

Correspondence

Epidural Test Solution or Spinal Fluid?

To the Editor:—Many anesthesiologists utilize the loss-of-resistance method to identify the epidural space. A syringe filled with saline solution or saline solution and an air bubble is commonly used. An injection of a test dose of local anesthetic drug is then recommended to rule out the possibility of unrecognized subarachnoid puncture. Occasionally, a small amount of clear fluid may continue to drip slowly from the needle hub, and the usual physical tests such as temperature estimation, attempts at aspiration and observation of flow rate still leave doubt in the mind of the anesthetists as to the nature of this fluid.

The chemical properties of spinal fluid, saline solution, and several local anesthetic drugs in various concentrations were compared utilizing a urine test strip.* The results are shown in table I. It is apparent that pH is the most reliable means of distinguishing spinal fluid from other solutions, as its pH is in the physiologic range (7.34),¹ while the other solutions are much more acidic (pH 5) due to buffering and/or the sterilization process. The glucose test in CSF is weak owing to the low levels usually found in fasting patients. The protein test in CSF is weak due to low levels usually present, but is relatively strong in local anesthetic solutions because the active nitrogen in the hydrophilic radical acts on the indicator in a manner similar to the nitrogen in proteins.²

The presence of a pH of 7 on the test strip with a weakly positive glucose test at 3 minutes confirms that CSF is, indeed, flowing

* Ames Multistix, Division of Miles Laboratories, Elkhart, Indiana 46514.

TABLE I. Urine Dipstick Results

Solutions	pH	Glucose		Protein
		10'	3'	
Cerebrospinal fluid	7	0	1+	Trace-1+
Saline solution, 0.9 per cent	5	0	0	0
Bupivacaine 0.25 per cent	5	0	0	2+
0.5 per cent	5	0	0	3+
0.75 per cent	5	0	0	4+
Lidocaine 1.0 per cent	5	0	0	2+
1.5 per cent	5	0	0	2+
2.0 per cent	5	0	0	2+
Mepivacaine, 1.0 per cent	5	0	0	2+
2-Chloroprocaine, 3.0 per cent	5	0	0	3+

from the hub of the needle. A pH of 5 or less with the absence of glucose would indicate the efflux of the injected solution. The protein test portion of the test strip is of no value for this distinction.

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REFERENCES

1. Plum F, Siesjo B: Recent advances in CSF physiology. *ANESTHESIOLOGY* 42:708-730, 1975
2. Free AH, Rupe CO, Metzler I: Studies with a new colorimetric test for proteinuria. *Clin Chem* 3:716-727, 1957

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Misplacement of an Umbilical Vein Catheter

To the Editor:—When Virginia Apgar performed the first umbilical-artery catheterization,¹ it was considered a radical procedure. Now umbilical arteries and veins are can-

nulated daily in neonatal intensive care units. However, the procedure is still not without hazard. Umbilical-vein catheters have a higher incidence of complications than those placed

in an umbilical artery,² but in either case the likelihood of problems ranges from 3³ to 61 per cent.² Thromboembolic phenomena are common,³ but the incidence has decreased with the advent of specially made umbilical catheters. Other reported complications include rupture of bowel,⁴ intraperitoneal insertion,⁵ and infection.⁶

We now report what we believe to be a new complication of an umbilical-vein catheterization. Even though the subject was a lamb, its anatomy is similar enough to that of the human infant to alert all who are involved in newborn care to this danger.

REPORT OF A CASE

As part of a study on neonatal resuscitation, a 2,500-g lamb was delivered by cesarean section. A 5-Fr Argyle[®] umbilical catheter was easily placed in an umbilical artery for measurement of blood gases and arterial pressure. Immediately thereafter, a similar catheter was inserted into an umbilical vein, to a depth of 4 cm. Slight resistance to its further advancement was encountered, but the catheter then threaded easily to a final depth of 9 cm. Blood was initially aspirated from the catheter, but this was impossible after it was fully threaded. However, since fluid infused freely, a test solution, consisting of 12.5 ml 2 per cent Evans blue dye followed by 50 ml 4.2 per cent sodium bicarbonate and 5 per cent dextrose, was injected. When the usual cardiovascular effects of this infusion were not seen, the catheter was aspirated, with a free return of approximately 50 ml of clear blue fluid. Since no blood could be aspirated, use of the catheter was discontinued, but it was left in place. A second catheter was placed through another umbilical vein and the study completed.

At the end of the study, necropsy was performed. Opening the abdomen disclosed a large, blue-tinted cystic structure, which ruptured almost immediately. The catheter in question was traced from the umbilicus, where it could be readily felt inside the umbilical vein, to its entrance into the liver. Further examination revealed the catheter tip exiting from the parenchyma of the left lobe of the liver and lying between the liver and its non-ruptured capsule.

DISCUSSION

Umbilical vein catheters generally enter the vena cava by way of the ductus venosus.⁷ However, they may enter almost any other channel, such as a mesenteric vessel or, as in our case, a branch of the portal vein. Penetration of the hepatic parenchyma is then possible.

Several recommendations can be made on the basis of this experience. First, never insert an umbilical catheter unless it is really needed. Second, use only blunt-tipped catheters specifically made for this purpose. Third, if resistance is met, do not attempt to thread the catheter further. And fourth, after placing the catheter, infuse only innocuous fluids in sufficient volumes to keep open the catheter until its position has been verified by x-ray.

With the above precautions, the risks of the procedure can be minimized. But always keep in mind that there is risk, and a corollary to Murphy's law applies—in this case, that catheters may go to many places that you don't desire.

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REFERENCES

1. James LS: Fond memories of Virginia Apgar. *Pediatrics* 55:1-4, 1975
2. Symansky MR, Fox HA: Umbilical vessel catheterization: Indications, management, and evaluation of the technique. *J Pediatr* 80: 820-826, 1972
3. Kitterman JA, Phibbs RH, Tooley WA: Catheterization of umbilical vessels in newborn infants. *Pediatr Clin North Am* 17:895-912, 1970
4. Friedman AB, Abellera RM, Lidsky I, et al: Perforation of the colon after exchange transfusion in the newborn. *N Engl J Med* 282: 796-797, 1970
5. Van Leeuwen G, Patney M: Complications of umbilical vessel catheterization: Peritoneal perforation. *Pediatrics* 44:1028-1030, 1969
6. Scott JM: Iatrogenic lesions in babies following umbilical vein catheterization. *Arch Dis Child* 40:426-429, 1965
7. Dunn PM: Localization of the umbilical catheter by post-mortem measurement. *Arch Dis Child* 41:69-75, 1966

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