Our paper referred to overall reflex activity in the upper airway after induction of anaesthesia with either thiopentone or propofol. Common clinical experience suggests that, after thiopentone, reflex activity in the upper airway is greater than after propofol, but the mechanism for this effect is unknown.

We have reviewed our video recordings as suggested by Dr Fink, but unfortunately it is not possible to demonstrate with any degree of certainty the direction of movement of the vocal processes.

J. LANGTON
I. WILSON
P. BARKER
G. SMITH
Leicester


SPINAL ANAESTHESIA FOR CAESAREAN SECTION

Sir,—The paper by Vucevic and Russell [1] on spinal anaesthesia for Caesarean section raises several interesting considerations.

First, one patient in the study had a dural tap with the extradural catheter. Accidental insertion of the extradural catheter into the subarachnoid space through the dural hole made by the spinal needle has always been quoted as one of the potential dangers of using the needle-through-needle technique. However, until now, there has been no report in the world literature of this happening since the advent of the technique.

Second, it is not clear what criteria, if any, the authors used to determine which patients required an extradural top-up. For example, close analysis of tables III and IV shows that patient No. 10 had a top-up 2 min after being turned to the supine position. The levels of sensory analgesia and anaesthesia as assessed by the authors at this time were T4 and T7, respectively. However, patient No. 31 did not receive a top-up until 30 min after being turned to the supine position. The level of sensory analgesia and anaesthesia in this patient after 2 min in the supine position were T9 and T10, respectively, and remained so for a further 10 min. Does this imply that surgery was commenced before T4 analgesia was achieved?

Third, do the authors feel that we should be using larger volumes of more dilute solutions of bupivacaine when providing subarachnoid anaesthesia for Caesarean section rather than 3.0 ml of 0.5% plain bupivacaine, and if so what volume and concentration do they recommend? However, we feel that 12 ml of 0.125% bupivacaine may be a slightly excessive volume to use, especially if the patients are turned supine immediately after the subarachnoid injection. The median value for sensory anaesthesia (12-ml group) after 5 min in the supine position was T2. However, these patients had spent 30 min in the right lateral position and if they had been turned supine immediately after the subarachnoid injection, a larger volume of unbound drug would have been available to travel rostrally in the cerebrospinal fluid, and the maximum height of sensory anaesthesia achieved would have been much higher.

M. PATEL
A. SWAMI
London

1. Vucevic M, Russell IF. Spinal anaesthesia for Caesarean section: 0.125% plain bupivacaine 12 ml compared with 0.5% plain bupivacaine 3 ml. British Journal of Anaesthesia 1992; 68: 590-595.

Sir,—Accidental insertion of an extradural catheter through the hole made in the dura by a spinal needle is, indeed, a theoretical risk of a needle-through-needle technique. The details of this patient were submitted as a case report to a peer review journal, but the report was rejected on the grounds of "faulcy technique" because the dural puncture could have been caused by the Tuohy needle and "the grounds for believing the catheter passed through the hole made by the spinal needle are rather tenuous". In our investigation, to reduce the risk of spinal headache and minimize damage to the tip of the spinal needle, both needles were inserted with their bevels facing laterally (but in opposite directions). Before the catheter was threaded, the extradural needle was rotated 90° to face cephalad. This rotation is believed to increase the risk of accidental dural puncture.

The main criterion used to decide on a top-up was a failure of the spinal to spread adequately. Drs Patel and Swami are to be congratulated for drawing our attention to patient No. 31: there is an error in the data and this patient received her extradural top-up at 10 min. One could argue about the exact definition of adequate spread, but after many years of experience we have found that, if low levels of block do not show signs of significant extension after turning the patient from the lateral to supine position, then anaesthesia is inadequate. While it could be argued that we were rather quick to top up the extradural in patients Nos 6, 7, 9 and 10, the lack of spread in patients Nos 11 and 31 support this approach.

Our knowledge of the clinically relevant factors governing the spread of spinal anaesthesia is incomplete and we cannot suggest a suitable volume or concentration of plain bupivacaine. However, Van Zundert and colleagues [1] injected 10 ml of 0.125% bupivacaine (with adrenaline) as a bolus and then turned their patient. They commented that levels of block were similar to those produced with 3 ml of 0.5% plain bupivacaine.

The principal point of this study, and its predecessor in which up to 18 ml of 0.08% bupivacaine was used [2], is to indicate that the spread of spinal anaesthesia involves some poorly understood and complex hydrodynamic interactions between several fluid compartments.

I. F. RUSSELL
M. VUCEVIC
Hull


METALLIC FRAGMENTS AND THE COMBINED SPINAL—EXTRADURAL TECHNIQUE

Sir,—Some anxiety may have been caused recently by suggestions in this journal [1, 2] and elsewhere [3] that, during the needle-through-needle method of combined spinal-extradural anaesthesia, the spinal needle tip may be damaged by contact against the inner aspect of the extradural needle, and even that metallic fragments might be produced. These allegations may be worrying particularly to those anaesthetists without access to facilities to confirm or refute them, and their implications are serious enough to merit further theoretical consideration and experimental investigation.

When a cutting-tipped spinal needle and a Tuohy needle are used together, there are three possible relative alignments of the bevels: parallel to, facing or at 90° to each other. I have studied these combinations under the microscope, and only when the bevels are parallel does the spinal needle tip make contact with the inner surface of the extradural needle. During the needle-through-needle technique, when the spinal needle is being inserted, the Tuohy needle bevel should be facing cephalad. As normal spinal technique requires the needle to be inserted through the dura with its bevel laterally, the relative alignment of the two needles is at right-angles—one of the "safe" alignments. Surprisingly, there is no reference to the relative position of the needle bevels in the most critical letter [3].

There are other theoretical considerations. Different gauges of spinal needle pass with varying ease through different gauges of extradural needle, and gauge size allows the manufacturers some variation in the external diameter of spinal needles and internal diameter of extradural needles. The latter also depends on the thickness of the needle wall, which varies between different makes. The needle combination chosen by Eldor and Brodsky [3] (a 25-gauge Braun spinal needle through an 18-gauge Portex extradural needle) was particularly unfortunate as it produces an unusually "tight fit". However, even with this combination, contact by the spinal needle tip does not occur when the bevels are aligned at 90° to each other. Another factor is the radius of bend of the tip of the Tuohy needle, a smaller radius making contact by the spinal needle tip more likely.
The final theoretical consideration involves pencil-point spinal needles. Only the shoulder of a pencil-point tip makes contact with the inside of the Tuohy needle curve so that, in addition to their other advantages, these needles theoretically are preferable for needle-through-needle techniques.

Both Portex U.K. Ltd, using an independent institute for biophysical equipment evaluation to test a variety of spinal and extradural needle combinations, and the Becton Dickinson company, using their own technical department to test their own spinal-extradural needle sets, have investigated the possibility of spinal or extradural needle damage and the production of metallic particles. In addition to microscopic examination, tests included energy-dispersive x-ray analysis of any particulate matter found. In none of the tests was any damage found to the tip of the spinal needle. Some extradural needles showed fine markings after the test, as reported by Eldor and Brodsky [3], but such marks were also present before the tests and are part of the normal manufacturing process. Neither investigation found any evidence of metallic particulate contamination.

In summary, while there is no evidence of spinal or extradural needle damage during needle-through-needle combined spinal-extradural anaesthesia, it is preferable to use pencil-point needles or very fine spinal needles and an extradural needle having a tip with a generous radius of curve. It is also wise to use one of the manufacturers' needle combinations recommended specifically for the technique. Examples include those from Portex, which combine 26-gauge cutting or pencil-point spinal needles with 16-gauge extradural needles, from Becton Dickinson, who provide a choice of 25- or 27-gauge cutting or pencil-point spinal needles and Braun, whose new Espocan system contains a spinal needle with a plastic sleeve which holds it centrally in the extradural needle lumen and guides it through a hole cut in the outer curve of the extradural needle tip.

L. E. S. CARRIE
Oxford


SIR,—In previous correspondence, Dr Carrie has written that “The origin of many innovations seems to lead back inevitably to Biblical times” [1]. So I searched there and found that “Iron sharpeneth iron; so a man sharpeneth the countenance of his friend.” [2] This is the final theoretical consideration involving pencil-point spinal needles. I have not seen the results of the work by Portex or Becton Dickinson, who have abandoned it. To my surprise, companies (Portex, Becton Dickinson, Braun, etc.) continue to market these packs, even after my observations [4].

Dr Carrie uses the word “contact” throughout his letter. I think it should be replaced by “friction”, as it is obvious that contact between the two needles cannot be avoided. In the case of the Becton Dickinson needle, it is evident that, when metal passes through another bent metal, it causes friction. Friction causes metallic fragments. The question is not if there are metallic particles, but if they have any clinical significance, or if there is a way to avoid them. Concerning the first question—it is too early to judge. We need to know the impact of these small particles on the spinal cord to determine both early and late implications. As to the second question—we can straighten the extradural needle tip, but create a problem in introducing the catheter. Alternatively, the Eldor needle consists of an 18-gauge extradural needle with a 20-gauge external spinal conduit. The spinal needle is introduced through the straight guide tube with the bent tip, so avoiding the problem.

I encountered this problem with my previous needle [3] and have abandoned it. To my surprise, companies (Portex, Becton Dickinson, Braun, etc.) continue to market these packs, even after my observations [4].

Dr Carrie is correct in saying that “the origin of many innovations seems to lead back inevitably to Biblical times”. It is obvious that the use of pencil-point spinal needles cannot be avoided. I have found no difference between any alignment, or any spinal needle, including a pencil-point tip needle. I have not seen the results of the work by Portex or Becton Dickinson, although I also was told by Portex that “Independent laboratory tests conducted by Portex show no metal particles produced on passing 26-gauge spinal needles through 16-gauge and 18-gauge Tuohy needles” [Russell CA, personal communication].

Dr Carrie stated that “some extradural needles showed fine markings after the test”. With enough magnification these “fine markings would become “not fine”. I cannot understand the next sentence that “such marks were also present before the tests”.

We think it should be replaced by “friction”, as it is obvious that contact between the two needles cannot be avoided. I have not seen the results of the work by Portex or Becton Dickinson, who have abandoned it. To my surprise, companies (Portex, Becton Dickinson, Braun, etc.) continue to market these packs, even after my observations [4].

Dr Carrie wrote: “How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth”.

J. ELDOR
Jerusalem


INSPIRATORY TO END-TIDAL OXYGEN DIFFERENCE

SIR,—I wish to comment on the interesting article by Bengtson and colleagues [1] on oxygen difference monitoring.

In my experience (I use oxygen and nitrous oxide with isoflurane in a low-flow system, ventilating manually to maintain an end-tidal carbon dioxide concentration of ±4.5 vol%) the rate of ventilation influences \(\text{\(t_{00} - t_{01}\)}\) inversely, complicating the interpretation of the oxygen difference further. \(\text{\(t_{00} - t_{01}\)}\) is merely a tidal measurement; to judge oxygen uptake the dimension “time” must be considered. To maintain \(\text{\(t_{00} = 4.5\text{ vol}\%}\) I can, for example, ventilation 14 times per minute with a tidal volume of 470 ml or 8 times 730 ml... this causes an increase in \(\text{\(t_{00} - t_{01}\)}\); meantime the \(s_{00}\) will be constant at ±98% and I assume that the oxygen uptake will also be constant. Is this assumption incorrect?

M. SCHRADER
Witten-Buchholz, Germany


SIR,—We thank Dr Schrader for his comment. An increase in \(\text{\(t_{00} - t_{01}\)}\) is seen as a result of acute hypoventilation, decreased uptake of nitrous oxide, increased inspired oxygen concentration and increased oxygen consumption rate. Dr Schrader has experience of an increase in \(\text{\(t_{00} - t_{01}\)}\) as a result of a decreased ventilatory frequency with a constant minute ventilation volume. As far as we understand, this is best explained by a change in \(\text{\(V_{D} / V_{T}\)}\) such that alveolar ventilation has decreased. If this is true, the end-tidal carbon dioxide concentration will also subsequently increase.

J. P. BENGTSON
A. HARALDSSON
B. A. BENGTSSON
A. HENRIKSSON
O. STENQVIST
Göteborg, Sweden

PRE-EMPTE EXTRADURAL ANALGESIA

SIR,—We congratulate Dr Dahl and co-authors [1] on their interesting and fundamental study on pre-emptive extradural analgesia in the context of major abdominal surgery. This topic is important for both surgeons and anaesthetists, and we feel that it is paramount to try to understand why this study apparently failed to produce the results to be expected from previous experimental work [2].

We wish to raise the following points:

Why was the combination of extradural bupivacaine and morphine chosen? Morphine has not only slow and unfavourable kinetics, particularly when used extradurally [3], it may also—under certain circumstances—possess excitatory [4, 5] and anti-analgesic properties (either directly [6, 7] or via its 3-glucuronide metab-