taken in two of the three children with acute hepatitis because a size-matched liver was unavailable. When a larger series has been accumulated, a multivariate analysis will be necessary to determine if primary diagnosis is truly an independent variable in predicting intraoperative blood loss in pediatric liver transplantation.

Why the younger patients require more blood is not clear. Patients who are sicker will receive their transplants when they are younger; the younger patients in our group tended to have a poorer nutritional status. Certainly, only the younger patient, for whom a smaller liver is much more difficult to obtain, will require a segmental liver transplant, and patients who received a segmental transplant did bleed more. Patients undergoing segmental transplantation may also tend to bleed more along the cut liver edge. However, none of these patients died from uncontrollable bleeding, and the fact that a patient received a segmental transplant did not predict survival. Significantly, blood loss, when included in the criteria for survival after 1 month, was not a predictor, in contrast to the strong correlation of blood loss and fatal outcome observed in adults.[7,8]

Proper timing of a transplant is important in reducing blood requirement and improving survival rates. Further prospective work is necessary to define appropriate timing. Additional controlled prospective studies are needed to ascertain whether modalities, such as the use of venous bypass, or a more defined use of blood products through techniques such as thromboelastography, will further decrease blood utilization.

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Separation of the Hub from the Shaft of a Disposable Epidural Needle

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With the development and widespread use of disposable needles for spinal and epidural anesthesia, separation of the hub from the shaft of the needle or needle breakage has become a rare event. The hubs of most of these needles are made of plastic and glued to the metal shaft with epoxy. However, a few manufacturers still provide disposable needles having metal hubs, and these are "crimped" onto the metal shaft as was done with reusable needles. While breakage of old reusable needles at the shaft-hub junction was a known complication in the past,[2,3] it has not been reported since the development of disposable needles. The following case illustrates the fact that separation of the hub from the shaft of a needle is also possible, especially if one uses disposable needles with metal hubs.

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Report of a Case

A 21-yr-old, gravida 2, para 1, 80-kg woman with a height of 62 inches, BMI = 32, presented for cesarean section because of non-progression of labor. The history and physical examination were unremarkable except that the patient's spinous processes were difficult to palpate because of her size. Premedication consisted only of 30 cc of oral sodium citrate. In the operating room, the appropriate monitors were applied, and the patient was placed in the sitting position. Following preparation and draping of the back, local infiltration of the skin and subcutaneous tissues with creation of a skin wheal was accom-

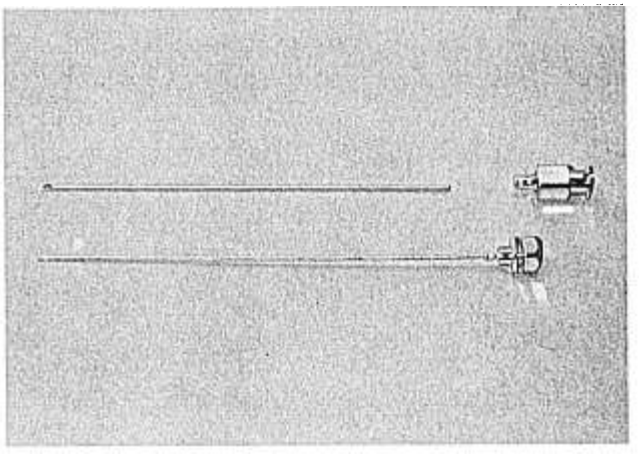

FIG. 1. Eighteen-gauge Hustead epidural needle showing shaft separated from hub.

plished using 1% lidocaine at the L_3–L_4 interspace. After a preliminary puncture wound was made in the skin wheal with an 18-gauge needle, an 18-gauge Hustead epidural needle§ was inserted, and the epidural space was entered on the first attempt using the modified loss-of-resistance technique as described by Bromage[1] to identify the space. Because there was no difficulty with insertion of the needle, it never needed to be withdrawn and/or repositioned. Also, because of the size of the patient, after the needle had finally been placed, only 1 cm of the 10-cm needle remained outside of the skin. After negative aspiration and injection of a 3-ml test dose of 2% lidocaine, a 20-gauge nylon epidural catheter was inserted without difficulty. After the stylet had been removed from the catheter, traction was applied to the hub of the needle to remove it from the patient's back. At this point, the hub simply slipped off and separated from the shaft (fig. 1). This left about 1 cm of the shaft protruding from the patient's back with the catheter still inside. By grasping the needle shaft with a Kocher clamp, the needle was easily removed from the patient's back, leaving the epidural catheter undisturbed. Lidocaine 2%, 15 ml with epinephrine 1:200,000 was subsequently injected in divided doses and provided good surgical anesthesia for an otherwise uneventful cesarean section.

DISCUSSION

The metal hub separated from the metal shaft of the needle in this case probably because, during the manufacturing process, the hub was simply not crimped onto the shaft with sufficient force to provide a firm union with the shaft. A review of the literature has shown this to be a rare, but not unheard of, complication. There are two case reports of fracture of a 25-gauge ⅝-inch needle at the metal hub-shaft junction[4] while being used for an axillary block, and separation of the shaft of a 20-gauge 1¼-inch disposable introducer (for a 25-gauge spinal needle) from its plastic hub.[5]

The problem in the past with reusable needles had usually been just the opposite from the problem in our case: during manufacture, the hub was crimped onto the shaft with excessive force, causing weakness at the shaft-hub junction, resulting in fracture at that point during use. The danger of this complication, as stated by Bonica,[1] was that "if the entire shaft is buried in tissues when such an accident occurs, it would be very difficult to retrieve it without an operative procedure." And indeed, such was the case with the broken axillary block needle.[4] It was because of this possibility that "security beads" were placed on reusable epidural and spinal needles,[2,3] although they were never incorporated into continuous spinal or epidural needles. These security beads served to prevent full insertion of a needle up to the hub, so that, if a needle broke at the shaft-hub junction, it would be virtually impossible to lose the shaft, since the shaft distal to the bead would still protrude from the patient's back. In the event of separation of the shaft from the hub (instead of fracture), that part of the shaft that had previously extended into the hub would still protrude, although this might be only a few millimeters.

In the present case, if the epidural space had not been entered on the first attempt, separation might very well have occurred when traction was applied to the hub in repositioning the needle. Such was not the case; thus, separation did not occur until after placement of the catheter. It was fortuitous that, in such a large woman, the needle did not need to be inserted "to the hilt."

It is our clinical impression that disposable needles having plastic hubs may be preferable to metal hubs because the plastic hubs, being glued to the steel shaft, seem to have a decreased potential for separation. In addition, needles with *translucent* plastic hubs offer another advantage in that they allow immediate visualization of blood and/or CSF. In any case, all needles should probably be "traction tested" prior to use to ascertain that the union of the shaft to the hub is adequate.

If a needle should break off or separate, the broken part must be removed even if surgery is required,[6] because, as Moore stated, "a broken needle is singularly dangerous because it has the tendency to change positions, *i.e.*, 'migrate' as the patient moves and, since both its point and the broken edge are sharp, it may puncture a vital organ."[3] If a needle breaks off at the skin level, a second needle should be inserted as a marker along the track of the broken needle to facilitate subsequent location of the needle.[5]

In summary, the newer disposable needles seem less prone to needle fracture or separation than older nondisposable needles, and, as our case illustrates, plastic hubs glued to metal shafts seem preferable to metal hubs crimped on metal shafts. Appropriate testing of the hub-shaft union should always be carried out prior to use of the needle.

§ Manufactured by American Medical Instruments, Inc. Hiannis, M. A., for TFX Medical Corp., 1986.

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Horner's Syndrome Resulting from a Lumbar Sympathetic Block

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Lumbar sympathetic blockade provides sympathectomy of the lower extremity. Numerous complications have been reported with this procedure, including neuralgia, subarachnoid block, bleeding,[1] and kidney damage.[2] We report a case of Horner's syndrome following this procedure.

Report of a Case

A 32-yr-old man was referred for evaluation of chronic left knee pain. The patient sustained a knee injury in August of 1985. Following three arthroscopies and a repair of the medial meniscus and anterior cruciate ligament, he continued to have pain. Repeat arthrogram was normal. The persistent pain was described as a continuous aching sensation that occasionally radiated down the leg to the foot. He also complained of coolness in the left lower extremity, but denied any alteration in skin color, texture, or nail or hair growth.

Physical examination revealed a well-developed, healthy man with equal skin temperatures in the lower extremities (as measured by cutaneous thermistors taped to corresponding areas of the lower extremities and recorded with a Yellow-Springs Telethermometer), and no alterations in skin texture or hair or nail growth. The left leg showed no edema or vasomotor or sudomotor changes, and neurologic examination was normal.

Roentgenographic studies showed a small amount of juxta-articular osteoporosis of the left knee joint. An area of homogeneous calcification with an irregular outline was also noted lying behind the extreme lower end of the femoral shaft.

The etiology of the patient's pain was unclear to the orthopedist, and this was the basis for the referral. Based on the pain's persistent nature and the complaint that the left leg felt cooler than the right and had intermittent edema by history, a reflex sympathetic dystrophy was felt to be a possible etiology.

A left lumbar sympathetic block was discussed with the patient and performed in the manner of Carron *et al.*[3] A 20-gauge, 15-cm needle was walked off the vertebral body of L2 into the left anterolateral paravertebral area. No paresthesias were obtained, and, after aspiration of the needle was negative for CSF or blood, 8 ml of 1% lidocaine were slowly and easily injected. Skin temperature of the left foot was noted to increase from 26 to 32.5° C over a period of 5 min. Right foot temperature remained 26° C. No sensory deficit in the lumbar dermatomes was present. After a repeat negative aspiration for CSF or blood, 6 ml of 0.25% bupivacaine were slowly injected, again without paresthesias, and the needle was removed.

Approximately 15 min following this second injection, the patient began to complain of mild numbness of the entire left side of his body. On repetitive examinations, the patient was noted to have slightly decreased sensation to pinprick in this same distribution. The sensory deficit extended to the midline. Reflexes were symmetrical bilaterally, and there was no motor weakness. No cardiovascular changes were noted, and vital signs remained stable throughout. A left-sided Horner's syndrome with obvious miosis, ptosis, and marked conjunctival injection, which was not present prior to the block, was noted to be present by multiple observers.

Despite the clearly apparent sympathetic block, there was no improvement in the patient's knee pain. The Horner's syndrome and sensory deficit resolved in 40 min, and the patient was sent home. Subsequent follow-up was remarkable for the complaint of blurred vision until late in the evening following the block and a gradual clearing of all symptoms by the next day. His knee pain remained unchanged.

Discussion

Sympathetic innervation to the head arises from preganglionic sympathetic fibers that exit the spinal cord in the anterior roots of C_8 and T_1, but may come off as low as T_4.[4] These neural fibers travel through the stellate ganglion; then, through the middle and superior ganglia. Horner's syndrome and related features of cervical sympathetic block (characterized by ipsilateral miosis, ptosis, anhidrosis, enophthalmos, and facial blushing) results after interruption of these sympathetic fibers, as occurs with stellate ganglion block. We report the occurrence of a *lumbar* sympathetic block associated with

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