

Severe Aortic Stenosis: Combined Lumbar Plexus, Sciatic and Iliohypogastric Nerve Block with 0.25% Levobupivacaine for Reduction of Hip Fracture

H Eker, A Kocum, T Kocum, A Turkoz, G Arslan

Citation

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Abstract

The potential advantages of 0.25% concentration of levobupivacaine in performing lumbar plexus with sciatic and iliohypogastric nerve block in patients with aortic stenosis is emphasized in this case report. A 48-yr old male patient who was scheduled for hip fracture surgery had severe aortic stenosis with aortic valve gradient of 85 mmHg. Anesthesia plan was combined lumbar plexus, sciatic and iliohypogastric nerve block with a total of 60 mL, 0.25% levobupivacaine. After performing the blocks, the patient underwent successful and uneventful hip reduction surgery except requiring only sedation medications. The patient had sufficient anesthesia and remained hemodynamically stable without the use of vasoconstrictive medication during the operation. We thought that combined lumbar plexus, sciatic and iliohypogastric nerve block with 0.25% levobupivacaine provides stable hemodynamic parameters with adequate anesthesia for hip fracture surgery in patient with severe aortic stenosis.

INTRODUCTION

Aortic stenosis (AS) is an important valvular lesion in anesthesia because of the difficulty in establishment of adequate systemic perfusion throughout the operation [1]. The management should be focused on maintaining normal sinus rhythm, adequate intravascular volume and systemic vascular resistance (SVR). There is no method of choice for anesthesia in such cases. However, peripheral nerve blocks with relatively fewer cardiovascular effects, may be an alternative in patients with severe AS requiring hip surgery. There are a few reports in the literature regarding combined lumbar and sacral plexus block for repair of hip fracture in patients with severe AS [2,3]. We hereby report the first case of stable hemodynamia and sufficient anesthesia via peripheral nerve block with 0.25% levobupivacaine in a patient with severe AS undergoing hip surgery.

CASE REPORT

A 48-yr-old man with body weight of 80 kg and height of 175 cm suffered a fracture of the left hip and femur neck in a traffic accident. He had diagnosis of severe aortic stenosis for two years in his past medical history and he was offered aortic valve replacement operation which he had refused. His coronary angiography was normal two years ago. He had no history of angina, congestive heart failure or syncope and

was taking no medication. His functional capacity was New York Heart Association Class I.

On physical examination, heart rate (HR) and blood pressure (BP) were 86 bpm and 140/90 mmHg, respectively. The cardiac examination revealed a regular heart beat with a grade 3/6 systolic ejection murmur radiating to the neck. The electrocardiogram (ECG) revealed normal sinus rhythm, left ventricular hypertrophy voltage criteria with negative T waves in leads D1-aVL and V5-6. A preoperative echocardiogram revealed severe aortic stenosis with peak aortic transvalvular gradient of 85 mmHg, aortic valve area of 0.8 cm², left ventricular hypertrophy, mild mitral regurgitation and an ejection fraction of >60%.

Anesthetic plan was combined lumbar plexus, sciatic and iliohypogastric nerve block. Invasive BP and central venous pressure (CVP) monitorization was recruited in addition to standard monitoring throughout the operation. The patient's baseline HR and BP were 92 bpm and 188/98 mmHg. Before block administration, the patient was given 2 mg midazolam and 50 µgm fentanyl intravenously for sedation and supplemental oxygen was administered prior to nerve block. The patient's HR and BP after sedation was 90 bpm and 178/88 mmHg and received 2 mL/kg isotonic saline prior to initiation of combined peripheral nerve block.

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The lumbar plexus block was performed using Winnie's posterior approach technique with 10 cm insulated needle (Stimuplex®, B Braun, Melsungen, Germany) [4]. The patient is turned to the lateral position, with the operated side uppermost, and the limb to be blocked flexed at both hip and knee. The needle was inserted at the intersection between a line parallel to the spine and passing through the posterior superior iliac spine, and a line connecting the cephalad borders of both iliac crests. The needle was directed to make contact with the transverse process of the fourth lumbar vertebra. After contacting the process, the needle was redirected caudally and advanced 2 cm beyond the transverse process until quadriceps femoris muscle motor response was obtained at 0.5 mA and 1 Hz. After aspiration to ensure absence of blood or cerebrospinal fluid, 30 mL 0.25% levobupivacaine was injected.

Left sciatic nerve block was performed using posterior approach described by Labat with the patient in the same position [5]. A line was withdrawn between greater trochanter and posterior superior iliac spine, and at mid-point of the line, a 5 cm mid-perpendicular line was withdrawn in mediocaudal direction. At a depth of approximately 5 cm plantar flexion of the foot was localized with a current 0.5 mA at 1 Hz and 20 mL 0.25% levobupivacaine was injected. The patient was returned to the supine position and iliohypogastric block was performed to reduce pain during skin incision with the same needle. The anterior superior iliac spine is identified by palpation and 2 cm medial and 2 cm superior to the anterior superior iliac spine is pointed and the needle is inserted perpendicular to the skin [6]. Following the initial loss of resistance and negative needle aspiration for blood, 10 mL 0.25% levobupivacaine was injected.

Sensory blockade by loss of pinprick sensation (0=sharp, 1=dull or decreased sensation, 2=no sensation) and motor blockade with a modified Bromage scale (0=no motor block, 1=hip blocked, 2=hip and knee blocked, 3=hip, knee and ankle blocked) were evaluated in every minute. Assessment of sensory and motor functions also performed for contralateral leg. Adequate ipsilateral loss of pinprick sensation at T12, L1, L2, L3, S2, S4 and S5 dermatomes and inability to move hip and knee of the operated limb occurred at 8th and 10th minute, respectively. The patient was able to move contralateral leg and complained of it being partially exposed and cold. After motor and sensory blockade, the patient no longer experienced pain on moving the fractured

leg during patient positioning for surgery.

A mild but consistent decline in BP was observed during the period between completion of combined block procedures and the establishment of motor and sensory block. HR and BP were 87 bpm and 141/80 mmHg when motor block occurred and the lowest hemodynamic values were recorded as 80 bpm and 122/78 mmHg throughout surgery which lasted for 80 minutes. The patient did not require any vasopressor agent administration during the operation; only slightly sedated with total intravenous dose of 4 mg midazolam, and did not require rescue analgesia.

The patient received a total amount of 1200 mL isotonic saline, 500 mL colloid, keeping CVP levels between 6-10 mmHg during the procedure. Blood loss was 200 mL and urine output was 200 mL. Sensory and motor block regression was evaluated by pinprick and modified Bromage scale every hour postoperatively. Sensory and motor blockade was resolved completely at 7th and 8th hours, respectively. Recovery period was uneventful and the patient was discharged from hospital 7 days after the surgery.

DISCUSSION

Patients with AS are clearly at higher risk for developing cardiac complications in non-cardiac surgery and the level of the risk is proportional to the degree of stenosis. The complication rate increases to 30% when pressure gradient is more than 50 mmHg [7]. In this report, the combination of lumbar plexus with sciatic and iliohypogastric nerve block with 0.25% levobupivacaine was preferred in the patient with severe AS and stable hemodynamia with sufficient anesthesia was provided.

Peripheral nerve blocks theoretically result in less extensive sympathetic blockade compared to central neuroaxial blocks [2]. Therefore, neuroaxial anesthesia techniques cause hypotension mainly as a result of decrease in systemic vascular resistance by block of preganglionic sympathetic fibers [8]. Also, general anesthetic agents can depress the myocardium, produce vasodilatation and general anesthesia can be associated with a wide swing in hemodynamic variables, particularly during tracheal intubation and extubation [2]. Other factors contributing to hypotension can have profoundly negative effects on coronary perfusion and particularly deleterious effects on cardiac rhythm in AS patients. Thus, tachycardia or bradycardia as frequently observed in general or neuroaxial anesthesia can cause less time spent in diastole, resulting in less ventricular filling and

decreased cardiac output in AS patients [9].

Compared to general anesthesia and neuroaxial block, combined lumbar plexus and sciatic nerve block offer several advantages with AS. Neither sudden decrease in preload due to reduction in SVR following neuroaxial block nor increased inotropic stimulation of the heart during general anesthesia are observed with peripheral nerve block anesthesia. Thus, peripheral nerve block anesthesia facilitates maintenance of a normal hemodynamic status [9].

Nevertheless, lumbar plexus block combinations have a 10% risk of epidural spread and blood pressure may decline following lumbar plexus block due to limited unilateral sympathectomy with minimal epidural spread of local anesthetic [10,11,12]. In two studies, the degree of decline in mean arterial pressure (MAP) was found to be over 20% of basal value in 12% and 67% of patients, respectively [11,13]. In our patient, at the time of complete sensorial and motor blockade, the reduction in MAP might be mainly related to pain relief. Following motor blockade, the highest MAP decline was approximately 15% during surgery and this reduction may have been caused by unilateral sympathectomy with minimal epidural spread of local anesthetic. Although contralateral extension of the lumbar plexus block was not observed clinically, because the patient was able to move his opposite leg during the operation and complained of it being cold, we cannot eliminate the possibility of minimal epidural spread of local anesthetic.

In this patient, a medial approach by Winnie's technique was performed for lumbar plexus block with 30 mL, 0.25% levobupivacaine but neither hypotension occurred nor was vasoconstrictive administration required. Epidural spread of local anesthetic after lumbar plexus block is claimed to vary according to the technique and it is argued by some that more lateral approaches might be preferable in minimizing epidural spread and adverse hemodynamic consequences [3]. However, a report where a more lateral approach by Parkinson's technique was performed with 15 mL, 0.5% ropivacaine in a patient with severe AS showed that moderate doses of vasoconstrictive drug were required to maintain normal blood pressure [2].

Independent from the preferred approach, the contributing factor for maintenance of a stable hemodynamic status might depend on using low concentration of local anesthetic for lumbosacral plexus block which also provides sufficient surgical anesthesia [14]. Because effects of local anesthetic

on vascular tone vary according to concentration and when a dilute solution of local anesthetic is intended rather than a more concentrated solution, incidence of hypotension reduces from 35% to 7% during epidural anesthesia [8].

Therefore, we decided to perform lumbosacral plexus block with 0.25% concentration of levobupivacaine by decreasing the dose rather than decreasing volume to minimize hemodynamic results of minimal epidural spread in AS patient.

In conclusion, combined lumbar plexus, sciatic and iliohypogastric nerve block with 0.25% levobupivacaine provided stable hemodynamic parameters with adequate surgical conditions. Therefore, we recommend lumbosacral plexus block with 0.25% concentration of local anesthetic as a suitable alternative for hip surgery in patients with severe aortic stenosis.

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CORRESPONDENCE TO

H. Evren Eker, MD Baskent University Faculty of Medicine, Adana Teaching and Research Hospital, Department of Anesthesiology Dadaloglu Mah. 39 sk. No.6 01250 Yuregir / ADANA, Turkey Tel: +90 322 3272727 Fax: +90 322 3271273 E-mail: evreneker@yahoo.com

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Author Information

H. Evren Eker

Department of Anesthesiology and Reanimation, Baskent University, Faculty of Medicine

Aysu Kocum

Department of Anesthesiology and Reanimation, Baskent University, Faculty of Medicine

Tolga Kocum

Department of Cardiology, Baskent University, Faculty of Medicine

Ayda Turkoz

Department of Anesthesiology and Reanimation, Baskent University, Faculty of Medicine

Gulnaz Arslan

Department of Anesthesiology and Reanimation, Baskent University, Faculty of Medicine