



Case report

Bacterial meningitis without pyrexia after spinal anesthesia for caesarean section: A case report

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ABSTRACT

Introduction and importance: Meningitis happening in post spinal anesthesia is rare. But it has potentially life threatening or permanent neurological sequel if delayed or left untreated. The cause can be infectious or noninfectious. In this case, uncommon pathogen is described causing bacterial meningitis. Incidence varies from 0% to 0.04%.

Case presentation: A term pregnant lady came to the Operation room (OR) for an emergency caesarian section (C/S) because of cervical dystocia. She has no history of known medical illness. The anesthetist planned to administer spinal anesthesia. Under aseptic technique, the senior anesthetist wore a tight-fitting surgical mask, cap, and sterile gloves after hand hygiene with alcohol-based solutions.

In sitting positioning between L(lumbar) 3 and L4 interspaces 10 mg bupivacaine +10 µg fentanyl was administered. Surgery and anesthesia were uneventful, 16 h into the postoperative period the mother develop severe headache, agitation, confusion, and forgetfulness.

She has no fever but meningeal sign was positive. Lumbar puncture (LP) reveals purulent cerebrospinal fluid (CSF).

Immediately, empirical treatment began. CSF sent for analysis and Culture, hematology, urinalysis, and organ function tests requested. Diagnosis was confirmed by clinical picture, low CSF glucose, and high body fluid protein, culture growth; showed *Escherichia coli* (E.coli). Treatment was instituted and patient has recovered fully.

Clinical discussion: E.coli is a very rare cause of bacterial meningitis but manifests a similar clinical picture like other bacterial meningitis but in our case no pyrexia. We believe there is a sterility breach somewhere in the process. The use of hospital sterilized spinal set, multidose antiseptics; institute sterility practice might be challenged.

Conclusion: The use of modern packaging is recommended. Despite absent of pyrexia empiric treatment must start earlier besides the application of national guideline developed by the Joint Commission of different associations including America society of regional anesthesia (ASRA) is recommended.

1. Introduction

Spinal anesthesia is the most common anesthesia technique for caesarian delivery but rarely followed by complications such as post-spinal anesthesia meningitis (PSAM). PSAM is potentially life-threatening or permanent neurological sequel if treatment is delayed or left untreated [1].⁴ It can occur after spinal or epidural anesthesia /lumbar diagnostic procedure or spinal surgery.

LP breaks the existing defense barrier of the central nervous system thus predisposing for risk of transmission of microbes/chemicals to

meninges and subarachnoid space. Bacterial contamination occurs when there is a break in sterility or due to migration of bacteria from the bloodstream into subarachnoid space via microscopic bleeding caused by the needle [2]. several retrospective studies reveal 0% to 0.04% incidence of infectious complications after epidural and spinal anesthesia [3]. Analysis of the reported 179 (1952 to 2005) post-Dural puncture bacterial meningitis cases shows 19 (10.6%) were obstetrics and all the 3 mortality recorded was among obstetrics cases. The viridans streptococcus found to be the dominant causative agent 49% in the report E.coli was not mentioned as a causative agent [4].

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⁴ [] used for reference number.

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The other cause is aseptic meningitis which is caused by chemical irritation of meninges from antiseptic solution or drug injected into subarachnoid space [5]. Differentiation of bacterial and aseptic meningitis is difficult because of mimic's clinical presentation, prophylaxis antibiotics, and change caused by the procedure.

This paper reports a rare PSAM caused by *E. coli* with unusual clinical picture and will discuss the importance of using modern packed kit and adherence to National guidelines that have been developed by the Joint Commission of different associations and ASRA (Table 1.)

This case report is compliant with the SCARE Guidelines criteria 2020 and submits after SCARE checklist [6].

2. Case

A term pregnant lady, Gravida III and Para II, in the first stage of labor, came to OR for emergency C/S because of cervical dystocia after

Table 1

National guidelines that have been developed by the Joint Commission of different

Associations including the ASRA for the standard of spinal anesthesia A checklist was prepared from recommendations of the New York school of regional anesthesia guide line. (open access to scientific and medical research) we believe number 10,11,12,13 and 14 are very helpful in prevention PSAM.

| No. | The Standards of Spinal Anesthesia | Yes | No |
|-----|--|-----|----|
| 1 | Informed consent was obtained after explaining about risks and benefits of spinal anesthesia. | | |
| 2 | A wide bore (16 or 18 G) intravenous cannula secured before administration spinal anesthesia | | |
| 3 | Prepare and check all necessary anesthesia equipment Endotracheal tube, laryngeal mask airway, Laryngoscope, and monitoring before giving spinal anesthesia | | |
| 4 | Resuscitation equipment available | | |
| 5 | Resuscitation drugs must be available whenever a spinal anesthetic is performed | | |
| 6 | Skilled assistance should available in the operation room | | |
| 7 | The patient should be monitored during the placement of the spinal anesthesia with a pulse oximeter, blood pressure cuff, and Electrocardiograph | | |
| 8 | Patient place in a lateral or sitting position by flexing the neck and push out the lower back to open up the lumbar intervertebral space | | |
| 9 | Equipment for the spinal blockade (spinal needle, gauze, artery and disinfectant solutions) should be ready for use, and all necessary medications | | |
| 10 | Anesthetist should wash his/her hands and wear sterile gown and glove surgical gloves | | |
| 11 | Anesthetist should wear cape, face mask and surgical gloves | | |
| 12 | Patient back should be cleaned with skin preparation solution such as iodine and alcohol. | | |
| 13 | The skin preparation solution allowed to dry | | |
| 14 | The area draped with fenestrated drapes in a sterile fashion | | |
| 15 | Appropriate land mark for injection site identified | | |
| 16 | Draw up the local anesthetic solution to be used for skin infiltration | | |
| 17 | Draw up the local anesthetic solution to be used for subarachnoid block int | | |
| 18 | inject a small volume of local anesthetic under the skin with a disposable needle at the proposed puncture site | | |
| 19 | Insertion of spinal needle at the appropriate land mark | | |
| 20 | After free flow of CSF is established, inject the local anesthetic slowly with intermittent aspiration | | |
| 21 | Assess patient's emotional reaction and pain during injection | | |
| 22 | Position the patient with a 15degree left lateral tilt and/or head up either by turning the table aftercomplete injection of local anestheti | | |
| 23 | Dispose waste materials in a leak proof container or plastic bag before removing gloves | | |
| 24 | Check patient's pulse rate and blood pressure immediately after spinal anesthesia | | |
| 25 | Asses the degree of sensory and motor block of the patient 19 (81) 5 (19) | | |
| 26 | Communicate the patient after spinal injection to end of surgery | | |
| 27 | Monitor Record patient's intra operation vital sign every 5 min | | |

3 h of labor. She has no history of chronic medical illness and allergy. Her last delivery was by C/S and was uneventful. No sign of systemic or local infection. All lab tests (Table 2) and vital signs are within normal range. Ceftriaxone 2 g given as prophylaxes. Classified as ASA IIE.⁵The anesthesia plan was performing spinal anesthesia this is after a written consent.

The senior anesthetist⁶ wore a fitting surgical mask, cap, and sterile gloves after hand hygiene with alcohol-based solutions. The lumbar area was cleaned with povidone 10% from a multi-use container and alcohol 70%. The skin was infiltrated with 3 ml of 2% lidocaine then the area was draped with a fenestrated towel. LP was done between L3 and L4 with 24G sterile spinal needle. CSF verified, 10 mg heavy bupivacaine +10 mg fentanyl was given. After seven minutes there was no motor movement and sensory level was at T6.⁷ An APGAR⁸ of 8/10 baby was delivered. The surgery took 45 min and both Intraoperative and in the post-anesthesia care unit vital sign was within normal range.

Postoperatively after 6 h, the patient started to complain severe frontal headache which was treated with paracetamol 1 g and diclofenac100mg suppository QID⁹0.16 h after surgery headache was worsened followed by episodes of confusion, forgetfulness, agitation and neck stiffness. After all these consultation was made with the internal medicine department. Diagnostic LP was done under aseptic technique for CSF analysis and culture. CSF appearance was purulent, pressure was not measured. Right away empirical treatment for bacterial meningitis began (ceftriaxone 2 g BID,¹⁰ vancomicine500mg QID, dexamethasone 10 mg, ampicillin 1 g, and clexane 40 mg). Imaging for MRI¹¹ and lab test requested for complete blood cell (CBC) count, urinalysis and organ function tests. (Tables 2, 3, 4) We found no derangement on urinalysis, renal and hepatic function tests.

After 22 h post-surgery patient assessed. There was no sensory or

Table 2

Lab, result for heamatology¹.

| Days | 05 Jul, 2021 | 7 Jul, 2021 | 9 Jul, 2021 | Reference range |
|---------------------|-----------------------------|-------------|-------------|------------------------|
| WBC ² | 10.27 cells/mm ³ | 17.8 | 13.9 | 4.8–10.8*1000 |
| NEU% | | 96% | 89% | |
| LYM% | | 3.6 | 7.7 | |
| MON% | | 0.4 | 3.3 | |
| EOS | | 0 | 0 | |
| BAS | | 0 | 0 | |
| HGB ³ | 14.2 g/dl | 12.6 | 11.2 | 12–16 mg/dl for female |
| HCT ⁴ | 40.5% | 34.7% | 33.5 | |
| RBS ⁵ | 86 mg/dl | 125 mg/dl | | 74-106 mg/dl |
| HBsAg ⁶ | Negative | | | |
| HCV ab ⁷ | Negative | | | |
| PICT ⁸ | Negative | | | |

¹ Patient is negative for hepatitis B,C and HIV, raw 1 to 3 respectively.

² WBC refer to white blood cell.

³ HGB refer to hemoglobin.

⁴ HCT refer to hematocrit.

⁵ RBS refer to random blood sugar.

⁶ HBsAg hepatitis B surface antigen.

⁷ HCV ab hepatitis B virus.

⁸ PICT refer to provider initiated counseling and testing usually for HIV.

⁵ ASAIIIE refers to, according to American society of anesthesiology to patient with mild disease in emergency.

⁶ Senior anesthetist refers to anesthesia professional who has master degree in clinical anesthesia and more than 2 years of clinical practice.

⁷ T6 refer to sixth thoracic spine.

⁸ APGAR is a tool to assess new born healthy statuses.

⁹ QID it means four times a day.

¹⁰ BID -twice a day.

¹¹ MRI- magnetic resonant image.

Table 3
body fluid and CSF, 06 Jul, 2021.

| Test name | Result | Unit | Reference range |
|--------------------------|--------|-------|-----------------|
| Glucose-CSF | 31.8 | mg/dl | 50–75 |
| Total protein-body fluid | 557.0 | Mg/dl | <4.1 |
| RBS | 127 | Mg/dl | 74–106 Mg/dl |

Table 4
Primary isolation and identification, 10 Jul, 2021 09:27 AM.a, b

| Media | After 24 h | After 48 h |
|-------------------|--------------------|---------------------|
| Blood agar | No growth | No growth |
| Chocolate agar | No growth | Wet colonies |
| MacConkey agar | No growth | NLF 3+ ^a |
| Nutrient broth | Turbid | NA ^b |
| Gram reaction | Gram Negative rods | |
| Isolated organism | E.COLI(A-D) | |

This table is results of culture and gram stain. Isolated organism *E.coli* is gram negative, rod-shaped, facultative anaerobic bacterium. Culture and MRI results arrive after some days.

^a NLF refer to nonlactose fermenting.

^b NA refer to nutrient agar.

motor deficit, no cranial nerve palsy, no photophobia or fever but meningeal sign (kerning's, brudzinski's and neck stiffness) was positive. Glasgow coma scale was 14/15. After assessing clinical picture, lab test (low CSF glucose level < 50% of blood glucose and high protein 557 Mg/dl (Table 3) and MRI result (Figs. 1–3). A diagnosis of post spinal *E.coli* Meningitis was made. Though the patient has no pyrexia, it was supposed to be due to the effect of paracetamol and early initiation of treatment. After 36 h of treatment headache and confusion improved, meningeal signs become negative and CBC results showed improvement. After 2 weeks of treatment the patient was discharged with full recovery and came back for follow up after a week, 2 weeks and 4 weeks no neurological or other abnormality was detected.

3. Discussion

E.coli is a very rare cause of bacterial meningitis. It is usually known as an indicator of fecal pollution of water and food mostly not associated with infection secondary to LP but results in a similar clinical picture to common bacteria like *Streptococcus salivarius* Meningitis [7]. We could not be able to find case reports in obstetric anesthesia *E.coli* induced meningitis in our literature review. There was community acquired spontaneously occurring *E.coli* meningitis in 45 adults (non-obstetric) cases from 1945 to 2017. But none of those cases have association with Dural puncture [8].

In this case, the anesthetists took all recommended precautions to avoid sterility breach except wearing sterile gown which is not included in the institute practice. Several international guidelines also do not routinely recommend the use of surgical gowns to perform single shot or catheter insertion procedures [9,10]. several studies in Ethiopia seem to indicate a questionable sterility practice besides failure to follow guidelines that have been developed by the Joint Commission of different associations including ASRA. The commission develop check list for safety steps to decrease infection and toxicity before performing a regional block [11]. A study in Debretabor specialized hospital reported all of the anesthetists did not wash their hands, wore a sterile gown, and draped the back of the patient with fenestrated drapes in a sterile fashion [12]. Another study conducted at the University of Gondar by Chekol W et al., found as all anesthetists did not wash their hands and wear sterile gowns [13].

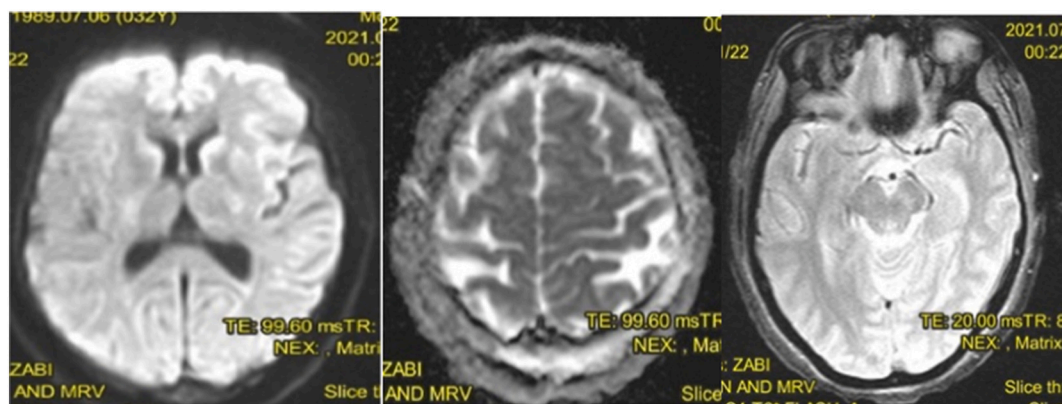
The possible causes for PSAM is a breach in sterility or aseptic techniques while spinal anesthesia is being administered, hematogenous spread in septicemic patients or patients with asymptomatic bacteremia due to microscopic bleeding while spinal anesthesia is administered or due to contamination being present in the drug utilized or the equipment used [14,15].

A study in India reported infected batch drug or needle as a source of infection [16]. In this case regarding drug/needle as source of contamination is unlikely because we use the same batch drug/needle without any incident. The equipment we use are sterile with indicator for its sterility. It is sterilized by hospital sterilization center. From Sterile package syringe and needle was supplied to sterile field. There were no technical error as to anesthesia team and other opinions. In this case, we didn't use single-use containers povidone solution. Multiple-use containers are less effective in creating asepsis and are more susceptible to colonization by bacteria [17].

The anesthetist feels it would be best to use modern packaging spinal kits with a spinal needle, syringe, drugs, and antiseptic solution. Empirical intravenous antibiotics should be initiated and adjusted based on culture and sensitivities report [18] to minimize these complications National guidelines have been developed by the Joint Commission of different associations and ASRA.

4. Conclusion

A review of our practice of sterility technique, it remains difficult to identify the exact source of the pathogen for meningitis. This is an extremely rare case of *E.coli* induced PSAM. It is caused by the inadvertent introduction of bacteria despite the aseptic technique, in this case without pyrexia. The authors recommend the use of a modern standard pack for spinal anesthesia and the use of nationally standardized guidelines. Meningitis is a serious complication and its early



Figs. 1–3. Those are brain imaged from MRI, diagnose as celebrities.3 image are selected to show pathology. Celebrities. NB. For confidentiality purpose the image is cropped the original CD is available for editorial in chief of this journal on request.

diagnosis and treatment is vital to decrease mortality and neurological sequel.

Ethical approval

In this institution study of case reports are exempted from ethical approval in a circumstance that patient or guardian gives consent.

Informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

1. Name of the registry: research [registry.com](https://www.researchregistry.com)
2. Unique identifying number or registration ID: researchregistry 7164
3. Hyperlink to your specific registration (must be publicly accessible and will be checked):

<https://www.researchregistry.com/browse-the-registry#home/>

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Provenance and peer review

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CRediT authorship contribution statement

Sulaiman Jemal: Conceptualization, Writing - Original Draft, Data Curation, review & Editing.

Declaration of competing interest

No conflict of interest.

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References

- [1] D. Burke, J.A. Wild Smith, Meningitis after Spinal Anesthesia, *Br. J. Anaesth.* 78 (1997) 635–636, <https://doi.org/10.1093/bja/78.6.635>.
- [2] A.R. Tunkel, B.J. Hartman, et al., Practice guidelines for the management of bacterial meningitis, *Clin. Infect. Dis.* 39 (2004) 1267–1284. Govardhane BT, Jambotkar TC, Magar JS, et al. Meningitis following spinal anesthesia. *Med J Dr. DY Patil University* 2015; 8:513.
- [3] T.T. Horlocker, D.G. McGregor, D.K. Matsushige, D.R. Schroeder, J.A. Besse, A retrospective review of 4767 consecutive spinal anesthetics: central nervous system complications, *Anesth. Analg.* 84 (1997) 578–584.
- [4] A. Estelle, M.D. Trauring Bear 105 (2006) 381–393.
- [5] S.D. Fijter, M. DiOrio, J. Carmean, et al., Bacterial meningitis after intrapartum spinal anesthesia-New York and Ohio, 2008–2009 59 (2010) 65–69.
- [6] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical Case Report (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230, 6.
- [7] M. Wilson, R. Martin, S.T. Walk, et al., Clinical and laboratory features of *Streptococcus salivarius* meningitis: a case report and literature review, *Clin. Med. Res.* 10 (2012) 15–25. Bichona A et al *Escherichia coli* spontaneous community acquired meningitis in adults a case report and literature review *int.j inf dis*, 2018; 67:70.
- [9] J.R. Hebl, The importunacy and implication of aseptic techniques during regional anesthesia, *Reg. Anesth. Pain Med.* 31 (2006) 311–323.
- [10] L.M.T. de Araújo Azi, N.M. Fonseca, L.G. Linard, *BSA 2020: regional anesthesia safety recommendations update*, *Braz J Anesthesiology* 70 (4) (2020) 398–418.
- [11] M.F. Mulroy, R.S. Weller, G.A. Liguria, A checklist for performing regional nerve blocks, *Reg. Anesth. Pain Med.* 39 (3) (2014) 195–199, <https://doi.org/10.1097/AAP.0000000000000075>.
- [12] Henie, in: *The Current Practice of Spinal Anesthesia in Anesthetists at a Comprehensive Specialized Hospital: A Single Center Observational Study*, *Local and Regional Anesthesia* 14, 2021, pp. 51–56.
- [13] W. Chekol, Z. Danu, H. Tawuye, Audit on documentation completeness after regional nerve blocks at University of Gondar referral hospital, 2018, *J. Anesth. Crit. Open Access.* 10 (6) (2018) 208–211.
- [14] T.T. Horlocker, D.G. McGregor, D.K. Matsushige, et al., Neurological complications of 603 consecutive continuous spinal anaesthetics using macro catheter and micro catheter techniques, *Anesth. Analg.* 84 (5) (1997) 1063–1070.
- [15] A. Ducornet, F. Brousous, C. Jacob, et al., Meningitis after spinal anesthesia: think about bupivacaine, *Ann. Fr. Anesth. Reanim.* 33 (4) (2014) 288–290.
- [16] C.E. Govardhane, Meningitis following spinal anesthesia, July-August, *Med. J. Dr. D.Y. Patil Univ.* 8 (4) (2015). on Sunday, August 29, 2021, IP: 196.189.24.231, <http://www.mjdrdypu.org>.
- [17] D.J. Birdbath, D. Stein, O.M.T. Murray, D. Thys, E.M. Sordillo, Povidone iodine and skin infection before initiation of epidural anesthesia, *Anesthesiology* 88 (1998) 668–672.
- [18] D.A. Austin, J.W. Sokolowski, Post lumbar puncture chemical meningitis, *New York State J. Med.* 68 (1968) 2444–2446.