

Epidural Catheters, Anticoagulation and the risk of Spinal Hematoma: A Review of Literature

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Abstract

Anticoagulation and epidural catheters have always been a problematic issue. While being a very common application in orthopedic surgery, puncture of epidural vessels during catheter placement occurs during 3–12% of attempts¹. Spinal hematoma causing neurological damage is rare but has devastating complications leading to irreversible paraplegia if immediate actions are not taken. In this concise review of literature, we try to provide you some information, that stands to be very useful in the practice of orthopedic surgery and to avoid the complication of spinal hematoma with the use of epidural catheters.

INCIDENCE

Incidence of clinically apparent epidural hematoma is unknown², due to the lack of case reporting on one side, and the huge number of patients needed to be enrolled in this kind of studies on the other. However, its occurrence may be increasing with the increasing use of anticoagulation, the use of spinal anesthesia and epidural catheter insertion for post operative pain management. There have been some interesting case reports of epidural hematoma after epidural catheter insertion or even removal, like the recently published case report of Sokratis et al.³ where the authors describe an epidural hematoma secondary to removal of an epidural catheter after a total knee replacement. Vandermeulen and colleagues combined 18 studies involving 200 000 patients who received epidural analgesia and found no incidence of epidural hematoma⁴. In another study done by Stafford, that grouped 13 case series and involved around 850 000 epidurals, found only three cases of epidural hematoma (0.0004%)⁵. At the other extreme, three cases of epidural hematoma were reported by Dahlgren et al. after 9232 (0.03%) epidural insertions⁶, and an even higher incidence, of two cases out of 1014 (0.2%) insertions, has also been reported by Scott et al.⁷ An overall estimation of spinal hematoma after epidural analgesia was given by Tryba et al. and showed to be 1:150 000 at the upper 95% confidence interval⁸.

RISK FACTORS

Case reports of spinal hematoma due to indwelling epidural

catheters contributed to the establishment of potential risk factors. However spinal hematoma after epidural catheter insertion may happen without any evident risk factor and no anticoagulation⁹. Risk factors like hemostatic abnormalities and/or anticoagulation, in particular the timing of catheter insertion and removal in relation to the administration of anticoagulants seems to be very important. In 61 cases of spinal hematoma associated with epidural or spinal anesthesia, 42 (68%) of them had evidence of hemostatic abnormalities (altered PT, PTT, INR or platelet count): 30 had received heparin and 12 had evidence of coagulopathy or were treated with antiplatelet agents, thrombolytic drugs or anticoagulants⁴. Forty-six of these had undergone epidural anesthesia, 32 with the use of an epidural catheter. In nearly 50% of the 32 patients, the spinal hematoma occurred immediately after removal of the catheter, nine being removed when heparin concentrations were therapeutic. This demonstrates that development of a hematoma is not just related to insertion but also and of equal importance to removal of the epidural catheter as the case report described recently by Sokratis³. Overall, 87% of epidural hematomas were related to some haemostatic abnormality or procedure difficulty. However, some studies done on anticoagulated patients with neuroaxial blockade described no cases of spinal hematoma.

SPECIFIC ANTICOAGULATION DRUGS

Low Molecular Weight Heparin (LMWH) as routine thromboembolic prophylaxis is widely used in orthopedic

surgery. This increased the risk of spinal hematoma and its use with epidural catheters is problematic for some.¹⁰ In their review, Horlocker and Wedel¹¹ made some recommendations concerning specific anticoagulants. It is relatively safe to insert an epidural catheter if the patient is receiving antiplatelet medication like aspirin; this is supported by several large studies.^{12,13} Also no increased incidence of bloody tap was observed during epidural insertion in 1000 patients on antiplatelet medication.¹⁴ Catheter placement/removal should not be performed in fully anticoagulated patients. Epidural insertion is relatively safe, if low-dose warfarin (3–5 mg day) is started after catheter insertion, as showed by a study done by Horlocker on 192 patients.¹⁵ An international normalized ratio (INR) of <1.4 at the time of catheter removal resulted in no cases of spinal hematoma in a study done on 459 patients by Wu CL et al.¹⁶ Low-dose subcutaneous heparin in combination with epidural analgesia is relatively safe. Three cases of spinal hematoma are described in the literature and none in a review of more than 5000 patients.¹ At least 45 cases of spinal hematoma have been reported in the USA with neuraxial anaesthesia under LMWH prophylaxis.¹⁷ The abovementioned cases were probably related to intraoperative or early postoperative administration, a twice-daily dosing schedule and concomitant antiplatelet therapy in the USA. The worst incidence of spinal hematoma has been estimated at 1 in 3100 cases with continuous epidural analgesia under LMWH cover in the USA.¹⁸ New recommendations follow the European guidelines, recommending 24-hourly dosing and a 12-h interval between LMWH injection and insertion or removal of the catheter. Nevertheless, once-daily dosing of LMWH is the primary mode of thromboprophylaxis following total joint replacement in Sweden. The one in 3,600 risk of spinal hematoma for women undergoing total knee replacement is similar to that calculated for the twice-daily dosing LMWH regimen in North America. This suggests that the European LMWH dosing schedule may not be as safe as previously considered.¹⁹ Another study done by Douketis compared the anticoagulant effect at the time of epidural catheter removal in patients receiving twice-daily or once-daily low molecular weight heparin and continuous epidural analgesia after orthopedic surgery.²⁰ showed that all 25 patients who received once-daily LMWH had an anti-Xa heparin level <0.10 U/ml at the time of catheter removal, and of 25 patients who received twice-daily LMWH, the anti-Xa heparin level at the time of catheter removal was 0.20 U/ml in 5 patients (P = 0.050), and 0.10 U/ml in 7 patients (P =

0.009). The study concluded that in patients who are receiving co-administered LMWH and continuous epidural analgesia after orthopedic surgery, twice-daily but not once-daily LMWH administration is more likely to be associated with a clinically important anticoagulant effect at the time of epidural catheter removal. The disadvantage of LMWH compared to Heparine and Warfarin in the case of spinal hematoma remains that the coagulating effect of Heparine and Warfarin may be reversed by the following antidotes, consecutively: protamine sulfate and vitamin K.

CONCLUSION

While anticoagulants are a must in orthopaedic surgery and considered safe to use during epidural analgesia, special attention and care to epidural hematoma should be given. Any signs or symptoms suggesting spinal cord compression, immediate action should be taken to decompress the spinal canal and this diagnosis of epidural or spinal hematoma should be kept in mind in the differential diagnosis while using epidural catheters and anticoagulation. To note that dural puncture, direct trauma to the spinal cord, transient neuropathy and infection are also common complications among others of epidural catheters but are not the subject of this work.

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