

Case Report

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Epidural Blood Patch in a Patient Taking Enoxaparin, Following Acoustic Neuroma Resection

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Introduction

Postdural-puncture headache (PDPH) may be seen in patients after violation of the dura such as is seen with lumbar punctures for drain placement or epidural anesthetic. The leakage of cerebrospinal fluid (CSF) from the dural hole results in a decreased volume of CSF, which cushions the brain. This results in tension on the meninges leading to subsequent headaches. Conservative management involves bed rest, increased oral fluid intake, analgesic drugs and caffeine. If symptoms persist, an epidural blood patch is often considered. The epidural blood patch forms a gelatinous tamponade, which prevents further leakage of spinal fluid, allowing the dura to undergo normal healing [1].

Anticoagulated patients face additional risk from epidural hematoma, either after the initial dural violation or with the blood patch procedure itself. Lovenox (enoxaparin sodium injection) is an antithrombotic agent that falls under the class of low molecular weight heparins (LMWH). LMWHs pose a threat to the aforementioned patient population due to the increased likelihood of development of spinal epidural hematoma (SEH), a blood clot around the spinal region that can cause compression of the spinal cord and can lead to paralysis. Placement of an epidural blood patch in anticoagulated patients suffering from PDPH presents a particular conundrum because of the increased risk of developing SEH when taking enoxaparin combined with the potential that their blood will not clot or afford the clot strength required. This case report focuses on such a situation, where a patient on enoxaparin suffering from PDPH, despite conservative medical management, was administered an epidural blood patch with positive results.

Case Report

A 40-year-old, 97-kg man presented with left sided hearing loss and a history of tinnitus. Prior to surgery the patient was on active duty in the U.S. military and in good physical condition with a social tobacco history, consistent with an American Society of Anesthesiologists (ASA) Physical Status classification of ASA P2. He presented to the primary care clinic and reported initial symptoms of difficulty hearing phone conversations but denied pain. Upon workup, an MRI revealed a 2.1 x 3 cm mass consistent with acoustic neuroma with mass effect on the left middle cerebellar peduncle and pons. The patient was admitted to the neurosurgical service with plans for operative intervention to remove the tumor. After he was informed of the risks of facial nerve injury, stroke and possible deafness, the patient signed the surgical and anesthesia consent forms and chose to proceed with surgery. On the day of surgery, he was taken to operating room where he was tracheally intubated and maintained under general anesthesia utilizing total intravenous anesthesia (TIVA). At the start of the case and after careful prone positioning, a lumbar drain was placed in the subdural space by the neurosurgical team. The patient then underwent an uneventful left sub-occipital resection of the acoustic neuroma.

The patient's postoperative status was normal except for complaints of severe headache pain, consistent with PDPH. Despite the surgical success of removing the lesion safely without damage to proximal brain tissue, the first six post-op days were marred by near constant pain. Because of the persistent anorexia and nausea which minimized oral intake, aggressive intravenous hydration with scheduled caffeine boluses was instituted to assist with analgesia. As there was minimal improvement by post-operative day 3, scheduled ketorolac (IV NSAID) and morphine PCA (patient-controlled analgesia) were added to the pain control plan, but the risk of a blood patch was still felt to be too great in the face of scheduled anticoagulation. Unfortunately, prophylaxis against deep venous thrombosis (DVT) was further warranted when the patient self-imposed maximal bed-rest and refused sequential compression devices (mechanical DVT prophylaxis) on post-operative day 4. Given the aggravation of PDPH pain upon sitting or standing upright, the patient was spending the entire bed as sedentary as he could, despite counseling that this could increase his risk for DVT, pulmonary embolus (PE) and associated thrombo-embolic complications. On post-operative day 6, and with no improvement using standard therapies, the possibility of an epidural blood patch was reconsidered and discussed with the patient.

The decision was difficult, and although discussed openly it was debated noting concerns for the increased risk of spinal epidural hematoma following percutaneous neuraxial technique in a patient receiving scheduled low molecular weight heparin. Special attention was paid to possible confounders to include dose and timing of last enoxaparin administration as well as its potential to compromise the clotting ability of the patient's native whole blood. After having discussed the repercussions with the patient, he endorsed understanding of the risks, benefits and option. He expressed that the pain was severe enough for him to proceed, especially since his PDPH-related pain was refractory to conventional therapeutics.

To mitigate some of the risk associated with performing an epidural blood patch in the anti-coagulated patient, the patient was premedicated with midazolam 2 mg IV for anxiolysis and then transported to a fluoroscopy suite. The patient was then assisted as he positioned himself prone and standard physiological monitors were applied (BP cuff, pulse oximeter and EKG). After patient/procedure/site verification, the L4-5

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interspace was confirmed with fluoroscopy and was marked with a 1% lidocaine skin wheal for topicalization. For patient comfort, the target track was infiltrated with a local anesthetic as well. A 20 gauge Tuohy needle then was then advanced, using both fluoroscopic guidance and the loss of resistance technique, into the lumbar interspace to a depth of 6.5 cm. Neither CSF nor blood was observed on aspiration of the Tuohy epidural needle. Concurrently, 40 ml of blood was drawn in an aseptic manner from the patient's right arm via a 14 gauge peripheral IV catheter placed under sterile conditions. Subsequently, blood was injected into the epidural space in a slow and deliberate fashion until immediate and significant analgesic effect was reported at 29 ml injected. Within 5 minutes of a total of 30 ml delivered for the blood patch, the patient noted complete resolution of his PDPH. He reported excellent analgesic relief from the PDPH up until his hospital discharge on post-operative day 7, and his only complaint was one day of mild-moderate pain at the surgical site; felt to be unrelated to his PDPH. The epidural blood patch proved to be a successful intervention in alleviating this patient's PDPH, despite systemic anticoagulation.

Discussion

Similar to the civilian patient population, enoxaparin is a mainstay of DVT prophylaxis in the military population; especially given the likelihood of significant polytrauma often combined with prolonged in-patient hospital stays. However, it is likely that both prophylactic dosing and therapeutic dosing are frequently suboptimal in critically ill patients [2,3,4]. Explanations for this include the fall in ATIII levels concurrent with critical illness – a 20% to 40% drop in sepsis; the heparin effect which decreases ATIII levels; and the common hypercoagulopathy seen in critically ill patients (putting more “stress” on the ATIII anticoagulant pathway) with elevated fibrinogen, factor VIII and other factors [2,4]. Besides factors which cause vascular endothelial damage, critically ill patients often also demonstrate an imbalance in their pro-coagulant and anti-coagulant factors (eg- low Protein C and Protein S) thereby increasing the likelihood of thromboembolic complications [3].

This patient posed an uncertain and unusual risk, since the application of a blood patch in patients consuming anticoagulants is rarely seen. To avoid complications such as hematoma, the enoxaparin was not administered for 12 hours prior to placement of the blood patch. This method allows for a greater degree of clotting, allowing the blood patch to be highly successful, even in patients taking LMWH. The data in Table 1 depicts a subjective indication of the patient's pain rating throughout the hospitalization. Immediately after surgical removal of the neuroma, on post-op day 1 (Apr 20), the patient had a pain rating of 5 out of 10. This pain score was while the patient was reporting a severe headache, keeping the patient from standing upright. This pain-induced bedrest prompted the consideration of a blood patch even though the patient was receiving LMWH. The advantage of an epidural blood patch is the ability to see immediate and prompt results. A patient could experience very dramatic improvement in symptoms,

within a few minutes after injection. A pain rating of 0/10 was noted on Apr 26, 5 minutes after patch application. The key in this situation is to withhold the anticoagulant for a period of time and only then proceed with the patch.

Literature review suggests that use of blood patch in patients receiving LMWH therapy such as enoxaparin is not common. The consideration for this therapeutic utility is limited by a lack of data as well as practical experience. The proper duration and the appropriate INR window remain points for debate with a scarcity of evidence-based practices or guidelines. Vadivelu et al. [5] described their experiences caring for a 204 kg parturient with PDPH related to a labor epidural and a history of recurrent popliteal DVT requiring anticoagulation therapy [5]. Because the patient's discomfort hampered her ability to care for her newborn, the authors risked placing a blood patch 24 hrs after her last dose of enoxaparin 190 mg twice daily and resumed it 12 hours later. While they considered their epidural blood patch only partially successful, the patient had complete resolution of symptoms within 48 hours. A more recent case report from Yale University School of Medicine, describes the management of PDPH after lumbar puncture in a 39 year old female requiring therapeutic anticoagulation for known DVT [6]. To date, this appears to be the greatest weight based dose for a patient receiving enoxaparin and still having a successful epidural blood patch. Given the 1.3 mg/kg twice daily dose for therapeutic dosing in this patient, the authors chose to wait 30 hours after the last enoxaparin dose; roughly seven times its 4 hour half-life for anti-Xa activity [6]. While they had total relief of symptoms, this came at the cost of increased thromboembolic risk and duration at risk. Alternatively, there is no other report of a successfully blood patch in a patient receiving such a large weight-based dose of enoxaparin.

In our described scenario, the patient's enoxaparin was withheld for 12 hours, which not only lessened the risk of epidural hematoma but also allowed for more normal clotting of the blood patch. In this case, placing the blood patch led to immediate pain relief, presumably as the CSF leakage ceased. An important factor to consider in a situation such as this is the weight of the patient and the dose of the anticoagulant medication. The DVT prophylaxis dose of LMWH is administered without regard to patient weight, and this should be taken into account when determining an appropriate time for withholding the drug. Further research will be needed to determine the minimum interval for withholding LMWH in the face of clinically indicated blood patch procedures. Thromboelastograph (TEG) and functional clotting assays continue to evolve to become more meaningful in these guiding therapeutic decisions. While there can be no substitution for clinical judgment and decision-making borne of evidence based medicine, successful interventions such as these favor clinical consideration of the therapeutic utility of an epidural blood patch to treat PDPH after a thorough risk-benefit analysis and informed consent in patients requiring continuing anticoagulant therapy.

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Day	Pain Rating (Site)
Pre-Op / Day of Surgery-1	0/10 (N/A)
Post-Op Day 1	5-10/10 (PDPH)
Post-Op Day 2	2-7/10 (PDPH)
Post-Op Day 4	2-5/10 (PDPH)
Post-Op Day 6	3-7/10 (PDPH)
Post-Op Day 7	0/10 (N/A)
Post-Op Day 8	0/10 (N/A)
Discharge	0/10 (N/A)

Table 1: Pain Rating vs. Time - Comparative Values.

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