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Cauda equina syndrome following a lumbar puncture

Alexandra J. Sinclair\textsuperscript{a,b,c,*}, Camille Carroll\textsuperscript{a}, Brendan Davies\textsuperscript{b}

\textsuperscript{a} Department of Neurology, Queen Elizabeth Hospital, University Hospital Birmingham NHS Trust, Birmingham, England, UK
\textsuperscript{b} University of North Staffordshire, Stoke-on-Trent, England, UK
\textsuperscript{c} School of Immunology, Infection and Inflammation, College of Medical and Dental Sciences, University of Birmingham, Birmingham, England, UK

Abstract

Lumbar puncture (LP), a common diagnostic procedure, is usually associated with low morbidity. We describe the case of a 29-year-old woman who underwent a non-traumatic LP in the setting of normal coagulation. Cauda equina syndrome subsequently developed secondary to an extradural spinal haematoma. Avoidance, identification and management of this uncommon complication are discussed.

Iatrogenic cauda equina syndrome following LP is rare, but can cause significant morbidity. Our patient’s experience and our review of the literature highlight that: (i) normal coagulation and a non-traumatic LP do not exclude this diagnostic possibility; (ii) early recognition determines the management and prognosis; as 50% of patients remain paraplegic if the condition is identified more than 12 hours after symptom onset; and (iii) neurosurgical intervention can be avoided, despite bladder dysfunction, if there are early signs of recovery.

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1. Introduction

Lumbar puncture (LP) is a common diagnostic procedure that is relatively straightforward to perform and usually associated with low morbidity. Though rare, significant neurological complications can occur. We present a case of extradural spinal haematoma (EDH) following LP. Early recognition of this disabling condition is important to reduce morbidity.

2. Case report

A 29-year-old woman underwent a LP for suspected demyelinating disease. Fully informed, written consent was obtained prior to the procedure. The LP was non-traumatic (2 red blood cells per μL of cerebrospinal fluid [CSF]), and the patient was asymptomatic following the procedure. Eight hours post-procedure the patient complained of progressive lower back pain, numbness of the sole of her right foot and weakness in her right leg. Examination of the right leg revealed a right L5/S1 neuropraxia (weakness in gluteus maximus [Medical Research Council (MRC) grade 4/5], tibialis anterior [MRC grade 0/5] and the hamstrings [MRC grade 4/5], absent right ankle reflex and S1 sensory loss). The bladder was also distended. An MRI identified a lentiform mass posterior to the L4/5 vertebral bodies compressing the cauda equina nerve roots. No vascular anomaly was seen. The imaging findings were consistent with an EDH (Fig. 1). Further laboratory investigations revealed normal coagulation.

Sensory recovery was documented over the subsequent hours, and following neurosurgical consultation the haematoma was managed conservatively with dexamethasone (4 mg four times per day for 48 hours). Examination at discharge, 3 weeks later, revealed mild weakness in the tibialis anterior (4+/5). A full recovery was noted at 3 months.

3. Discussion

Cauda equina syndrome secondary to EDH is a rare and potentially devastating complication of LP that can result in permanent paraparesis and loss of sphencter control. We discuss avoidance, identification and management.

Primary prevention should ensure LPs are only performed when truly justified, and then only after fully informed, written consent (including an explanation of the potential risk of bleeding).\textsuperscript{1} Clotting abnormalities should be corrected pre-procedure; spinal haematoma following LP is associated with coagulopathy in 47% of patients (Table 1). A midline LP approach will minimise the risk of trauma to the artery and vein of Adamkiewicz, which are implicated in spinal bleeding. The impact of the spinal needle diameter and type are not established.

Following LP, the principle indicator of spinal haematoma is severe lower back or radicular pain, found in approximately 58% of patients (Table 1). Additionally, symptoms of cauda equina compression and meningeal symptoms are typical. Our review of the literature (Table 1) identified that time to presentation is variable: acute, less than 6 hours (4 out of 18 cases, 22%), subacute, 6 to 24 hours (11 out of 18 cases, 61%), and chronic, greater than 24 hours (3 out of 18 cases, 17%). An absence of red blood cells in the CSF does not preclude the diagnosis; 50% of reported cases documented clear spinal fluid (Table 1). Physician awareness of spinal haematoma following LP is vital to expedite neurological examination and subsequent MRI scanning.\textsuperscript{2} Delayed diagnosis is associated with poor prognosis.\textsuperscript{3–5} We note that 70% of instances are identified after 12 hours and, of these, 50% remain paraplegic and disabled. Overall, 37% of patients with spinal haematoma remain paraplegic (Table 1).

Management of post-LP spinal haematoma is similar to that of haematoma resulting from other causes. Clotting anomalies should initially be corrected. Rigorous clinical research to support surgical intervention versus conservative treatment is lacking.\textsuperscript{3,6–9} Our review highlights that patients with EDH are equally likely to receive surgical intervention or conservative treatment, while those with subdural haematoma are more likely to be treated only surgically (67%). Additionally, conservative treatment may be appropriate in those patients who have mild symptoms and early signs of recovery.\textsuperscript{5} In these instances, dexamethasone treatment and prolonged vigilant monitoring are advised. The most important prognostic factors, however, are time from LP to diagnosis, time from diagnosis to intervention,\textsuperscript{7} and the extent of paraplegia at presentation.\textsuperscript{3}
<table>
<thead>
<tr>
<th>Case</th>
<th>Article</th>
<th>Procedure</th>
<th>Clotting defect</th>
<th>Time to presentation (h)</th>
<th>Pain</th>
<th>Red cell count in CSF (μL)</th>
<th>Haematoma</th>
<th>Management (time post-procedure)</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>1</td>
<td>Edelson et al., 1974 Arch Neurol</td>
<td>LP</td>
<td>Yes</td>
<td>2</td>
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<td>0</td>
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<td>Conservative</td>
<td>Severe paraplegia</td>
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<td>2</td>
<td>Edelson et al., 1974 Arch Neurol</td>
<td>LP</td>
<td>Yes</td>
<td>12</td>
<td>Nil</td>
<td>1250</td>
<td>SDH</td>
<td>Lumbar</td>
<td>Conservative</td>
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<td>3</td>
<td>Edelson et al., 1974 Arch Neurol</td>
<td>LP</td>
<td>Yes</td>
<td>12</td>
<td>Nil</td>
<td>Unknown</td>
<td>SDH</td>
<td>Surgical (&gt;12 h)</td>
<td>Mild paraparesis</td>
</tr>
<tr>
<td>4</td>
<td>Rengachary and Murphy, 1974 J Neurosurg</td>
<td>Spinal anaesthesia</td>
<td>No</td>
<td>24</td>
<td>Lower back</td>
<td>Clear CSF</td>
<td>SAH</td>
<td>Surgical (5 days)</td>
<td>Mild paraparesis</td>
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<tr>
<td>5</td>
<td>Kirkpatrick and Goodman, 1975 Surg Neurol</td>
<td>Myelography</td>
<td>No</td>
<td>12–20</td>
<td>Lower back</td>
<td>Blood-stained CSF</td>
<td>SDH</td>
<td>Surgical (30 h)</td>
<td>Moderate right leg weakness</td>
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<tr>
<td>6</td>
<td>Gutterman, 1977 Surg Neurol</td>
<td>LP</td>
<td>No</td>
<td>18</td>
<td>Nil</td>
<td>228</td>
<td>EDH</td>
<td>Surgical</td>
<td>Full recovery</td>
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<tr>
<td>7</td>
<td>Dean and Woodside, 1979 Urology</td>
<td>LP</td>
<td>Yes</td>
<td>24</td>
<td>Nil</td>
<td>0</td>
<td>SDH</td>
<td>Conservative</td>
<td>Death from unrelated cause</td>
</tr>
<tr>
<td>8</td>
<td>Gathikonda et al., 1979 Neurosurgery</td>
<td>LP</td>
<td>Yes</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>SAH</td>
<td>Surgical</td>
<td>Unknown</td>
</tr>
<tr>
<td>9</td>
<td>Blade et al., 1983 J Neurosurg</td>
<td>LP</td>
<td>Yes</td>
<td>10</td>
<td>Back</td>
<td>Clear CSF</td>
<td>SAH</td>
<td>Surgical (48 h)</td>
<td>Mild paraparesis</td>
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<td>10</td>
<td>Owens et al., 1986 Anesth Analg</td>
<td>LP</td>
<td>Yes</td>
<td>16</td>
<td>Severe back</td>
<td>1450</td>
<td>SDH</td>
<td>Surgical (22 h)</td>
<td>No recovery from paraparesis</td>
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<tr>
<td>11</td>
<td>Spanu et al., 1988 Neurochirurgia (Stuttg)</td>
<td>LP</td>
<td>No</td>
<td>–</td>
<td>Severe back and leg</td>
<td>0</td>
<td>SDH</td>
<td>Surgical</td>
<td>Full recovery</td>
</tr>
<tr>
<td>12</td>
<td>Bills et al., 1991 Aust N Z J Surg</td>
<td>LP</td>
<td>Yes</td>
<td>48</td>
<td>Back</td>
<td>Unknown</td>
<td>SDH</td>
<td>Surgical (&lt;24 h)</td>
<td>No recovery from paraparesis</td>
</tr>
<tr>
<td>13</td>
<td>Metzger and Singbartl, 1991 Acta Anaesthesiol Scand</td>
<td>LP</td>
<td>Yes</td>
<td>12</td>
<td>Nil</td>
<td>Unknown</td>
<td>EDH</td>
<td>Surgical (3 days)</td>
<td>Severe paraplegia</td>
</tr>
<tr>
<td>14</td>
<td>Boukobza et al, 1994 Neuroradiology</td>
<td>LP</td>
<td>No</td>
<td>–</td>
<td>Unknown</td>
<td>Dry tap</td>
<td>EDH</td>
<td>Conservative</td>
<td>Mild paraparesis</td>
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<td>15</td>
<td>Peltola et al., 1996 Lancet</td>
<td>LP</td>
<td>No</td>
<td>&lt;1</td>
<td>Severe back and leg</td>
<td>1425</td>
<td>SDH</td>
<td>Conservative</td>
<td>Full recovery</td>
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<tr>
<td>16</td>
<td>Egede et al., 1999 Md Med J</td>
<td>LP (traumatic)</td>
<td>No</td>
<td>72</td>
<td>Back and neck</td>
<td>15</td>
<td>SDH</td>
<td>Surgical (3 days)</td>
<td>Mild paraparesis</td>
</tr>
<tr>
<td>17</td>
<td>Wirtz et al., 2000 Pediatr Neurol</td>
<td>LP</td>
<td>Yes</td>
<td>24</td>
<td>Back</td>
<td>63</td>
<td>EDH</td>
<td>Conservative</td>
<td>Full recovery</td>
</tr>
<tr>
<td>18</td>
<td>Adler et al., 2001 Pediatr Emerg Care</td>
<td>LP</td>
<td>No</td>
<td>4</td>
<td>Severe back and leg</td>
<td>Blood-stained CSF</td>
<td>EDH</td>
<td>Conservative</td>
<td>No recovery from paraparesis until death</td>
</tr>
<tr>
<td>19</td>
<td>Chen and Bailin, 2004 J Clin Anesth</td>
<td>LP</td>
<td>No</td>
<td>72</td>
<td>Mild lower back</td>
<td>1425</td>
<td>SDH</td>
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<tr>
<td>20</td>
<td>Tubbs et al, 2004 Pediatrics</td>
<td>LP</td>
<td>No</td>
<td>~12</td>
<td>Nil</td>
<td>Clear CSF</td>
<td>SDH</td>
<td>Surgical</td>
<td>Severe paraplegia</td>
</tr>
</tbody>
</table>

CSF = cerebrospinal fluid, EDH = extradural haematoma, h = hours, LP = lumbar puncture, SAH = subarachnoid haematoma, SDH = subdural haematoma.
4. Conclusion

The rare complication of spinal haematoma following LP can result in significant morbidity, particularly if the diagnosis is delayed; 50% of patients remain paraplegic if spinal haematoma is identified more than 12 hours after symptom onset. Normal coagulation and a non-traumatic LP do not exclude this diagnostic possibility. Even with bladder dysfunction, neurosurgical intervention is not always necessary if there are early signs of recovery.

References