into the epidural space, but then we administer top-up doses with extra caution, lest the catheter has been placed intrathecally, which had indeed occurred in two cases as demonstrated by an ability to aspirate a continuous flow of spinal fluid.

I wonder if, on the basis of their conjectures, your contributors have considered the distribution of blood injected for an epidural blood patch? To date, we have administered 246 of these in the treatment of headaches, consequent upon either an inadvertent perforation or a spinal block, when, by definition, there is a hole in the dura. In no such circumstance has there been evidence that the blood has reached either the subdural space or the cerebrospinal fluid.

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Pseudoarterialization of the CVP by an Infusion Pump

To The Editor:—We would like to call attention to a problem associated with the use of an Abbott/Shaw Life Care Infusion Pump (Model 3) during induction of anesthesia in a neurosurgical patient. A 20-gauge needle attached to the infusion set was inserted through a rubber port in a long-line central venous catheter that displayed a normal CVP tracing on our monitor. Shortly after initiating the infusion of fentanyl at a rate of 300 ml/h, we observed a sudden increase in the CVP from 10 to greater than 60 mmHg. In addition, the configuration of the tracing was arterial. We were concerned that the tip of the catheter had migrated into the right ventricle. Withdrawal of the catheter did not result in the return of the previously normal CVP tracing. It also was noted at this time that the frequency of these newly observed waves in the CVP tracing appeared to be regular but was not the same as that of the systemic arterial pressure waves being monitored simultaneously. Turning off the infusion pump resulted in the reappearance of a normal CVP tracing. When the infusion was restarted, the abnormal tracing reappeared. At this time, we decided to continue the iv infusion of fentanyl, using a peripheral rather than the central venous access to avoid further confusion.

A study of the Abbott/Shaw Life Care Pump was undertaken *in vivo* to determine the range of pressures that could be generated in the central venous catheter at different infusion rates. In a patient with a CVP of 8 mmHg, four sets of measurements, including systolic, diastolic, and mean pressures, were averaged and are presented in table 1 along with their corresponding stroke and infusion rates. Peak systolic and mean pressures are significantly higher than the baseline CVP at all infusion rates, and all pressures increase gradually as infusion rates increase. To determine if the pressures generated by the pump in the tubing could be transmitted to the central circulation, a double lumen pulmonary artery catheter was modified by removing about 30 cm of length distal to the proximal (CVP) port, and was inserted into the central venous circulation. No alterations in the CVP tracing monitored distally were observed during infusion of fluid through the proximal port at a rate of 400 ml/h. The system operating manual of the Abbott/Shaw Life Care Pump states that the pressure at the tip of the needle remains essentially similar to that within the cannulated vein, regardless of the pressure developed within the set, pump chamber, and tubing. In view of our findings, we feel that this information is accurate. The high pressures measured in the CVP catheter result from the rapid acceleration of small quantities of fluid by the pump mechanism. It appears that these pressure waves are attenuated almost instantaneously after exiting the infusion set tubing and nee-

TABLE 1. Pressures Generated by the Abbott/Shaw Life Care Pump at Various Infusion Rates in One Patient with a CVP of 8 mmHg

Rates		Pressures*		
Infusion (m/h)	Strokes (no./min)	Systolic (mmHg)	Diastolic (mmHg)	Mean (mmHg)
10	3	59	14	29
20	5	63	14	30
40	10	63	14	30
100	24	66	16	33
200	48	74	22	39
300	72	82	31	48
400	96	92	40	57

* Average reading after four trials.

dle and present no danger to the central venous circulation.

We do recommend, however, that the Abbott/Shaw Life Care Pump be avoided for the administration of fluids through a central venous line for the following reason. The stroke rates, being similar to the clinical range of human heart rates (at infusion rates of 200–400 ml/h), and pseudoarterialization of the CVP tracing during needle infusion will interfere with monitoring and interpretation of the CVP.

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Another Way to Insert a Macintosh Blade

To the Editor:—The letter by Lagade and Popper[1] pointed out a useful technique. However, there are two additional points to consider. First, the Polio Macintosh blade gives poor mechanical advantage, because little force can be applied and control is minimal. Second, difficulty is usually encountered only during insertion. Once the blade is placed down the pharynx, there is ample space for the handle in its normal configuration.

The following technique allows the normal Macintosh blade to be used in most of these difficult cases. With the patient's head in the sniffing position and the neck slightly extended, open the mouth as widely as possible. Next, without the handle attached, insert the Macintosh blade into the mouth and pharynx gently and as far as possible. Control the blade by holding it with the left thumb and placing the left index finger along the cephalad surface with the blade held firmly against the tongue. It is usually only a simple matter to connect the handle to the blade. This technique gives the anesthesiologist all the advantages of the normal Macintosh blade in a patient whose anatomy normally would prevent the insertion of the blade-handle assembly.

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