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Aseptic Meningitis after Spinal Anesthesia: Diagnostic Dilemma for Anesthetist, Surgeon, and Intensivist Alike!

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Abstract

Spinal anesthesia is a commonly performed anesthetic procedure for inguinal, gynecological, obstetric and lower limb surgical/orthopedic procedures. Neurological complications after an uneventful spinal anesthesia and surgery are infrequent and dangerous. One such complication is meningitis or meningoencephalitis, which may be infectious or non-infectious in etiology. One subset of non-infectious meningitis is Drug-Induced Aseptic Meningitis (DIAM). DIAM may be difficult to distinguish from bacterial meningitis by clinical picture (fever, nuchal rigidity, headache, disorientation) and laboratory investigations. CSF analysis may show polymorphic picture on cytology with increased protein levels and normal to decreased glucose levels. CSF cultures are invariable negative in DIAM. Antibiotics, if started empirically, may be stopped after a diagnosis of DIAM has been made. Bupivacaine has been frequently implicated as a causative agent for post-spinal anesthesia DIAM. The condition is self-limiting with spontaneous and complete recovery.

We present a case of an ASA (American Society of Anesthesiologists) Grade I patient posted for arthroscopic knee surgery under spinal anesthesia. The patient developed meningeal signs in post-operative period and was admitted to ICU. DIAM seemed probable after eliminating bacterial meningitis as a probable diagnosis by negative CSF culture. The patient showed a complete recovery within a few days and was discharged uneventfully.

Keywords: Aseptic meningitis; Bupivacaine; DIAM; Intensive care; Neck rigidity; Anesthesia; Subarachnoid block

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Main Points

1. Meningitis (both bacterial and aseptic) may be one of the uncommon neurological complications seen after spinal anesthesia.

2. One of the causes of aseptic variety is Drug Induced Aseptic Meningitis (DIAM) reportedly caused by bupivacaine given during spinal anesthesia.

3. DIAM may be difficult to distinguish from septic meningitis by clinical picture (headache, vomiting, nuchal rigidity and disorientation) and laboratory investigations.

4. It may be prudent to start antibiotics upon suspicion, but they may be discontinued once negative CSF cultures are reported.

Introduction

Meningitis subsequent to subarachnoid block is an extremely rare and dreaded complication (incidence <0.01%) with potentially serious implications [1]. Similar to that in general population, post-spinal meningitis may be caused by bacterial and aseptic reasons. The latter comprises of infection by viruses, meningeal involvement in autoimmune and neoplastic diseases, and Drug-Induced Aseptic Meningitis (DIAM). DIAM may in turn be caused by two mechanisms -direct chemical irritation of the meninges by intrathecal administration of anesthetic and chemotherapeutic drugs or systemic immunological hypersensitivity (antibiotics, non-steroidal anti-inflammatory drugs, intravenous immunoglobulin) [2]. When associated with spinal anesthesia, it generally has an acute onset within 24 h of dural puncture, and a self-limiting and benign course. Multiple authors have reported DIAM following bupivacaine spinal anesthesia. We present a case of likely DIAM, subsequent to bupivacaine subarachnoid block for elective arthroscopic surgery, posing a diagnostic dilemma for the involved surgeons, anesthetists and intensivists. Informed consent was taken from the patient before reporting this case.

Case Summary

A 36-year-old male patient presented with history of injury to the right knee, resulting in multiple locking episodes and joint instability. Magnetic Resonance Imaging (MRI) showed partial ACL tear. The patient was posted for arthroscopic right anterior cruciate ligament repair with partial medial meniscectomy under subarachnoid block. Pre-anesthetic check-up was completely normal, and the patient was declared ASA (American Society of Anesthesiologists) grade I. On the day of elective surgery, subarachnoid injection was given with 2.4 ml of 0.5% hyperbaric bupivacaine with 20 mcg fentanyl as additive. Cleaning and draping were performed as per departmental protocol and the spinal was given at L3-L4 level using 25 Gauge Quincke needle after local anesthetic injection. Patient was positioned and surgery was started after achieving a sensory level of T8. Surgery lasted for less than an hour and patient was shifted to the Post-operative Anesthesia Care Unit (PACU) with stable vitals. From here, the patient was transferred to admitting ward when level of sensory block receded to L1 level. Four hours after shifting to ward, patient started complaining of severe headache for which injection diclofenac 75 mg was given. This was followed by 2 episodes of vomiting, tachypnea and disorientation to time, place, and person. The surgeon and anesthetist on duty decided to shift patient to Intensive Care Unit (ICU) for further evaluation and management.

The patient arrived in ICU with a low GCS (Glasgow Coma Scale) score of E2V2M3 and dyspnea, necessitating tracheal intubation and assisted ventilation. Neck rigidity was observed but there was no fever. Bilateral pupils were normal in size and reaction. Blood investigations revealed a White Cell Count (WBCs) of 12,300/cumm and neutrophilia (89%) on differential count. Serum procalcitonin level was 4.1 ng/ml. A working diagnosis of bacterial meningitis was made, and neurology consultation was sought. Ceftriaxone, vancomycin, phenytoin, and dexamethasone 8 mg thrice a day were started empirically, while the patient was investigated further. Non-Contrast Computed Tomography (NCCT) and MRI brain were done, which were normal. Fundus examination did not reveal any disc edema. A lumbar puncture was subsequently performed, which showed cell count of 400 cells/cumm with 60% mononuclear cells and 40% polymorphs in Cerebrospinal Fluid (CSF) on cytological examination. CSF biochemistry revealed a glucose level of 150 mg/dl and protein of 777 mg/dl. Gram staining and culture were found to be negative.

As per the above findings and the observation that patient never exhibited any fever, the diagnosis of bacterial meningitis seemed unlikely. We started thinking along the lines of aseptic meningitis, post-subarachnoid block. Antibiotics were de-escalated, but steroids and phenytoin were continued. After 3 days of assisted ventilation and supportive care in ICU, the patient's GCS, blood investigations and ventilation parameters improved markedly. The patient was responsive, neck rigidity was absent and diaphragmatic excursion was normal on ultrasonography. Trachea was extubated and patient's neurological assessment, including higher mental functions were found to be normal, except for some residual amnesia about surgery and post-operative period. The patient was kept in ICU another day and then shifted to orthopedics ward for further care.

Discussion

Neurological complications after an uneventful spinal anesthesia and surgery are infrequent, but when they occur, they pose a diagnostic dilemma to the physicians. It is essential to differentiate DIAM from bacterial meningitis, as the latter is a potentially life-threatening condition, requiring urgent intervention and leaves the patient with neurological sequela. Additionally, establishing the diagnosis of DIAM also prevents unnecessary treatment with advanced antibiotics and hospital/ICU stay [3]. However, symptomatology and clinical findings may not help us distinguish between bacterial and aseptic meningitis, as both may present with headache, nuchal rigidity and febrile episodes [4,5]. CSF findings may also confuse the situation further, showing pleocytosis with neutrophil predominance (later, may shift to mononuclear predominance) and raised protein levels (hyperproteinorrachia). CSF glucose levels may be low (hypoglycorrachia) or normal [5,6].

Bihan et al. [6] reported in their study on 329 cases of DIAM that a clear meningeal syndrome, involving headache, neck stiffness and vomiting may be seen in only 15.5% of cases. Out of the typical symptoms of the meningeal triad, only headache is present in >2/3 of DIAM cases. All other symptoms are reported in only 20% to 40% of cases. Ducornet et al. [7] published certain defining criteria for diagnosis of aseptic meningitis: Time to onset of signs within 24 hours after spinal anesthesia; the absence of prior antibiotic therapy; apyrexia; a WBCs in CSF similar to bacterial meningitis; high protein value in CSF; a normal glucose value in CSF; negative bacterial CSF culture; full recovery in less than 48 h Our patient met each of the above criteria.

This goes to show that DIAM is a diagnosis of exclusion and empirical antibiotics should be started initially in all cases. When negative CSF cultures are obtained, antibiotics may be stopped to prevent development of antibiotic resistance [5]. However, some clinicians favor the continuation of antibiotics till complete symptom resolution, as bacterial meningitis may masquerade as DIAM and is almost always more dangerous, leaving neurological complications. Aseptic meningitis, on the other hand, has a favorable outcome with

Table 1: Case reports incriminating bupivacaine used in spinal anaesthesia for DIAM.

S. No.	Author	Year published	Findings reported
1	Ducornet et al. [7]	2014	Reported likely cause for DIAM to be bupivacaine.
			Gave diagnostic criteria for DIAM, as outlined in discussion.
2	Oliveira et al. [8]	2019	Reported 2 cases of DIAM post-spinal anesthesia.
			Bupivacaine was given in the first patient, who underwent an orthopedic procedure. Post-operatively, the patient showed meningitis like features with elevated WBCs, C-reactive protein in blood and polymorphs with elevated proteins on CSF analysis.
			The second patient underwent caesarean section under spinal anesthesia with ropivacaine. Similar post-operative course as the first patient.
3	Doghmi et al. [9]	2017	Female patient developed features of meningitis 10 hours after spinal anesthesia for caesarean section.
			CSF analysis did not show infective cause and a diagnosis of DIAM implicating bupivacaine was made.
4	Tateno et al. [10]	2010	Case of 34 year old female patient who received spinal bupivacaine for caesarean section reported. CSF analysis showed polymorphs, and elevated proteins, but negative cultures. Bupivacaine implicated as the causative factor.
5	Besocke et al. [11]	2007	16 year old male patient underwent orthopedic surgery, following which meningitis like features developed.
			Antibiotics and steroids were started, but stopped after negative CSF cultures. Bupivacaine was hypothesized as the causative agent.

a spontaneous recovery. Mortality is an exception rather than the rule [6].

There have been many published reports incriminating bupivacaine used in sub-arachnoid block for DIAM (Table 1). The same remains our hypothesis in the above case. Oliveira et al. [8] have also implicated ropivacaine as a causative agent for DIAM in one of the cases. This may be due to similarity in structure amongst amide local anesthetics. The case made a complete recovery, similar to bupivacaine induced chemical meningitis.

Conclusion/Learning Points

DIAM is a possible diagnosis in patients showing features of meningitis, following spinal anesthesia (especially with bupivacaine). Clinical and laboratory findings cannot distinguish between DIAM and bacterial meningitis. CSF analysis may show polymorphs on cytological examination and hyperproteinorrachia, similar to bacterial meningitis. Antibiotics and supportive treatment may be started empirically, but may be discontinued after negative CSF cultures. Recovery is spontaneous and complete, without any neurological sequela.

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