Role of Transthoracic Echocardiography in the Diagnosis and Anaesthetic Management of a Case of Atrial Septal Defect having Diagnostic Ambiguity with Mitral Valve Disease

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ABSTRACT

Anaesthesiologists come across many surgical conditions with associated medical diseases. Being the perioperative physician they have to diagnose the previously unrecognised, associated medical conditions for a safe anaesthetic course resulting in a better surgical outcome. It becomes even more important during an emergency surgery, when they attend the patient directly on the operating table and are unable to consult other medical fraternity for clinical diagnosis. Sometimes, few medical conditions simulate the others so much so that, the anaesthesiologist may inadvertently reach in a wrong diagnosis, thus endangering the anaesthetic management of the patient. Here, two emergency surgical cases associated with atrial septal defect having diagnostic ambiguity with mitral valve diseases are being reported and the role of transthoracic echocardiography in the anaesthetic management is being discussed.

Keywords: ASD, MS, MR, PAH, Bifid P wave, Harrison’s groove.

How to cite this article: Mishra S. Role of Transthoracic Echocardiography in the Diagnosis and Anaesthetic Management of a Case of Atrial Septal Defect having Diagnostic Ambiguity with Mitral Valve Disease. Int J Periop Ultrasound Appl Technol 2012;1(2):77-81.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

During emergency surgery, for the best surgical outcome, it is very important on the part of the perioperative physician, i.e. the anaesthesiologist to correctly and quickly diagnose the associated medical condition, as he might not get the help of a physician friend due to lack of time. Some of the auscultatory and ECG findings of atrial septal defect (ASD) with pulmonary arterial hypertension (PAH) in the adult patients might bear similarities with mitral valve disease leading to clinical ambiguity in diagnosis and hence anaesthetic mismanagement. But, this has never been reported in the literature, especially in the perioperative setting. Therefore, two emergency surgical cases of adult ASD with PAH having diagnostic ambiguity with mitral valve disease are being reported here and the role of transthoracic echo study in the perioperative anaesthetic management are also discussed.

CASE REPORTS

Case 1

A 45-year-old male patient was posted for emergency laparotomy and closure of peptic perforation having 10 days old history with features of peritonitis and dehydration. A quick examination by the attending anaesthesiologist revealed a loud first heart sound, mid-diastolic murmur (MDM) with presystolic accentuation, midsystolic murmur with fixed split second heart sound and loud P2 over left sternal border and apex. On asking, the patient revealed the history of frequent attacks of cough and cold and exertional dyspnoea. He also had deformed chest wall (Harrison’s groove) (Fig. 1) and bilateral basal coarse crepitation.1 Because of the previous experience of diagnostic ambiguity between ASD and mitral valve disease in her past, the author herself rushed the patient to the cardiologist where the ECG showed bi-atrial enlargement (bifid P wave) (Fig. 2) with strong pulmonary component (peaked P wave in V3) (Fig. 3), right axis deviation and right ventricular enlargement with strain pattern (rSR’ in V1-3 with T inversion in V1-4, depressed convex-upward S-T segment with inverted in V1-4) (Fig. 4) and absence of sinus arrhythmia (Fig. 5).1,3 The ECHO study revealed a large ostium secondum ASD (Fig. 6) with left to right shunt.
(Fig. 7), hugely dilated right atrium (RA) and right ventricle (RV) pushing the interventricular septum (IVS) towards left (Fig. 8), pulmonary arterial hypertension (PAH) with pulmonary arterial (PA) systolic pressure of 41 mmHg, and mild to moderate tricuspid regurgitation (TR) (Fig. 9). The ejection fraction and stroke volume of left ventricle was 63% and 31 ml respectively (Fig. 10). The details of the diagnostic ambiguity, its clinical implications during the anaesthetic management and the role of echocardiography will be discussed during the time of presentation.

Infective endocarditis prophylaxis was given by 2 gm of ampicilin intravenously. He was premedicated with midazolam 1 mg, avil 1 amp, morphine 5 mg (titrating with the BP); palonosetron 75 μg. Five mg morphine diluted in 10 ml of normal saline was injected through the epidural catheter inserted by the technique of loss of resistance to saline. He was induced and intubated with propofol 60 mg and vecuronium 5 mg. Anaesthesia was maintained with isoflurane 0.4% and nitrous oxide 33%. Intraoperative serum potassium and sodium were 5 and 129 mEq/l respectively. Over the perianaesthetic period of one and half hour, 1500 mls normal saline infusion produced 100 mls urine. The induction hypotension of 85/50 mmHg, was treated with ephedrine 5 mg and phenylephrine 50 μg in intravenous drips. Additional perioperative analgesia was provided with 1 gm intravenous paracetamol. Patient’s legs were kept raised at 30º and airway pressure kept at lower side (P_max—17 and P_min—7 cm of H_2O), to improve venous return and thereby decreasing left to right shunt with improved LV output. Intraoperative course was smooth. Transient, mild tachycardia (118/min) and hypertension (142/93 mmHg) occurred just after extubation and the patient was little irritable, though conscious and taking spontaneous breaths of lower than normal tidal volume. Hence, the breathing was assisted with 100% oxygen, to bring down his ETCO_2 to 32 mmHg. Ten millimeter of 0.625% of bupivacaine was injected through epidural catheter for analgesia to reduce pulmonary vascular resistance (PVR). A repeat echocardiography ruled out any impending RV failure or excessive RV dilation pushing the intraventricular septum
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Case 2

A 32-year-old lady had to undergo emergency caesarian-section for fetal distress. On the operating table, a quick auscultation by the anaesthesiologist revealed mid-diastolic murmur and loud first heart sound. The lead II in the monitor was showing bifid P wave. With the above findings, the anaesthesiologist presumed it to be a case of mitral stenosis and managed the case in that line. But, afterwards it was confirmed by echocardiography to be a case of ASD with moderate TR and PAH.

DISCUSSION

ASD in adults presents with dyspnoea, atrial arrhythmias and congestive heart failure. However, adults often lack both obvious murmurs and symptoms, making diagnosis more difficult than in children. Complications of uncorrected secondum type of ASD include, PAH, rightsided heart failure, atrial fibrillation or flutter, stroke and Eisenmenger’s syndrome. Perioperative changes in PVR and systemic vascular resistance (SVR) have important implications. Anticipated problems are air embolism during vascular access, dysrhythmias (5-10%, if no prerepair dysrhythmia), heart failure, heart block and infective endocarditis. According to WHO classification, the patient of first case report had large ASD, mild pulmonary arterial hypertension and grade II functional status.

Diagnostic ambiguity of ASD with MS in first case report as follows:

1. MDM with presystolic accentuation in left parasternal and apical area (as found in MS) could also be found in ASD, for increased blood flow through TV along with volume overloaded hyperkinetic RA and dilated RV occupying the apex by pushing the LV posteriorly.
 Delayed pulmonary component of second heart sound might be mistaken for opening snap of MS.1

3. Bifid P seen in unrestrictive ASD, simulate ‘P mitrale’ of MS.1

4. Loud first heart sound [for rapid closure (by the hyperkinetic and diluted RV) of wide apart cusps (by the high blood flow through it) of TV] is confused for loud first heart of MS.1

5. Loud P2 of ASD with PAH, is also found in advanced MS with PAH.2

Diagnostic ambiguity of ASD with MR as follows:

1. In ASD, pulmonary systolic flow murmur, by high blood flow from volume overloaded RV occupying the apex, simulates apical systolic murmur of MR.1

2. The bifid P, simulates the ‘P mitrale’ of MR.2

3. Loud P2 of ASD with PAH, is also found in advanced MR with PAH.2

Though the current recommendations do not warrant, considering the emergency setting, infective endocarditic prophylaxis was given avoiding aminoglycoside for pre-renal uremia.11-14 Combined approach of general anaesthesia with controlled ventilation and epidural analgesia provided better haemodynamic stability with control over PVR and SVR and allowed high concentration of oxygen preventing the rise in PVR. Though nitrous oxide increases PVR, this deleterious effect was more than counterbalanced by its excellent analgesic effect and also by the prostaglandin (causing vasodilatation) secreted by the stretched lung tissue, due to positive pressure ventilation.15 Chlorpheniramine was used to prevent morphine-induced vasodilatation. Moreover, positive pressure ventilation of lungs was well tolerated in increased pulmonary blood flow. Epidural catheter was inserted with loss of resistance to saline technique to avoid air embolism. Intra-operative hypothermia, hypercarbia and hypoxemia were avoided to prevent shunt reversal.15-17

**IMPLICATION OF THE CASE REPORTING**

1. Bifid P wave and ASD murmur simulating MS and MR has more chance of being misdiagnosed as mitral valve disease by an anaesthesiologist on first examination.

2. The fluid management of ASD differs from mitral valve disease in an emergency setting of pre-renal failure with hyperkalemia (as in author’s case). Rapid hydration may cause pulmonary oedema in MS, whereas in ASD, high pre-load maintains forward flow in the face of dilated and compliant RV and associated PAH.

3. Mitral valve disease requires more sophisticated invasive monitoring for fluid and anaesthesia management, where as ASD could be managed without it (as in author’s case), by proper knowledge of the physiological principle behind SVR and PVR.

4. This clinical diagnostic ambiguity has never been reported in a perioperative setting.

5. The anaesthesiologist, being the peri-operative physician, must acquire working knowledge in interpreting the auscultation, ECG and ECHO by accompanying the patient to the cardiology department to have a look by himself during the echo study to develop the necessary skill for a better patient outcome.

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