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Neuraxial Blockade in Atrial Fibrillation - A Case Series

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Abstract
Atrial fibrillation can be encountered in preoperative work-up, yet there is no single anaesthetic technique that seems superior to another for intraoperative management. Here we present a case series of 5 cases with preoperative atrial fibrillation who underwent surgical procedures under spinal anaesthesia. Out of the 5 patients 2 of them received combined spinal epidural anaesthesia. From the management of these cases, we can infer that with proper preoperative evaluation, correction of precipitating factors of atrial fibrillation, adherence to anticoagulation, timely withholding of anticoagulation when possible, vigilant monitoring in the intra and postoperative period and use of appropriate vasopressors, neuraxial blockade can be used safely in patients with atrial fibrillation.
Keywords: Atrial Fibrillation, Spinal Anaesthesia, Epidural Anaesthesia, Anticoagulation.

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Introduction

Atrial fibrillation is the most common arrhythmia encountered in the perioperative period the estimated prevalence being 1-2%. Surgical patients can present in atrial fibrillation in a variety of ways as pre-existing AF, new onset AF and paroxysmal AF. This is associated with significant morbidity and mortality which includes increased risk of heart failure, stroke and prolonged hospitalisation.[1] The main aim of management in atrial fibrillation involves control of ventricular rate, conversion to sinus rhythm and anti-thrombotic prophylaxis. The Congestive heart failure, Hypertension, Age older than 75 years, Diabetes and Stroke (CHADS2) score is the most widely used, with higher scores correlating with higher risk of thromboembolism. The more recent Congestive heart failure, Hypertension, Age older than 75 years, Diabetes, Stroke, Vascular disease, female Sex (CHA2DS2-VASc) score adds an extra point each for female sex and vascular disease (which includes both coronary heart disease and peripheral vascular disease), and divides age into 3 categories (<60 years: 0 point, 60–74 years: 1 point, and ≥75 years: 2 points) instead of the 2 categories in the original CHADS2 score. Oral anticoagulation is indicated in men with CHA2DS2-VASc scores ≥1 and women with scores ≥2.[2] The main objective of preoperative evaluation is to ensure hemodynamic stability and maintain optimal anticoagulation status in the perioperative period. General anaesthesia is associated with increased morbidity and mortality in patients with atrial fibrillation. The factors that precipitate arrhythmia such as electrolyte abnormalities, hypoxia, hypervolemia and hypovolemia must be avoided. Sympathetic stimulation that occurs during general anaesthesia is also a trigger factor for atrial fibrillation. Hence it is prudent to avoid drugs such as ketamine, glycopyrrolate given with neostigmine for reversal that causes tachycardia.

Report:

Abbreviations
Electrocardiogram (E.C.G)
Echocardiography (ECHO)
right ventricular systolic pressure (R.V.S.P)

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ejection fraction (E.F)
A.S.A (American Society of Anesthesiologists)
Gauge (G)
post-anesthesia care unit (PACU)
chronic obstructive airway disease (c.o.p.d)
beats per minute (bpm)
Thoracic T8
Lumber (l)
atrial fibrillation (A.F)
blood pressure (b.p)
tablet (T)
Tricuspid annular plane systolic excursion (TAPSE)
Ultrasound (U.S.G)
Heart rate (H.R)
Pulmonary artery hypertension (PAH)
American society of regional anesthesia (ASRA)

We present a case series of five patients who underwent neuraxial blockade in the setting of atrial arrhythmias. All of these patients were having atrial fibrillation with a controlled ventricular rate. Patients on oral anticoagulants were bridged to unfractionated heparin or enoxaparin and the last dose before neuraxial block was administered as per ASRA guidelines. Defibrillator leads were connected and anti-arrhythmic drugs were kept standby. Standard ASA monitoring and invasive blood pressure monitoring was initiated for all the patients and spinal blockade was administered in sitting position. Oxygen was supplemented by face mask for all patients. After the procedure the patients were shifted to post anaesthesia care unit (PACU) and were observed until stable.

Case 1

A 73-year-old male patient, presented with scrotal abscess and was posted for incision and drainage in April 2020. This was the peak of the covid pandemic, when every effort was being taken to avoid general anaesthesia and post-operative ventilation. He had a history of mitral valve replacement a year back, hypothyroidism and chronic atrial fibrillation with a controlled ventricular rate. His medications included tablet warfarin which was bridged to injection enoxaparin 60mg twice daily. Enoxaparin was withheld for 24 hours before surgery. Echocardiography revealed a normal prosthetic valve with a trivial valvular leak, global hypokinesia of left ventricle with a reduced ejection fraction (E.F) of 26%, and a high probability of pulmonary artery hypertension (P.A.H) {right ventricular systolic pressure (R.V.S.P) 75 mmHg}. The patient was administered spinal anaesthesia in sitting position, and 1.2 ml hyperbaric bupivacaine (0.5%) with 20 ug fentanyl (0.4 ml) was administered. After 10 minutes the patient was positioned for surgery. Sensory blockade up to Lumbar (l) 1-2 was achieved. The patient remained stable in the intraoperative period.

Case 2

A 72-year-old gentleman was posted for wound debridement for necrotizing fascitis of the left leg in March 2022. He was an active smoker, a diabetic, had chronic obstructive pulmonary disease (C.O.P.D) and Brugada syndrome. He was recovering from sepsis, during which he developed type 1 respiratory failure, acute kidney injury, and stress cardiomyopathy. This caused him to have paroxysmal atrial fibrillation and was started on the tablet diltiazem 30 mg TDS and injection enoxaparin 0.6 ml B.D. ECHO showed adequate left ventricular function and no other structural heart disease. Under all aseptic precautions, the patient was given 2 ml

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0.75% isobaric ropivacaine in a sitting position at lumber 3-4 level, and sensory blockade up to thoracic T6 was achieved. He had hypotension (the lowest blood pressure recorded was 80/60) and this was managed by phenylephrine infusion which was tapered off by the end of the surgery. He was eventually discharged and went home after 12 days of hospital stay.

Case 3

A 75-year-old female patient presented with implant subluxation and was posted for implant removal in April 2022. She was a hypertensive with recent diagnosis of Parkinson's disease. She was also diagnosed with atrial fibrillation in November 2021 and was on dabigatran and metaprolol and defaulted on dabigatran since a month.

She was also a known case of interstitial lung disease of unknown etiology. Her preoperative ECHO showed a good left ventricular function with EF 56% but with mild concentric left ventricular hypertrophy and paradoxical movement of the interventricular septum. This patient was given a femoral block and 20 ml 0.2 % Ropivacaine was injected under real-time ultrasound guidance. The patient was positioned in a sitting position for the spinal block and 2 ml 0.75% hyperbaric ropivacaine with 20 ug fentanyl (0.4 ml) was injected into the subarachnoid space. Sensory block till T8 was achieved. An epidural catheter was also placed in L2-3 level however the surgery was completed in 2 hours and it was not activated in the intraoperative period. The patient had some hypotension in the intraoperative period which was managed by phenylephrine infusion (100ug/ml, 6-8 ml/hr) The patient was shifted to PACU after the completion of surgery where the phenylephrine infusion was continued and eventually stopped the next morning.

Case 4

A 73-year-old male patient presented with a right intertrochanteric fracture and was posted for closed reduction and internal fixation in March 2023. He was a known case of congenital heart disease, hypothyroidism and C.O.P.D. for 12 years. On examination, the patient was disoriented, irritable, and had incoherent speech at times. Baseline vitals were recorded as pulse rate 121 bpm, b.p 160/90 mmHg, spo2 83 % on room air, and respiratory rate 30 per minute. On investigation, ECHO showed normal left ventricular systolic function with EF 55%, grade 1 left ventricular diastolic dysfunction, atrial and ventricular septal defect with a right to left shunt with pulmonary stenosis P.G 78 mmHg, R.V.S.P 112mmHg, right-ventricular dysfunction. Arterial blood gas analysis showed hypoxia with paO2 53.2 on room air. A preoperative computerized tomography (CT) scan showed chronic infarct in the right thalamus and age-related cerebral atrophy. The patient was administered femoral nerve block with 10 ml 0.25% bupivacaine using the landmark technique and subarachnoid block in L3-4 level with 3 ml 0.5% hyperbaric bupivacaine and 0.4 ml 20 ug fentanyl in sitting position. The epidural block was technically challenging and was abandoned after a few attempts. Sensory blockade up to T 6 was achieved. The patient had hypotension intraoperatively which was managed with phenylephrine bolus and noradrenaline infusion 6ug/hr and the lowest b.p recorded was 90/50 mmHg. The surgical duration was 3hours and the patient was shifted to PACU on noradrenaline infusion. In the PACU, the patient had a worsening breathing pattern and was intubated on suspicion of pulmonary edema. Post intubation the patient had 3 episodes of seizures. The patient was taken up for a repeat CT scan and C.S.F analysis was within normal limits. He was treated with antiepileptics and he was gradually weaned and extubated on the second postoperative day. He was eventually discharged from the hospital after 8 days against medical advice. He was seizure free but with not much improvement in neurological status compared to the preoperative status.

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Case 5

A 79-year-old female patient, sustained a left intertrochanteric fracture, and was posted for proximal femur nailing on May 2023. She had hypertension, hypothyroidism, an old intracranial infarct with no residual weakness, coronary artery disease, and chronic kidney disease. She was on treatment for atrial fibrillation with a controlled ventricular rate for the past 2 years with tablet carvedilol 3.125 mg, tablet amiodorone 100 mg and tablet clopidogrel 100 mg. Echocardiogram revealed hypokinesia of the anterior wall of LV with an Ef of 53%, biatrial enlargement, moderate mitral and tricuspid regurgitation, and right ventricular dysfunction with a high probability of PAH (RVSP 50). Clopidogrel were withheld 5 days before the procedure and the patient was bridged with unfractionated heparin 5000 units thrice a day. The patient was administered an ultrasound guided left femoral block using 15 ml of 0.25% bupivacaine. This was followed by injection of 0.5% 1.6 ml Heavy bupivacaine and 20 ug fentanyl in the subarachnoid space at l3-4 level and an epidural catheter was secured at L 2-3 space in sitting position. Adequate analgesia was achieved up to T8. An epidural bolus was given towards the end of the surgery with 3 ml of 0.25% bupivacaine. The patient had hypotension in the intraoperative period which was managed by noradrenaline infusion of 3-6 ug/kg/minute. Noradrenaline was tapered and stopped by the end of surgery which lasted 3.5 hours. However, the patient developed two episodes of atrial fibrillation with fast ventricular rate and hypotension in the PACU and she was started on amiodarone infusion. She was evaluated for an acute coronary event, septic foci and electrolyte imbalance; however, all investigations were normal. The patient was later shifted back to the ward and remained hemodynamically stable until discharge.

DISCUSSION

Neuraxial techniques have been successfully used to manage geriatric patients with atrial fibrillation.[3,4] Our first patient had reduced left ventricular dysfunction and severe pulmonary hypertension in addition to atrial fibrillation. Spinal anaesthesia has a reduced stress response to surgery and also provides faster recovery. As our patient had to be operated during peak of COVID, low dose spinal anaesthesia was administered considering not only patient factors but also the risk of cross infection of the operating room personnel. As intended, the hemodynamic parameters of the patient were maintained in spite of the atrial fibrillation and the perioperative period was uneventful. Low dose spinal also called as selective spinal anaesthesia can be a simple and useful technique in high risk patients.[5] The second patient in our case study presented with a comparatively more morbid picture wherein he had atrial fibrillation in the presence of sepsis and an underlying Brugada syndrome. Considering the risks associated with administering general anaesthesia in a patient with COPD we opted to go for neuraxial technique with isobaric Ropivacaine. Local anaesthetics in general are sodium channel blockers. Bupivacaine has been shown to cause severe arrhythmias in patients with Brugada syndrome.[6] Mena S et al in their case report have suggested that with due precautions local anaesthetics can be used in low dose for neuraxial techniques in patients with Brugada syndrome.[7] A 12 year case series on anaesthetic management of Brugada Syndrome failed to recognise any deleterious arrhythmia that was possible with the use of drugs like Ropivacaine.[8] In our second and third patients the development of intraoperative hypotension was managed with phenylephrine infusion. Paroxysmal AF is caused by ectopic beats of the atria that originate from the pulmonary vein (PV) or the superior vena cava (SVC). Phenylephrine causes a change in autonomic tone which has been found to suppress paroxysmal AF arising from the pulmonary vein.[9] Patients who had atrial fibrillation with an underlying sepsis had modestly lower heart rates with phenylephrine when compared to nor epinephrine.[10] In the management of our fourth patient the preoperative general and neurological condition of the patient made us to go for a neuraxial technique rather than general

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anaesthesia. Low dose combined spinal epidural has been successfully employed for caesarean section in a patient with Eisenmenger's syndrome.[11] Regional anaesthesia has been shown to have a lesser mortality rate than general anaesthesia in patients with this syndrome though the difference is statistically not significant. Mortality was associated with the disease process as such and the surgical cause rather than the anaesthetic technique employed.[12] As far this patient is concerned we feel that the Eisenmenger's syndrome made the management difficult. The reason for the intraoperative seizure episode was unknown as the CT picture was unremarkable. The fifth patient in our series was also managed in a similar way to the other four cases by employing neuraxial technique as the mode of anaesthesia. The use of Noradrenaline as the vasopressor here could have been a reason for the precipitation of AF with fast ventricular rate in the postoperative period. Phenylephrine may have provided a better heart rate control in this patient who had a higher heart rate of 110-120/minute to start with.[10] Though all our patients had atrial fibrillation as a common factor, they also had other conditions that complicated the overall patient profile. As keeping it simple and safe is our primary concern we opted for neuraxial blockade in all our patients weighing the risks and benefits. The outcome was satisfactory in all the patients except the patient with Eisenmenger's syndrome.

CONCLUSION

Neuraxial blockade, with proper monitoring and use of phenylephrine as vasopressor of choice when deemed appropriate, can be used in patients with atrial fibrillation. From the care givers' perspective, the faster recovery and the shorter duration of stay in the post anaesthesia care unit in four out of our five patients was the most welcomed benefit of employing neuraxial blockade. We hope that our case series will be useful for the management of patients with atrial fibrillation in low resource settings were invasive monitoring and intensive care may not be available.

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