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Delayed Onset of Regional Anaesthesia in An Elective Sectio Caesarea: A Case Report

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Case Report

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Abstract

Spinal anesthesia (SA) is a popular technique of anesthetic for pregnant women undergoing elective cesarean surgery. The purpose of this study was to present a case of delayed onset of spinal anesthesia in a patient undergoing cesarean section and factors associated with delayed onset of spinal anesthesia. We report a case of a 20-year-old female patient with a diagnosis of G1P0A0 + CPD + Oligohydramnios, 40 weeks of age, who underwent cesarean section with spinal anesthesia using a 26 G Quincke spinal needle and 0.5% hyperbaric bupivacaine (Regivell). 5-8 minutes after the local anesthetic was injected into the intrathecal space, the anesthetic effect should have been given, both legs felt warm and could not be moved (Bromage score 3). However, in this case there was a delay in the onset of sensory and motor block. In the first 10 minutes of the left leg Bromage block was still 2 while in the right leg the Bromage motor block score was 0. Several factors that are suspected to influence this delay are: changes in the physiology of pregnant women, drug dosage, patient psychology, difficult injection techniques, variations in the anatomy of the patient's spine. A thorough understanding of these factors is necessary to improve the effectiveness and safety of spinal anesthesia, especially in obstetric procedures.

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Keywords: Neuraxial; regional anesthetic technique; intrathecal; subarachnoid; bupivacaine; pharmacodynamics.

1. Introduction

Spinal anesthesia (SA) is a widely used methods of choice of anesthesia in pregnant women undergoing elective cesarean section (Alkinani et al., 2024; Olawin & Das, 2022). SA is relatively easy to perform and to maintain (Magdić Turković, et al., 2022), onset of analgesia theoretically is achieved rapidly (Agegnehu et al., 2020), postoperative pain control is clinically restrained (Horn et al., 2024), with maternal and fetal mortality rates are lower than general anesthesia (Olawin & Das 2022; Sung et al., 2021). This procedure also minimizing bleeding (Kim, et al., 2012) even though this is debatable depend on the type of surgery (Wong et al., 2007). Besides that, SA avoids fetal as well as maternal risks of general anesthesia complications (Ring et al., 2021), requires only slightly minimum postoperative pain related anesthesia care (Eroglu, et al., 2014) by providing sufficient amount of adequate postoperative analgesia (Koutp et al., 2024).

Spinal nerve blockage is performed by directly injecting anesthetic drugs into the subarachnoid cavity *lege artis* (Olawin & Das, 2022) at the level of L3-L4 or L4-L5, to avoid the risk of direct trauma to the spinal cord (Pozza et al., 2023). The mechanism of action of local anesthetic drugs is to block sodium ion channels so that depolarization slows down and nerve impulse stimulation prevented (Körner et al., 2022; Taylor & McLeod, 2020). Right after the effects of spinal anesthesia achieved, there are several physiological changes in the body (Salinas, et al., 2003) such as initial sympathetic changes such as higher peripheral temperature changes (Kessack et al., 2024), transient neurological symptoms such as numbness (Forget et al., 2019), hypotension (Hofhuizen et al., 2019), nausea and or vomiting (Huh, 2023), shivering (Amsalu et al., 2022) and urinary retention (Cambise et al., 2024). Unfortunately, unwanted condition may take place during this early initiation of SA, e.g., delayed on onset, which may cause snow ball effect to the subsequent surgical procedure (prolonged surgical time) which can affect the already scheduled surgical procedure that use the same operating room. A prolonged surgical procedure can indeed affect the scheduling of subsequent surgeries (Lyons et al., 2023) due to factors like increased OR downtime, resource availability, and potential delays or cancellations of scheduled procedures (Pandit et al., 2022; Calegari et al., 2020).

Delayed onset spinal anesthesia is a condition where local anesthesia takes longer to start nerve block than it should. Five to eight minutes after the local anesthetic is injected into the intrathecal space, motor block should have occurred. sometimes anesthesia effect obtains within seconds to minutes, and the exact time can vary (Olawin & Das, 2022). A study has shown motor block onset achieved within 15 minutes (Parikh & Seetharamaiah, 2018; Ciftci et al., 2015). In some cases, depending on the local anesthetic and patient factors (Sung et al., 2021), it might take up to 30 minutes for the motor block to fully take effect.

The slow onset of spinal anesthesia in cesarean section will cause its own challenges for the anesthesiologist to maintain the welfare of the mother and baby. Delayed onset spinal anesthesia may have deleterious consequences for the mother as well as the newborn baby (Parikh & Seetharamaiah, 2018). Delayed onset of spinal anesthesia in cesarean section can be caused by several factors, namely chronic drug abuser (Gross et al., 2025), physiological changes in pregnant women (Bhatia & Chhabra, 2018), patient's psychology condition such as anxiety- it can indirectly contribute to the perception of a delayed onset and potentially impact the successful establishment of the block because anxiety or fear in a patient can lead to misinterpreted pain signals and make it seem like the anesthesia is not working effectively when it actually may just need more time to take effect (Baagil et al., 2023), difficult injection techniques due to anatomical variations of the patient's spine (Crowe & Drew, 2024; Tanzil et al., 2021).

2. Case Presentation

A 20-year-old female patient with a diagnosis of G1P0A0, 40 weeks pregnant and MR number 00-XX-98-XX, came to the Hospital for a pregnancy check-up. The patient was also diagnosed with Cephalopelvic Disproportion (CPD) and oligohydramnios and complained of lower abdominal pain since the night before admission. The patient was planned to undergo an elective caesarean section (CS) with spinal anesthesia.

On physical examination, compos mentis consciousness was found, blood pressure 121/80 mmHg, pulse 105x/minute, respiratory rate 26×/minute and oxygen saturation 99%. Hematology laboratory examination found hemoglobin levels of 10.9 g/dL and hematocrit 33% (slightly low), platelets 281 thousand/uL and leukocytes 9.7 × 10^3/uL, bleeding time three minutes and clotting time 12 minutes.

On the operating room table, the patient was placed in a supine position and closely monitored. The initial intravenous perfusion loaded with 500 mL of Ringer Lactate solution for 15 minutes and injected with antiemetic drugs, namely ondansetron 4 mg IV. Then the patient was positioned sitting with his head slightly lowered towards his chest. The protrusion of the L3–L4 spinous process was identified, then asepsis and antisepsis procedures were performed in the injection area. With a median approach (paramedian approach), a 26 G Quincke spinal needle was injected until it penetrated the subarachnoid cavity and the clear cerebrospinal fluid (CSF) came out. The anesthetic drug bupivacaine 0.5% heavy (Regivell®) 12.5 mg was injected into the subarachnoid cavity at a rate of 1 mL/20 seconds. Then the patient was put to sleep and her hemodynamics were continued to be monitored.

As a routine procedure, a five minutes after injecting spinal anesthesia, the patient was asked whether there was a tingling sensation (numbness), a sensation of warmth and heaviness in both of the lower extremity, but the patient answered that there was no change. The tingling sensation and warmth are the effects of sympathetic blockade while the heavy legs are the effects of motor blockade. The patient was then positioned in Trendelenburg for 5 minutes. At the 10th minute post SA, a Pin Prick Test (for sensory blockade) was performed, the results of which the patient did not complain of pain up to T10 (umbilicus), the left leg Bromage score was 2 and the right leg bromage score was still 0. The anesthesiologist then informed the obstetrician-gynecologist about the slow onset of spinal anesthesia and the obstetrician was willing to wait a few minutes because there was no fetal distress. After the second 10 minutes interval, the left and right leg bromage scores had become 1, the pin prick test was as high as T4 (mammae), meaning that the spinal analgesia effect was complete as expected and the obstetrician was informed about it.

The caesarean section operation itself was carried out for 45 minutes, during the operation the patient's hemodynamics were stable. After 5 minutes of incision, a male newborn was successfully delivered with APGAR Score 9/10, followed with the insertion of uterotonic drugs Oxytocin 20 IU, methylergometrine 0.2 mg in 500 mL Ringer Lactate infusion. The amount of bleeding was approximately 500 cc. After the caesarean section, the patient was transferred to the recovery room and instructed to rest in bed for 10 hours, injected with 30 mg of ketolorac™ analgesic. When the motor strength of both legs had returned to normal (Bromage scale 0), the patient allowed to tilt to the left and right, slowly and gradually. Maintenance infusion of Ringer Lactate at a rate of 30 drops per minute continued. Her vital signs are observed every 30 minutes and urine output checked every hour. In the treatment room, the patient is allowed to drink gradually.

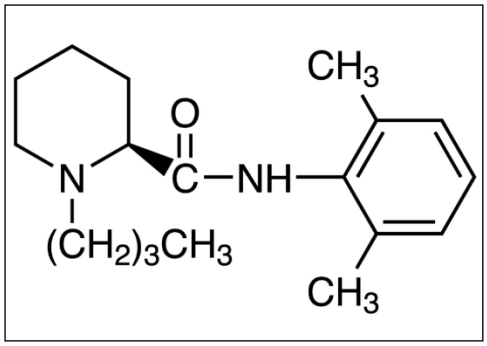

Fig. 1. Chemical structure of (-)-Bupivacaine hydrochloride C18H28N2O HCl H2O. Synonim: Bupivacaine hydrochloride monohydrate, 1-Butyl-N-(2,6-dimethylphenyl)-2-piperidinecarboxamide hydrochloride hydrate, 1-Butyl-N-(2,6-dimethylphenyl)-2-piperidinecarboxamide

Fig. 2. The hemodynamic of the patient after SA achieved and maintained

3. Discussion

In this case, the parturient who underwent cesarean section with spinal anesthesia experienced unilateral sensory and motoric onset delays. According to Kasi et al., 2016 (Lyons et al. 2023) sensory block onset of spinal anesthesia has been achieved in 2–5 minutes and motoric block onset in 5–8 minutes. If both effects are not achieved within that time frame, then it can be categorized as late onset of spinal anesthesia (Demilie et al., 2024; Olawin & Das, 2022). This late-onset neuraxial anesthesia refers to a delayed or prolonged time for a neuraxial block (spinal or epidural anesthesia) to take effect which can be happened through the mechanism of inadequate spreading of drugs through cerebrospinal fluid (Fettes et al., 2009). This condition potentially causing obvious challenges in clinical settings such as prolonged operating times (Demilie et al., 2024). While generally a rare occurrence, it can pose significant risks in urgent situations, such as cesarean sections (Punchuklang et al., 2022), and in patients with certain medical conditions (Doelakeh & Chandak, 2023) or specific medications such as antithrombotic and antiplatelet therapy (Horlocker, 2011) or even drug abuser such as chronic opioid user (Gross et al., 2025).

Several risk factors that can cause delayed onset of spinal anesthesia:

1. The effects of pregnancy on drug action and spread are primarily due to hormonal and anatomical changes, e.g., changes in the epidural space, CSF volume, and sensitivity to local anesthetics. Physiological changes in pregnant women (Bhatia & Chhabra, 2018), such as (a) venous dilation in epidural veins. During pregnancy, the enlarging uterus can compress the inferior vena cava (IVC) and the descending aorta, causing venous pressure to increase and leading to dilatation of the epidural venous plexus (Melaku et al., 2022) Bhatia & Chhabra, 2018; Bedson & Riccoboni, 2014). This dilatation can increase the risk of a "bloody tap" or intravascular injection during epidural anesthesia Yentis & Malhotra (2012). (b) additionally, uterine contractions during labor caused "auto-transfusion" of approximately 500 mL of blood back into the maternal circulation (Kepley & bates, 2023) which can further increase blood volume in the epidural veins, adding to the risk (Bhatia & Chhabra, 2018; Kepley et al., 2023) Beside that, (c) Pregnancy has been reported to enhance the progesterone mediated sensitivity of nerves to local anesthetics and to decrease anesthetic requirements during regional anesthesia (Arakawa, 2004). This altered sensitivity to local anesthetic blocks due to pregnancy, can affect the spread and onset of spinal anesthetic drugs. Increased estrogen hormones during pregnancy will complicate injection and affect the spread of drugs in the subarachnoid space due to lumbar lordosis. Last but not least (d) Body mass index (BMI) ≤ 29.5 kg/m² in pregnant women is associated with total failure of spinal anesthesia (Doelakeh & Chandak, 2023; Punchuklang, et al., 2022; Bernstein, et al., 2020; Arakawa, et al. 2024). As pregnancy progresses, there is dilation of

epidural veins and increased abdominal pressure (Kepley et al., 2020), which decrease the size of the epidural space and cerebrospinal fluid (CSF) volume in the subarachnoid space. This ultimately alters the spread of local anesthetics in the space [Bernstein, et al., 2020).

2. **Drug Dosage:** Drug dosage, administration of too low a dose of the drug or an inappropriate volume of the drug to achieve the desired target (Tariq et al. 2025). Other interesting aspect which possibly responsible for this delayed was poor drug storage and handling that is not in accordance with the specified temperature (Marshall & Chrimes, 2019).

   Long-term use of opioids causes neurophysiological adaptation and pharmacokinetic interactions in the central nervous system (Cascella et al., 2020; Volkow & Blanco, 2021). As a result, even though spinal anesthesia has been injected in the right way, the body's response to the anesthesia drug is slow because the nervous system is recklessly accustomed to chronic and recurrent exposure to the active substance (Cascella et al., 2020; Volkow & Blanco, 2021; Powell et al., 2016).

3. **Patient Psychology:** Before undergoing anesthesia and surgery, a patient's well-being is crucial for a safe and successful procedure (Volkow & Blanco, 2021). This involves physical and mental preparation, including following fasting instructions, managing medications, and addressing anxiety (Wilson et al., 2016; Powell et al., 2016). Ensuring the patient is informed, comfortable, and prepared can significantly impact their recovery (Powell et al., 2016). The patient's feelings of anxiety and restlessness may cause every stimulus to be interpreted as pain and cause a false perception of a failed spinal block (Jlala et al., 2010). That is why with increasing prevalence of surgery under local or regional anesthesia, which allows patients to remain conscious during the intraoperative phase, there is a growing need to comprehend the lived experiences associated with this practice through pre surgical visit to give adequate information and strengthening the patient mental condition (Volkow & Blanco, 2021).

4. **Injection Technique:** Injection technique might also be contributed to this delay (Fettes et al. 2009). the patient's position during injection is not right or the anesthetic solution does not completely enter the subarachnoid space so that the anesthetic effect is slow or uneven (Demilie et al, 2024)

   Suboptimal sitting position or movement occurred\ immediately after injection (Park, et al., 2010). In hyperbaric drugs, correct position is very crucial for perfectly even distribution. Immediate change in position right after the injection, e.g., the patient tilts, it can cause unwanted partial block (Besha et al., 2023).

5. Undetected variations in Spinal Anatomy. Variations in vertebral column anatomy can affect spinal needle insertion and spinal block distribution (Joo et al., 2010; Popham, 2009). Sacral meningocoele and sacral perineural cyst have been reported to be anatomical condition which may affect anesthetic procedure which involve the vertebrae. The predictive factors for the difficulty of spinal anesthesia in patients undergoing cesarean section has been investigated and consists the condition of Increasing age (Hofhuizen et al., 2019), weight (Ciftcy, 2015) body mass index (Jlala et al. 2010), reducing the ability to bend the waist, the non-touching of the spinous process and interstitial space (Joo et al. 2010) All of those conditions might causes the difficulty of performing spinal anesthesia in patients undergoing cesarean section (Atashkhoei, et al., 2019).

The slow onset of spinal anesthesia in this case of cesarean section resulted in the cesarean section operation being delayed by 20 minutes to begin. The parturient was still able to undergo cesarean section because of good communication between the anesthesiologist, patient and obstetrician and no fetal distress was found (baby's APGAR score 9/10).

4. Conclusion

The occurrence of delayed onset of spinal anesthesia in cases of cesarean section is rare. The most likely cause of the delayed onset of spinal anesthesia in cases of cesarean section is the physiological changes that occur in the parturient. Delayed onset of spinal anesthesia will cause a delay in the start of emergency surgery and if this occurs in cesarean section will cause adverse effects on the mother and baby.

Consent

As per international standards or university/hospital standards, patient(s) written consent has been collected and preserved by the author(s).

Ethical Approval

It is not applicable.

Disclaimer (Artificial Intelligence)

Author(s) hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Competing Interests

Author has declared that no competing interests exist.

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