Case Report

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Close Reduction with K-wire Fixation of Neer Type-III Fracture Surgical Neck Humerus with Multiple Valvular Heart Disease and Asthma under Interscalene Brachial Plexus Block: A Case Report

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Abstract

Regional anesthesia has always been considered as a safer alternative to general anesthesia specially in geriatric patients. The interscalene approach to the brachial plexus block is particularly well suited for operations on the shoulder, clavicle, or upper arm. The approach preferentially blocks nerves of the brachial plexus (C5-C7), with variable proximal spread to the cervical plexus (C3-C4), while usually sparing the ulnar nerve (C8-T1). We report a case of 78-year-old lady, who was prepared for close reduction with K-wire fixation of Neer Type-III fracture surgical neck humerus (right). The patient was a known asthmatic, hypertensive, with diagnosed multiple valvular heart disease (severe aortic stenosis, mild aortic regurgitation, mild tricuspid regurgitation, and mild mitral regurgitation). The patient was operated under regional anesthesia using peripheral nerve stimulator guided interscalene brachial plexus block with 30 ml of 0.5% ropivacaine. The operative procedure lasted for 1 h and throughout the procedure patients vitals, and other parameters were well maintained with the added advantage that the patient was fully conscious and oriented during the entire duration of the procedure.

Key words: Aortic stenosis, Asthmatic, Fracture humerus, Hypertensive, Interscalene block, Regional anesthesia, Valvular heart disease

INTRODUCTION

Regional anesthesia has always been used as a viable alternative to general anesthesia specially in geriatric population. There has been a dramatic rise in the elderly population with the number of people aged over 65 increasing three-fold in the last century. Consequently, this has led to a progressive increase in the number of surgical interventions in elderly people. There has been a dramatic increase in the incidence of valvular heart disease among aging population.[1] An estimate of the prevalence of moderate to severe disease valvular heart disease in patients >75 years old is 13.3%.[2] Maintenance of intraoperative hemodynamic stability in these patients can be quite challenging. Asthma is a disorder of variable intensity, typified by sentinel symptoms, airway obstruction, inflammation, and hyperresponsiveness.[3] World Wide, this condition is estimated to occur in 300 million persons and is implicated in one of every 250 deaths.[4]

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CASE REPORT

After obtaining a written informed consent, a 78-year-old American Society of Anaesthesiologists (ASA) Physical status Class III, a female patient weighing 51 kg, height 5ft 2 inch, was posted for close reduction with K-wire fixation of Neer Type-III fracture surgical neck humerus (Rt). The patient was a known case of multiple valvular heart disease (New York Heart Association Class III at present) diagnosed at the age of 51 years, other co-morbidities being hypertension for last 15 years and seasonal asthma (asymptomatic at present) since childhood. She had refused valvular heart surgery previously on

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multiple occasions. She was on the tablet amlodipine 5 mg, tablet hydrochlorothiazide 12.5 mg, tablet aspirin 75 mg, occasional use of Duolin@ metered dose inhalers for asthma. On pre-anesthetic check-up, pulse rate was 86/min, blood pressure (BP) 130/80 mmHg, respiratory rate was 18/min, and the metabolic equivalent of physical activity 4. She had Mallampati Grade was III, edentulous, absent buccal pad of fat with slight restriction of neck extension. All routine investigation results were within normal limit except pre-operative Hb being 9.3 g% after one unit whole blood transfusion and Serum creatinine being 1.7 mg/dl. ECG showed left axis deviation. Recent Transthoracic echocardiography showed severe aortic stenosis with thickened aortic valve (AVA = 0.7 cm^2, mean gradient of 58 mmHg), mild aortic regurgitation, mitral regurgitation, tricuspid regurgitation, concentric left ventricular (LV) hypertrophy, Grade-I diastolic dysfunction, and LV ejection fraction 45%. Chest X-ray showed cardiomegaly. Systemic examination revealed an ejection systolic murmur, heard loudest at the upper right sternal border and at the 2nd right intercostal space which radiated to the carotid arteries bilaterally. The patient's relatives and medical specialists decided to go ahead with surgery, in spite of her risk as she was in severe pain and to prevent immobility and infection. She was counseled on the previous day about the merits and demerits of both general anesthesia and regional anesthesia techniques and gave consent for regional anesthesia. The anesthetic plan was peripheral nerve stimulator (PNS)-guided inter scalene brachial plexus block. The patient was kept nil orally overnight prior to surgery. On the morning of surgery, she was administered 2 puff of Duolin@ inhaler about 1 h prior to surgery. On arrival to the operation theater, an intravenous line was secured with 18 G cannula and lactated ringer's solution was started. All anesthetic equipment were checked. Antibiotic as per hospital protocol was given pre-operatively. Standard ASA monitors were attached to the patient and on table vitals were recorded. With the patient in supine position and neck turned to left side, PNS-guided inter scalene brachial plexus block was performed. Contraction of the arm and shoulder was elicited at 0.9 mv stimulation current, which persisted even on reducing it to <0.5 mv, following which 30 ml of 0.5% ropivacaine was injected. 20 min post injection adequate motor block, and the sensory block was noted. Monitoring was done throughout the operation, and vitals were recorded on monitors every 3 min. The patients were kept in a state of conscious sedation with injection midazolam 1 mg IV and injection fentanyl 50 mcg IV. Oxygen was given by face mask at the rate of 3 L/min. The operation lasted for 1 h; the patient was stable intraoperatively. Estimated blood loss of around 200 ml and 800 ml Ringer lactate was given intraoperatively, and 1 units packed cell was transfused post-operatively. Intraoperative urine output was 100 ml. All intraoperative vitals were within normal limits.

DISCUSSION

Goldman first reported aortic stenosis as an independent predictor for life-threatening cardiac complications during non-cardiac surgery,[5] and this was confirmed by Detsky *et al.*[6] Aortic stenosis is often accompanied by coronary disease, heart failure, stroke, diabetes mellitus, renal failure, and hypertension. These patients have a 5-7 fold increase in mortality when subjected to the stress of non-cardiac surgery.[7,8] Perioperative mortality and nonfatal myocardial infarction were higher in patients with Aortic stenosis.[9] Post-operative cardiovascular complications were also higher in these patients following general anesthesia.[10] The Goldman cardiac risk index attempts to quantify the risk of adverse perioperative cardiac events. The index scores each of a range of various conditions including cardiac disease, age, and the nature and urgency of the proposed surgery. The total score predicts the likelihood of complications and death. For certain operations, this risk can be minimized by avoiding general anesthesia and using local anesthetic techniques. Examples include peribulbar eye blocks for cataract surgery and brachial plexus blocks for upper limb surgery. Our patient had major predictor's positive for intraoperative cardiac events, and he was to undergo an intermediate risk surgery.

We should bear in mind that "mixed" valvular lesions are more common than "pure" valvular lesions thus we need to determine which is the most severe (hemodynamically significant) lesion and/or will need to "split the difference" between management goals for multiple valve lesions.[11] In our patient, severe aortic stenosis was the predominant valvular pathology.

The incidence of aortic stenosis in elderly is 2%,[12] it being the most common valvular pathology with increasing age. Valvular sclerosis being the most commont cause. Normal aortic valve area is 2.5-4.5 cm^2, when narrowed by 25% it leads to an obstruction to the LV outflow. Aortic stenosis is classified based on valve surface area, mild is an area of 2.5-2.0 cm^2, moderate is 1.5-0.8 cm^2, and severe being <0.8 cm^2. Common symptoms include syncope, angina, and dyspnea.[13] Aortic stenosis is a fixed outlet obstruction and is dependent on sinus rhythm to maintain cardiac output. Patients may have associated concentric LV hypertrophy that may lead to diastolic dysfunction and congestion; angina may occur when the oxygen demand outstrips delivery. Aortic stenosis cases with associated LV hypertrophy have increased the rate of mortality.[14] Critical aortic stenosis, i.e. valve area of 0.7 cm^2 and gradient of 50 mmHg.[15] Our patient had severe aortic stenosis with a valve area of 0.7 cm^2, a transvalvular pressure gradient of 58 mmHg, she was symptomatic New York Heart Association stage III on medications.

Patients with concentrically LV hypertrophy do not tolerate tachycardia, atrial arrhythmias, or hypotension. Any decrease in systemic vascular resistance may precipitate coronary ischemia. They eventually cannot compensate for a fall in systemic vascular resistance which may result in severe hypotension, myocardial ischemia and a downward spiral of reduced contractility causing further falls in BP and coronary perfusion. Elevated aortic valve gradient is associated with increased risk of cardiac complications.[9] A low cardiac output state and abnormal LV function predispose these patients to higher incidence of intraoperative hypotension.[16]

Anesthetic plan in such a patient is formulated keeping in mind the above-discussed problems as these patients are in a state of low fixed cardiac output state. Hemodynamic goals in them include:

- Maintain normal heart rate
- Maintain sinus rhythm
- Adequate volume loading
- High normal systemic vascular resistance.

Anesthetic management mainly involves maintenance of sinus rhythm, systemic vascular resistance, and preload are important to avoid cardiac decompensation.[8] The selected anesthetic technique should maintain afterload and avoid tachycardia to maintain the balance between myocardial oxygen demand and supply in the presence of a hypertrophied ventricle and reduced coronary flow. Talking general anesthesia for consideration, nearly all induction agents, as well as inhalational anesthetics, cause generalized vasodilatation to a variable extent, causing decompensation, therefore, titrating dose of all inhalational and induction agents is mandatory. Maintenance of intraoperative BP at pre-induction levels prevents intraoperative cardiac ischemia. Adequate analgesia maintaining a proper plane of anesthesia intraoperatively specially during the time of intubation prevents catecholamine-induced tachycardia, hypertension, and the risk of cardiac ischemia. Direct measurement of arterial BP is helpful except for short procedures. Treating hypotension using directly acting alpha-agonists such as phenylephrine may improve systolic and diastolic LV function. Careful fluid balance is essential, specially invasive monitoring (central venous pressure, esophageal Doppler, trans-esophageal echocardiography) guided fluid therapy may be helpful. Arrhythmias must be treated promptly. In our patient, we did not use invasive monitoring as operative duration was short, no arrhythmias, episodes of ischemia, or hypotension occurred intraoperatively.

Taking into consideration the problems related with general anesthesia for such cases, performing the operation under peripheral nerve blocks with or without sedation is a good alternative to general anesthesia. It has the following advantages of offering superb hemodynamic stability in terms of maintenance of cardiac output & systemic vascular resistance, adequate sensory and motor blockade of the limb, less incidence of intraoperative tachycardia and arrhythmias, avoidance of problems related to difficult airway and intubation and decreasing the requirement of supplemental systemic analgesics. Anesthetic toxicity and intravascular injection are the main disadvantages. In our patient, we used PNS guided inter scalene brachial plexus nerve block with 0.5% ropivacaine 30 ml. Regurgitant lesions of aortic, mitral, tricuspid regurgitation can be managed by the maintenance of hemodynamic goals - high normal heart rate, adequate preloading, lowering systemic vascular resistance, lowering pulmonary vascular resistance intraoperatively. Both general and regional anesthesia can be used safely when the regurgitant lesion is the predominant one. Our patient had mild mitral, aortic, tricuspid regurgitation.

Use of regional anesthesia in this asthmatic patient also reduced the risk of perioperative respiratory complications, e.g., bronchospasm.

CONCLUSION

Intraoperative hemodynamic challenges of multiple valvular heart disease patient, perioperative pulmonary complications of an asthmatic patient, perioperative complications of a hypertensive patient, perioperative complications of an elderly patient can easily be avoided if an anesthetist prefers regional anesthesia over general anesthesia for operative management of fracture of bones of arm, forearm and hand.

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