



Intracranial epidural hematoma following lumbar puncture

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Despite technical advances and changes in the indication, lumbar puncture (LP) is an important and indispensable procedure for diagnostic and therapeutic purposes in neurological disorders. LP is generally considered safe, but complications such as post-puncture headache, hypoacusis, cranial nerve palsies and subdural hematoma can occur [1, 2]. Recently, the risk of spinal epidural hematoma (EDH) following LP was evaluated 0.2% among patients without coagulopathy and 0.23% among those with coagulopathy [3]. By our own clinical observation and one additional reported case in the literature, we wish to red-flag that even *intracranial* EDH can occur after LP [4].

A 32-year-old man was admitted due to a left-sided headache and neck pain with an intensity of 8 out of 10 on a numeric pain scale (10 is severest pain) without a fever. He denied a preceding trauma, and drug or alcohol abuse. Some days earlier, he contacted the emergency department due to a headache, which was judged as a headache due to arterial hypertension. His history was otherwise unremarkable. On admission, he reported pronounced neck pain and left-sided headache without focal neurological abnormalities. The blood pressure was 128/88 mm Hg. The routine laboratory tests including coagulation studies, platelet count, and his computed tomography (CT) brain scan were normal (Fig. 1a). To exclude meningitis and CT-negative subarachnoid hemorrhage LP was indicated. A LP with a 22-gauge atraumatic Sprotte needle (0.7 mm diameter) did not succeed to retrieve CSF. Therefore, the puncture was repeated

with a 20-gauge Quincke needle (0.9 mm diameter) with success and showed normal results. Clinically, there were no signs of hemorrhage at this time. After analgesic medication, the patient reported some improvement that was then followed by a relapse. Cerebral magnetic resonance imaging (MRI) was performed the next day to exclude cerebral venous thrombosis, but demonstrated a marked frontal EDH (Fig. 1b), which was treated neurosurgically. Intraoperatively slight venous trickling on the surface of the dura mater was identified as the bleeding source. The patient recovered prompt and was ambulatory after a further 4 days.

Non-traumatic intracranial EDH is associated with infection, abscess, coagulopathy, hemorrhagic tumors, or vascular malformations, which could be excluded by our patient's history and ancillary examinations [5]. In addition, a spontaneous EDH due to cerebral venous thrombosis seems improbable as the MRI was otherwise normal. Rather, we see a connection between the LP and the EDH. In a literature search, we identified one similar case [4]. Rapid shifts in CSF pressure following LP and consequent CSF hypotension are discussed as pathophysiological causes which lead to the dura detaching from the skull and inducing EDH [6]. Theoretically, a 20-gauge needle opening allows a flow of 36 ml CSF per minute, thus after removing the needle, a notable amount of CSF can leak from the dural sac, if the dura tissue does not close sufficiently. A similar pathophysiological moment of brain shift with loss of tamponade effect is discussed in delayed EDH, following contralateral epidural hematoma evacuation [7]. In our patient, we cannot absolutely exclude a LP-independent spontaneous EDH, but the course of disease with inconspicuous cranial CT at the time of LP speaks strongly against an EDH in nascendi. The frontal location and the younger age of the patient also indicate a relationship between LP and EDH as discussed by Patel et al. [4].

Taken together, spontaneous EDH is an extremely rare condition but should be considered as a possible

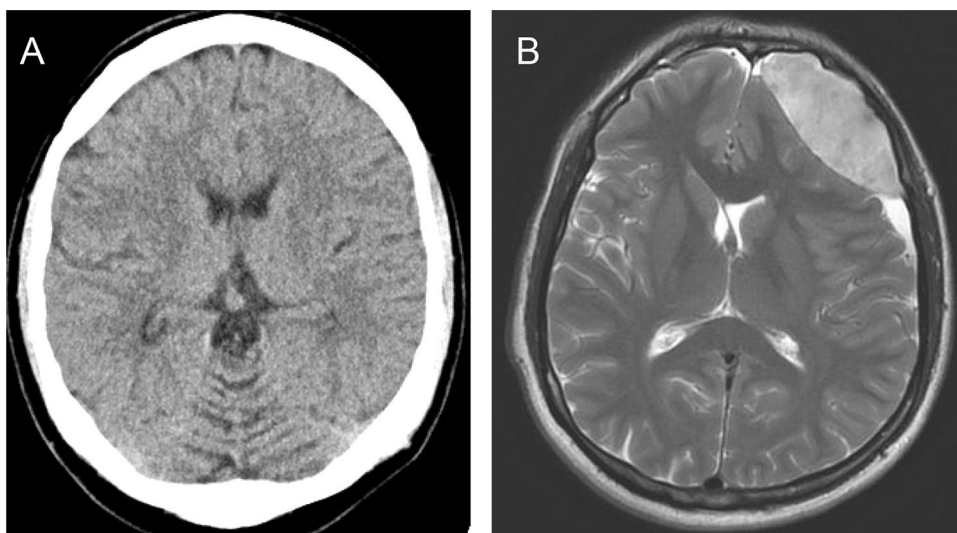
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Fig. 1 **a** Normal cranial computed tomography in a 32-year-old man on admission due to a headache and neck pain. **b** T₂-weighted MRI revealing pronounced frontal epidural hematoma (7.5×2.5×5 cm) with consecutive midline shift of 10 mm following lumbar puncture. (Courtesy of Hans-Peter Dinkel, MD, PhD, Radiological Institute, Municipal Hospital Landshut)



complication of CSF loss during surgery or even after LP as in our case [4, 6, 8]. Furthermore, our observation suggests that LP should be performed under in-hospital conditions with a sufficient observation period to detect such complications quickly and react promptly. However, this should not lead to omit LP if indicated. In our own institution, with increasing number of diagnostic LP over a 30-year period (in 2019, 799 diagnostic lumbar punctures), such a condition has been observed for the first time.

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Compliance with ethical standards

Conflict of interests None.

Patient's consent Obtained.

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