

Outbreak of bacterial meningitis after spinal anaesthesia in Bangladesh

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Abstract:

Iatrogenic meningitis following spinal anaesthesia is very rare. Recently we have experienced severe headache, vomiting, fever, restlessness, nuchal rigidity and altered level of consciousness 5-6 hours after spinal anaesthesia in one hundred and nineteen patients diagnosed as iatrogenic bacterial meningitis during the period of September 2008 to March 2009. Patients were successfully treated with Inj. Ceftriaxone 2gm BID for 14 days, Inj. Dexamethasone 20mg daily in four divided dose for five days. Purulent CSF, high cell count (1570mm⁻³), elevated protein level (269mg/dl) and normal glucose (57mg/dl) levels in CSF were noted. There were 5 (4.2%) cases of mortality. No causative organisms were isolated from CSF, blood of the affected patients and anaesthetic agent used for the block. In conclusion, the cause of meningitis was diagnosed as bacterial in origin though no organism was isolated.

Key words: spinal anaesthesia, neurological complications, bacterial meningitis

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Introduction

Meningitis is a common and devastating complication that presents as a medical emergency requiring high level of diagnostic and therapeutic skills. The mortality and morbidity is very high if intervention delayed. The incidence of meningitis after central neuraxial blocks is difficult to quantify and it is as high as 1:506,000 in one retrospective study¹. The etiology of meningitis after spinal anaesthesia in obstetrics has been extensively reviewed by Roberts et al². The cause may be bacterial, viral, fungal and chemical or aseptic. Pandian et al reported 27 cases of post lumbar puncture iatrogenic meningitis in India that occurred between 1984 to 2002. They have isolated the causative organism and mostly were streptococcus and 5 cases were *Aspergillus fumigatus*³. Rodrigo et al reported a cluster of fungal meningitis in Sri Lanka after Tsunami in the year 2005⁴. To find out the cause, they carried out an extensive search. They have carried out culture and sensitivity test of representative amount of syringes, spinal needles, Bupivacaine and fentanyl

ampoules and found bacillus in 27 syringes, *Aspergillus fumigatus* in 13 syringes and 2 spinal needles. They also found staphylococcus and coliform species in the wall of ampoules, fluid insight the ampoules were sterile.

Central neuraxial block especially spinal anaesthesia is very popular in Bangladesh because of low cost, easy to perform and maintenance. Recently, there are reports of one hundred and nineteen cases of severe headache, vomiting, restlessness, fever and altered mental state after five to six hours of spinal anaesthesia suggestive of meningitis. Turbid cerebrospinal fluid is also noted in some cases. There were five deaths related to the outbreak also⁵. We believe that the outbreak gives an important message to the Anaesthesiologists to face the historical challenge that occurred in UK in 1950s⁶. We also believe that the cause and source of the recent out break should be addressed as early as possible to stop the further mortality and morbidity.

A Case

Twenty six years old primi gravid mother with her 38 weeks of pregnancy was admitted to an ISO certified private clinic at 7am in the morning on January 15, 2009 with early stage of labour pain. She was 65kg weight, non diabetic and normotensive. Labour was augmented with synthetic oxytocin and membrane was ruptured spontaneously. Due to non-progression of labour and foetal distress, it was decided to perform emergency caesarean section. She remained nil by oral from the morning. Intravenous fluid (Hartmann's solution) was started from the labour room as preloading and Inj. Ceftriaxone 1gm, Inj, Metoclopramide 10mg and Inj. Ranitidine 50mg was given IV. Her body temperature was 98⁰F at axilla.

She had a history of sore throat and fever ranging from 101-102⁰F 15days back from the date of caesarean section. She was treated with paracetamol, antihistamine and Azythromycin for 5 days and temperature was subsided.

At 3.30pm on the same day spinal anaesthesia was performed with the patient in the left lateral position. The skin was prepared with Chlorhexidine in alcohol. Lumbar puncture was done in single prick at L₃₋₄ interspaces with 25G Quincke type spinal needle. The bevel of the needle remains parallel to the dural fibre. After free flow of clear cerebral spinal fluid (CSF), 2.25ml of 0.5% hyperbaric bupivacaine was injected slowly. The caesarean section proceeded uneventfully. During the whole surgery period, she was infused of total 1700ml of lactated Ringers solution. Synthetic oxytocin of 5unit was given after delivery of baby. Her haemodynamic status was stable and no vasopressor was required. Total duration of surgery was 45minutes and blood loss was average. Per rectal Diclofenac 50mg and misoprostol 400µg was given after the end of surgery and patient transferred to the post operative ward at 04.30pm.

The patient received 100mg of Inj. Pethidine with Inj. Prochlorperazine at 07.30pm after complaining of pain. The patient became restless at 08.45pm. Considering the cause of restlessness as extra pyramidal syndrome (EPS), Inj. Procyclidine IM was given to the patient. During the time she was afebrile, haemodynamically stable, jerks normal but slight confused. On January 16, 2009 at 02.45am, the patient became unconscious. She was haemodynamically stable, body temp 98.6⁰F at axilla, pupil 3mm, symmetrical, reacting to light, nuchal rigidity and positive Kerning's signs. All jerks were brisk and planter extensor was found in the right. Inj. Ceftriaxone 2gm was given empirically

to cover bacterial meningitis. She was transferred to intensive care unit of another private hospital, because of the fear that tracheal intubation and artificial ventilation may required at any time.

Laboratory investigations revealed leukocytosis of 21.2 K/µL (ref 4-11 K/µL) but negative for any growth. Lumbar puncture was performed on the same day at 09.10am; the CSF appeared turbid, pressure raised. Analysis of CSF revealed a white cell count of 3090 mm⁻³ (92% were polymorphs), protein 485mg/dl (reference value- 15-40mg/dl) and normal glucose contents. Gram stain showed plenty of pus cells per high power field. No organism was detected on gram stain. The culture (routine, anaerobic) and sensitivity showed no growth. Diagnosis of bacterial (pyogenic) meningitis was made depending on CSF study. Inj. Ceftriaxone 2gm twice daily continued for ten days.

On the third postoperative day, she was transferred to the primary hospital and discharged home on the eleventh postoperative day with out any residual neurological effect. The patient was examined again on April 30, 2009 three and half month from the incidence, no neurological deficit was detected.

Action plan

Sporadic reporting from practicing anaesthesiologists were received by BSA regarding post spinal severe headache, vomiting, fever, restlessness, nuchal rigidity and diffuse mental orientation provisionally diagnosed as case of meningitis. A multidisciplinary meeting was arranged by Bangladesh Society of Anaesthesiologist (BSA) in the form of panel discussion comprising of a neurologist, a microbiologist and senior anaesthesiologists. The panel has decided to include the cases of severe headache, vomiting, fever, restlessness, nuchal rigidity and obtunded level of consciousness after spinal anaesthesia for any surgery retrospectively and in future cases. A course of action plan was chalked out and a questionnaire was designed. BSA has taken an initiative to send it to all of their members. We have decided to utilise Sri Lanka's experience tackling meningitis after lumbar puncture in 2005⁴. In the meantime short term measured has taken as autoclaving of pre-packed spinal needle, gloves, syringes and local anaesthetics ampoule.

Methodology

1. Retrospective review of cases:

All data were recorded in a pre-design data collection sheet (Appendix: I) after report of any case. The attending Anaesthesiologist fill in the Form and

further follow up was carried out by the Principal Investigator up to six month from the date of incident.

2. Laboratory Procedures for CSF and Blood:

A. Under full aseptic condition lumbar tap was done and CSF sample was collected in four sterile tubes. Pressure and Colour was also recorded at Data Sheet. One test tube was stored at liquid nitrogen for future use.

Laboratory Procedures for CSF and Blood: CSF

Under full aseptic condition lumbar tap was done and CSF sample was collected in four sterile tubes. Pressure and Colour was also recorded at Data Sheet. One test tube was stored at liquid nitrogen for future use.

Following cytological tests were done:

- Total count of WBC by Neuber counting chamber,
- Differential count of WBC by Leishman staining,

Zeihl-Neelson staining for Acid Fast Bacilli

Biochemical test:

Total protein and glucose content were estimated by spectrophotometer.

Culture and sensitivity tests were done by conventional method

B. Under aseptic condition Blood was collected for culture and sensitivity. Culture and Sensitivity test was done by conventional method

3. Culture and sensitivity of local anaesthetic solution was done by traditional method

Surveillance of twenty one cases

One hundred and nineteen cases of suspected meningitis so far identified after the outbreak has noticed. Out of these, it was possible to perform repeat lumbar puncture only in twenty one cases for collection of CSF.

Table-I
CSF and blood biochemical, cytology and microbiological profile of twenty one cases

Case no	Blood leukocyte count/cu mm	CSF study				Culture and sensitivity test	Culture and sensitivity of Blood
		Protein content mg/dl	Glucose content mg/dl percentage of plasma glucose level	Total Cell count cells /cu mm	PMN absolute number (%) of total		
1	21.9k	485	61 (51%)	3900	92	Bacterial antigen for Streptococcus B, Haemophilus influenzae type b, Streptococcus Pneumoniae, Neisseria meningitis A, B, C, Y and Escherichia coli K1 negative. Negative for growth of any aerobic bacteria.	Culture and Sensitivity (aerobic) of blood is negative for all cases.
2	-	312	59 (52%)	1674	89	Culture (routine aerobic) and sensitivity of CSF negative in 19 cases.	
3	-	268	46 (54%)	4200	94		
4	-	432	58 (49%)	3219	82		
5	-	278	62 (52%)	1793	75		
6	-	179	49 (48%)	1643	87		
7	-	289	52 (51%)	2147	91		
8	-	345	84 (53%)	1259	79		
9	-	239	53 (54%)	2154	68		
10	-	376	49 (53%)	1027	74		
11	-	274	58 (54%)	942	91		
12	-	394	53 (45%)	496	85		
13	-	123	75 (63%)	742	84		
14	-	140	37 (43%)	294	79		
15	-	134	59 (53%)	528	84		
16	-	264	63 (49%)	2473	76		
17	-	284	67 (53%)	1634	69		
18	-	173	41(43%)	1954	57		
19	-	394	49 (57%)	200	60		
20	-	264	62 (64%)	295	80		
21	-	198	59 (53%)	276	87		

Within parenthesis are percentages over plasma glucose concentration.

Distribution of hospital

Complete data were available for twenty one patients only out of one hundred and nineteen reported cases. Data were collected 7 cases from teaching hospital, 4 from govt general hospital and 10 from private hospital (Fig. 1). Unfortunately, we have failed to collect data of other 98 cases (24 from teaching hospital, 11 from govt general hospital and 57 from private hospital).

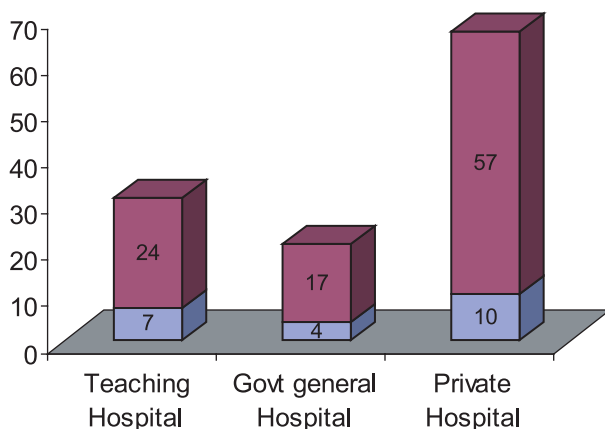


Fig-1: Type of hospital reported for post spinal meningitis

Type of surgery

Out of twenty one cases, spinal anaesthesia was induced 7 patient for caesarean section, 3 patient for total abdominal hysterectomy and 11 for other surgery (Fig.-2) mostly urological procedure in the same day list of a teaching hospital.

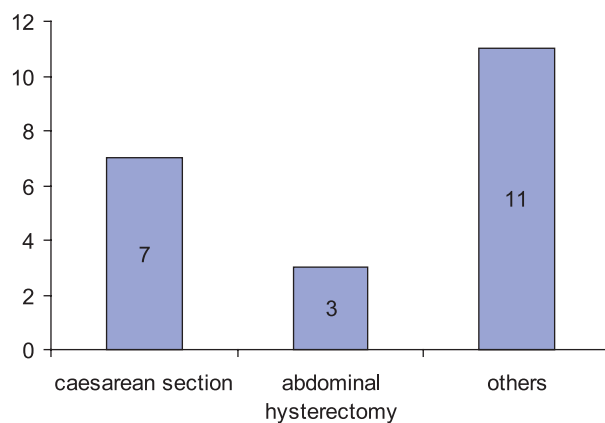


Fig-2: Surgery performed in the case series of post spinal meningitis

Death review of five cases

There are reports of five deaths after spinal anaesthesia during the period. Out of five cases,

one was in a govt general hospital and other four were in private hospital. Spinal anaesthesia was induced for caesarean section in all five cases. After 5-6 hours of surgery, they complaints of severe headache, nausea and vomiting, restlessness and altered mental state but no change of haemodynamic status. They all were put on artificial ventilator but died after 2-3days.

Culture of drug used for block

Hyperbaric bupivacaine ampoules presently marketed by the manufacturers were collected from the market in a random fashion Five ampoules for each batch were collected and out of these two ampoules in each batch used for aerobic culture to identifying bacteria and fungus present if any in local anaesthetic solution. All samples were negative for any growth.

Discussion:

Central neuraxial especially spinal anaesthesia is used almost all patients undergoing caesarean delivery in all over the World. It is also used in lower abdominal and pelvic surgery. Despite aseptic techniques, sporadic cases of bacterial, chemical and viral meningitis have been reported after spinal anaesthesia¹. Infectious complications especially bacterial meningitis is extremely rare and difficult to quantify. Horlocker et al retrospectively reviewed infectious complications as a whole after spinal anaesthesia and it was from 0 to 0.04%⁷. Michael Kremer published his experienced of eight cases of meningitis after spinal anaesthesia and proposed the theory that might explained the aetiology in the year 1945. These were chemical theory, secondary meningitis theory and infective theory⁸. On the other hand, Lee JJ et al. classified post spinal meningitis etiologically into bacterial, viral and aseptic or sterile⁹. Differentiation between bacterial and aseptic meningitis is difficult, but the later is characterized usually by a negative culture, normal CSF glucose concentration, high polymorphonuclear leukocytosis and elevated protein level. The symptom of aseptic or chemical meningitis usually starts as early as 6-24 hours after spinal anaesthesia with the complaints of nausea, vomiting, headache, fever and nuchal rigidity¹⁰. On the other hand, symptoms of bacterial meningitis frequently begins within 12-72 hours after spinal puncture with nausea, vomiting, headache, malaise, neck stiffness, photophobia, somnolence, agitation and

fever¹. During the time of study by Rendell C, syringe usually sterilized by irritant chemicals but presently it is replaced by Ethylene Oxide. It is usual practice in Bangladesh to start third generation cephalosporin therapy before surgery. Probably that is why; no organism was isolated in our cases.

The death rate of iatrogenic meningitis is relatively low than community acquired meningitis which ranges from 3-29%¹¹. In the present study, death rate is 4.2%, spinal anaesthesia was performed for caesarean section and no neurological deficits were noted in other patients. The death of all five obstetric cases may be due to increased susceptibility and it is proposed by Rodrigo N et al⁴. The rapid diagnosis and provision of effective treatment may explain this favorable outcome.

Meningitis after spinal anaesthesia is a rare complication but can be a significant clinical problem with mortality and morbidity in our country. Adequate Aseptic precautions such as wearing a face mask, proper washing of hands with an antiseptic solution, wearing a sterile gloves, cleaning the skin with iodine solution and wait for three minutes then clean with alcohol or chlorhexidine, use of pre-pack sterile spinal needles, blister pack syringes and sterile local anaesthetic ampoules or wiping of ampoule with alcohol hopefully decrease the incidence of this preventable conditions in anaesthetic practice.

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APPENDIX I:

Record Sheet For Post Spinal Meningitis Patient

Particulars of Patient:

Name: _____; Age: _____ yrs; Body Weight: _____ kgs;
 Type of surgery: Scheduled / Emergency; Name of surgery: _____

In case of caesarean section:

Cause of emergency: LFM / Ruptured Membrane / Obstructed labour / Chorioamnitis; Gravida: primi / multi

Other Data:

Date: _____; Time of block: _____ am / pm; end of surgery: _____ am / pm; Type of Hospital: teaching / specialized / Up zilla Hospital / private clinic

Past medical history in one month:

Type of illness: Fever / sore throat / nasal discharge; Duration: _____ days; Antibiotics used: yes / no; Bacterial culture: done / not done

Fever at the time of block: yes / no; If yes please mentioned: _____ ° F / C

Antibiotic prophylaxis:

Antibiotic given before block: yes / no; Name of group with amount: Cephalosporin / Amoxicillin / Cephradine 500mg / 1000mg

SAB data:

Space: L 2-3, L 3-4, L 4-5; Number of prick- Single / Twice / Multiple; Bloody tap: yes / no

Information regarding Needle:

Type of Block: SAB/ Epidural / Caudal; Type of Needle: Quincke / Touhy; Gauze: 25G / 26G/ 18G
 Manufacturer: B Braun / Terumo/ BD / others; No of use: single / reuse with autoclave;

Information about Drugs used:

Infiltration done: Yes / No; Type of vial: new / used before; Aspiration Needle remains in situ: Yes / No; LA vial top clean with antiseptic: yes / no; type of antiseptic: Chlorhexidine / 70% alcohol

Bupivacaine / Lignocaine; Volume: _____ ml; Manufacturer: Jaysons / Popular / Incepta / Ganoshyasta

Batch no: _____; Date of manufactured: _____ Date of expiry: _____

Vasopressor used: yes / no; amount: _____ mg in total

Fluid used for Preload: _____ ml; Intraoperative: _____ ml

Uterine stimulant: Oxytocin _____ unit / Ergometrine _____ mg /

Co-analgesic used: yes / no; if used: Ketamine mg / Pethidine _____ mg

H₂ receptor blocker: Ranitidine / Omeprazole; Anti emetic: prochlorperazine / Metoclopramide / Ondansetron mg _____ before block / after block

Back sterilization before block:

By: 10% povidine Iodine / 70% Alcohol / both;

Hand wash before block: yes / no; Glove used: new / autoclaved; Wear mask & cap: yes / no; Use sterile drape: yes / no; Spinal Needle tip touched before skin puncture: yes / no

Intra-operative events:

Parameters	Before block	10 min after block	20 min after block	After surgery	POW
BP					
HR					
Nausea / vomiting					
Shivering					
Headache / neck ache					

