epidural analgesia for emergency Caesarean section increases the preparation time. In view of this and the other potential problems of additives, it would seem prudent to consider using simple solutions only, until good evidence is provided for the benefits of these additives.

Acknowledgement

DNL was supported by an Obstetric Anaesthetists’ Association Research Fellowship.

References

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