Case report

Backstabbed: routine lumbar puncture complicated by retroperitoneal hematoma and hemorrhagic shock✩✩

George Horani, MDa,*, Kunwar Kaur, MDa, Dianelys Mendez, MDa, Sushant Nanavati, MDb, Fred Berlin, MDc, Konstantinos Leou, MDb

aDepartment of Internal Medicine, St. Joseph’s University Medical Center, 703 Main St., Paterson, NJ 07503
bDepartment of Critical Care Medicine, St. Joseph’s University Medical Center, 703 Main St., Paterson, NJ 07503

cDepartment of Interventional Radiology, St. Joseph’s University Medical Center, 703 Main St., Paterson, NJ 07503

A R T I C L E   I N F O

Article history:
Received 17 May 2021
Accepted 23 May 2021

Editor: Dr. F.S. Chew

Keywords:
Lumbar puncture
Retroperitoneal hemorrhage
Hemorrhagic shock

A B S T R A C T

Lumbar punctures (LPs) are commonly performed procedures, serving diagnostic and therapeutic purposes. They are generally safe, and serious, life-threatening complications are rare. We report a case of a patient who underwent an LP and subsequently developed shock. Imaging studies revealed a retroperitoneal hematoma with an active bleed. Interrogation of the lumbar branches in the interventional radiology suite revealed an active arterial bleed at the level of L3-L4 which was successfully embolized. We present this case to highlight the possibility of a rare complication of an LP and to emphasize the importance of early detection and resuscitative intervention.

© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

Introduction

Lumbar punctures (LPs) are commonly performed procedures, for both diagnostic and therapeutic purposes. They are generally considered safe and even though side effects are not uncommon, they rarely lead to morbid outcomes. Post-LP headache and local discomfort are common but generally well tolerated complications [1]. Uncommon and more serious complications are infection, spinal hematoma, retroperitoneal abscess formation, intracranial and intraspinal hemorrhage, and brain herniation [2–4]. Although retroperitoneal hemorrhage from a punctured artery is a known complication after percutaneous coronary intervention or spinal anesthesia, the incidence of retroperitoneal hemorrhage after an LP is low with only a few case reports in current literature [5,6].

Herein, we present a case of post-LP retroperitoneal hemorrhage leading to hemodynamic instability and shock.

✩✩ Acknowledgments: None
	 Competing of interest: None
	 Corresponding author.

E-mail address: georgebhorani@gmail.com (G. Horani).
https://doi.org/10.1016/j.radcr.2021.05.060

1930-0433/© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)
Case report

Patient is a 75-year-old female with a medical history of hypertension and diabetes mellitus type II who presented to the hospital for evaluation of dysphagia for a few months causing failure to thrive. The patient was admitted to the medical floor where she underwent an esophagogastro-duodenoscopy, results of which were unremarkable. Three days after the esophagogastroduodenoscopy, the patient developed a sudden change in mental status, with worsening lethargy and altered sensorium. A thorough assessment for focal deficits was not possible given the patient’s inability to cooperate with a complete neurological exam. A magnetic resonance imaging scan of the brain was obtained, which did not show any acute abnormalities. An arterial blood gas showed a hypoxic and hypercapnic pattern, and the patient was transferred to the intensive care unit where she was later intubated for airway protection. Further workup at this time consisted of electroencephalogram and LP. Findings of the electroencephalogram revealed moderate encephalopathy, but no seizure activity. Subsequently, a lumbar puncture was performed by a medical doctor with the experience and certification required to perform LPs as per standard protocols. The patient was placed in the left lateral decubitus position and a 22-gauge needle was used to enter the subarachnoid space at the level of L4-L5; several unsuccessful attempts were made prior to obtaining cerebrospinal fluid (CSF) for analysis. The international normalized ratio, prothrombin time, and partial thromboplastin time were 1.1, 14.2 seconds (12.2–14.9 seconds), and 34.9 seconds (21.3–35.1 seconds), respectively. In addition, the platelet count was 227 K/mm³ (140.440 K/mm³). The blood urea nitrogen was 34 mg/dL (7–23 mg/dL), improved from the blood urea nitrogen on admission of 63 mg/dL, without any evidence of uremia. Her medications included aspirin 81 mg, which was held 2 days prior to the LP and heparin thromboprophylaxis 5000 units every 12 hours, which she last received approximately 18 hours prior to the procedure. There were no immediate complications after the LP. CSF analysis showed clear fluid with 4 mm³ red blood cells (0 mm³), 1 mm³ white blood cell (0–5 mm³) with 1 polynuclear cell (0–6 cells). CSF glucose was 153 mg/dL (50–75 mg/dL) and CSF protein was 46 mg/dL (14–45 mg/dL). Culture of the CSF was negative. With eventual correction of hypercapnia induced respiratory acidosis, the patient’s mental status improved. Despite this, she failed multiple weaning trials and neurology was consulted to explore the possibility of an underlying neuromuscular disorder complicating successful extubation.

Meanwhile, daily complete blood counts revealed a decline in hemoglobin levels from 12.4 g/dL prior to the LP to a range of 6–8 g/dL over a week’s course, with an eventual drop to 4 g/dL despite multiple transfusions of packed red blood cells. As no overt source of bleeding could be identified, a computed tomography (CT) scan of the abdomen and pelvis was obtained, which demonstrated a large left retroperitoneal hematoma, located posterolaterally to the level of the subidiaphragmatic area, down the posterior pararectal space to the left pelvic sidewall in addition to a left psoas hematoma. Correlating with the rapid decline in hemoglobin, physical exam findings revealed a lethargic patient with cold and clammy skin, tachycardia, and hypotension, with a mean arterial pressure of 40 mm Hg. Emergent triple lumen and Cordis catheters were placed for initiation of massive transfusion protocol and vasopressors for hemodynamic support. A CT angiogram of the abdomen and pelvis was obtained thereafter, which showed large left retroperitoneal and psoas muscle hematomas with a small focus of active hemorrhage (Fig. 1) and displacement of the left kidney anteriorly (Fig. 2A). The patient was then emergently taken to the interventional radiology suite. Selective interrogation of the left lumbar branches was performed, demonstrating active bleeding from the distal branches of the left lumbar artery, at approximately the level of L3-L4 with extravasation of contrast (Fig. 3). Three detachable coils and Gel-Foam slurry were delivered into this artery, with postprocedural angiography confirming occlusion of the vessel and no further bleeding (Fig. 4). Patient’s hospital course was further complicated by progressive weakness and difficulty weaning from the ventilator, ultimately leading to tracheostomy and percutaneous endoscopic gastrostomy tube placement. After five weeks of hospitalization, she was discharged to a long-

Fig. 1 – A: CT angiogram without contrast showing large left retroperitoneal hematoma. Figure 1B: CT angiogram with contrast showing the hematoma with a small focus of active hemorrhage.
Fig. 2 – A: The left kidney is displaced anteriorly by the hematoma. **Figure 2B:** Resolution of the hematoma with return of the kidney to its normal position one month later.

Discussion

LPs are commonly performed procedures that serve many purposes, both diagnostic and therapeutic. They aid in the diagnosis and management of intracranial pressure disorders (ie, idiopathic intracranial hypertension, spontaneous intracranial hypotension), and are used to administer agents such as intrathecal antibiotics or medications for spinal anesthesia [7,8]. CSF analysis can be used to differentiate between various etiologies of insults to the central nervous system, including infectious, autoimmune (ie, multiple sclerosis, Guillain Barre), and suspected neoplastic and neurodegenerative disorders [1]. Despite being an invasive procedure, the risk of major complications from an LP is relatively low [7]. The most serious complication is the precipitation of brain herniation in patients with mass lesions [3]. Nevertheless, the most common complications from an LP include post-LP headache (10%-40%), back pain (up to 16%), and least commonly, infections and spinal hematoma formation (<0.01%) [1]. Uncommon cases of retroperitoneal abscess formation from dural laceration in patients with meningitis have been reported [1,2]. Although rare, retroperitoneal hemorrhage from arterial injury is a known complication after certain procedures such as percutaneous coronary intervention and nerve blocks [9–12] however, only a few cases have been reported after an LP [5,6].

Ultrasound and fluoroscopic techniques have shown to reduce the number of attempts as well as the number of traumatic LPs [13–15]. Regardless, this procedure is relatively safe
and commonly done without guidance. Moreover, there is limited data on whether imaging guidance would reduce iatrogenic arterial injury during LPs. Accordingly, we are not suggesting the use of assistive techniques routinely as proposed by some authors [13–15]. Perhaps instead, it may be more responsible to suggest the use of ultrasonography when a difficult LP is anticipated in a patient with distorted anatomy, obesity, or on antiplatelet or anticoagulant therapy. In addition, ultrasonography is a fast and inexpensive tool that may be used in certain settings without introducing considerable costs. Finally, if unsuccessful with landmark based and ultrasound-guided techniques, escalation to the use of CT or fluoroscopic guidance can be pursued in the IR suite to avoid multiple failed attempts and arterial injury.

Maintaining a clinical suspicion for an iatrogenic retroperitoneal hematoma after LP, despite its low incidence, may be noteworthy in a declining patient. Furthermore, arriving at a diagnosis in a timely manner paired with resuscitation and emergent intervention can be lifesaving. Due to the rarity of such a complication, the drop in hemoglobin in this case was not initially attributed to an arterial injury after the LP, delaying our decision to obtain imaging and identify the bleed. Our aim with this case report is to draw attention to the possibility of such a complication and encourage critical thinking and timely evaluation for a retroperitoneal bleed in a declining patient with a recent LP.

**Patient consent**

Patient deceased; written informed consent for publication of this case was obtained from the patient’s next of kin.

**REFERENCES**

[1] Niemantsverdriet E, Engelborghs S, Teunissen CE, Duits F, Struyfs H. Techniques, contraindications, and complications of CSF collection procedures. In: Deisenhammer F, Sellebjerg F, Teunissen CE, Tumani H, editors. Cerebrospinal Fluid in Clinical Neurology. Springer International Publishing; 2015. p. 49–50.

[2] Weji BG, Ohsia MS, Melese KG, Azege GA. Incidence and risk factors of postdural puncture headache: prospective cohort study design. Perioper Med (Lond) 2020;9(1):32. doi:10.1186/s13741-020-00164-2.

[3] Sternbach G. Lumbar puncture. J Emerg Med 1985;2(3):199–203. doi: 10.1016/0736-4679(85)90397-x.

[4] Liu WH, Lin JH, Lin JC, Ma HI. Severe intracranial and intraspinal subarachnoid hemorrhage after lumbar puncture: a rare case report. Am J Emerg Med 2008;26(5) 633.e1–633.e633. doi:10.1016/j.ajem.2007.10.008.

[5] Bruha R, Simon SR. Lumbar puncture complicated by retroperitoneal hemorrhage. Am J Med 1999;107(4):404–5. doi:10.1016/s0002-9343(99)00210-7.

[6] Soto-Mesa D, Herrera-Soto A, Bermejo-Álvarez MA, Argüelles-Tamargo L. Retroperitoneal haematoma following diagnostic lumbar puncture: clinical case. Col J Anesth 2016;44(1) 44–47.7.

[7] Duits FH, Martínez-Lage P, Paquet C, et al. Performance and complications of lumbar puncture in memory clinics: Results of the multicenter lumbar puncture feasibility study. Alzheimers Dement 2016;12(2):154–63. doi:10.1016/j.jalz.2015.08.003.

[8] Doherty CM, Forbes RB. Diagnostic lumbar puncture. Ulster Med J 2014;83(2):93–102.9.

[9] Trimarchi S, Smith DE, Share D, et al. Retroperitoneal hematoma after percutaneous coronary intervention: prevalence, risk factors, management, outcomes, and predictors of mortality: a report from the BMC2 (Blue cross blue shield of michigan cardiovascular consortium) registry. JACC Cardiovasc Interv 2010;3(8):845–50. doi:10.1016/j.jcin.2010.05.013.

[10] Aveline C, Bonnet F. Delayed retroperitoneal haematoma after failed lumbar plexus block. Br J Anaesth 93(4):589–91. doi:10.1093/bja/aeh242.

[11] Parvaz MA, Korwar V, McArthur D, Claxton A, Dyer J, Isgar B. Large retroperitoneal hematoma: an unexpected complication of ilioinguinal nerve block for inguinal hernia repair. Anaesthesia 2012;67:80–1 2012. doi:10.1111/j.1365-2044.2011.06971.x.

[12] O’connor WR, Preston FW, Theis FV. Retroperitoneal hemorrhage following lumbar sympathetic block during treatment with dicumarol: report of a fatality. Ann Surg 1950;131(4):575–80. doi:10.1097/00000658-195004000-00010.

[13] Mofidi M, Mohammadi M, Saaidi H, et al. Ultrasound guided lumbar puncture in emergency department: Time saving and less complications. J Res Med Sci 2013;18(4):303–7.

[14] Soni NJ, Franco-Sadud R, Schnobrich D, et al. Ultrasound guidance for lumbar puncture. Neurrol Clin Pract 2016;6(4):358–68. doi:10.1212/CPJ.0000000000000265.

[15] Rodriguez D, Branstetter BF 4th, Agarwal V, et al. Incidence of complications following fluoroscopically guided lumbar punctures and myelograms. AJR Am J Roentgenol 2016;206(1):20–5. doi:10.2214/AJR.15.14664.