Lumbar drain for CSF leakage: a word of caution

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Abstract

Continuous lumbar drain is a frequently practiced procedure to prevent cerebrospinal fluid (CSF) infection in post-operative neurosurgical cases. However, the level of CSF drained must correspond to the intracranial pressures, where any accidental increase in lumboventricular gradient by slipping of the drainage bag below the level of the iliac crest can lead to over drainage and catastrophe. The learning point is to use automated or manual measures to monitor Intra-Cranial Pressure (ICP) and sound alarm in such an event to prevent sagging of the brain.

Keywords: *lumbar drain, intracranial pressures, cerebrospinal fluid, neurosurgical*

Introduction

Closed continuous lumbar drainage in cases of post-traumatic and postoperative cerebrospinal fluid (CSF) leakage has encouraging prospects in preventing life-threatening conditions like bacterial contamination, especially meningitis. But the care of CSF drainage and intracranial pressure (ICP) monitoring assume an equally important role.¹ Any inadvertent event of over drainage due to human error can prove fatal for the patient and hence must be anticipated before it is late. We describe a case report of accidental CSF over drainage due to increased lumboventricular pressure gradient saved by timely intervention and propose certain solutions for preventing this complication.

Case Report

A post-operative case of a 35-year-old male with a traumatic penetrating head injury, subarachnoid hemorrhage, and Glasgow coma scale (GCS) E4V1M5 was planned for continuous lumbar drainage on 5th post-operative day owing to non-resolving CSF leakage. The external ventricular drainage (EVD) was already ongoing since the immediate postoperative period and was allowed to continue simultaneously. Under all aseptic precautions and after local anesthetic infiltration, 14 Gauge Touhy's needle was inserted in L3-L4 subarachnoid space and after a free flow of CSF, a 7 French catheter was inserted till 20 cm from the skin. The head was kept flat, and the drainage unit was fixed at the shoulder level at the bed stand with the drip chamber turned on (Figure-1).

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Figure 1. *Correct position of the lumbar drainage bag at the level of patient's shoulder*

After 3 hours, the patient presented with sudden deteriorated GCS, agitation, and sinus bradycardia on electrocardiogram (ECG). The drainage bag was observed to have slipped below the level of the iliac crest and showed 100 ml CSF. Prompt diagnosis of CSF over drainage was made and the patient's lumbar drain line was stopped. He was put in Trendelenburg position; intravenous atropine 0.01 mg/kg and normal saline was transfused leading to resolution of symptoms within 10 minutes of recognition of the deterioration.

Discussion

CSF over drainage is the most common complication associated with continuous lumbar drain (CLD) insertion, often misdiagnosed and attributed to post-surgical brain inflammation or cerebral vasospasm.² It is important to recognize and revert CSF over drainage before it leads to brain sag and herniation. We want to emphasize several factors which if strictly monitored after CLD insertion can prevent such an occurrence. The head end of the patient needs to be flat while the drain is open and plugged whenever the patient's position is changed. Head elevation, in particular, can increase the lumboventricular pressure gradient leading to increased CSF outflow. Hourly ICP monitoring and setting up of the drain set accordingly helps in appropriate CSF drainage only when the ICP is raised above 20 cmH₂O. Usually, if the "0" reference point is kept correctly at the iliac crest and the head end is flat, the chamber is kept 10 cm above the lumbar space, and roller of the set is kept open.³ Targeted volume of CSF to be drained is said to be 5-20 ml/hour, though over drainage has been reported with smaller volumes as well.⁴ Another modification that can avoid the complication is to fix the drainage bag at the head end of the bed itself rather than the side stand to become mobilized with every change in position of the head. However, our Neuro ICU beds are constructed in such a way that it is

not possible to attach the bag with the mobile head unit.

The main factors described in the literature for CSF over drainage after CLD insertion can be insidious spinal fluid fistulas either due to side leaks from the catheter into the epidural space⁵, dura leaks due to multiple attempts during CLD insertion⁶, apart from the sudden changes in head position, drainage bag position, intracranial compression, etc. The diagnosis becomes more conveniently explorable if there is a demonstration of excessive spinal fluid in the drainage bag along with suggestive clinical symptomatology, but sometimes occult fistulas are unrecognizable and can prove fatal for the patient. In this regard, the vital role of ICP monitoring cannot be undermined as an effective approach to not only diagnose CSF hypovolemia in case of suspicion but also elicit the daily variations to guide CSF drainage therapy accordingly.

Failure to monitor ICP efficiently can cause increasing CSF volumes being drained and consequently leading to sinking brain syndrome diagnosed by keen observation of hemodynamic, respiratory parameters, and clinical features like headache, pneumocephalus, cranial nerve palsy, and deterioration of GCS. Computed Tomography (CT) scan findings consistent with the diagnosis include pneumocephalus, subdural fluid collection, bulging convex inferior margin of the transverse sinus (venous distension sign), effacement of basal cisterns, reduced size of ventricles, and pachymeningeal enhancement.⁷ The management includes a checklist of the patient's head position, correct placement of chamber level, and maintenance of intravenous hydration.

Conclusion

The use of lumbar drain in cases of CSF leakage should be cautiously supervised for CSF flow rate and ICP monitoring as over drainage due to slipping of the drainage bag below the level of the iliac crest can cause sudden CSF hypovolemia and brain sagging.

Declaration of patient consent

The authors declare that they have obtained all appropriate consent forms. The patient's relatives have agreed to provide his/her images and other clinical information to be reported in the journal. They understand that patient's name, initials, or any other proof of identity shall not be revealed in any form in the manuscript.

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Conflict of interest

There are no conflicts of interest.

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