Epidural haematoma after removal of an epidural catheter in a patient receiving high-dose enoxaparin†

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A patient developed an epidural haematoma 6 days after removal of an epidural catheter resulting in paraplegia and death. Insertion and removal of the epidural catheter during anticoagulation with prophylactic unfractionated heparin and subsequent administration of high-dose enoxaparin (Clexane), which commenced 3 days after catheter removal, were implicated.

Case report

A 70-kg, 82-yr-old man presented for anterior resection for rectal adenocarcinoma. He had two previous myocardial infarctions, chronic stable angina, moderate chronic airway limitation and peripheral vascular disease. He was a former smoker and had poor exercise tolerance. Lung spirometry showed a forced expiratory volume in 1 s of 1.95 litre (84% predicted) and forced vital capacity of 2.86 litre (92% predicted). An echocardiogram showed mild cardiomegaly and inferior hypokinesia. Preoperative medications were nitroglycerin skin patches and bronchodilators. Unfractionated heparin 5000 u., s.c. twice daily, was started and calf compression stockings were applied on the morning of surgery which was conducted under isoflurane–nitrous oxide–oxygen, opioid and neuromuscular block anaesthesia. An epidural catheter was not inserted before operation as this was not the anaesthetist’s practice for this operation (not one of the authors).

After uneventful surgery on day 0, the patient was electively transferred to the intensive therapy unit (ITU) for mechanical pulmonary ventilation because of concerns of possible inadequate postoperative respiratory function. A continuous i.v. morphine infusion was commenced but analgesia was inadequate despite infusion rates of 3–5 mg h⁻¹. Weaning from mechanical ventilation on day 1 was extremely difficult because of inadequate analgesia, opioid-induced respiratory depression and poor compliance with pulmonary physiotherapy. On day 1, 7 h after administration of unfractionated heparin and 5 h before the next dose of unfractionated heparin, a thoracic epidural catheter was inserted at the T8–9 interspace with the patient sedated. The epidural space was identified using the loss of resistance to air method, after two passes with a 16-gauge Tuohy needle. Blood was not detected during the procedure. Platelet count, prothrombin time (PT) and activated partial thromboplastin time (APTT) were normal. Epidural infusion of 0.125% bupivacaine–fentanyl 5 µg ml⁻¹ at 8–12 ml h⁻¹ was commenced and i.v. morphine infusion was ceased. On day 2, the patient was weaned successfully from mechanical ventilation, the trachea was extubated and he was discharged to the general ward.

Between days 2 and 5, the patient had effective epidural analgesia with no adverse effects and was reviewed daily by the acute pain program staff. On day 5, the epidural catheter was removed 3 h after the morning dose of unfractionated heparin. Days 5–8 were uneventful, and the patient was able to ambulate with assistance. On day 8, the patient complained of pleuritic chest pain and a clinical diagnosis of pulmonary embolism was made, although there was no evidence of deep venous thrombosis. Enoxaparin 60 mg s.c. twice daily was commenced, replacing unfractionated heparin. A venous Duplex scan performed the next day revealed soleal sinusoidal and tibial vein thrombi, and pulmonary embolism was reported as an intermediate possibility on ventilation–perfusion lung scan. No neurological deficits were reported at this time.

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In the early hours of day 11, the patient complained of sudden severe back and interscapular pain. No obvious cause was found at the initial examination by the ward resident. However, flaccid paraplegia with a sensory deficit to T4 was discovered 7 h later (6 days after removal of the epidural catheter). An urgent MRI scan revealed a T4–L1 epidural haematoma with mixed signal intensities corresponding to haematoma components of varying age. Enoxaparin was discontinued immediately. PT, APTT and platelet counts were normal but measurements of anti-factors Xa and IIa activity were not performed at any stage. Because of the patient’s poor medical condition and the profound nature and extent of his neurological deficit, the decision was made not to proceed to surgical decompression of the haematoma. The patient died of respiratory failure 3 days later. Permission for a post-mortem examination could not be obtained.

Discussion

The risks and benefits of epidural analgesia and anaesthesia in conjunction with prophylactic anticoagulation have been reviewed.1 The alert from the North American Food and Drug Administration (FDA) citing 30 safety reports of epidural or spinal haematoma associated with enoxaparin since the release of the drug in May 19932 has also fostered much discussion. An additional 20 safety reports were received by the FDA by April 1998. The proposed causes for epidural haematoma in this alert included both insertion and removal of epidural catheters in the presence of enoxaparin. In this patient, removal of the epidural catheter 3 h after a dose of unfractionated heparin on day 5 and the unmonitored use of high-dose enoxaparin were implicated.

The epidural haematoma was reported to have hyperintense signal components consistent with a haematoma of up to 7 days old (subacute haematoma) and also iso-intense signal components consistent with a haematoma of less than 24 h old (acute haematoma). It is possible that the haematoma was developing continuously, but it is more likely that two discrete bleeding episodes occurred. The initial episode was asymptomatic or may have been the cause of the patient’s thoracic pain on day 8. The second more acute episode resulted in paraplegia. The episode of sudden back and interscapular pain and the rapid change in neurological function over the course of less than 24 h could not be explained by a haematoma developing slowly over 6 days. Insertion of the catheter on day 1 and removal 3 h after a dose of unfractionated heparin on day 5 may have been responsible for the initial subacute haematoma. Horlocker and Heit1 recommended avoidance of needle placement or catheter removal within 4 h of administration of unfractionated heparin. Later removal of the epidural catheter might have prevented the subacute haematoma, which ultimately may have prevented paraplegia. At present, there is no evidence that this would have reduced the incidence of epidural haematoma during anticoagulation. However, attention to the timing of insertion and removal of epidural catheters in anticoagulated patients would be prudent clinical practice. Such procedures are now in place in our institution.

The use of high-dose enoxaparin (0.8 mg kg\(^{-1}\) twice daily) without monitoring the anticoagulant effect is a concern raised by this case. Several authors have suggested that low molecular weight heparin (LMWH) may have a dose-dependant bleeding potential.3 4 It is interesting to note that in North America the approved dose of enoxaparin is 30 mg twice daily while in Europe a 40-mg single daily dose is used.5 The higher dose used in North America may have contributed to the apparent increase in anticoagulant-related epidural haematoma.6 The acute haematoma causing paraplegia in this patient may have been caused by spontaneous bleeding from recently traumatized epidural blood vessels in the presence of high-dose enoxaparin. That this may occur 6 days after epidural catheter removal is of concern. It is possible that high-dose enoxaparin might not have resulted in paraplegia had the epidural catheter not been inserted in the first place. The duration of vessel fragility and propensity to re-bleed under these circumstances are unknown. There are no other reported cases of epidural haematoma occurring as a result of high-dose enoxaparin or any other LMWH commencing after epidural catheter removal.

The use of low-dose LMWH does not usually require monitoring of the anticoagulant effect because of the predictability of its effect. However, the use of high-dose LMWH in elderly patients with multi-system disease probably requires laboratory monitoring because it may be incorrect to extrapolate the effects of low-dose LMWH to high dose in these patients. It is interesting to note that the majority of FDA safety reports were in patients more than 75 yr of age. Unfortunately, there is no simple and inexpensive laboratory test for the effects of LMWH on anti-Xa and anti-IIa activity. In addition, we cannot be certain that measurements of anti-Xa and IIa would have prevented paraplegia in this patient.

Early diagnosis of an epidural haematoma after initial symptoms and early surgery might have improved this patient’s outcome.7 8 Unfortunately, the symptoms reported by this patient in the early hours of day 11 were thought to be caused by further pulmonary embolism, and the possibility of acute spinal canal pathology was not considered until the discovery of paraplegia 7 h later. An important implication of this case is that patients who are anticoagulated for longer than the period of epidural catheterization should be monitored for neurological deficits, at least for the duration of anticoagulation.

References

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