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Cauda equina syndrome following a lumbar puncture

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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.

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 sphincter 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).[1] Clotting abnormalities should be corrected preprocedure; 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 meningism 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 document clear spinal fluid (Table 1). Physician awareness of spinal haematoma following LP is vital to expedite neurological examination and subsequent MRI scanning.[2] Delayed diagnosis is associated with poor prognosis.[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.[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.[9] 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,[5] and the extent of paraplegia at presentation.[3]

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Table 1
Reported instances of spinal haematoma following a lumbar puncture

Case	Article	Procedure	Clotting defect	Time to presentation (h)	Pain	Red cell count in CSF (μL)	Haematoma	Management (time post-procedure)	Outcome
1	Edelson et al., 1974 Arch Neurol[10]	LP	Yes	2	Nil	0	SDH	Conservative	Severe paraplegia
2	Edelson et al., 1974 Arch Neurol[10]	LP	Yes	12	Nil	1250	Lumbar	Conservative	Mild sensory disturbance
3	Edelson et al., 1974 Arch Neurol[10]	LP	Yes	1	Nil	0	SDH	Conservative	Severe paraplegia
4	Rengachary and Murphy, 1974 J Neurosurg[11]	Spinal anaesthesia	No	12	Nil	Unknown	SDH	Surgical (>12 h)	Mild paraparesis
5	Kirkpatrick and Goodman, 1975 Surg Neurol[12]	Myelography	No	24	Lower back	Clear CSF	SAH	Surgical (5 days)	Mild paraparesis
6	Gutterman, 1977 Surg Neurol[13]	LP	No	12–20	Lower back	Blood-stained CSF	SDH	Surgical (30 h)	Moderate right leg weakness
7	Diaz et al., 1978 Neurosurgery[14]	LP	No	18	Nil	228	EDH	Surgical	Full recovery
8	Dean and Woodside, 1979 Urology[6]	LP	Yes	24	Nil	0	SDH	Conservative	Death from unrelated cause
9	Guthikonda et al., 1979 Neurosurgery[15]	LP	Yes	–	Unknown	Unknown	SDH	Surgical	Unknown
10	Blade et al., 1983 J Neurosurg[16]	LP	Yes	10	Back	Clear CSF	SAH	Surgical (48 h)	Mild paraparesis
11	Owens et al., 1986 Anesth Analg[17]	Epidural anaesthesia	Yes	16	Severe back	1450	SDH	Surgical (22 h)	No recovery from paraparesis
12	Spanu et al., 1988 Neurochirurgia (Stuttg)[18]	LP	No	–	Severe back and leg	0	SDH	Surgical	Full recovery
13	Bills et al., 1991 Aust N Z J Surg[3]	Epidural anaesthesia	Yes	48	Back	Unknown	SDH	Surgical (<24 h)	No recovery from paraparesis
14	Metzger and Singbartl, 1991 Acta Anaesthesiol Scand[4]	Epidural anaesthesia	Yes	12	Nil	Unknown	EDH	Surgical (3 days)	Severe paraplegia
15	Boukobza et al., 1994 Neuroradiology[9]	Epidural anaesthesia	No	–	Unknown	Dry tap	EDH	Conservative	Mild paraparesis
16	Peltola et al., 1996 Lancet[19]	LP	No	<1	Severe back and leg	Clear CSF	EDH	Surgical	Mild sensory disturbance
17	Egede et al., 1999 Md Med J[20]	LP (traumatic)	No	72	Back and neck	1425	SDH	Conservative	Full recovery
18	Wirtz et al., 2000 Pediatr Neurol[21]	LP	Yes	24	Back	15	SDH	Surgical (3 days)	Mild paraparesis
19	Adler et al., 2001 Pediatr Emerg Care[22]	LP	No	4	Severe back and leg	63	EDH	Conservative	Full recovery
20	Chan and Bailin, 2004 J Clin Anesth[5]	Spinal anaesthesia	No	72	Mild lower back	Blood-stained CSF	EDH	Conservative	No recovery from paraparesis until death
21	Tubbs et al., 2004 Pediatrics[23]	LP	No	~12	Nil	Clear CSF	SDH	Surgical	Severe paraplegia

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

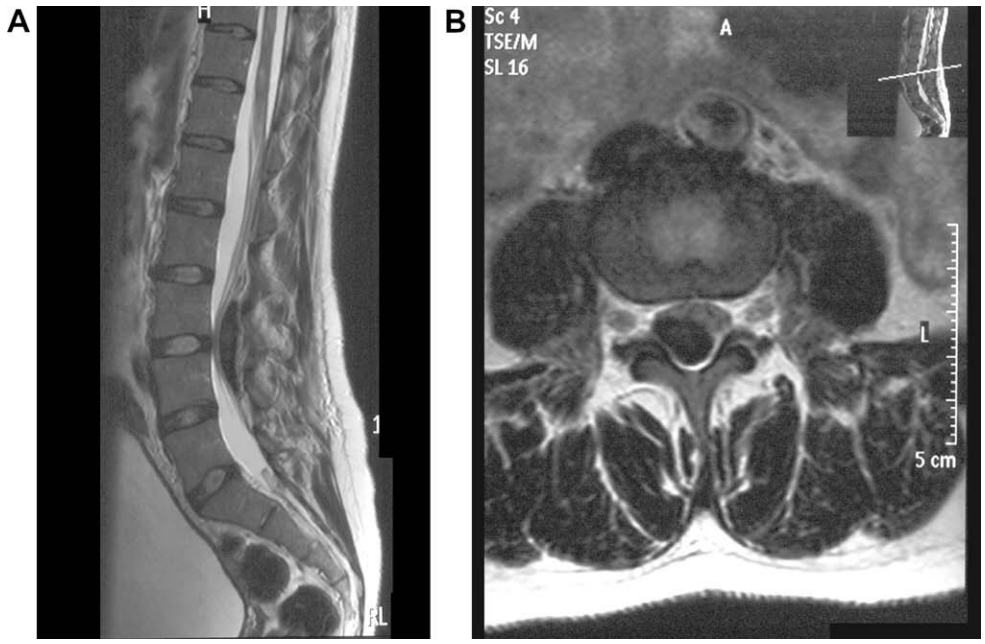

Fig. 1. (A) Sagittal and (B) axial views from a T2-weighted MRI scan of the lumbar spine showing a hypointense lentiform mass consistent with an extradural haematoma impinging on the cauda equina.

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.

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