ELSEVIER

A Case of Resident Malpractice Administering Spinal Anesthesia

Bryan A. Liang, MD, PhD, JD*

Pepperdine University School of Law, Malibu, CA.

Commentary by Charles E. Laurito, MD†

Facts

HA had a significant past history of being injured in a car accident in 1967 that resulted in severe injuries to both legs. In 1972, due to this injury, HA permanently retired from the military. HA became a barber but it became apparent that his past leg injury prevented him from standing long hours.

As a result of HA's leg problems, he entered the V.A. Hospital. On 7/12/76, HA underwent an initial operation to drain an infection from one of his ankles. He was given a spinal anesthetic for that operation and recovered from the anesthesia without complications. However, the operation was not completely successful, and HA was scheduled for an additional operation on 7/14/76.

Dr. CH, an anesthesia resident in his fourth month at the V.A. Hospital program, was assigned to administer the anesthetic to HA on 7/14/76. Dr. CH's supervising physician was Dr. CK, a board-certified anesthesiologist, who was provided to the V.A. Hospital under a contract between the V.A. Hospital and its affiliated medical school. When HA was taken to surgery, Dr. CH attempted to administer the spinal anesthetic, but his attempt to introduce the needle was unsuccessful. Dr. CK then obtained a successful spinal tap and administered 12 mg of tetracaine and "some amount" of epinephrine. Dr. CH testified that, at that time, neither he nor Dr. CK detected the onset of anesthesia. Believing that the anesthetic had not been introduced into the proper location, and after waiting a disputed length of time, Dr. CK administered a second dose of tetracaine and a "drop" of epinephrine.

Immediately after this second injection of anesthetic, HA began experiencing difficulty breathing, and within minutes, ceased breathing. Normal breathing was restored in about 15 minutes. Once breathing was restored, the surgery was performed. After surgery, HA suffered from muscle weakness below the waist, impotence, and incontinence; he was unable to walk even short distances with a walker, and he was confined to a wheelchair.

HA sued the United States (as owner of the V.A. Hospital), alleging that Dr. CH and Dr. CK negligently managed the anesthetic administration. The district (trial) court entered judgment for HA. The district court found that Dr. CH and Dr. CK were each responsible for anesthesia management because each was assigned to HA's care, each was present during the procedure that caused injury, and each was required to insure that epinephrine was excluded from the second injection (their duty); Dr. CK breached this duty by including epinephrine while Dr. CH breached this duty by failing to call to Dr. CK's attention the danger of including epinephrine (breach of duty); and HA's injury (damages) resulted from inclusion of epinephrine in the second injection (causation). The Government appealed.

On appeal, the Government challenged two findings: that epinephrine was negligently included in the second anesthetic injection and it was the proximate cause of HA's injuries and that Dr. CH, the resident in anesthesiology, was negligent in his actions.

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*Assistant Professor of Law

†Associate Professor of Anesthesiology, University of Illinois-Chicago

Address correspondence to Dr. Liang at the Pepperdine University School of Law, Malibu, CA 90263, USA.

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Legal Analysis

The Court of Appeals affirmed the trial court judgment of malpractice against Dr. CH [Harold "D" Ayers v. United States, 750 F.2d 449 (5th Cir. 1985)].

Under the state malpractice law where the action was brought, to sustain a malpractice action a patient must prove through appropriate expert testimony that: (1) the diagnosis or treatment complained of was such as to constitute negligence, and (2) it was a proximate cause of the patient's injuries.

Dr. G, HA's expert witness, testified that either Dr. CK did not wait long enough for the first spinal anesthetic to have its effect or missed the signs of the beginnings of a spinal anesthetic, and that the second dose should have been markedly reduced and epinephrine omitted. Dr. G also indicated that the anesthesia given contributed to the long-term neurologic problems of HA due to a marked reduction in the cardiac output, causing a significant degree of local ischemia and cauda equina syndrome; this was manifested as HA's partial loss of bladder and bowel control, impotence, and weakness in his lower extremities. Dr. M, another expert witness of HA, testified there was no reason to use epinephrine for extremity surgery that was calculated to last no longer than one hour to one hour, 15 minutes, particularly in light of the first surgery; in addition, the second dose should not have contained epinephrine.

From the testimony of Dr. G and Dr. M, the Court of Appeals found there was ample evidence to conclude that the failure by Dr. CK and Dr. CH to detect the onset of anesthesia from the initial injection precipitated the second injection; the epinephrine caused HA's injuries; and that such a result was foreseeable. In combination, these factors established proximate cause. The Court noted that expert testimony need only show that the negligence was *a* proximate cause of the injuries, not that it was the sole proximate cause.

The Court also found that the record supported the conclusion that including epinephrine in the second injection was negligent. The Court noted that Dr. G testified that the administration of the second dose was probably not needed, exceeded what would be a reasonable dose of tetracaine, and contained unnecessary epinephrine. Thus, its administration and its ingredient balance was below the standard of care.

The Court also addressed the Government's argument regarding the hypotheticals used in questioning of HA's expert witnesses. The Government asserted that HA was not a basically healthy individual at the time of his surgery, with the exception of his leg problem, as the hypothetical questions assumed. The Government argued that HA was very ill and that a progression of his illness caused his present problems. The Court indicated that because the district court was presented with this theory of the case and rejected it, HA adequately demonstrated a factual basis for the applicability of the hypothetical questions. The Court noted that the Government had the burden of proving a mistake had been made in the fact findings of the district court, and the burden was not met merely by demonstrating conflicts in the expert testimony or by seeking to redetermine the credibility of the expert witnesses.

The Government also argued that HA's experts failed to establish the standard of care to which Dr. CH, the resident, must adhere and thus they failed to establish that Dr. CH's actions were a breach of the standard of care. However, the Court noted the testimony of Dr. GS, Associate Professor of Clinical Anesthesiology at the medical school and Director of the Anesthesiology Section at the V.A. Hospital, describing the responsibilities of the hospital's anesthesia residents, which included making initial contact with the patient, taking the pertinent anesthesia history, doing the pertinent physical examination, and explaining the risks and benefits to the patient. Once the patient comes to the operating room, the "resident would perform the actual anesthesia management." Only if the resident has difficulty performing the anesthesia would the supervising doctor step in and do the procedure. Dr. GS stated that the role of the supervisor is to "get the resident back on the right track." Thus, the resident had primary responsibility for the anesthesia care given. In addition, the Court noted that Dr. J, the defense expert and former Chairman of the Department of Anesthesiology at the medical school, testified that there could be a delay in the onset of anesthesia. Because Dr. CH acknowledged that he knew the procedures for checking for the onset of anesthesia and he was a licensed physician who had four months of experience in the hospital's anesthesia residency program, he was experienced enough to know that there could be a delay in anesthesia onset. The Court also noted that Dr. CH admitted at trial that both he and Dr. CK were checking for the onset of anesthesia and acknowledged that he would know whether the anesthetic was taking effect.

The Court concluded that the resident is not relieved of responsibility to the patient merely because the faculty supervisor steps in and demonstrates a proper technique and it was reasonable for the district court to infer that once the supervising doctor became actively involved in the anesthesia management, both doctors were then responsible for providing the proper anesthetic ingredient mix. Therefore, it was not erroneous for the district court to conclude that Dr. CH was negligent because he failed to call to Dr. CK's attention an error in the ingredient mix.

Thus, because the components of negligence and proximate cause were found by the Court and, since Dr. CH was an employee of the V.A. Hospital at all times pertinent to this case, the United States was liable for Dr. CH's negligence in malpractice.

Commentary

If this information were presented to me at a morbidity and mortality conference, I would need to interrupt every few phrases to understand what had occurred during the case. Basic facts needed for preoperative planning are not provided. One side described the patient as relatively healthy; the other sees him as terribly ill. No specifics regarding the critical period after the onset of the spinal are mentioned. At this point, however, the jury enters the story, and a decision is rendered. The verdict hinges on the reasoning that each physician was "required to insure that epinephrine was excluded from the second injection," their duty to the patient was breached by including this dose, and "injury resulted from inclusion of epinephrine in the second injection." The resident is found to be at fault for not specifically informing the attending anesthesiologist of the inclusion of epinephrine in the second dose of tetracaine, "an error in the ingredient mix."

This is a remarkable line of reasoning. With so little information available, how could the court focus so intently on the second dose of spinal anesthetic? Why is the jury not hearing the responses to specific questions about the critical 15 minutes when the patient complained of dyspnea? With no focus on these events, it seems frivolous to conclude that "it was negligent to include epinephrine in the second injection," as though this one act would reliably explain the adverse event and allow the determination of liability.

Even more remarkable is the complaint against the resident independent of the attending. My time in the operating room is spent with students and physicians-in-training. Together we care for the patient. Regardless of the level of training and allocation of anesthesia duties, the attending is ultimately responsible for the anesthetic management of the case. Specifically, he or she is responsible for deciding which medication is in the syringe when a spinal block is performed, particularly in the case where the resident has only four months of experience. If a resident has difficulty with the technical aspects of a block and an intervention is needed, the attending is responsible for the syringe's contents.

In general, I favor regional techniques. I prefer the specificity provided by nerve blocks for surgical procedures and their ability to help avoid general anesthesia risks. A few tenets must be considered prior to my decision to provide a spinal. The patient must desire a regional, which may require patient education, and be able to communicate for the duration of the case. Physical insertion of the needle and administration of drugs cannot cause medical problems, and normal or near normal levels of coagulability, lack of infection at the relevant skin site, and adequate volume status should be established. If there are preexisting neurologic deficits, complaints of chronic back pain, or the possibility of sepsis, more thought and judgment are required to weigh risks against benefits. Finally, I consider the possibility of unanticipated conditions discoverable by a probing needle: occult spinal cord diseases, undiagnosed epidural tumors, quiescent epidural hemangiomas. HA may have met the criteria for regional anesthesia. He underwent a spinal two days earlier, with no adverse events reported. Although the ankle infection could not be adequately drained during the previous operation, it does not appear that he was septic or dehydrated from a progression of the lesion.

If I see no evidence of block within ten minutes following a tetracaine spinal, I repeat it using the same dose. This seems to be the course of action taken by the physicians in our Docket. If the initial dose is deposited in the appropriate place but onset is delayed, there may be a change in the patient's vital signs when helped to the sitting position for re-prepping and draping. If this occurs, I either reduce the second dose or withhold it and re-position the patient supine in anticipation of an adequate block.

The 12 mg of tetracaine used by the physicians is a generous dose for a procedure on the lower leg. Perhaps the surgeon is slow. I might have mixed a similar dose in D_5W to make it hyperbaric and administered this to the patient. I commonly use epinephrine with local anesthetics to reduce their rate of absorption; 200 mcg of epinephrine reliably extends block duration by approximately 40%.[1] Epinephrine seems to improve the quality of the block in addition to prolonging its duration. However, I can find no evidence in the literature that a spinal with epinephrine in tetracaine will cause nerve or spinal cord damage,[2–9] or that a combination of intrathecal tetracaine with 200 mcg of epinephrine could cause neural damage intrinsically or from a decrease in regional blood flow.[6,7,10] Studies examining this specific concern have shown that this amount of epinephrine does not decrease spinal cord blood flow in dogs.[11] There is little evidence of direct damage by tetracaine to nerve roots with doses used in clinical practice. Even if 24 mg of tetracaine had been injected intrathecally, this would be a very unusual cause of nerve damage.[12]

How much epinephrine was actually administered? From the *Facts* (above), we see that "some amount" in the first spinal was followed by "a drop" in the second. Although this is less scientific than terminology used in the 1990s, when performing spinals in the mid-1970s, dosing regimens and documentations were less rigorous than they are now. When mixing medications, I commonly give a small amount (one fifth to one third of 1 ml of epinephrine) per dose of tetracaine.

Focusing on the pathology itself, what could have caused the adverse events of "muscle weakness below the waist, impotence, and incontinence" immediately following the operation? If a needle is advanced directly into the substance of a nerve root or a segment of the spinal cord, I would expect the patient to immediately complain of severe pain in his back. If a deficit were found at the conclusion of the procedure, I would expect a complaint of paresthesia and findings of motor weakness limited to the root that was traumatized. However, no pain on needle insertion or medication injection was indicated in this case.

Adhesive arachnoiditis from an accidental injection of a harmful substance is always a possibility. A syringe swap would have permitted the injection of a known neurolytic (KCl or a detergent containing material) into the intrathecal space. Again, we have no indication that this action occurred, but accidental injection of an unintended substance into the neuraxis still belongs in the differential.

An epidural hematoma from direct needle puncture of a vessel in the area may have occurred during spinal needle placement. We know that several passes with a needle of unknown gauge at an unspecified spinal level were made before the medications were successfully placed. A significant epidural hematoma would characteristically cause intense back pain, but this sensation may potentially be blocked by the action of the local anesthetic. The patient may not have been able to relate any complaint of back pain given the events that occurred immediately after the spinal was injected.

Although we do not know what specifically led to the postoperative findings, an anterior spinal artery syndrome seems likely. The patient had immediate onset of painless paraplegia following the procedure. Possible causes of the syndrome include occlusion of the arterial blood supply to the cord or reduced arterial perfusion pressure coupled with local venous congestion, preventing adequate arterial inflow.[6,7] Hypotension alone is an extraordinarily rare cause of spinal cord damage.[6] Possibly significant hypotension occurs when a hematoma develops in the epidural space. The presence of even a small epidural hematoma in this setting may have been sufficient to decrease arterial blood flow to the spinal cord. A mass effect coupled with hypotension seems a much more likely cause of pathology than the inclusion of two clinical doses of epinephrine.

How could the case have hinged on the inclusion of epinephrine with the second injection? We are taught to avoid the use of epinephrine when injecting at end organs. The drug is known to vasoconstrict and decrease arterial inflow. Epinephrine should not be added to local anesthetics for penile or digital blocks. Was this rule emphasized to the court with a generalization to all types of nerve blocks? The jury was probably not aware of the vast clinical experience indicating that the use of epinephrine is safe. Their reasoning may have been influenced by the bad outcome and the desire for a simple explanation.

Could this adverse event be completely unrelated to needles, tetracaine with epinephrine, or hypotension? Possibly. Patients who are scheduled to receive neuraxial blockage, but who do not, are not immune from spontaneous epidural hematomas and their neurologic sequelae.[13]

Was justice served? Who knows? If it was, was it served for the right reasons? The doctors may have managed the case well or poorly, but we do not have a sense of it. We do know the outcome was bad and that two doses of epinephrine were injected. We do not know if the jury heard any of the information regarding the critical period in the operating room or the necessary interplay of risks with benefits any time a procedure is performed. With no focus on these events and issues, the verdict seems oddly misplaced.

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