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Case Report

Anaesthesia Section

Management of Accidental Dural Puncture using Continuous Spinal Catheter in High-risk Geriatric Patient: A Case Report

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ABSTRACT

Accidental Dural Puncture (ADP) during epidural placement occurs in 0.5-2% of cases. This can lead to significant complications. Converting such incidents into a Continuous Spinal Catheter (CSC) technique offers a practical approach and is an effective alternative for high-risk surgical patients. This approach not only salvages the neuraxial access but also provides titratable neuraxial blockade and postoperative analgesia. We report the case of a 75-year-old hypertensive female with a history of Pulmonary Thromboembolism (PTE) after prior hip surgery, who has presented for implant removal and uncemented hemiarthroplasty. During epidural placement, an ADP occurred at the L2-L3 level, so the catheter was deliberately secured in the subarachnoid space and used as a CSC. A titrated spinal anaesthesia was administered and supplemented intraoperatively. General Anaesthesia (GA) was also used due to anticipated discomfort. The patient remained haemodynamically stable throughout the 3.5-hour surgery. The catheter was retained for one day postoperatively, with no neurological complications or Post-Dural Puncture Headache (PDPH). CSC is a safe and effective alternative following ADP, providing stable haemodynamics and a reliable anaesthesia, and good postoperative analgesia, especially in high-risk patients. Administration of incremental doses of Local Anaesthesia (LA) through this technique reduces the risk of profound hypotension and allows real-time adjustments based on the patient's haemodynamic responses.

Keywords: Geriatric population, Haemodynamic stability, Titrated dose of local anaesthesia

CASE REPORT

A 75-year-old female, with a prior history of a skid and fall resulting in a right hip fracture, underwent Closed Reduction with Internal Fixation (CRIF) with femoral nailing one month back. Postoperatively, she developed PTE, managed initially with rivaroxaban 15 mg twice daily for 15 days, followed by a prophylactic dose of rivaroxaban 20 mg once daily for 30 days. She was also a known hypertensive for the past 15 years, on Telmisartan 40 mg once daily. One month post-surgery, the patient presented with pain at the surgical site. Imaging revealed screw back-out at the site of the previous femoral nailing. She remained bed-bound postoperatively. Because of the mechanical complication and functional limitation, a decision was made to proceed with implant removal and bipolar modular uncemented hemiarthroplasty. Preoperative evaluation revealed haemoglobin: 9.5 g/dL; other routine blood investigations were within normal limits. Computed Tomography Pulmonary Angiography (CTPA) showed no evidence of pulmonary embolism; bilateral pulmonary arteries were normal; trace pleural effusion and right lower lobe collapse-consolidation were noted. Echocardiography revealed the following: Mild left ventricular hypertrophy, diastolic dysfunction (grade 1), no regional wall motion abnormalities, Pulmonary Artery Systolic Pressure (PASP) of 30 mmHg, and Left Ventricular Ejection Fraction (LVEF) of 60%. A cardiology consultation was obtained, and anticoagulation management was optimised. Rivaroxaban was stopped three days before surgery, and bridging therapy with intravenous unfractionated heparin (5000 IU QID) was initiated and stopped six hours prior to surgery. Patient was assessed under the American Society of Anaesthesiology (ASA) class 3 as she was uncontrolled hypertensive and had a recent history of PTE.

After attaching standard ASA monitors, GA with epidural technique was the plan of anaesthesia. Epidural was performed at the L2-L3 level with 18 g Tuohy needle. Due to ADP, the catheter was secured in the subarachnoid space and used as a CSC. Dural puncture was confirmed when free flow of CSF was seen getting collected in the Loss of Resistance (LOR) syringe. So, the catheter was threaded into the subarachnoid space obtained at 6 cm and the catheter was fixed at 9 cm; a sterile dressing was applied. Through the CSC, 1.5 mL of 0.5% bupivacaine, combined with 25 mcg fentanyl, was given. Surgical duration was about 3.5 hours, and the patient remained haemodynamically stable throughout. One top-up was given intraoperatively with 1.5 mL of 0.5% bupivacaine combined with 25 mcg fentanyl. After completion of surgery, the patient was safely extubated and transferred to the postoperative ward. The spinal catheter was kept for one day postoperatively. Patient received 1 mL of 0.5% bupivacaine hyperbaric with 25 mcg of inj. The catheter was removed on day 2, and surgical pain was managed with systemic analgesics. Fentanyl was used twice in the CSC when the visual analogue score was more than 5. The postoperative period was uneventful and the patient was discharged on the 7th postoperative day. No incidence of PDPH or neurological dysfunction was noted.

DISCUSSION

The ADP during epidural placement occurs in 0.5-2% of cases [1]. CSC is a well-established central neuraxial technique, proven for its rapid onset and haemodynamic stability. CSC has been used for lower limb surgeries, urology surgeries and gynaecological surgeries [2]. The CSC technique offers significant benefits over traditional epidural analgesia, including the ability to precisely control the desired level by using small, incremental doses of local anaesthetics, leading to enhanced haemodynamic stability. Furthermore, additional doses can be administered if the surgical procedure extends beyond the anticipated duration. Placement accuracy is assured by the confirmed aspiration of Cerebrospinal Fluid (CSF), ensuring 100%

correct catheter placement [3]. When comparing with GA, CSC offers a lower incidence of postoperative nausea and vomiting, postoperative delirium and improved gastrointestinal function recovery, especially in the geriatric population [4]. Spannella F et al., did a retrospective study of 90 high-risk geriatric patients posted for major abdominal surgeries under thoracic CSC technique. They found this technique to be safe and there were no complications reported [4].

A significant concern with CSC is the risk of PDPH, which may be postulated due to the use of larger-bore needles, such as 18 G, which can lead to continuous CSF leakage from the catheter insertion site. However, the incidence of PDPH decreases if the catheter remains in situ for 24 to 36 hours. In a study by Parthasarathy S and Ravishankar M, the PDPH was noted in two out of the 60 patients in the study population [1]. Emyedu A et al., reported a case of CSC following ADP for laparotomy. They retained the catheter for 24 hours to decrease the incidence of PDPH [5]. The proposed pathophysiology for reduced PDPH incidence in CSC involves the accumulation of inflammatory cells near the catheter entry point, which aids in sealing the dural tear. The formation of fibrin threads around the intrathecal catheter is also documented. Similarly, Matturu S et al., published a case report of a 49-year-old patient for emergency laparotomy. Following ADP, the epidural catheter was inserted into the subarachnoid space and was managed as CSC. They removed the catheter 24 hours postoperatively [2].

Additionally, the risk of infection associated with CSC can be mitigated through strict aseptic techniques during the procedure and in postoperative care. A potential neurological complication related to CSC is cauda equina syndrome, which is primarily associated with the use of micro-catheters [1]. These devices can result in slow local anaesthetic flow, leading to repeated dosing attempts. This can cause a high concentration of local anaesthetic to accumulate around the cauda equina, resulting in neurotoxicity.

CONCLUSION(S)

Inadvertent subarachnoid puncture can be effectively managed by utilising it as a CSC. This approach obviates the need for multiple attempts to place an epidural catheter. The CSC technique provides enhanced haemodynamic stability and allows for a rapid onset of anaesthesia. Administration of incremental doses of LA through this technique reduces the risk of profound hypotension and allows real-time adjustments based on the patient's haemodynamic responses. It is particularly advantageous for surgeries of prolonged duration.

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