

# The Pitfalls of Epidurals and Thromboprophylaxis



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**N**ORCAL has defended several cases involving patients who have developed an epidural hematoma in the immediate postoperative period. These patients, who had epidural catheters placed by their anesthesiologist for postoperative pain relief, were also started on antithrombotic agents by their surgeons. Communication failures on several levels were major factors in these cases—lack of communication between the anesthesiologist and surgeon, hospitalist, and/or radiologist; nurse and physician; and physician and pharmacy.

The Joint Commission National Patient Safety Goals for 2008 recognize the need to “reduce the likelihood of patient harm associated with the use of anti-coagulation therapy.”<sup>1</sup> At the same time, guidelines promote the use of postoperative deep venous thromboembolism prophylaxis. If we are to continue providing epidural postoperative analgesia, new safety measures will have to be put into place to prevent what happened to the patients in the following cases from happening to other patients.

## Case One

A 78-year-old man underwent a right total knee replacement. He had a history of mild valvular heart disease with normal systolic function. The surgery was completed at 10:53 a.m. An epidural catheter was placed at 1:50 p.m. due to ongoing complaints of pain in the post-anesthesia care unit. A dilute solution of bupivacaine and fentanyl was infused epidurally. The surgeon ordered 40 mg subQ of enoxaparin (Lovenox®) starting 18 to 24 hours after surgery and then daily. The orders also advised to hold enoxaparin 12 hours before removing the epidural catheter and two hours after epidural catheter removal.

On **postoperative day one**, the patient was doing fine and able to ambulate with the physical therapist.

By **postoperative day two** at 8 a.m., the nursing notes revealed weakness in the patient’s legs. By 2:30 p.m., he was having back pain radiating to his left hip and profound leg weakness and numbness. An anesthesiologist was called.

## Epidural Hematoma (cont'd)

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The patient complained of severe back pain and was barely able to wiggle his toes. The catheter was removed at 2:45 p.m. and a CT scan was ordered.

At 5:40 p.m., the anesthesiologist called the nurse, who read only the impression section of the CT scan, which was negative. The patient was continued on enoxaparin. Later that evening the patient continued to complain of pain and numbness and at 11:30 p.m. the on-call anesthesiologist ordered an MRI, which revealed an epidural hematoma extending from T12 to L2. Surgical decompression was performed at 2:30 a.m. and the hematoma was evacuated. However, the patient did not regain nerve function and remains totally dependent and wheelchair-bound.

### What the Experts Said:

Nearly all of the defense experts criticized the anesthesiologist for:

- 1) Not consulting with the radiologist  
*An MRI is better for identifying an epidural hematoma.*
- 2) Not reading the entire CT report  
*The body of the CT report included a comment that an MRI would be a better test to diagnose an epidural hematoma.*
- 3) Failing to return to see the patient after the CT was negative  
*The anesthesiologist should have had a next step planned or consulted with someone to determine why the patient had back pain with numbness and paralysis.*
- 4) Not ascertaining the amount of enoxaparin, time of last dose, or when enoxaparin was started before pulling the catheter  
*If the anesthesiologist had reviewed the dose and administration of the enoxaparin, he would have realized that the patient was on 30 mg twice daily (6 a.m. and 6 p.m.) and that it was too soon to pull the catheter. He also would not have authorized the next dose of enoxaparin. It turned out there was a clerical error in transcribing the surgeon's orders; so the patient received 30 mg twice daily, not the single daily dose of 40 mg the surgeon intended to prescribe.*

### Case Two

An 80-year-old woman underwent right total knee arthroplasty for knee pain. The surgery proceeded without complication and the anesthesiologist placed an epidural catheter for postoperative pain management with bupivacaine and fentanyl. Prior to surgery, the patient had been taking aspirin, which had not been discontinued. The surgeon's postoperative orders included enoxaparin 30 mg subQ bid and warfarin (Coumadin®). Later that evening, the nurses

## Epidural Hematoma (cont'd)

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noted the patient was unable to move her legs and that she was numb to T3. Four hours later, the nurses again noted loss of sensation up to L3 on the right and T5 on the left.

On **postoperative day one**, the anesthesiologist examined the patient, noted her complaint of “diffuse orthopedic pain,” restarted her ketorolac (Toradol®) and doubled her bupivacaine concentration. He signed off the patient’s postoperative care to a second anesthesiologist. Routine doses of enoxaparin and warfarin continued throughout the day. The INR was 1.2 the morning of postoperative day one.

Early on **postoperative day two**, the nurses again noted the patient could not move or feel her legs, and a telephone call to the second anesthesiologist resulted in a verbal order to discontinue the epidural bupivacaine. Later that morning, the surgeon noted the weakness as likely due to the effects of the double-strength bupivacaine epidural. The patient continued to receive both enoxaparin and warfarin. The INR was 1.6 the morning of postoperative day two.

Nurses continued to note no sensation or movement in the patient’s legs. Due to “lower thoracic pain,” the second anesthesiologist examined the patient for the first time at 3 p.m. Noting knee pain, which was at odds with the prior nursing notes, he removed the epidural catheter.

On **postoperative day three**, nurses continued to note increased back pain and no sensation below the waist. That morning the surgeon noted bilateral lower extremity paresis and numbness despite the bupivacaine being discontinued for 24 hours. The second anesthesiologist then examined the patient and noted no sensation below T8 to T10 and no motor function in the legs. Insofar as epidural anesthetic had likely worn off by then, he suspected epidural hematoma, discontinued the enoxaparin and ordered an MRI. The INR was 2.3 the morning of postoperative day three.

The MRI showed an epidural hematoma from T5 to L2. The patient was transferred for decompression laminectomy, which was unsuccessful. The result was below the waist paralysis. Nine months later the patient expired from pneumonia combined with a number of other medical problems.

### What the Experts Said:

While the experts were split as to both the placement of an epidural catheter in this patient who was to be on both enoxaparin and warfarin, as well as whether the catheter should have been removed when it was, they agreed as to these **Communication** defects in this patient’s care:

## Epidural Hematoma (cont'd)

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- 1) **Preoperative:** The first anesthesiologist and the surgeon did not devise a careful monitoring plan for a patient receiving epidural pain management, enoxaparin, and warfarin following this surgery.
- 2) **Postoperative:** Despite the medications in use, both of the anesthesiologists, the surgeon, and the nursing staff did not seem to grasp the urgency of follow-up considering the nursing notes as to severe back pain and leg numbness. Had the administration of enoxaparin and warfarin been considered, a more careful postoperative day-one examination by the first anesthesiologist may have prompted the investigation for a possible epidural hematoma as a cause for the patient's "diffuse orthopedic pain," which included back pain.
- 3) **Transfer of Care:** The second anesthesiologist did not see the patient until late on postoperative day two, despite nursing notes documenting continued pain and numbness. Had the second anesthesiologist reviewed the patient's chart more fully, he might also have done a neurological exam, at which point an MRI likely would have been ordered. Despite the postoperative day two removal of the epidural, the patient continued to have motor function problems, but these problems were not investigated until postoperative day three.

Both of the above cases had to be settled prior to trial for substantial sums of money on behalf of the physicians and hospitals.

### Risk Management Issues

In 2002, the American Society of Regional Anesthesia (ASRA) held their 2nd Consensus Conference on Neuraxial Anesthesia and Anticoagulation. The results were published a year later.<sup>2</sup> (The 3rd Consensus Conference was held in April 2007; the results have not yet been published.) Other organizations, such as the American College of Chest Physicians, have also published guidelines for thromboprophylaxis.<sup>3</sup>

The ASRA guidelines discuss postoperative initiation of low molecular weight heparin (LMWH) thromboprophylaxis and continuous epidural catheter techniques. These guidelines differentiate between twice-daily dosing and single-daily dosing of LMWH. For twice-daily dosing of LMWH, the recommendation is to administer the first dose no earlier than 24 hours post-operatively, regardless of the anesthetic technique. The guidelines recommend removing the epidural catheter at least two hours before the patient receives the first dose of twice-daily LMWH. (*This was not done in the first case because the intent of the surgeon was to order single-daily dosing of LMWH.* The clerical error in transcribing the order is likely one reason the hospital contributed

## Epidural Hematoma (cont'd)

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more to the settlement.) The guidelines with single daily dosing of LMWH allow for maintaining an epidural catheter. However, the guidelines recommend that the catheter should be removed a minimum of 10 to 12 hours after the last dose of LMWH. Subsequent doses of LMWH should occur a minimum of two hours after catheter removal. (*This is what the surgeon and anesthesiologist ordered when the epidural was placed in the first case.*)

### **What was the role of the hospital pharmacy in catching the prescription error?**

With so many different physicians (surgeons, hospitalists, pulmonologists, cardiologists, anesthesiologists, etc.) caring for one patient, the presence of an epidural catheter may be forgotten and anticoagulants may be prescribed. Ideally, the pharmacy should be another set of eyes—especially since they are dispensing the medications. There is a black box warning on Lovenox®, which highlights the risk of spinal and epidural hematomas in patients who receive neuraxial anesthesia and receive LMWH.<sup>4</sup> Should the pharmacy have alerted the physician before filling an order for twice daily enoxaparin for a patient who was also receiving an epidural infusion? The same concerns exist for newer anticoagulants such as fondaparinux (Arixtra®), a factor Xa inhibitor with a long half-life. The ASRA guidelines recommend avoiding indwelling epidural catheters in patients on fondaparinux.<sup>2</sup>

### **What was the role of the nursing staff?**

In these cases, the nurses documented increasing radicular back pain and leg weakness without understanding the significance of these classic symptoms of epidural hematoma. In both cases, they attributed the leg weakness to the epidural local anesthetic (despite the patient in the first case ambulating earlier with the same epidural solution). The nurses in both cases should have alerted the anesthesiologists earlier of the change in the patients' conditions. By the time the nurses called the anesthesiologists, even if MRIs had been ordered and epidural hematoma diagnosed, it is possible that the patients would still have been left with neurological deficits given the time that had passed since the onset of symptoms.

### **What was the role of the radiologist?**

Ideally, the anesthesiologist should have consulted with the radiologist and even a neurosurgeon before ordering an imaging study. MRI is considered the modality of choice for diagnosing epidural hematoma. Prior to MRI, myelography and CT were used to evaluate the presence of a spinal epidural hematoma. MRI is the most accurate technique to identify blood in the epidural space. If MRI is not available, then a decision should be made jointly among

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the neurosurgeon, orthopedist, and radiologist as to whether a CT, CT myelogram, or surgical exploration without a radiologic study is the best course. In the first case, the anesthesiologist was criticized by the experts for not speaking directly with the radiologist before ordering the CT scan. The radiologist could also be criticized for not calling the ordering physicians and for putting his recommendation for the MRI in the body of the scan interpretation and not in the conclusion section.

### Conclusion

We are faced with balancing the use of thromboprophylaxis with the use of neuraxial techniques for postoperative analgesia.<sup>5</sup> There is ample evidence for the benefits of spinal and epidural anesthesia in postoperative outcome.<sup>6</sup> At the same time, venous thromboembolism remains a primary cause of surgically related mortality and morbidity and warrants prophylaxis. Among historical control or placebo groups in clinical trials that used contrast venography, the prevalence of total (proximal and/or distal) deep venous thrombosis at seven to 14 days after total hip or knee arthroplasty or hip fracture surgery is reported to be 36 percent to 84 percent.<sup>3,4</sup>

We all need to heed the following black box warning for enoxaparin. As this case illustrates, all physicians also need to be alert for the possible development of an epidural hematoma and the nursing staff must be trained to watch for and alert the physicians to these complications. The pharmacy also has a role in alerting physicians when they dispense anticoagulants to patients who are receiving epidural infusions; some hospital pharmacies consult the pain service for guidance when an anticoagulant is ordered in a patient with an epidural or peripheral nerve catheter.<sup>7</sup>

LOVENOX® (enoxaparin) BLACK BOX WARNING:

#### SPINAL/EPIDURAL HEMATOMAS

“When neuraxial anesthesia (epidural/spinal anesthesia) or spinal puncture is employed, patients anticoagulated or scheduled to be anticoagulated with low-molecular-weight heparins or heparinoids for prevention of thromboembolic complications are at risk of developing an epidural or spinal hematoma, which can result in long-term or permanent paralysis.

The risk of these events is increased by the use of indwelling epidural catheters for administration of analgesia or by the concomitant use of drugs affecting hemostasis such as nonsteroidal anti inflammatory drugs (NSAIDs), platelet inhibitors, or other anticoagulants. The risk also appears to be increased by traumatic or repeated epidural or spinal puncture.

Monitor patients for signs and symptoms of neurological impairment. If neurologic compromise is noted, urgent treatment is necessary.

Consider the potential benefit versus risk before neuraxial intervention in patients anticoagulated or to be anticoagulated for thromboprophylaxis.”<sup>4</sup>

*This article has been reviewed by NORCAL.*

### References

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