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Retrospective analysis of the incidence of epidural haematoma in patients with epidural catheters and abnormal coagulation parameters

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Editor's key points

- Obtaining accurate data on rare but severe complications of regional anaesthesia can be difficult.
- This large retrospective study focused on epidural haemtomas occurring in patients with abnormal coagulation.
- The presence of abnormal coagulation did increase epidural haematomas, but not to 100%.
- A careful risk assessment should take into account individual factors before deciding on regional anaesthesia.

Background. Epidural haematoma is a rare but potentially catastrophic complication associated with epidural catheterization. The times of insertion and removal of epidural catheters are high-risk periods for epidural haematoma formation, especially with abnormal coagulation parameters. There is a lack of data on the incidence of epidural haematoma in patients with abnormal coagulation parameters.

Methods. A retrospective analysis was undertaken from 2002 to 2009 on patients with an epidural catheter. Queries were performed on the coagulation parameters for the dates of placement and removal of the catheters and on all documented epidural haematoma cases.

Results. During the study period, 11 600 epidural catheters were placed. In the setting of abnormal coagulation parameters, 278 (2.4%) epidural catheters were placed and 351 (3%) were removed. Two epidural haematomas occurred; both patients had epidural catheters and spinal drains placed for vascular procedures with abnormal coagulation parameters after operatation. The haematomas occurred after removal of the catheters. Based on our study, the incidence of epidural haematoma in patients with abnormal coagulation parameters is 1 in 315 patients, with the lower limit of the 95% confidence interval at 87 and the upper limit at 2597.

Conclusions. The risk of epidural haematoma is clearly elevated with abnormal coagulation parameters. Our data suggest that as the incidence of epidural haematoma with neuraxial access in patients with abnormal coagulation is not 100%, individual risk–benefit evaluations are warranted.

Keywords: anticoagulant; epidural analgesia; international normalized ratio; partial thromboplastin time; spinal epidural haematoma

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Epidural haematoma is a rare but potentially catastrophic complication associated with epidural catheter placement and removal.[1] The incidence of epidural haematoma in the setting of epidural catheter placement or removal is reported to be as low as 0.00055 and 0.00008%.[1 2] However, other more recent studies have reported a higher incidence, from 0.01 to 0.03%.[3–5]

Coagulopathy either from the use of anticoagulant, antiplatelet, or thrombolytic medications or from underlying medical conditions is considered one of the major risk factors of epidural haematoma formation related to epidural catheter placement or removal.

The American Society of Regional Anesthesia (ASRA) guidelines recommend checking a coagulation panel before placing and removing epidural catheters in patients at risk for abnormal coagulation panels.[5] There is controversy in the literature on the real risk of bleeding in patients with abnormal coagulation parameters.[6 7]

Clinicians are often faced with assessing benefits and risks for a patient who develops abnormal coagulation parameters while an epidural catheter is *in situ*. There are risks for certain patient populations with aggressive correction of coagulation abnormalities. In addition, recent literature has raised doubts about the benefits of prophylactic correction of coagulation abnormalities in reducing bleeding risk with invasive procedures.[8 9]

The times of insertion and removal of epidural catheters are high-risk periods for epidural haematoma formation. It is recommended that placement and removal of epidural catheters occur with normal coagulation parameters.[5] Previous studies have provided data on the overall incidence of epidural haematomas per number of epidurals performed. In order to estimate accurately the risk of epidural catheter

placement or removal in patients with abnormal coagulation parameters, it is important to understand the incidence of haematoma in patients who had epidural catheters placed or removed with abnormal coagulation parameters.

We hypothesize that all patients with abnormal coagulation parameters who have epidurals placed or removed do not develop epidural haematoma. There is a paucity of data on what percentage of patients with abnormal coagulation parameters will develop epidural haematoma. Our study aims to provide a more appropriate denominator when assessing risk in patients with abnormal coagulation parameters.

Methods

Definition of abnormal coagulation parameters

Based primarily on the ASRA guidelines[10] and our laboratory's normal value range, the following were considered abnormal for the purpose of this study: partial thromboplastin time (PTT) >35 s, an international normalized ratio (INR) ≥ 1.5, and a platelet count $<100{,}000$ ml^{-1}. Patients who had any one of these three coagulation parameters in the abnormal range were included in the study.

Definition of cohort

After receiving approval from the Institutional Review Board, our cohort consisted of all patients from 2002 to 2009 with abnormal coagulation parameters at the time of epidural placement or removal.

Data analysis

A retrospective data analysis was conducted on 11 600 patients who received epidurals from 2002 to 2009 for postoperative analgesia. We reviewed the last documented coagulation tests for patients within a 12 h period prior to the placement or removal of an epidural catheter. We then formed our cohort of 629 patients by selecting patients with abnormal coagulation parameters during epidural catheter placement or removal. Validation of the data was performed by reviewing the abnormal laboratory values and the temporal relationship with regard to epidural placement and removal in individual patient records.

We identified patients with abnormal coagulation parameters who were on antiplatelet and/or anticoagulation medications at the time of epidural placement or removal. Our Quality and Safety database was then queried for all documented epidural haematoma cases from 2002 to 2009.

Given that both patients in our study who developed epidural haematoma underwent vascular surgery, we also queried the percentage of vascular surgical patients among those with abnormal coagulation parameters.

Statistical methods

The statistical results reported in this article were calculated using Exact binomial 95% confidence interval (CI) in SAS Version 9.2 (SAS Institute Inc., Cary, NC, USA).

Results

Between 2002 and 2009, a total of 11 600 epidural catheters were placed for postoperative analgesia at the Massachusetts General Hospital. On average, the epidural catheters were maintained for 2.5 days (range 0–6 days). Of all epidural catheters, 5.4% ($n=629$; 95% CI 5.0–5.9%) were either inserted or removed in the setting of abnormal coagulation parameters. Of these, 44.2% ($n=278$; 95% CI 40.3–48.2%) of epidural catheters were placed and 55.8% ($n=351$; 95% CI 51.8–59.7%) were removed with abnormal coagulation parameters. The average age of the 629 patients with abnormal coagulation parameters was 66.97 yrs (variance 1.15 yrs). All of the 278 patients with abnormal coagulation parameters were on anticoagulant therapy at the time of catheter placement. Of the 351 patients with abnormal coagulation parameters at the time of removal, 170 were on anticoagulant therapy (Table 1).

The average of abnormal coagulation values were as follows: INR 1.69 (range 1.5–4.4), platelet count 82 760 ml^{-1} (range 22 000–99 000), and PTT 43.82 s (range 35.1–84.4) (Fig. 1).

Two epidural haematomas occurred in the study period. Both patients had epidural catheters and spinal drains placed for open abdominal aortic aneurysm repairs, with abnormal coagulation parameters postoperatively. The haematomas occurred after removal of the catheters. Of the patients who developed epidural haematoma, both had abnormal coagulation values at the time of removal. One patient had abnormal PTT and INR and multiple attempts at spinal drain placement for spinal cord ischaemia. The other patient was started on dalteparin after surgery in addition to warfarin as a result of a

Table 1 Medications

Medication	Number of patients		
	Placement	Removal	Total
Aspirin	24	45	69
Clopidogrel	1	1	2
Heparin s.c.	188	62	250
Dalteparin	7	8	15
Warfarin	6	20	26
Fondaparinux	1	5	6
Low-molecular weight heparin	1	8	9
Aspirin + heparin s.c.	46	11	57
Aspirin + warfarin	0	1	1
Aspirin + clopidogrel	0	2	2
Aspirin + fondaparinux	0	2	2
Aspirin + dalteparin + heparin s.c.	1	0	1
Warfarin + heparin s.c.	1	0	1
Warfarin + dalteparin	0	3	3
Warfarin + low-molecular weight heparin	0	1	1
Dalteparin + heparin s.c.	2	1	3
Total	278	170	448