CASE REPORT:

Epidural block performed in the presence of full anticoagulation.

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ABSTRACT;

INTRODUCTION; The risk for an epidural injection to cause an epidural hematoma is increased in the presence of anticoagulation therapy.

THIS CASE: A 55-year-old male underwent revision of below-knee amputation under epidural anaesthesia. The fact he was on warfarin anti-coagulation therapy was erroneously missed by the anesthesiologist, and only discovered after completion of the surgery. The INR was immediately measured as 3.54, and the Prothrombin Time (PT) was 26-seconds. The catheter was removed without correcting the coagulation. The patient recovered fully and without complication.

DISCUSSION; The exact risk of a hematoma developing with epidural anesthesia inserted in the presence of full anticoagulation is unknown. The successful outcome of this single case does however not change the standard recommendation that full anticoagulation be an absolute contraindication to epidural injection. It is hoped that the case report will contribute to the limited knowledge in this situation.

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INTRODUCTION

There is always a risk of causing a hematoma within the spinal canal when performing an epidural injection and placing epidural catheters. As the hematoma probably results from the epidural introducer needle or catheter damaging one of the epidural blood vessels, it is logical and expected that any deficiency in the clotting physiology will increase the risk to develop an epidural hematoma. Coagulopathy is a general contra-indication to doing an epidural block.

It may be believed by the clinician that for a particular patient, the risk of developing an epidural hematoma may be sufficiently small during mild clotting abnormality, such as with mild prophylactic therapy, such as small dose aspirin therapy, that the benefits of the epidural nerve block well exceed the risks. The exact levels of clotting abnormality that are unacceptable in the presence of which to perform an epidural block are not exactly known. These risks cannot be determined in prospective controlled trials for ethical reasons. Risk estimation is therefore based the information contained in case reports.

This is case report of an epidural block and catheterization that was performed in the presence of significant coagulation abnormality.

CASE REPORT

A 55-year-old male was presented for anesthesia for re-amputation and shortening of an old below knee amputation where the stump had an ulcer that would not heal. The original amputation was for tissue ischemia from arterial disease. The patient was not obese, was an active smoker, and had no known coronary or cerebral arterial disease. The patient had severe chronic obstructive airway disease that had caused an extended period of intubation and ventilation after his previous abdominal aorta repair. The patient had a poor tolerance for opiates, which tended to cause severe nausea and he was very concerned that he would experience pain. He had no drug allergies. Chronic medication consisted of anti-hypertension medications and bronchodilator medication. The special investigation done before surgery only measured the patient's hemoglobin, urea and electrolytes, and a chest X-ray. They were available to the anesthesiologist. There were no electronic medical records and the anesthesiologist had to rely solely on the information that the patient provided. The patient did not mention he was on long term warfarin anti-coagulation therapy. When the anesthesiologist phoned the laboratory for the blood test results there were no coagulation test results. The blood tests were normal. The chest X-Ray was compatible with severe chronic obstructive airway disease.

Full asepsis with scrubbing, and sterile gown and gloves were utilized for the epidural block insertion. An Arrow 17G soft-tip catheter epidural kit was used for the procedure. The skin was first infiltrated with local anesthetic to a depth of 3 cm with 2% lignocaine. The patient had no discomfort upon Tuohy introducer needle insertion. The Touhy introducer needle was inserted at the L2-3 interspace using a midline approach, with the patient in the lateral position. Much redirecting of the needle was needed as the bony interspace was very narrow. The patient had to be repositioned with the assistance of a nurse to help the patient maximally curve his lumbar spine outwards towards posterior. That widened the midline gap between the vertebral dorsal spines slightly. The anesthesiologist re-inserted the Tuohy needle in the midline. One centimeter deep to the skin the needle entered the firmer tissues of the interspinous ligament, as expected. The anesthesiologist used a saline Loss of Resistance (LOR) technique with a low-resistance syringe, and with no air in the syringe. While advancing the Tuohy needle slowly through the interspinous ligament, all the time applying soft pressure to the LOR syringe plunger, the plunger did not move. Eventually, a loss of resistance to the injection of saline was felt at a depth of 5cm from the skin. About 1.5 ml of saline was injected. The needle was presumed to have penetrated the presumed Ligamentum of Flavum. No fluid or blood flowed back spontaneously out of the rear of the needle, and no fluid or blood could be aspirated by syringe.

Next an epidural catheter was inserted but could only be advanced 2.5 cm before total resistance to further advancement was met. This was considered as sign of a failed epidural space localization, and the needle and catheter were fully removed. The skin puncture-site bled moderately.

The needle had likely done one of three things; (1) entered a false interspinous ligament cyst between the spinous processes {*figure #1*}, (2) the tip was located in the supra-flavum space {*Figure #2*}, or (3) the needle tip had exited the interspinous ligament to paravertebral and the LOR was due to the fluid being injected into the *paravertebral muscle* immediately lateral to the spinous processes {Figure #3}. All three possibilities would explain the very limited distance the catheter could be advanced out of the needle. The anesthesiologist thought the most likely possibility was that the needle direction had deviated slightly to lateral into the paravertebral space. Interspinous cysts within the interspinous ligament are occasionally found in aging patients, especially males. The cysts form from degeneration of the interspinous ligament.

Using the same vertebral interspinous space the needle was reinserted via a fresh skin puncture site few millimeters more to the one side and studiously directed directly towards anterior. A satisfactory LOR was found at a distance of 6.5cm from the skin. No fluids drained back spontaneously from the needle hub, nor with aspiration. The catheter was able to be freely advanced for 10cm beyond the introducer needle tip. That was considered affirmation that the catheter was situated in the epidural space. The catheter also did not yield any fluids, clear or bloody, upon aspiration. The catheter was then withdrawn to be only a length of 4 cm within the epidural space.

A test dose of 1.5ml 2% lignocaine with 15 microgram of added adrenaline was administered. After waiting 3 minutes no heart rate change was noted and the patient was still able to move both legs. Then the main epidural dose of 10-milliliters of 0.75% levobupivacaine, and 2ml of fentanyl (100 microgram) was injected. Within 5 minutes an epidural block height of T10 was observable, as determined by the

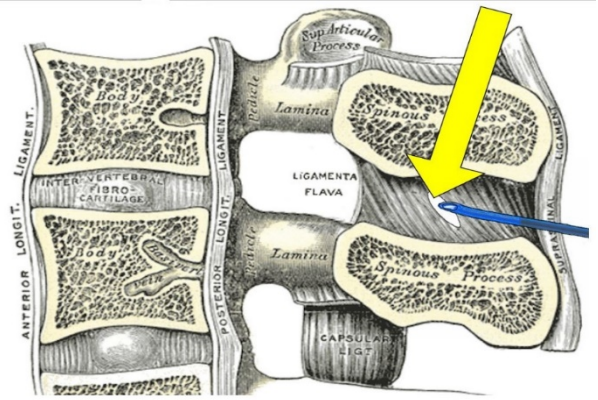

Figure @1. Interspinous ligament cyst.

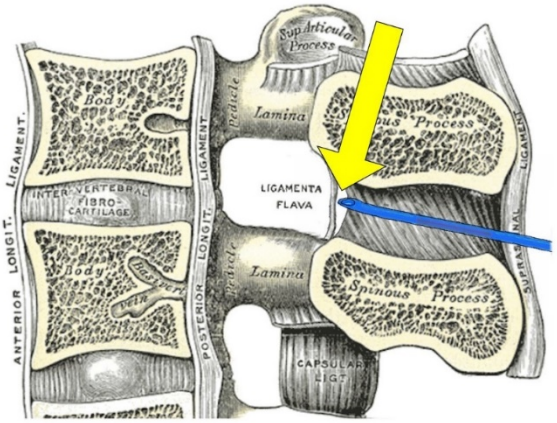

Figure #2. The supra-flavum space is an occasional perceived space where an epidural needle obtains a false sense of loss of resistance to injection 1-2mm superficial to the needle touching the ligamentum flavum.

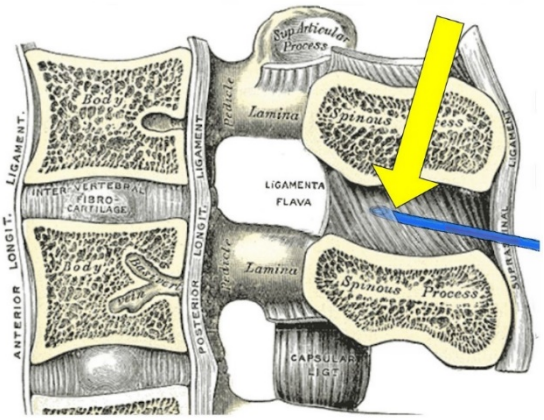

Figure #3. Epidural needle entering the paravertebral space, with a Loss of Resistance to injection of saline falsely suggesting the needle tip is in the epidural space.

demonstration of the patient's loss of skin perception for the coldness of a cube of ice. All further events were uneventful and surgery was successfully completed. During surgery the patient was very talkative and nervous and midazolam 2 mg IV was administered twice. No other sedative or drugs were injected and the below knee amputation surgery was completed under epidural anesthesia.

After completion of the surgery, it was discovered that the patient was on therapeutic doses of warfarin. An immediate INR was determined and it was 3.54 (PI 26%). That strongly contra-indicated the use of epidural anesthesia. Standard therapeutic doses of warfarin aim at achieving an INR of 2.0 to 3.0. This patients INR of 3.54 was supratherapeutic. There was strong concern that an epidural hematoma could develop. Some persons argued for removal of the epidural catheter only after normalization of the INR. The anaesthesiologist decided rather than wait and attempt to correct the TNR a few days before removing the catheter, that it would be wiser to immediately remove the epidural catheter, and abandon the intended post-surgical epidural infusion. If the INR were corrected it would take a few days thus extending the duration of risk period for development of an epidural hematoma, in addition to creating risks for arterial thrombosis which the warfarin was being used to prevent.

Motor paralysis lasted 2.5 hours after removal of the epidural catheter. Analgesia lasted 5 hours after removal of the epidural catheter. Urine bladder catheter was removed at 12 hours after surgery. The pain, once it began, was managed by nurse titrated IV morphine. The nursing assessment of analgesia efficacy was good, but the patients reported dissatisfaction with the analgesia.

The biggest concern was monitoring for signs of an epidural hematoma developing. The patient was monitored half-hourly for 12 hours, for (1) return of leg function, for onset of (2) lumbar back pain. The first voluntary toe movements, in the non-operated leg, were elicited at 2½ hours after surgery, with full leg motor strength achieved by 3½ hours after surgery. After 12 hours after surgery, monitoring intervals for signs of epidural hematoma were changed to hourly observations. After 36-hours after surgery monitoring intervals for signs of epidural hematoma were changed to 4-hourly observations. The patient was discharged at 72 hours without any complications having arisen. The plan was to do an MRI scan at any point in time that any concern arose for the patient having an epidural hematoma. Urgent spinal surgery would have followed any diagnosis of epidural hematoma.

DISCUSSION

1. **The false epidural space[1].**

Supportive signs suggesting a true epidural space has been penetrated by the epidural needle are: (i) there is a loss of resistance to injection, (ii) the needle-tip is at a depth below the skin near the expected epidural depth for the specific patient, (iii) the epidural catheter advances out of the needle-tip easily, and (iv) as the needle-tip transitioned from passing through the interspinous ligament tissues, it experienced a tightening or enhanced firmness to the needle tip as it started penetrating the ligament

flavum which then released exactly as the Loss of Resistance to injection occurred.

If the operator has been very gentle and slow in advancing the Tuohy needle, and a suspected false epidural space has been entered, because the usual subtle increased tissue stiffness of the ligamentum deep to the interspinous ligament was no felt before the LOR occurred. It is reasonable to test the midline epidural space by advancing the Tuohy needle another 5mm. If the needle-tip meets a new firmness and the LOR is obliterated, the needle tip has highly likely met the ligamentum flavum and may continue to be gently advanced. If no new resistance has been met, and the LOR persists, then regard the needle tip as being in the epidural space and proceed with catheter placement.

2. Epidural catheter in a fully anti-coagulated patient who has a critical need for anti-coagulation therapy.

This case is reported to document an event of epidural placement during a patient level of warfarin anticoagulation with an INR 3.54 value, that is generally considered unsafe for epidural catherization due to the risk of causing an epidural hematoma. This case report scenario arose from a deficient pre- anesthetic assessment of the patient. Electronic Medical Records would have revealed the overlooked critical information to the anesthesiologist.

The removal of catheters during full anticoagulation is generally not recommended. Specifically, when heparin products have been used, the timing of catheter removal is advised to take place in the middle of therapeutic trough and I -2 hours before the next dose of heparin. In this case the catheter was removed without effort to improve the coagulation.

Some epidural hematomas have been associated with difficulty of epidural needle insertion, as was in this case. In this case the first attempt at epidural needle insertion likely never reached the epidural space. It was inserted only to a depth of 5cm from the skin, whilst the epidural was discovered at 6.5cm deep from the skin. Thus, the needle was only inserted once into the epidural space with minimal trauma. possibly was not into the epidural space at all, as the catheter would not advance properly and the final satisfactory needle position was perhaps 8mm (estimated) to the side of the first needle tip position, it is possible that the epidural space had only been truly entered once and then easily.

The fact that the epidural catheter was safely removed during a supratherapeutic dosing of warfarin, is very illustrative and not previously reported. The priority of the immediate post-operative care of the patent was to obtain the earliest possible diagnosis of the presence of a compressing hematoma. That priority was served by the intense nursing monitoring of the patient. A responsible physician was phoned to report every hematoma-monitoring-result immediately. A physician did a clinical examination of the patient every hour for the first 12 hours after surgery.

The following are key observations from this case report:

- Epidural catherization in the presence of an INR of 3.54% should remain prohibited, as stated in all professional medical guidelines.
- Performing an epidural, accidentally, in the presence of an INR or 3.54, without causing an epidural hematoma is possible.
- In the event of an epidural block being, accidentally performed in the presence of the patient having an INR of 3.54, big priority must be placed on subsequent intense clinical monitoring for the earliest clinical signs of an epidural hematoma.
- In the event of an epidural block being, accidentally performed in the presence of the patient having an INR of 3.54, there are no suggestions as to whether an immediate spinal MRI examination would offer any advantages, nor as to how often the MRI should be repeated. Relying only on clinical testing for possible epidural hematoma signs seems reasonable. It is an observation that full recovery from a spinal hematoma can occur if the hematoma is evacuated within 8 to 12 hours after first clinical signs.
- The value of modern electronic medical records being available to the anesthesiologist is priceless. This case illustrates the dangers of missing patient information.
    - Regardless, a good routine before performing any neuraxial procedure would be to always ask a patient whether they use blood-thinning drugs.

It is hoped that more reports of such rare cases as this one was, with good or bad outcomes, may help clarify the absolute risk for epidural hematoma in similar situations and the best management strategies.

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[1] Sharrock NE. Recordings of, and an explanation for, false positive loss of resistance during lumbar extradural analgesia. British Journal of Anesthesia. 1979;51:253-258

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The author.

Dr. Robert M Raw MD is a physician anesthesiologist. He has 7-years of experience as a rural African general medical physician, including doing obstetrics, surgery, and anesthesia. He has two degrees in primary care medicine and emergency room medicine. He has two degrees in anesthesiology. He founded a national regional anesthesia society, worked 13 years as a private practicing anesthesiologist, followed by entering American university anesthesiology practice for 12 years becoming a full professor. He has won teaching awards twice and has lectured in many countries. At his last university he was consistently assessed as being a master clinician in his annual performance reviews.