A case of total spinal anesthesia

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A R T I C L E   I N F O

Article history:
Received 1 August 2020
Received in revised form 26 September 2020
Accepted 27 September 2020
Available online 29 September 2020

Keywords:
Complete spinal block
High neuraxial block
Obstetric anesthesia Spinal anesthesia
Total spinal

A B S T R A C T

INTRODUCTION: In situations where the time to delivery is urgent, but not critical within minutes, and otherwise contraindicated spinal anesthesia is the safer option of avoiding the risks and complications of general anesthesia, mainly difficult airways and risks of pulmonary aspiration.

CASE PRESENTATION: A 35 years old woman (Gravida-7, Para 6) having an emergency cesarean section under spinal anesthesia for the indication of cephalopelvic disproportion (CPD). Spinal anesthesia given at L3/L4, with a sensory block of T-4, the fetus delivered uneventfully. Meanwhile, the mother complains difficulty of breathing, developed hypotension, bradycardia, hypoxia, and loss of consciousness. Immediate maternal resuscitation done with vasopressor support, endotracheal intubation, and mechanical ventilation. Over a week, the patient progressively regained motor and sensory functions and discharged without any neurological or clinical sequelae.

DISCUSSION: Total spinal anesthesia is an uncommon incident that can happen during epidural anesthesia, caudal anesthesia, spinal anesthesia, lumbar plexus block, paravertebral block, stellate ganglion block, interscalene brachial blocks, and other regional anesthesia techniques performed at or near to the vertebral column. Often characterized by a sudden decrease in blood pressure, rapidly increasing motor block, difficulty of breathing, loss of consciousness, dilated pupils, apnea, and even cardiac arrest.

CONCLUSION: Unexpected total spinal anesthesia during neuraxial anesthesia can produce devastating consequences. Precautionary measures should be made during the conduct of regional anesthesia for high-risk patients and early identification and immediate intervention should be applied.

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1. Introduction

Cesarean section is the most frequently performed obstetric surgical procedure, and spinal anesthesia is a common anesthetic technique used across the world. It produces a rapid, dense, predictable block, is relatively easy to perform with a definite endpoint, and has a very high success rate. However, there are contraindications to its use, and complications associated with spinal anesthesia, which all patients should be counseled about. Spinal anesthesia is inevitably associated with hypotension and it is important to manage this to avoid adverse outcomes in the fetus and the mother. High neuraxial anesthesia is also one of the commonly faced problems, with a rare incidence of a complete spinal block; which is one of the life-threatening complications unless immediately identified and managed [1].

This work has been reported in line with the SCARE 2018 criteria [2].

2. Case presentation and observation

A 35 years old mother (Gravida 7, Para 6) in labor referred from a nearby primary hospital for better diagnosis and treatment to our hospital. After continuous follow-up by gynecology and obstetrics resident, the mother was scheduled for an emergency cesarean section for the indication of cephalopelvic disproportion (CPD). Her previous obstetric history was six spontaneous vaginal delivery at home. Apart from the symptoms caused by her pregnancy and having pregnancy-induced hypertension, she was in good health. Having discussed the options available, she had decided upon spinal anesthesia for the procedure.

According to local routines, premedication with cimetidine 300 mg and metoclopramide 10 mg iv given and 500 mL normal saline solution infused as preload. Blood pressure (BP), heart rate (HR), and SPO2 were measured 148/88 mmHg, 110 b/min 95% respectively. Anesthesia student performed spinal anesthesia under the guidance of the attending anesthetist. Having confirmed the free flow of CSF, 3 mls of 0.5% isobaric bupivacaine which says not for spinal despite the national regulatory body approved to use it, was slowly injected. On completion of the injection, the patient was immediately placed in a supine position, with a left lateral tilt.

The subsequent blood pressure measurements were in the normal
range and the fetus delivered 16 min after the conduct of spinal anesthesia uneventfully.

Late after delivery, she becomes; apprehensive, had chest heaviness, and difficulty breathing. Upon the patient's complaints, we tried to reassure, gave 100% oxygen via facemask and there was no significant vital sign disturbance. However, amid of the procedure, she became apneic and unresponsive. She developed hypotension, bradycardia, and hypoxia with BP-80/34, heart rate-46, and SpO2-76 with no palpable peripheral pulse. As the patient failed to respond, we went ahead with rapid induction (with thiopental 200 mg) and orotracheal intubation. However, after anesthesia, to surmount, she maintained her vital signs BP 105/60, HR 83, SpO2 97%, and respirant spontaneous breathing effort. As the hemodynamics stabilized with signs of respiratory efforts, we gradually withdrew vasoactive drugs. However, she becomes unresponsive kept under artificial assisted controlled intermittent ventilation and pressure support until the end of the procedure (an hour and ten minutes).

However, the case was futher complicated by pulmonary edema, hypoglycemia and manged with continuous positive pressure ventilation, intravenous furosemide and 40% glucose. Even with meticulous intervention the patient remained unresponsive with non-purposeful right-hand movement. To rule out other possible causes of loss of consciousness; organ function test, electrolyte and CT-scan results were collected which are within the normal range. After 24 h of follow up and mechanical ventilation in the ICU, she was extubated. Over a week, the patient progressively regained motor and sensory functions and discharged without any neurological or clinical sequelae.

3. Discussion

The proportion of cesarean sections performed under regional anesthesia has increased over the last two decades, and this has avoided the problem of difficult airway during anesthesia [3]. Maternal mortality decreased significantly during the first half of the 20th century. Further reduction in obstetric mortality was seen after 1980 and is attributed to the increase in neuraxial anesthesia for Cesarean delivery, improved safety of neuraxial technique, as well as algorithms and airway devices to improve the safety of general anesthesia [4]. A review examining anesthesia-related maternal deaths from 1991 to 2002 and 1997 to 2002 noted maternal mortality rates for general anesthesia were reduced from 16.8 to 6.5 per million, and regional anesthesia mortality rates remained lower at 2.5 and 3.8 per million, respectively because of this regional anesthesia is the preferred choice of anesthesia for obstetrics [5].

However, despite lower incidences of morbidity and mortality, regional anesthesia can cause troubling to crippling life-threatening complications. One of the feared complications remained total spinal or complete spinal block; in which where there is unintended cephalad spread of local anesthetic agents in the subarachnoid space, which involves the brainstem and cranial nerves that end up with loss of consciousness. The incidences vary between 1:2,971 and 1:16,200 anesthetics [1]. On the other hand, it was stated as 1:100,000 [6]. Our hospital is a newly established teaching specialized hospital a year ago, and we had 416 Cesarean section done under spinal anesthesia over 12 months period and this was the first total spinal incident.

Reasons for high morbidity and mortality associated with spinal anesthesia may include inadequate experience and training of the anesthetist, inappropriate use of the technique in mothers with significant comorbidity, performing of both anesthesia and surgery by the same practitioner, and neonatal resuscitation by the anesthetist at the expense of dedicated care to the mother. Many problems are avoidable or amenable to treatment by attention to details of safe practice, intended to supplement the document on spinal anesthesia [7]. The provider was anesthesia student which necessitates the need for close follow up by their consultants throughout the conduct of anesthesia.

The volume of local anesthetics injected in susceptible patients like; obstetrics, short stature, old age, and obese patients need to be reduced to minimize the incidence of high neuraxial blockade. Bupivacaine is the commonly used local anesthetics agent, for spinal anesthesia for obstetrics in a typical dose range of 10–15 mg but in this case, 15 mg was used which is higher than most literature recommendation. Although successful Cesarean deliveries have occurred with doses <5 mg, logistic regression studies examining doses of intrathecal bupivacaine that provided a 95% rate of effective anesthesia (ED95) for Cesarean delivery when combined with fentanyl (10 mcg) and morphine (0.2 mg) were 11.2 and 13.0 mg for hyperbaric and isobaric bupivacaine, respectively [8,9].

From the literature review, total spinal anesthesia can happen during epidural anesthesia, caudal anesthesia, spinal anesthesia, paravertebral blockade, stellate ganglion block, interscalene brachial blocks, and other regional anesthesia techniques performed at or near to the vertebral column. The clinical manifestations are often characterized by a sudden decrease in blood pressure, rapidly increasing motor block, temporary loss of breathing, loss of consciousness, dilated pupils, apnea, and even cardiac arrest [8–12].

Before complete spinal block patients often complain and manifest different clinical features, often depending on the level of spread of local anesthetics agents. Hypotension with or without bradycardia is due to venous and arterial vasodilation resulting in a reduced venous return, cardiac output, and systemic vascular resistance, and due to direct blockage of the cardio accelerating fibers (T1-T4) [13,14]. Patients often complain mild shortness of breath secondary to blockade of abdominal and intercostal respiratory accessory muscles (T1-T12) and numbness or weakness in the arms, shoulders, and trunk (C5-T1), followed by nausea, with or without vomiting secondary to cerebral hypotension, respiratory arrest secondary to diaphragmatic paralysis (C3-C5), and loss of consciousness (brainstem) [13,15]. Cardiac arrest may occur due to hypotension and hypoxemia or unopposed vagal dominance [14,16].

Management comprises; reassurance, supplemental oxygen (intubation if required to support oxygenation and ventilation or for loss of airway reflexes), and IV fluid administration plus vasopressors such as ephedrine or phentylephrine (adrenaline may be required) to support maternal blood pressure. Early recognition is vital, as block progression may be mitigated by adjusting the patient’s position. If total spinal anesthesia occurs, placing the patient in a Trendelenburg position will increase venous return and improve cardiac output. If the patient has a high spinal (compared with a total spinal), the Trendelenburg position is not recommended as it can cause a further rise of the block that can progress to a total spinal. Sedation and mechanical ventilation need to continue until there is evidence of block regression in the form of adequate spontaneous respiratory function and stable hemodynamic parameters [1,5–7,17,18].

Occasionally, a patient can lose consciousness while hemodynamically stable, and this has been attributed to the subdural spread of anesthesia. There may be no warning before the loss of consciousness (LOC) suddenly occurs sometime after the block has been inserted. Other causes of LOC during CS include air or amniotic fluid embolism, pulmonary embolism, inadvertent sedative drug administration, or hysteria should be considered and need systematic exclusion [15,17,18].
4. Conclusion

A pregnant woman with increased oxygen requirements cannot withstand hypoxia or hypotension for long before sustaining damage to herself or her infant. Even if rare, unexpected total spinal anesthesia during caesarean analgesia can produce devastating consequences. Precautionary measures should be made during the conduct of regional anesthesia for high-risk patients and early identification and immediate intervention should be applied.

Declaration of Competing Interest

None of the authors declare a conflict of interest.

Funding

No funding source for this case report.

Ethical approval

Study of clinical case report is exempted from ethical approval in our institution once get the patient consent or the guarantee.

Consent

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

Author’s contribution

Atalay Eshetie involved in: Data curation, Investigation; Resources; Writing - original draft.

Gebrehiwot Asfaw involved in: Conceptualization, literature review; Writing - review & editing, Validation.

Registration of research studies

1. Name of the registry: other; case report.
2. Unique identifying number or registration ID: researchregistry6027.

Guarantor

Gebrehiwot Asfaw.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Acknowledgments

Our gratitude goes to Tibebe Ghion specialized hospital and Bahir Dar University College of medicine and health science staffs. We would also like to thank the patient who gave us her permission for the publication.

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