Detection and management of epidural haematomas related to anaesthesia in the UK: a national survey of current practice

J. Meikle1, S. Bird1, J. J. Nightingale2* and N. White3

1Department of Anaesthesia, Basingstoke and North Hampshire Foundation Trust, Aldermaston Road, Basingstoke RG24 9NA, UK. 2Department of Anaesthesia, Queen Alexandra Hospital, Cosham, Portsmouth PO6 3LY, UK. 3Department of Anaesthesia, Royal Bournemouth Hospital, Castle Lane East, Bournemouth BH7 7DW, UK

*Corresponding author. E-mail: jeremy.nightingale@porthosp.nhs.uk

Background. Epidural haematoma is a rare, but potentially disastrous complication of epidural analgesia. Favourable neurological outcome depends upon early recognition and surgical decompression; therefore, the management of epidural analgesia should include a systematic approach to recognition of the signs of epidural haematoma.

Methods. We conducted a national postal survey of the policies and protocols used by acute pain services for investigating clinical signs suggestive of epidural haematoma, and the availability of urgent MRI scans. This was a repeat of a survey that was carried out in 2001, but not published.

Results. The response rate was 84%. Of the acute pain services that responded, 99% have a written protocol for running epidural infusions, 91% include regular assessment of sensory and motor function, and 55% have a written protocol for the investigation of abnormal motor block. On-site 24 h access to MRI scanning facilities was available to 57%, 33% have arrangements with another hospital, and 10% do not have 24 h access to MRI. Thirty per cent of respondents knew of an epidural haematoma related to epidural analgesia in their hospital, one-third of which were not diagnosed and treated within 24 h.

Conclusions. Improvements in monitoring have occurred over the last 5 yr, but observations of neurological function are not routine in all units, and are not continued after removal of the epidural catheter in the majority. The authors suggest that acute pain services should be responsible for protocols for the investigation and treatment of epidural haematomas.

Br J Anaesth 2008; 101: 400–4

Keywords: anaesthetic techniques, epidural; analgesia, postoperative; analgesic techniques, epidural; complications, haematoma; complications, neurological

Accepted for publication: May 4, 2008

Epidural infusions are used routinely for analgesia after operation and during labour. The recently published national census of central neuraxial block in the UK, which reported the snapshot phase of the Third National Audit Project of the Royal College of Anaesthetists,1 found that a total of 3839 epidurals, excluding caudals, and 657 combined spinal and epidurals were performed for postoperative analgesia in adults and children over a 2 week period. Applying the multiplier of 25 used by the census, the authors suggest that approximately 112 400 epidurals may be performed annually for postoperative analgesia in the UK. The survey does not distinguish between epidural catheter insertion and ‘single-shot’ epidurals, so the rate of catheter insertion may be lower, but it is reasonable to assume that the majority of these procedures involve insertion of an epidural catheter. This correlates with our estimate obtained by extrapolating from our acute pain service audit data. Approximately 900 epidural catheters are sited annually for postoperative analgesia in Portsmouth, which serves a population of approximately 580 000—roughly 1% of the national population, so assuming other institutions have a similar epidural rate to our own, the number

†This article is accompanied by Editorial I.
of epidural catheters sited annually for postoperative analgesia in the UK would be of the order of 90 000.

The quoted incidence of epidural haematomas is around 1:190 000,2 but this is likely to be an underestimate as it is based on cases reported in the literature. This would suggest a likely incidence of one epidural haematoma every 2 yr related to epidurals used for postoperative analgesia in the UK. Although rare, the consequences of an epidural haematoma can be devastating, especially if not detected and treated rapidly.

Seven years ago, an epidural haematoma occurred in our hospital. Both detection and treatment were delayed. In response to this, we revised the protocol for investigation of abnormal motor block and, as MRI was not routinely available outside normal working hours in our hospital, made arrangements with the regional neurosurgery unit for MRI to be performed when indicated by our acute pain service protocol. We subsequently undertook, but did not publish, a national postal survey to assess how and where patients with epidural infusions were monitored in other hospitals, and what arrangements were in place for the investigation and management of epidural haematomas.

The results of this survey showed that regular checks of sensory and motor function did not occur in all hospitals and that fewer than one-third of acute pain services continued checks after the epidural had been removed. Only 43% had access to MRI scanning in their hospital. Many of those without direct MRI access used MRI scanners in non-neurosurgical units, increasing treatment delay if the results were positive. Thus, 6 yr later, we have repeated the survey to elicit current practice and to determine whether practice in this area had changed.

Methods

We obtained a list of all anaesthetic departments in the UK from the Royal College of Anaesthetists and obtaining the addresses of the 301 departments registered as having College Tutors. We sent a numbered questionnaire (Appendix 1) to each of these departments, addressed to a member of the acute pain service. A covering letter explained that data collected would be made anonymous and be non-attributable. After 12 weeks, we re-sent the survey to elicit current practice and to determine whether practice in this area had changed.

Results

Three hundred and one questionnaires were sent out, and 254 replies were returned—a response rate of 84%. Ten hospitals which had no acute pain team returned uncompleted questionnaires. All but two hospitals ran postoperative epidurals. Thus, completed replies were received from 242 hospitals where postoperative epidural infusions were in use, and this figure is used as the denominator for calculating percentages, which are rounded to the nearest integer.

Table 1: Acute pain service protocols

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have a written protocol for running postoperative epidural infusions?</td>
<td>236</td>
<td>12</td>
</tr>
<tr>
<td>Does this include regular assessment of sensory level and motor function?</td>
<td>197</td>
<td>39</td>
</tr>
<tr>
<td>Are observations made at least 4 hourly?</td>
<td>177</td>
<td>20</td>
</tr>
<tr>
<td>Do observations continue after the epidural is removed?</td>
<td>73</td>
<td>124</td>
</tr>
<tr>
<td>Do they continue for more than 12 h?</td>
<td>16</td>
<td>57</td>
</tr>
</tbody>
</table>

Epidural infusions are managed on normal wards in 222 units (92%), and the remaining 20 units (8%) run them only on a high dependency facility. These results show a change in practice from 2001 when only 80% of units managed epidurals on surgical wards. Written protocols for running postoperative epidural infusions were in place in 239 units (99%), compared with 95% in 2001 (Table 1).

Epidural observations

Two hundred and twenty units (91%) make regular assessment of sensory level and motor function (84% in 2001), with the remaining 20 not making assessments (Table 1). In 189 units (78%), these observations are made at least 4 hourly (six respondents did not answer this question). One hundred and seven units (44%) continue to monitor sensory and motor function after epidural catheters are removed (29% in 2001), and 30 units (12%) monitor for more than 12 h after removal.

In 2001, only 31 units (13%) had a written protocol for the investigation of a suspected epidural haematoma. In 2007, we asked more specifically about the existence of a protocol for the investigation of abnormal motor block, and 129 (53%) confirmed such a protocol was in place. When an epidural haematoma is suspected, a consultant anaesthetist is solely (49%) or jointly (34%) responsible for instigating investigation in 202 units, leaving 40 units (17%) in which responsibility is not taken by a consultant anaesthetist.

Access to MRI scans

Six years ago, 43% of units had 24 h access to an MRI scanner, compared with 136 (57%) now, but 100 do not, and six did not answer this question (Table 2). Of the 100 units which do not have in-house access to a scanner, 81 have access to an MRI in another hospital and 19 do not have 24 h access. One hundred and twenty-six units (52%) have a specific agreement with their radiologists to allow 24 h access to MRI scanning for suspected haematomas.
and 116 either do not (75) or did not answer. Forty-seven units (19%) have agreed an investigation and treatment protocol with their local neurosurgical or spinal unit, 187 (77%) do not, and 11 did not answer this question.

**Epidural haematomas**

Seventy-two (30%) of the respondents were aware of an epidural haematoma that had occurred in their hospital at some time. The figure 6 yr previously was 32 (13%). This suggests that our estimate of one epidural haematoma per 2 yr occurring in the UK may indeed be an underestimate. In 48 of 72 cases of epidural haematoma, the diagnosis, investigation, and treatment were achieved in 24 h, but in 24 cases (33%), this was not achieved. Reasons for delay reported in the current survey were: delay in picking up the clinical signs (20 cases), lack of MRI availability (two cases), and delays in transfer to other units (two cases). In comparison, in 2001, 10 out of 32 cases (31%) were not managed within 24 h.

**Discussion**

Epidural haematomas after the use of epidural analgesia are mercifully rare. However, in our study, 72 respondents were aware of an epidural haematoma having occurred in their unit, an increase of 40 over the last 6 yr. The forthcoming publication of the second stage of the Royal College of Anaesthetists Third National Audit project may provide more information about the incidence of epidural haematomas.

Classically, epidural haematomas cause radicular pain, motor impairment, sensory loss, and urinary retention. Patients with epidural infusions are usually catheterized and have some sensory deficit, so these clinical signs may not be helpful in detecting problems. When related to epidural anaesthesia, not all haematomas are painful. In a review of 61 epidural haematomas related to central neuraxial block, pain was the presenting complaint in only 38% of cases. The most reliable sign of a developing haematoma in a patient with an epidural infusion is the development of motor block, and this should therefore be checked for regularly. The literature also suggests that motor block is the most sensitive prognostic indicator. The Frankel scale for assessing spinal injury and its subsequent modification by the American Spinal Injury Association uses motor function as the principle variable assessed (Appendix 2). This is the scoring system used in the two largest studies relating outcome from epidural haematomas to the severity of neurological deficit. Our survey revealed that there are still some units where regular checks of motor and sensory block are not made, although this has improved a little compared with 6 yr ago. The authors agree with Christie and McCabe that it is vital that motor function be assessed regularly in all patients with epidural analgesia.

Epidural haematoma related to an epidural catheter may occur at any time after insertion, including after removal. A review reported that 50% of haematomas relating to epidural catheters occurred after their removal. There have been several case reports of haematomas occurring more than 12 h after catheter removal. It is of concern that only 44% of units continue epidural block assessments after removal of the catheter, and only 12% of units continue these assessments for more than 12 h. The authors believe that observations should be continued for 24 h after removal of the catheter.

The definitive treatment of an epidural haematoma is surgical decompression by laminectomy. The factors that determine outcome are the severity of the neurological deficit at presentation and the time from presentation to surgery. If surgery is carried out within 12 h of the onset of symptoms, recovery rates are better than 60%, but if surgery takes place more than 24 h after the presentation of symptoms, recovery rates drop to about 10%. This demonstrates the importance of regular assessment of patients’ motor function both while the catheter is in place and after it is removed. We feel that the referral path for patients with signs suggestive of epidural haematoma, particularly motor block, should be clearly delineated, preferably involving a consultant anaesthetist, in order to avoid delays in the instigation of appropriate investigations and treatment.

The investigation of choice for a suspected epidural haematoma is an MRI scan. Our study showed that 56% of units had 24 h access to an MRI in their hospital, an increase of 25% over 6 yr. Twenty-four units did not have any access to MRI scanning. Most of the units without MRI scanners have access to a scanner in another hospital. However, if this is not the hospital that can offer decompression, then a positive result will need a second transfer to a neurosurgical or spinal unit. As time between diagnosis and treatment is critical, introducing another transfer
Epidural haematomas are not common and early detection and treatment can make a profound difference to outcome. Therefore, the authors believe that it is necessary to have protocols for the management of suspected cases, covering assessment of motor and sensory function, access to MRI scanning, and referral to a neurosurgical unit. To make the comparison with malignant hyperpyrexia, which is similarly rare (1:40 000 patients), there are widely adopted protocols for its management. We believe that the same practice should be used for epidural haematomas. After reviewing the literature and examining practice, we propose that a protocol for the diagnosis, investigation, and management of epidural haematomas should include the following elements:

(i) Patients with epidural infusions running should have observations that include assessment of motor block made at least every 4 h.
(ii) These observations should continue for at least 24 h after removal of the epidural catheter.
(iii) There should be a designated person responsible for investigating signs suggestive of epidural haematoma.
(iv) If significant deterioration in motor function occurs in the absence of a recent bolus dose of local anaesthetic being administered, the designated person should be contacted immediately.
(v) If motor block is attributed to a recent bolus dose of epidural drugs, reassessment should occur within 2 h.
(vi) If an epidural infusion is running, it should be turned off, alternative analgesia instigated as necessary, and a reassessment of the patient’s motor function should be made after a defined interval. The motor block would be expected to resolve if due to overdose or catheter migration. If motor power does not improve, remediable causes, including epidural haematoma or abscess, must be excluded.
(vii) Once an epidural haematoma is suspected, an MRI scan should be organized immediately, as this is a potential neurosurgical emergency. A protocol should be agreed in advance with the diagnostic imaging service.
(viii) If MRI scanning is not available in the local hospital or there will be a delay, then the patient should be referred to a neurosurgical unit to be scanned. It may be appropriate to arrange a protocol with local neurosurgical units to minimize delays in investigation and treatment.

**Funding**

This survey was funded by the Portsmouth Hospitals NHS Trust Anaesthetic Department.

**Appendix 1: Data collection form**

Survey of management and investigation of spinal–epidural haematomas secondary to epidural analgesia

1. Do you use epidurals for peri and postoperative analgesia in your hospital?  
   □ Yes □ No
2. Do you run epidural infusions postoperatively?  
   □ Yes □ No
3. If yes, where are the patients managed?  
   □ ITU □ HDU □ Ward
4. Do you have an acute pain service?  
   □ Yes □ No
5. Do you have a written protocol for running postoperative epidural infusions?  
   □ Yes □ No
6. Does this include regular assessment of sensory level and motor function?  
   □ Yes □ No
7. How frequently are these observations made?  
   □ <1H □ 1–2H □ 2–4H □ 2–4H □ >4H
8. Do they continue after the epidural is removed?  
   □ Yes □ No
9. If yes to question 8, for how long?  
   □ 0–4H □ 4–8H □ 8–12H □ >12H
10. Do you have a written protocol for the investigation of abnormal motor block?  
    □ Yes □ No
11. Who takes responsibility for investigation of suspected epidural haematomas?  
    □ Surgical team □ Pain nurse □ Anaesthetic trainee □ Anaesthetic consultant
12. Do you have access to emergency MRI scanning 24 hours per day in your hospital?  
    □ Yes □ No
13. If the answer to question 12 is no, do you have access to scanning 24 hours per day in another hospital?  
    □ Yes □ No
14. If the answer to question 13 is yes, is this hospital your local spinal or neurosurgery unit?  
    □ Yes □ No
15. If you have answered yes to question 12 or 13, have your radiologists agreed to provide urgent MRIs for suspected epidural haematomas 24 hours per day?  
    □ Yes □ No
16. Do you have an investigation and treatment protocol agreed with your local spinal surgery of neurosurgical unit?  
    □ Yes □ No

**Acknowledgement**

The authors would like to thank all those who completed and returned the data collection forms.
17. Have you ever had an epidural haematoma related to epidural anesthesia or analgesia in your hospital?
   □ Yes □ No
18. If yes, was it diagnosed, investigated and treated within 24 hours?
   □ Yes □ No
19. If not where was the worst delay
   □ Clinical diagnosis □ Getting an MRI scan □ Waiting for transfer to spinal injury unit

Thank you!

Appendix 2: Frankel scale for spinal injury scoring

American Spinal Injury Association (ASIA) impairment scale (modified from Frankel).

A, complete. No sensory or motor function is preserved in the sacral segments S4–S5.
B, incomplete. Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4–S5.
C, incomplete. Motor function is preserved below the neurological level and more than half of key muscles below the neurological level have a muscle grade less than three.
D, incomplete. Motor function is preserved below the neurological level and at least half of key muscles below the neurological level have a muscle grade greater than or equal to three.
E, normal. Sensory and motor function are normal.

References