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Case Report

Anaesthesia Section

Dealing with Dual Challenges Posed by an Uncorrected Atrial Septal Defect with Poliomyelitis- Anaesthetic Considerations for a Non Cardiac Surgery

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ABSTRACT

Atrial Septal Defect (ASD) is one of the most common congenital heart diseases. This is one such disease where patients largely remain asymptomatic throughout childhood and begin showing symptoms during adulthood. Here, the authors present a case of a 44-year-old male patient, with an uncorrected ASD and poliomyelitis, who presented with fracture femur. He was posted for Open Reduction Internal Fixation (ORIF) with plating of femur. The anaesthetic management was successfully done with general anaesthesia through endotracheal intubation along with fascia iliaca block. After the procedure and extubation, the patient was conscious, oriented, responded to commands, and had normal vital parameters. He was shifted to the Intensive Care Unit (ICU) for further observation and monitoring in view of his pre-existing co-morbid conditions. Postoperatively, cardiovascular surgeon advised a correction surgery for his ASD at a later date. The patient was discharged on Postoperative Day (POD) 12. Dealing with these two vastly different disease entities in the same patient certainly posed a unique aspect to the present case considering the fact that there was no prior literature regarding the same.

Keywords: Congenital heart diseases, Fascia iliaca block, Femur

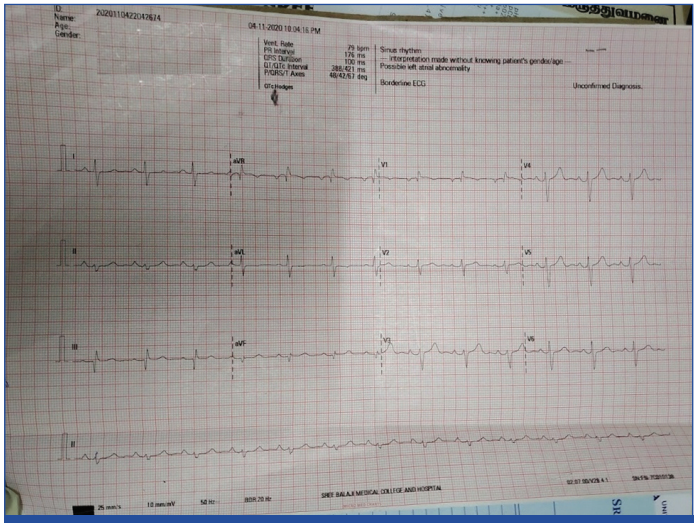
CASE REPORT

A 44-year-old male patient, was admitted for ORIF with plating of femur for distal one-third left shaft of femur fracture at Sree Balaji Medical College and Hospital, Chromepet, Chennai, Tamil Nadu, India. He sustained an injury to the femur following a slip and fall down the stairs at his house. It was known that he had an uncorrected ASD, with poliomyelitis involving both the lower limbs with muscle atrophy. He did not have any other co-morbid illnesses and there was no prior surgical history and no family history of similar diseases.

During the pre-anaesthetic check-up, possibility of Postpolio Syndrome (PPS) was looked into as well. Auscultation revealed systolic murmur over the pulmonary area. The patient did not have exertional symptoms. A cardiologist's opinion was sought, and an evaluation revealed an incomplete right bundle branch block on his Electrocardiogram (ECG) [Table/Fig-1] and cardiomegaly on chest radiograph. His preoperative echocardiography revealed ASD (OS) 32 mm, D-shaped septum, dilated right atrium and ventricle, moderate pulmonary hypertension, moderate tricuspid regurgitation, grade 1 diastolic dysfunction, normal Left Ventricle (LV) systolic function, and Ejection Fraction (EF) of 65%. The cardiologist advised deep vein thrombosis prophylaxis and perioperative cardiac monitoring.

Within a day of admission, he was taken up for emergency surgery in view of open fracture, increased risk of infection and bleeding. A multicentric plan of anaesthetic management was planned keeping in mind the dual challenges posed by ASD and poliomyelitis.

After adequate nil per oral status, the patient was shifted to the operation theatre with an 18 G intravenous (i.v.) access on his left hand. Premedication with anxiolytics and hypnotics were avoided in anticipation of hypoventilation, and hypercapnia, which may adversely increase the pulmonary vascular resistance. The i.v. fluids were administered, Routine monitoring of Non Invasive Blood Pressure (NIBP), Heart Rate (HR), Oxygen Saturation Levels (SpO_2), End Tidal Carbon Dioxide ($ETCO_2$) was observed. Arterial line was secured in the right radial artery, and invasive blood pressure monitoring was carried on. Injection (inj.) Glycopyrrolate



[Table/Fig-1]: Electrocardiography (ECG) showing incomplete right bundle branch block.

0.2 mg and Inj. Fentanyl 100 mcg was administered intravenously. After adequate pre-oxygenation, induction was performed with Inj. Etomidate 18 mg slow i.v. and Inj. Vecuronium bromide 6 mg i.v. In anticipation of sympathetic stimulation, due to intubation stress response which may deleteriously increase the systemic vascular resistance, Inj. Loxicard (Lignocaine hydrochloride) 3 mL i.v. was administered. A one metred dose of 10% lignocaine spray was used 3 minutes before laryngoscopy. The patient was intubated with 8 size Endotracheal Tube (ET) tube fixed at 23 cm after checking bilateral and equal air entry.

The goal of anaesthetic management for the patient was to prevent acidosis, prevent hypercapnia, hypoxia and pain stimulus to prevent a rise in pulmonary vascular resistance and to minimise the use of Positive End Expiratory Pressure (PEEP). This would be deleterious, if, there was a reversal of shunt where the possibility of air emboli was further augmented by PEEP.

Following this, under aseptic sterile precautions with Ultrasonography (USG) guidance, fascia iliaca block was performed with 20 mL of 0.25% bupivacaine, 4 mg Dexamethasone diluted with 10 mL sterile water. Usually in lower limb orthopaedic procedures, epidural anaesthesia [1] is employed for analgesia. But usage of epidural anaesthesia in a patient with ASD carries the risk of uncontrolled hypotension, haemodynamic instability and reversal of intra-cardiac shunt, which has been prevented by employing a safer technique of fascia iliaca block for analgesia. Normothermia was also maintained by employing the use of warmer.

Keeping in mind the increased sensitivity of poliomyelitis patients to non depolarising neuromuscular blockers, judicious use of titrated muscle relaxants was carried on for maintenance doses while maintaining the plane of anesthesia with sevoflurane. Simultaneously, the relaxants also had to be given on time to avoid sympathetic stimulation. The intraoperative period was uneventful due to extensive monitoring to maintain systemic vascular resistance and prevent any rise in pulmonary vascular resistance. Intraoperative blood loss was well within the allowable blood loss parameters, without any haemodynamic instability.

Perioperative fluid management was carried on as per his body weight requirements and to compensate for the deficit as well. The total intraoperative urine output was 500 mL. An Arterial Blood Gas (ABG) done intraoperatively, also turned out to be normal. In view of uneventful intraoperative period, extubation was planned.

In anticipation of extubation stress response, Inj. Loxicard and Inj. Esmolol were kept ready. The patient did not have adequate tidal volume and muscle recovery was inadequate. Hence, he was further ventilated for an extended duration while the cause for delayed recovery was looked into. With a history of poliomyelitis during childhood, this was an anticipated scenario. Subsequently, the patient's tidal volume and respiratory efforts improved after an hour. He was reversed with Inj. Glycopyrrolate 0.4 mg i.v. and inj. Neostigmine 3.5 mg. After extubation, the patient was conscious, oriented, responded to commands, and had normal vital parameters. He was shifted to the ICU for further observation and monitoring in view of his pre-existing co-morbid conditions. Postoperatively, cardiovascular surgeon advised a correction surgery for his ASD at a later date. On Postoperative Day (POD) 1 the patient was shifted from Intensive Care Unit (ICU) to the postoperative ward, and subsequently discharged on POD 12.

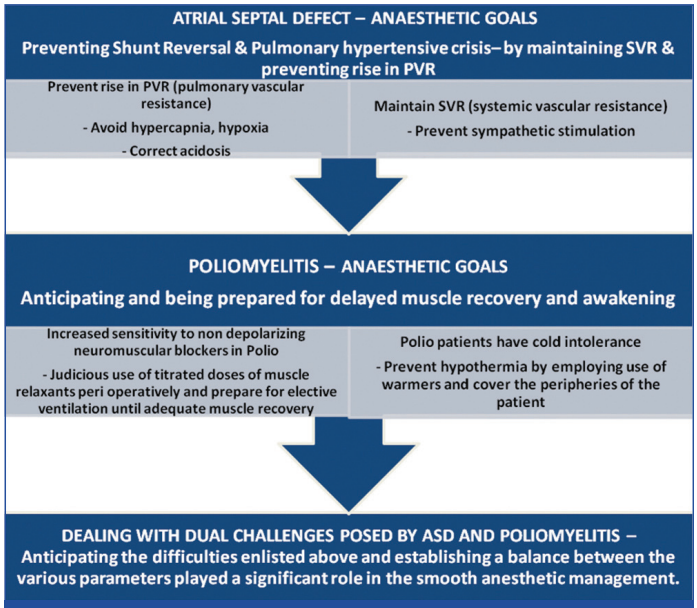
DISCUSSON

Atrial septal defect is one of the most common acyanotic congenital heart diseases. With increasing age due to reversal of shunt symptoms usually appear later in life by adulthood. A vast majority of untreated patients have symptoms of exertional dyspnoea, fatigue, palpitation or sustained arrhythmia. Left-sided pressures are more than right-sided pressures. Hence, shunt is from left atrium to right atrium. During moments of strain or exertion, right-sided pressures increase more than the left and chances of paradoxical embolus from right to left heart are more. This can subsequently enter the aorta and then into the blood vessels supplying organs like the brain ultimately causing a stroke. Split S2 is heard on auscultation because right heart has more volume of blood to carry and pulmonary valve closure is slightly delayed compared to aortic valve closure.

Goals of anaesthesia for ASD with pulmonary hypertension: The goal is to maintain systemic vascular resistance and to prevent a rise in Pulmonary Vascular Resistance (PVR) [2]. The understanding behind this is that large ASDs have significant left to right shunt leading to right-sided volume overload, dilatation and failure, and increased flow into the lungs causing pulmonary hypertension. So, to prevent further rise in PVR, hypoxia, hypercapnia and acidosis must be prevented or corrected if present, normothermia must be maintained and sympathetic stimulation should be avoided. If it is not prevented, pulmonary hypertensive crisis can result leading to decreased cardiac output and hypoxaemia. Simultaneously, systemic vascular resistance must be maintained preventing a further rise which can increase the shunt leading to haemodynamic instability. Hence, sympathetic stimulation needs to be avoided [3].

Roy R and Prasad A reported the successful anaesthetic management of a patient with large ASD, planned for total abdominal hysterectomy [1]. They employed the use of general anaesthesia with bilateral transversus abdominus plane block for the purpose of stable haemodynamics, and to prevent the reversal of shunt. Reversal of intracardiac shunt can cause air to enter systemic circulation leading to paradoxical cerebral air embolism which is further augmented by PEEP. This can be prevented by not using PEEP [4]. In the present case, all these strategies for ASD enlisted above were implemented leading to a smooth and uneventful perioperative period.

The goals of anaesthesia with respect to these disease entities have been elaborated in [Table/Fig-2].



[Table/Fig-2]: Anaesthetic goals for Atrial Septal Defect (ASD) with Poliomyelitis.

Polio: Polio virus targets the lower motor neurons on anterior horn cells thus causing weakness in the muscles supplied. Clinical recovery from the acute infection is by reinnervation of remaining muscles by nearby surviving neurons, which then carry a heavier metabolic load. During the ageing these compensatory neurons may get damaged and patients can develop Post Polio Syndrome (PPS) years after the first attack.

Criteria for the diagnosis of PPS [5]:

1. History of polio;
2. Partial or complete functional recovery for atleast 15 years;
3. Onset of progressive muscle weakness lasting atleast one year; and
4. Exclusion of other possible neurologic causes

Anaesthetic goals and implications for poliomyelitis: Due to widespread CNS damage, several concerns were anticipated: sensitivity to the centrally acting anaesthetic drugs, prolonged wakening, autonomic nervous system issues such as low blood pressure in response to drugs, sensitivity to neuromuscular-blocking drugs, and respiratory failure after surgery.

Hiremath VR employed the use of spinal anaesthesia for a young adult with PPS, who underwent open reduction with nailing of femur [6]. The intraoperative and postoperative period was uneventful, as described in this case report. de Oliveira AR et al., employed the use of regional epidural anaesthesia for a 26-year-old primigravida patient (39-week gestation), with premature rupture of membranes, taken up for an emergency caesarean section [7].

While the above cases employed regional anaesthesia, Roy R and Prasad A reported the successful anaesthetic management of a patient with large ASD, for total abdominal hysterectomy with general anaesthesia and bilateral Transverse Abdominis Plane (TAP) block [1]. They chose this technique keeping in mind the possibility of sudden hypotension, unstable haemodynamics and reversal of intra cardiac shunt associated with central neuraxial blockade. An uncorrected ASD can lead to pulmonary arterial hypertension, right heart failure, atrial fibrillation, atrial flutter, stroke and Eisenmenger's syndrome.

The uncorrected ASD in this patient led to the use of general anaesthesia along with a fascia iliaca block for analgesic purposes. Emergence from anaesthesia should be preceded by ensuring complete reversal of neuromuscular blockade. The risk of aspiration is greater in at least some PPS patients. As such, selected patients may benefit from prophylactic antiemetic medication. Careful suctioning of the hypopharynx before emergence is essential. Vital capacity "big breaths" before extubation may help to recruit a maximal number of alveoli. With respect to analgesia opioids must be used judiciously in carefully titrated doses and longer acting analgesics can be avoided [8].

CONCLUSION(S)

Thinking ahead, the optimal use of muscle relaxants and analgesic requirements met appropriately with a fascia iliaca block helped with a smooth perioperative period. In poliomyelitis, postoperative pain perception may be abnormal, possibly because of polio virus induced damage to endogenous opioid secreting cells in the brain and spinal cord. Since delayed muscle recovery was anticipated, adequate preparations were made for ventilating the patient for an extended period until his efforts were adequate. The patient's respiratory parameters were also cautiously monitored in the post operative period and were found to be normal. The dual challenges posed by ASD and poliomyelitis in combination were successfully dealt with effective strategies by planning ahead. As always, anaesthesia is all about establishing a balance and the present case reiterated the same.

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