2 *Taylor JA.* Lumbosacral subarachnoid tap. J Urol 1940; 43: 561.
3 *Murphy TM.* Spinal, epidural, and caudal anesthesia. *In:* Miller RD (Ed.). Anesthesia, 2nd ed., New York: Churchill Livingston Inc., 1986; 1061–111.
4 *Ready LB, Cuplin S, Haschke RH, Nessly M.* Spinal needle determinants of rate of transdural fluid leak. Anesth Analg 1989; 69: 457–60.
5 *Bromage PR, Van Zundert A, Van Steenberge A, et al.* A loss of resistance to negative pressure technique for subarachnoid puncture with narrow gauge needles. Reg Anesth 1992; 4: S17.

REPLY

We wholeheartedly agree that hypobaric spinal anaesthesia is a useful technique for perirectal surgery when performed in the prone jackknife position. Furthermore, we appreciate the technical suggestions and comments. Your method for documenting loss of resistance is interesting, may well facilitate correct needle placement, and is worth a trial in any anaesthetist's clinical practice. We certainly plan to evaluate it in ours! However, we do have some questions regarding your technique. First, we would be interested to know the reasons for selecting tetracaine as the local anaesthetic. Were any of your patients discharged on the same day as the operation? If so, how long did it take to recover from the hypobaric tetracaine spinal anesthetic? Second, my experience with hypobaric tetracaine suggests that even smaller doses would still be effective. Have you utilized less than 4 mg? Third, did you collect additional data regarding the extent of anaesthesia produced by this dose of tetracaine? For example, can you describe the rapidity of onset, extent of spread, and rate of regression of sensory anaesthesia in greater detail? Did you observe any change in the spread of anaesthesia after surgery when the position was changed? Fourth, the lack of motor blockade is surprising (particularly in the foot). Please comment on the methods and timing of these assessments. Finally, the closing sentence contrasts your technique with ours, noting that you utilize a lower volume and baricity of local anaesthetic, and a lower interspace for spinal puncture. If your intention was to imply that these differences constitute advantages, we are forced to disagree for the following reasons: (1) we routinely utilize volumes of 4–8 ml of hypobaric tetracaine solutions (in concentrations of 1–2 $mg \cdot ml^{-1}$) for spinal anaesthesia in our practice without apparent complications; (2) to our knowledge, the impact of varying degrees of hypobaricity on the quality or spread of spinal anaesthesia has not been established. Thus, the effect of these minor differences in baricity remain speculative; and (3) although the Taylor approach has obvious theoretical advantages in patient populations where flexion of the spine is limited (such as this population where the prone jackknife position limits flexion of the spine) we rarely find it necessary to utilize this approach in our patients. We have found that needle placement is usually accomplished quite easily with a midline or paramedian approach when patients are in the prone jackknife position.

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Vaporizer overfilling

To the Editor:

As one of the experts involved in the litigation arising from the case referred to in the Letter by Sinclair and Van Bergen,[1] with the accompanying Editorial by Hardy,[2] I am particularly interested in the issue of vaporizer overfilling and its consequences. The various parties in the Defense in this legal matter have admitted liability, although the issue of damages remains to be determined.

My initial impression, when confronted with the suggestion of vaporizer overfilling, was that this was not possible. The information subsequently made available to me, both in the form of the results of the investigation summarized by Sinclair and Van Bergen[1] and separate tests clearly demonstrated that overfilling with the vaporizer model in question was indeed very easily achieved. Two faults (vaporizer concentration dial "on" and air entry allowed at the threaded connection between bottle neck and filling adaptor) are required to achieve the overfilled state. Critical overfilling (that required to produce markedly increased vaporizer output) was not possible with either single fault condition. The reason I was so sure at the outset that vaporizer overfilling was not possible was because of my knowledge of the Canadian Standards Association (CSA) Anaesthetic Gas Machine Standard Z168.3–M84.[3] Clause 12.2.2 states: "Each vaporizer shall be equipped with a liquid-level indicator, and shall be designed so that it cannot be overfilled when in the normal operating position ... ."

It appears that despite this very clear wording, manufacturers and others have added an implied qualifier to the clause, namely ... "when the manufacturer's operating instructions are followed." This implied (but not approved by CSA) qualifer has become the essential issue with respect to the prevention of another patient injury. Is this qualifier an acceptable solution? The qualifier is indeed the basis for the concluding message of Dr. Hardy's Editorial as Chairman of the Canadian Anaesthetists' Society Standards of Practice Committee: "This editorial comment entreats clinicians, for the sake of patient safety, to follow instructions ... please."

I accept fully that if correct filling instruction had been used in the Windsor hospital, or even if a single fault error had been made, the overfilling would not have occurred. But it did occur. The filling technique errors occurred despite operating instructions to the contrary. The result of the overfilling was a catastrophic injury to a young patient who was left permanently and severely neurologically impaired. A second victim of the incident was the anaesthetist, who was provided equipment to use with a hidden defect – a vaporizer critically overfilled by a

hospital employee. It is ironic that a safety device (keyed filler) should itself lead to a hazard with such catastrophic consequences. It is of course impossible to overfill a vaporizer (mounted in the correct upright position) without the keyed filler, but with a funnel filling port. Although virtually eliminated from Canada, this older style filling port remains common in the United States.

Sinclair and Van Bergen note that overfilling can be prevented by the inclusion of an overfill drain as part of the keyed filler block assembly. Some manufacturers currently incorporate this feature. All Canadian vaporizers of the same type involved in the Windsor incident will be refitted by the manufacturer with a redesigned filler block, including an overfill drain. Sinclair and Van Bergen also remind us that these overfill drains are not themselves perfect, as they are subject to clogging.

There remain large numbers of vaporizers in widespread use in Canada without the overfill drain. Sinclair and Van Bergen are clear in their recommendation with respect to these units. "As long as the keyed filler system is used, we believe that the overfill drain, or its equivalent, should be included." I agree. While Hardy recognizes this recommendation, he neither accepts it nor rejects it. I find his silence on this critical issue a curious omission and I invite him to comment specifically on it.

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REFERENCES

1 *Sinclair A, Van Bergen J.* Vaporizer overfilling. Can J Anaesth 1993; 40: 77–89.
2 *Hardy J-F.* Vaporizer overfilling (Editorial). Can J Anaesth 1993; 40: 1–3.
3 Continuous-flow inhalation anaesthetic apparatus (Anaesthetic Machine) for Medical Use CAN3-Z168.3-M84. 1984, Canadian Standards Association, Rexdale, Ontario.

REPLY

The issue of vaporizer overfilling was brought to the attention of the Canadian Anaesthetists' Society (CAS) Standards of Practice committee meeting held on June 8, 1992 in Toronto. To prevent repetition of the tragic Windsor accident, three recommendations emanated from the committee:

1 that the CAS Newsletter publish a note as a reminder to anaesthetists concerning the safe use of vaporizers;
2 that the Canadian Standards Association (CSA) technical committee proceed with the testing of existing vaporizers to determine if overfilling is possible. Should overfilling be possible, an overfill protection device should be retrofitted on the vaporizers known to present this hazard, as offered by Penlon Ltd. for PPV and PPV Sigma vaporizers;
3 that the CAS Guidelines to the Practice of Anaesthesia be modified to encourage the use of anaesthetic gas monitoring by the addition of the following statement: "The use of agent-specific anaesthetic gas monitors is encouraged."

All of the proposed actions were endorsed by the Council of the CAS in June 1992 and have been implemented since then. In addition, the Journal invited a letter by the Bureau of Radiation and Medical Devices and an editorial comment to heighten physican awareness on the subject. I recognized Sinclair and Van Bergen's recommendation and approved it, albeit implicitly. I still concur with Sinclair and Van Bergen that an overfill drain is the best available and most effective remedy for some existing vaporizers, but leave it to the appropriate technical committee of the CSA to issue recommendations as to the actual device(s) to be used and for which specific vaporizer(s) such a device may be useful. Mandatory retrofitting of an overfill prevention device on all existing vaporizers equipped with the keyed filler system, without thorough testing of performance by regulatory bodies, may introduce a new hazard nobody is aware of ... yet. Finally, while the available devices may be useful, they are not perfect (overfill drains tend to clog) and, consequently, they will never replace physician education and vigilance.

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Standards of Practice Committee
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Errata

Scanlon P, Carey M, Power M, Kirby F. Patient response to laryngeal mask insertion after induction of anaesthesia with propofol or thiopentone. Can J Anaesth 1993; 40: 816–8.

Please note that on page 818, the first sentence of the third paragraph was printed as "In the latter study, all patients who received premedication with diazepam were given fentanyl 1 $\mu g \cdot kg^{-1}$ at induction." It should have read: "In the latter study, all patients received premedication with diazepam and were given fentanyl 1 $\mu g \cdot kg^{-1}$ at induction."

(re: Dr. Robert Hudson's review of *Kinetics of Anaesthetic Drugs in Clinical Anaesthesiology* in the Book Review section of the July 1993 issue, page 690)

Please note that in the third paragraph, the phrase that was printed as "that children require lower doses of thiopentone" should read "that children require *larger* doses of thiopentone."