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Case Report

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Caudal epidural block for elderly patients who have limited cardiac reserve

Emine Arzu KÖSE, Aliye ÖZTÜRK, Gülnaz ATEŞ, Alparslan APAN

Abstract: The choice of anesthetic technique based on its advantages and disadvantages in elderly patients will inevitably be influenced by the patient's comorbidities, such as cardiovascular disease, diabetes mellitus, stroke, renal insufficiency, and pulmonary disease. The patient's underlying cardiac conditions, although apparently stable at present, may become manifest during perioperative stresses. Caudal epidural block should be taken into consideration as a safe and effective anesthetic technique for the elderly patients who have limited cardiac reserve and comorbidities. Six patients with low ejection fraction and poor functional status due to ischemic cardiac disease scheduled for surgery under caudal epidural block are presented.

Key words: Caudal epidural block, ischemic cardiac disease, elderly, urologic surgery

Introduction

Transurethral resection of the prostate gland (TURP) for benign or malignant hyperplasia of the prostate gland and transurethral resection (TUR) of urinary bladder tumors, which are performed under general or regional anesthesia, are more common in elderly patients who have multiple comorbidities such as cardiovascular disease, diabetes mellitus (DM), stroke, renal insufficiency, and pulmonary disease (1). The patient's underlying cardiac conditions, although apparently stable at present, may become manifest during perioperative stresses (2). Since the choice of anesthetic technique and its advantages and disadvantages will inevitably be influenced by the patient's comorbidities, it is necessary to consider these issues on a case-by-case basis (2).

Caudal epidural block (CEB), which involves injections of a drug into the epidural space through the sacral hiatus, has been used effectively to provide analgesia and anesthesia in various surgical procedures, especially in children. Drugs injected epidurally act directly on spinal nerves and receptors in the spinal cord by way of diffusion across the dura and cerebrospinal fluid. Sensory block level below thoracic vertebrae (T) 6–8 can be achieved under sedation by maintaining mental status and respiratory function (2,3). The level of anesthesia is predictable and the blocked segments directly depend on the volume of the injected anesthetic drug (3). Additionally, the complications of spinal anesthesia and lumbar epidural anesthesia such as arterial hypotension, postdural puncture headache, transitory radicular irritation, and epidural hematoma are less often observed in CEB (3). Another advantage of CEB is prolonged postoperative analgesia, which is maintained by the use of long-acting local anesthetics (3). Nevertheless, variable sacral anatomy, thick presacral fat, and calcified ligaments can make it difficult or impossible to perform this neuraxial technique in adults (4).

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Department of Anesthesiology and Reanimation, Faculty of Medicine, Kırıkkale University, Kırıkkale - TURKEY
Correspondence: *Emine Arzu KÖSE, Department of Anesthesiology and Reanimation, Faculty of Medicine, Kırıkkale University, Kırıkkale - TURKEY*
E-mail: arzuhct@hotmail.com

Six patients with low ejection fraction (EF) ratios and poor functional status due to ischemic cardiac disease who were scheduled for urological surgical procedures, and whose surgical procedures were successfully performed under CEB without hemodynamic instability or postoperative complications, are presented.

Case 1

A 90-year-old patient with coronary artery disease (CAD), hypertension (HT), and chronic obstructive pulmonary disease (COPD) was scheduled for TURP due to the urinary retention resulting from benign prostate hyperplasia. Preoperative therapy included acetylsalicylic acid (300 mg daily), amlodipine (10 mg daily), enalapril (5 mg daily), furosemide (40 mg daily), and inhaled salbutamol (200 μg every 6 h). He showed no abnormality in laboratory tests. Cardiomegaly and prominent aorta were observed on the chest X-ray and there was ST depression in the D1 and V1-V6 leads on the electrocardiogram (ECG). Concentric hypertrophy, global hypokinesia in left ventricular wall motions, and decrease in left ventricular functions were determined by transthoracic echocardiography (TTE), and EF was calculated as 30%. Because of the patient's refusal, coronary angiography (CAG) could not be performed. Forced vital capacity (FVC), forced expiratory volume (FEV_1), and FEV_1/FVC were measured as 79%, 73%, and 72%, respectively. The patient was classified according to New York Heart Association (NYHA) criteria as Class III and according to the American Society of Anesthesiologists (ASA) as ASA IV, and the acetylsalicylic acid therapy was ceased 1 week before the surgery. The patient was placed in the left lateral decubitus position. The skin of the sacrococcygeal area was prepared with povidone iodine. Once the sacral hiatus was identified and 2 mL of lidocaine 1% was given for skin infiltration, CEB was administered using a 20-G Tuohy needle. The needle was inserted at 90° to the sacrococcygeal membrane. After the feeling of the loss of resistance, the needle was depressed in a caudal direction through an angle of approximately 55°–60°. In order to reduce the risk of dural puncture, the needle was not advanced more than only a few millimeters after the penetration of the sacrococcygeal membrane. Following the negative aspiration of blood and/or cerebrospinal fluid, the local anesthetic solution, containing 25 mg levobupivacaine + 50 mg prilocaine diluted with 0.9% NaCl in a volume of 20 mL, was injected into the caudal epidural space. The correct needle positioning was also confirmed by the lack of subcutaneous edema or lack of the resistance to the injection resulting from intraosseous injection. The patient was turned to the supine position and then placed in the lithotomy position. The highest sensory block level was evaluated at T6 by pinprick test.

Case 2

A 71-year-old patient with a diagnosis of CAD, congestive heart failure (CHF), HT, previous myocardial infarction (MI), and smoking history was scheduled for TUR of urinary bladder tumor. He was using digoxin (0.125 mg daily), isosorbide mononitrate (60 mg daily), enalapril (5 mg daily), and acetylsalicylic acid (300 mg daily). He showed no abnormality in laboratory tests. Increased cardiothoracic ratio on chest X-ray and ST depression in the D1 and aVL leads and Q wave in DII, DIII, and aVF leads on ECG were observed. Dilated left ventricle and left atrium, hypokinesia of interventricular septum and posterolateral wall, and akinesia of inferior wall was observed by TTE, and the EF was calculated as 24%. Although 80% obstruction in the right coronary artery (RCA), 75% obstruction in the circumflex artery (CA), and 60% obstruction in the left coronary artery (LCA) were observed by CAG, the recommendation of coronary artery bypass graft (CABG) surgery was refused by the patient**.** The patient was classified according to NYHA as Class III and according to ASA as ASA IV. Acetylsalicylic acid therapy was ceased 1 week before the surgery and CEB was administered as described in Case 1. The highest sensory block level was evaluated at T8 by pinprick test.

Case 3

A 76-year-old patient with CAD, previous MI history, HT, and DM was scheduled for TURP. He had undergone CABG surgery 1 year earlier. Preoperative therapy of the patient included diltiazem (60 mg daily), quinapril/hydrochlorothiazide (25/12.5 mg

daily), gliclazide (80 mg daily), and acetylsalicylic acid (100 mg daily). Laboratory tests, chest X-ray, and ECG were unremarkable. Left atrial dilatation and hypokinesia of the interventricular septum and inferior and anterior walls were observed by TTE, and the EF was calculated as 36%. The patient was classified according to NYHA as Class II and according to ASA as ASA III. Acetylsalicylic acid was ceased 1 week before the surgery. Once the sacral hiatus was identified, CEB was administered as described for the previous cases to achieve a sensory block level at T8.

Case 4

A 72-year-old patient (NYHA Class III and ASA IV) with CAD, HT, DM, chronic renal failure (CRF), and previous CABG surgery history was scheduled for TURP. He was using digoxin (0.125 mg daily), isosorbide mononitrate (60 mg daily), atorvastatin (40 mg daily), nebivolol (5 mg daily), glimepiride (4 mg daily), amlodipine (5 mg daily), and acetylsalicylic acid (300 mg daily). Except for a high urea/creatinine level (71/2.41 mg/dL) and a high K^+ level (5.39 mmol/L), the laboratory tests and chest X-ray were normal. There was ST depression in the D1 and aVL leads and Q wave in the DII, DIII, and aVF leads on ECG. Dilated left ventricle and left atrium, hypokinesia of the interventricular septum and posterolateral wall, and akinesia of the inferior wall was observed by TTE, and the EF was 24%. Acetylsalicylic acid was ceased 1 week before the surgery and CEB was administered similar to that in Case 1. The highest sensory block level was evaluated at T6.

Case 5

A 45-year-old NYHA Class III and ASA IV patient with CAD, HT, and CRF was scheduled for internal urethrotomy due to urinary retention. He had been treated by dialysis 3 days/week. Preoperative therapy of the patient included ivabradine (5 mg daily), amlodipine (10 mg daily), valsartan (160 mg daily), and acetylsalicylic acid (100 mg daily). Laboratory tests were compatible with CRF (urea = 149.4 mg/dL, creatinine = 5.89 mg/dL, K^+ = 6.09 mmol/L). Chest X-ray and ECG were evaluated as normal. Anterior wall of the left ventricle was hypokinetic and the EF was 37%. There was 80% obstruction in the left anterior descendent (LAD) artery and 100% obstruction in the RCA, which was determined by CAG. Acetylsalicylic acid was ceased 1 week before the surgery. Within 24 h after dialysis, CEB was performed. The highest sensory block level was evaluated as T10.

Case 6

A 77-year-old patient with CAD, previous MI history, HT, and DM was scheduled for TUR of urinary bladder tumor. He was using digoxin (0.25 mg daily), bisoprolol (5 mg daily), glimepiride (4 mg daily), and acetylsalicylic acid (300 mg daily). Except for a high urea/creatinine level (57/2.17 mg/dL), the laboratory tests and chest X-ray were normal. There was ST depression in the D2, D3, aVF, and V4-6 leads on ECG. Global hypokinesia of the left ventricle wall and decrease of left ventricle functions was observed by TTE, and the EF was 35%. Presence of 80% obstruction in the LCA and 70% obstruction in the LAD was determined by CAG. Acetylsalicylic acid therapy was ceased 1 week before the surgery. After the CEB was administered, the highest sensory block level reached was T6.

Discussion

Six patients with low EF and poor functional status due to ischemic cardiac disease operated under CEB with no hemodynamic instability or complications were presented.

Caudal block was introduced in France at the turn of the last century. Although infrequently used for adults, CEB is an anesthetic option with a low incidence of hemodynamic instability or catastrophic complications such as epidural hematoma, local anesthetic intoxication resulting from intravenous injection, and radicular irritation (4).

The sacral hiatus is located at the caudal end of the sacrum and bordered laterally by 2 sacral cornua. Only skin, subcutaneous fat tissue, and the sacrococcygeal ligament cover the hiatus. When the needle has passed through the sacrococcygeal ligament, the hiatus communicates with the epidural space directly (4). Although CEB has a wide range of

clinical applications, it is sometimes hard to determine the anatomical location of the sacral hiatus and the caudal epidural space, especially in adults. However, it is a safe and effective anesthetic technique. The most commonly used method to identify the caudal epidural space is based on feeling the 'pop' upon penetrating the sacrococcygeal membrane, but the 'loss of resistance' technique is the most reliable (5). The most frequently encountered problem in CEB is failure in needle placement. A bony septum in the sacral hiatus (2%), hiatal agenesis (4%), or complete agenesis (1%) (spina bifida) caused failure of CEB in 7% of cases (6). It has been reported that the sagittal (anteroposterior) diameter of the sacral canal at the apex of the hiatus was less than 2 mm in 1%–5% of cases (6).

The level of the sympathetic, sensory, and motor blockade is affected by the used volume of the local anesthetic solution. The suggested doses for adults are 20–30 mL for blocks of the lower abdomen and 15–20 mL for blocks of the lower limb and perineum (7). Additionally, changes in the systemic absorption, distribution, and clearance of local anesthetics lead to an increased sensitivity, decreased dose requirement, and change in the onset and duration of action in the elderly. Decreases in neural population, neural conduction velocity, and inter-Schwann cell distance can also lead to an increased sensitivity to local anesthetics (8). Crighton et al. (4) reported that the mean volume of the sacral canal was 14.4 (range: 9.5–26.6) cm^3. Because of the limited cardiac reserves of the patients, we avoided using high levels of sympathetic blockade and affecting the cardiac accelerator fibers (T1–T4). The target sensory block level was T6–T10. Therefore, the volume of the local anesthetic solution was limited to the lowest volume to be compatible according to the literature knowledge and our previous experiences to provide adequate anesthesia with hemodynamic stability (1,4), and CEB was performed after fluid loading with 250 mL of 0.9% NaCl. The observed highest level of sensory block in the patients was T6 with the administration of 20 mL of the local anesthetic solution for CEB. Neither hypotension (20% decrease of systolic arterial pressure from baseline value) nor bradycardia (heart rate < 50 beats/min) was observed in any of the patients. As a long-acting local anesthetic, levobupivacaine was preferred to bupivacaine because of its lower cardiotoxicity potential, and it was combined with prilocaine for its rapid onset. Because of their increased perioperative cardiac complication risk due to ischemic heart disease, the DII and V5 leads were monitored and radial arterial catheterization was obtained in addition to standard ASA monitoring for all patients preoperatively following their sedation with 1–1.5 mg intravenous midazolam. Oxygen at 5 L/min was given via a facemask during the surgery as a standard practice. In all cases, the surgical procedure could be started after 15 min from the CEB procedure and none of the patients needed rescue analgesic or sedative agent administration during the surgery. Two of the patients were operated because of a urinary bladder tumor, but their localization was appropriate for resection under regional anesthesia. Therefore, we did not observe any complications such as bladder wall perforation due to the unsuppressed obturator reflex. In addition, no need for any analgesic drug in the first postoperative 12-h period was observed. No complications, including hemodynamic instability, epidural hematoma, postdural puncture headache, lumbar pain, transitory radicular irritation, nausea, and vomiting, were documented in the postoperative period.

Kita et al. (9) reported that CEB provided postoperative analgesia as effective as lumber epidural anesthesia in total hip arthroplasty and that the time to first request for analgesia was longer in the CEB group than the general anesthesia group, at 13 ± 16 h versus 1 ± 1 h. Although the time to first request for analgesia was shorter in our patients than Kita et al. reported, this difference can be explained by the lack of opioid or any other adjunct agent such as ephedrine in the solutions that we used.

Antiplatelet medications, including acetylsalicylic acid, exert diverse effects on platelet function. There is no accepted test, including the bleeding time, that will guide antiplatelet therapy. Although receiving these medications is not a contraindication to perform the neuraxial blocks according to the American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines (10), since increased age is one of the contributing factors for increased risk of the epidural hematoma, we preferred to discontinue the acetylsalicylic acid therapy 1 week before surgery. The

clotting functions were evaluated for all patients in the preoperative period by the laboratory tests (platelet count, prothrombin time, partial thromboplastin time, activated partial thromboplastin time, and bleeding time).

In conclusion, CEB should be taken into consideration as a safe and effective anesthetic technique for elderly patients who have limited cardiac reserve and comorbidities when performed by an experienced anesthetist with appropriate volumes of local anesthetics. It provides adequate anesthesia and long-term postoperative analgesia under hemodynamic stability in surgical procedures with a satisfactory sensory block at T10 and/or below.

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