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Ultrasound Guided Supraclavicular Brachial Plexus Block in an Adult with an Undiagnosed Ventricular Septal Defect for Upper Limb Orthopaedic Surgery

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Sir,

Adult congenital heart disease which has not been diagnosed earlier is very rare. We present the successful anaesthetic management using ultrasound guided brachial plexus block of a patient with ventricular septal defect (VSD) who was diagnosed only at preanaesthetic evaluation.

A 30 year old male presented to us following a motor vehicle accident for surgical fixation of open fracture of the left radial head. On pre-anaesthetic evaluation, he had no other medical comorbidities and had never undergone any surgical or anaesthetic procedure; the only significant history was of air bag inflation during the trauma. General physical examination was unremarkable, his pulse rate 82 beats/min regular normovolaemic, blood pressure of 112/54 mm Hg, respiratory rate of 16 cycles/min and room air saturation of 98%. On cardiovascular examination, precordium appeared normal with apex beat shifted to left 5th intercostal space beyond midclavicular line. A palpable thrill was felt but no parasternal heave. On auscultation a grade III pan systolic murmur was heard over the tricuspid and mitral area loudest at tricuspid area. This raised the suspicion that he may have developed a ventricular septal defect (VSD) secondary to blunt chest trauma. But there were no signs of congestive heart failure, pulmonary hypertension or signs of trauma over the chest. The patient was asked again about any symptoms suggestive of cardiac ailment, he then gave history of breathlessness on climbing around 3 floors and the need to stop exercise/exertion much before his peers of same age. He did not have chest pain, cough, wheeze, palpitation, syncope, cyanosis, orthopnea, paroxysmal nocturnal dyspnea during any period. He also had no other significant birth or developmental history.

An electrocardiogram showed normal axis but deep S waves in lead V2, V3, V4 and T wave inversion in lead III. His haemoglobin was 14.2 g/dl and haematocrit 42.5%. A screening bedside transthoracic echocardiography was done and revealed a ventricular septal defect (subaortic) of 11 mm with left to right shunt, dilated left atrium, concentric left ventricular hypertrophy, moderate aortic regurgitation, mild tricuspid regurgitation, PASP 35 mmHg and normal biventricular function. A transesophageal echocardiography was suggested by the cardiologist to assess shunt post operatively.

The plan of anaesthesia was regional block with supraclavicular brachial plexus block. Informed consent was taken and patient was shifted to operation theatre. Standard ASA monitors were connected and oxygen via face mask was provided. All emergency drugs and defibrillator were kept ready. Injection midazolam 2 mg was given for anxiolysis and sedation. A GE Venue 40 Ultrasound Machine with a 5-12 MHz linear probe was used to identify the brachial plexus in the supraclavicular fossa. Under strict asepsis a 22 gauge 50 mm Stimuplex® insulated needle (B. Braun, Melsungen, Germany) was inserted by an in plane approach and 30ml of local anaesthetic mixture (20ml 0.75% Ropivacaine and 10ml of 2% Lignocaine with 4 mg dexamethasone) was administered. Adequate anaesthesia was achieved in 10 minutes and the patient remained haemodynamically

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stable throughout. The surgeons excised the radial head and cortical screws were placed for reducing the fracture. The surgery lasted for two hours and intraoperatively 700 ml of intravenous fluid was administered. Post operatively patient was shifted to PACU and continuous haemodynamic monitoring was done. He had sensory blockade for 7 hours. He was discharged on request on post op day 2 as he wanted further management at his home town.

Isolated VSD is the most common congenital heart malformation at birth (30–40%). Majority of isolated muscular and perimembranous VSDs are small and close spontaneously. Adults with small VSD's usually asymptomatic and have a high risk of bacterial endocarditis. VSD's cause volume load to the left heart; the magnitude of hemodynamic impact is directly related to the size of the shunt and after load to the ventricles. Five percent of VSD are near to aortic valve and cause aortic regurgitation, and may present with SVT and atrial fibrillation. Large defects cause the pressures in the ventricles to equalize during systole and the vascular resistance on either side will determine the shunt flow. Due to prolonged left to right shunt pulmonary hypertension can develop and reversal of shunt flow i.e Eisenmenger complex occurs by 2nd or 3rd decade of life. Patients with small VSD (<10mm) with normal pulmonary vascular resistance have better prognosis[1].

Posttraumatic VSD due to blunt chest trauma is a rare but potentially life-threatening complication which should be recognised early and evaluated by a cardiologist. A high index of suspicion warranted in blunt chest trauma patients presenting with a systolic murmur, abnormal electrocardiogram, or elevated cardiac enzymes. An urgent screening echocardiogram should be performed if a structural heart disease is suspected[2].

The challenge to the anaesthetist is to balance the systemic and pulmonary vascular resistances. The right ventricular preload and contractility and left ventricular after load has to be maintained such that pulmonary blood flow is maintained. Hypothermia, hypoxia, hypercarbia, acidosis, high airway pressures and adrenergic agents should be avoided. We should ensure that there are no air bubbles in the intravenous infusion. Supplemental oxygen should be provided and oxygen saturation monitored[3]. Although the risk of infective endocarditis in an unrepaired VSD is high, antibiotic prophylaxis is not recommended[4]. The tourniquet should be used with caution in these patients as tourniquet inflation can increase blood volume and systemic vascular resistance leading to a transient increase in central venous pressure. Subsequently tourniquet deflation can lead to a sudden fall in central venous pressure, mean arterial pressures and release of accumulated metabolites from the ischemic limb into the systemic circulation[5]. The increase in blood volume may be up to 800ml when using tourniquets on both the lower limbs and may not be very significant during use of a single upper limb tourniquet.

A regional anaesthesia technique (ultrasound guided supraclavicular brachial plexus block) was preferred to avoid changes in shunt dynamics and pulmonary blood flow, and avoid polypharmacy[6].

An ultrasound guided supraclavicular brachial plexus block is a safe and excellent anaesthetic choice for congenital VSD coming for upper limb

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