Eastern Heartland Journal of Medicine
VOL. 1 NO. 2 ISSN -2734-2875
EAST H MEDJ 2020;1:80-83

WHEN YOU RUN OUT OF 0.5% HYPERBARIC BUPIVACAINE FOR SUBARACHNOID BLOCK ANYSAFE ALTERNATIVES IN AT-RISK PATIENTS FOR COMPLICATIONS OF SUBARACHNOID BLOCKS IN LOW RESOURCE ECONOMIES

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ABSTRACT

Subarachnoid block for caesarean section is an acceptable and safe anaesthetic procedure. Cases of high spinal are encountered from time to time; especially in patients that are at risk; pregnancy itself being a risk factor. Efforts at minimizing the unpredictable spread of local anaesthetic agents informs the choice of hyperbaric bupivacaine over hypobaric or isobaric bupivacaine. Following a critical incident in a patient that had plain 0.5%bupivaine, subsequently 0.5% hyperbaric bupivacaine was constituted from plain isobaric bupivacaine in an at-risk patient without any sequelae. Drug availability and potency is a recurring challenge in patients presenting for emergency caesarean section; in whom subarachnoid block is a better and safer option in low resource environments.

Key words: subarachnoid block, Isobaric bupivacaine, hyperbaric bupivacaine, high Spinal

Introduction

Subarachnoid block for caesarean section is an acceptable and safe anaesthetic procedure. There are however incidents of morbidities and mortalities associated with the procedure. High spinal and, severe hypotension and cardiac arrest are known complications treated with set management guidelines.[1,2]

The royal college of anaesthetist publication, 3rd national audit suggested an incidence of 1 in3, 019 for emergency Caesarean section and 1 in 5334 for elective deaths attributable to High Spinal.[3] Figures as high as 1% have been reported in a Danish study especially in patients who had prior epidural. [4]Locally, Nigerian data are not readily available.The review of these two cases are meant to stir up research interest and explore safe alternatives when confronted with the limitations of constrained resources with a background of international best practices.

Case Presentation

Case 1

A 28year old paragravida 1 patient presented for emergency caesarean section on account of cervical dystocia. Preoperative assessment was not significant and patient was prepared for subarachnoid block.

It was found incidentally that the stock of heavy Marcaine was exhausted. Preoperative blood pressure was 100/60mmHg. After preloading with a litre of normal saline, the anaesthetist then decided to use isobaric Marcaine which was available at the time. The blood pressure at this point was 110/70mmHg. About 2mls of isobaric Marcaine was given at L3/L4 interspace with a 25G Quincke needle in the anaesthetic room after routine scrubbing and draping , just next to the operating suit.

In less than a minute, the patient developed features of hypotension. Blood pressure dropped to unrecordable levels and patient became unconscious.On the operating table endotracheal intubation was done and vasopressors administered

Apart from vasopressors (Ephedrine 30mg-2 doses with second dose in an infusion of normal saline) and normal saline, no further medication or anaesthetic agent was given. With the help of an assistant, crystalloids were infused while the surgeon cleaned up the patient and quickly extracted the baby. Apgar score was 6 and 9 at 1 and 5 minutes respectively

Vital signs were maintained at reasonable levels (90/60-100/60mmHg), and the blood loss was minimal Thirty minutes when the surgeon was closing up the skin, patient stated moving.

Eastern Heartland Journal of Medicine
VOL. 1 NO. 2 ISSN -2734-2875

The skin was hurriedly closed and patient extubated and had good cardio respiratory profile in the immediate postoperative period
The recovery was uneventful and patient was discharged home with her baby on 7th post-operative day

Case 2

A 22 year. old 5 feet tall primigravida presented for caesarean section on account of obstructed labour.Preoperative assessment was essentially normal with a preoperative blood pressure of 100/65mmHg and heart rate of 88/min. She was counselled for spinal anaesthesia. At this point only plain bupivacaine was available. After intravenous access, she was preloaded with 1litre of normal saline. Spinal anaesthesia was done with a 25G Quincke needle after the constitution of heavy 0.5% bupivacaine from 0.5% plain bupivacaine and administered at L3, L4 interspace.

Heavy bupivacaine was constituted by mixing 50% dextrose with isobaric bupivacaine (Marcaine).Standard constitution of heavy bupivacaine (Marcaine) is 80mg of dextrose per ml of 4ml vial

50% dextrose comes in a 100 ml, this means, 50 grams of dextrose in a 100ml. About 100ml of 5% dextrose is 50gms. This implies that 0.5g is equivalent to 500mg.

To constitute 4mls of heavy bupivacaine (Marcaine), we need approx. 80mg x4, that is, 320mg of 50% dextrose in water. This approximates to 320/500 which is equal to 0.6mls of 50% dextrose water.

About 0.6mls of 50% dextrose water is drawn in a 2ml syringe, put in a 5ml syringe and made up to 4mls with 0.5% plain bupivacaine (Marcaine). It gives an approximate content of 0.5% heavy bupivacaine (Marcaine). Strict asepsis was observed in this procedure.

The patient's blood pressure remained stable at between 90/ 55mmHg to 100/60mmHg throughout the surgery. Anaesthesia and surgery were uneventful

Discussion

Spinal Anaesthesia is a safe procedure for caesarean section. Cardiac arrest after a subarachnoid block with isobaric or hypobaric bupivacaine (Marcaine) is not an uncommon feature worldwide.[5]In this article we experience high spinal and severe hypotension with a near cardiac arrest with the use of 0.5% plain bupivacaine.

Our usual practice is the use of heavy bupivacaine in view of its predictable spread; especially in patients for caesarean section at risk of high spinal. On this occasion we ran out of 0.5% heavy bupivacaine leaving us with the option of isobaric plain 0.5% bupivacaine. A second case however profiles the safe and effective constitution of 0.5% hyperbaric bupivacaine where only plain bupivacaine was available.

In order to minimize the unpredictable spread of plain bupivacaine (Marcaine) the constitution of heavy Marcaine with dextrose may become a necessity in dire circumstances. Hyper baric bupivacaine is made in 8% concentration of glucose, while plain bupivacaine which is referred to as isobaric, was contradicted by Blomqvist and Nilsson who described it as hypobaric.[6]Some studies have recently confirmed plain bupivacaine as hypobaric in comparison with cerebrospinal fluid (CSF). Heavy bupivacaine is a preferred option against the unpredictable spread of plain bupivacaine.[7,8,9]

Previous Studies by Richardson and Wissleffi suggest that CSF density at term is 1.00028 g/ml at 37°C but it is 1.00075 g/ml in men and postmenopausal women. In another study done by a Wynne Aveling, of University College Hospital, London, Plain 0.5% bupivacaine was found to have a density of 0.99937 g/ml but the addition of 25 µg (0.5 mL) of fentanyl raises the density towards that of CSF. Bupivacaine 0.5% in 8% dextrose has a density of 1.0020 g/ml.[8]

While plain bupivacaine may cause immediate effects with upward ascent in the sitting position as illustrated in the first case, heavy bupivacaine causes delayed effects 15 to 30mins after the administration of the block and positioning of the patient. In pregnant women whose thoracic spine is more dependent in the supine position, a little elevation with a pillow or elevation of the head of the operating table at 30 degrees ensures a more predictable spread to the dependent lumbosacral region with heavy bupivacaine, unlike the upward spread of plain bupivaccine. This maneuver may help prevent unnecessary hypotension and cardiac arrest. This is purely within the control of the anaesthetist unlike the upward and unpredictable spread of plain bupivacaine.

Other factors that affect the spread of spinal blocks in the pregnant patient are the reduced volume of CSF, as seen in pregnancy induced hypertension, multiple pregnancy and obesity I

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VOL. 1 NO. 2 ISSN -2734-2875

n pregnancy.Other factors that affect cephalad spread in CSF are the gravid uterus and the relaxation of the thoracic curvature on moving from sitting to lying position: However, Nilsson and Holqmvist reported no difference in spread between plain and heavy bupivacaine in caesarean section.[4]

Hyperbaric bupivacaine has been shown to cause sudden cardiac arrest post spinal block due to an extension of sympathetic block after patient has been positioned. In contrast,isobaric bupivacaine is less sensitive to patient's position; but in its strict sense is hypobaric in pregnancy.[10,11,12] Plain Levo- bupivacaine which has less toxicity to the heart and CNS has been found to be truly isobaric in pregnancy; a property that confers to it a more predictable spread than plain bupivacaine. [13,14,15] From previous reviews, other authors claim there is no significant difference in the use of either hypobaric or hyperbaric bupivacaine for caesarean section.[16, 17,18] Repeated critical incidents with the use of plain Marcaine has raised questions in our minds. Though the use of hyperbaric bupivacaine is favored in our experience in obstetric anaesthesia because of its safety profile, it is not absolutely without risks. [19, 20, 21] This case is one of such near misses worth reporting and possibly calls for more reviews.
In low resource environments, sometimes only plain bupivacaine (Marcaine) is available. Sometimes also some available heavy Marcaine may cause failed spinal anaesthesia due to poor storage. When you have a batch of non-potent heavy bupivacaine (Marcaine), what do you do, especially when the batch of plain Marcaine is potent? Do we constitute 0.5% heavy bupivacaine?

It is common knowledge that only preservative - free agents should be used for spinal anaesthesia. It should be noted that only hyperbaric (heavy) bupivacaine and plain Levobupivacaine are licensed for İntrathecal use in some countries like the United Kingdom. Preservative-free lidocaine 1% or 2% cannot be recommended for İntrathecal use because of the high incidence of transient neurological symptoms (TNS).
Also, the introduction of the newer local anaesthetic agents has reconfirmed the need for hyperbaric, glucose-containing solutions in order to provide predictably reliable clinical block patterns.[22]

Conclusion

Safety issues in low resources climes require a balancing act in knowledge application, and available resource mobilization in a peculiar environment in meeting patient's needs. The ability to be proactive and innovative is illustrated in these cases reviewed. This adaptation should be the exclusive preserve of physician anaesthetists, trained with well set guidelines for this possibilities. This question comes to mind vividly each time one sees patients with total spinal in the intensive Care Unit.

Declaration of conflict of interest

The author declares that no conflict of interest exists

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VOL. 1 NO. 2 ISSN -2734-2875

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