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Anesthetic Considerations in Patient with Wolff-Parkinson-White Syndrome for Laparoscopic Cholecystectomy: Role of Perioperative Dexmedetomidine

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Abstract

Wolff-Parkinson-White (WPW) syndrome is a cardiac disorder having abnormal electrical communication between atria and ventricles. It is an uncommon disorder may be asymptomatic or present with symptoms like palpitation. Intraoperatively these patients may present with serious cardiac emergencies like paroxysmal supraventricular tachyarrythmias (PSVT) and atrial fibrillation (AF). We report a case of 35 years old female posted for elective laparoscopic cholecystectomy under general anesthesia with the use of dexmedetomidine in the perioperative period. Perioperative management of these patients under general anesthesia is a real challenge for the anesthesiologists particularly under general anesthesia.

Keywords: General anesthesia; Re-entrant tachycardia; Arrhythmia; Wolff-Parkinson-White syndrome

Introduction

WPW syndrome is a condition in which supraventricular tachyarrythmias can occur as a result of an abnormal pathway, the accessory bundle of Kent that directly connects the atria and ventricles bypassing the atrio-ventricular (AV) node [1]. The resulting SVT that occur in WPW are the result of either decreased conduction through the AV node or an increased conduction along the accessory bundle of Kent. Treatment of WPW includes medical management and radiofrequency or surgical ablation of the offending accessory band to restore normalcy through the AV node. WPW is not a frequent occurrence for anesthesiologists due to a high rate of ablation in symptomatic patients. Anesthetic drugs and techniques change the physiology of AV conduction. Therefore the management of such patients with the use of different drugs is the key to the successful management.

Case Report

A 35 years old female was posted for elective laparoscopic cholecystectomy. She was a known case of WPW syndrome, which was diagnosed one year back when, was evaluated for occasional palpitation. In her past medical history, she was not suffering from hypertension, diabetes and ischemic heart disease. She was on sustained release Metoprolol tablet 50 mg once daily since last year. On preoperative examination, her pulse rate was 76 per minute, blood pressure was 128/70 mm Hg and preoperative peripheral oxygen saturation (SpO_2) was 99%. On auscultation, chest was clear bilaterally. Electrocardiograph (ECG) showed decreased PR interval, delta waves, wide QRS and associated ST and T wave changes. Transthoracic 2-D echocardiography (ECHO) showed normal valvular and ventricular function with preserved systolic function. Laboratory tests including complete hemogram, liver function test, renal function test, serum electrolytes and coagulation parameters were normal.

Preopeartively, the patient was counselled and tab Pantoprazole 40 mg given in early morning on the day of surgery with continuation of Metoprolol as before. In the operation theatre, after 2% Xylocaine local infiltration, intravenous (IV) access secured and routine standard monitoring non-invasive blood pressure (NIBP), SpO_2, and 12 lead ECG were attached. Patient was premedicated with Fentanyl 100 µgm and anti-arrythmic drugs like Adenosine, Lignocaine, Esmolol, Amiodarone, Phenylephrine, inotropic drugs and defibrillators were kept ready.

Preinduction Dexmedetomidine IV started 1 µgm/kg for 10 minutes followed by 0.7 µgm/kg/min by syringe pump. Induction consisted of Propofol and Vecuronium. During induction and intubation, the heart rate remained stable

in the 70/min with disappearance of delta wave and normalization of QRS complex and PR interval. Placement of radial invasive blood pressure monitor and central venous catheter via right internal jugular vein established following intubation. Anesthesia was maintained with Sevoflurane, an admixture of Oxygen and air, Fentanyl, Vecuronium and continuous infusion of Dexmedetomidine. Precaution was taken during carbon di oxide pneumoperitoneum for surgery and slowly increased the intra-abdominal pressure, keeping the upper limit less than 12 mm Hg and $EtCO_2$between 35-40 mm Hg. Patient was hemodynamically stable during different positioning and ECG rhythm was normal. After completion of the surgery, after decurarization with Neostigmine and Glycopyrolate, patient was extubated in the operation table and shifted to recovery room for monitoring of vitals with continuation of Dexmedetomidine infusion for 24 hours. Postoperative analgesia was maintained with IV Paracetamiol 1gm every 6 hourly and Fentanyl boluses as rescue analgesic. Patient had an uneventful postoperative course being discharged home on 3rd postoperative day.

Discussion

In 1930, Wolff, Parkinson and White [2] described a series of patients in whom the resting surface ECG showed a short PR interval. All these patients experienced paroxysmal bouts of tachycardia. The explanation for both ECG findings in sinus rhythm and the arrhythmias seen in WPW syndrome was first proposed by Wolferth [3] in 1933 and later histologically [4].This abnormality of cardiac conduction consists of an electrically conductive tissue bridge which connects the atrium to the ventricle and allows impulses originating in the sinus node to bypass the normal pathway thorough the AV node and produces ventricular activation over the alternate pathway. Normally cardiac impulse originating at the sinus node conducted down through the AV node, and can't return to reactivate the atria, because of the fibrous annulus, non-conductive tissue separating atria from ventricle at all points except the AV node and thus re-entrant arrhythmias not found. But in WPW syndrome, both the AV node and the bypass tract can conduct impulses in either direction, producing re-entrant arrhythmias.

The presence of an accessory conduction pathway by itself doesn't carry any increased anaesthetic risks, but the management of PSVT that can result, have the potential for devastating outcome. Management of WPW syndrome includes controlling the sympathetic nervous system in an attempt to avoid hyperadrenergic state that may predispose these patients to SVT. Common medications used control heart rate in SVT may be detrimental in these patients. Calcium channel blockers such as Verapamil or Diltiazem, Digoxin and Adenosine all slow conduction through the AV node [2]. These medications may also enhance conduction along the accessory bundle or at the very least don't slow conduction along this abnormal tissue, resulting in rapid ventricular rates. Once rapid conduction along this abnormal bundle takes hold, a rapid ventricular response can deteriorate into ventricular fibrillation. The use of Beta-blockers in these patients may be useful in slowing re-entry tachyarrhythmias through the accessory bundle [1] as well as decreasing the sympathetic activation of the normal cardiac conduction pathways. In our patient, Beta-blocker was started preoperative and we continued it in the perioperative period.

The goal of anesthetic management in these patients include: avoidance of sympathetic stimulation such as pain, anxiety, stress response to intubation and hypovolemia. Regional anesthesia is preferred technique over general anesthesia to avoid poly pharmacy and sympathetic stimulation during intubation [5,6]. General anesthesia is a real challenge in these patients due to the perturbations in the stress factors and use of poly pharmacy. Thiopentone and Propofol both can be used, but the latter is preferred, as it has no effect on refractory period of accessory pathway. Sometimes Propofol infusion produces normalisation of PR interval and reduction in wide QRS complex in ECG as seen in our case [7]. Isofluarne and Sevoflurane have no effect on AV node, so preferred as inhalation agent of choice. Muscle relaxant Rocuronium and Vecuronium are cardio stable and preferred. Newer relaxants Cis-atracurium and Mivacurium can be safe because reversal agents are not required [5]. Neostigmine used in reversal of muscle relaxant may enhance accessory pathway conduction during AF associated with WPW syndrome [8]. But in our patient we used Neostigmine during reversal without any such effects. Drugs like Atropine, Ketamine, Pncuronium, Halothane precipitate tachycardia and therefore should be avoided.

Dexmedetomidine an alfa-2 adrenoceptor agonist has been shown to have the potential novel anti-arrhythmic properties. In a recent case series it was successfully used for the treatment of junctional and atrial tachyarrhythmias for conversion to sinus rhythm or heart rate control [9]. It has also the properties of analgesics and sympatholysis like blunting stress response during intubation and extubation+. We used it in the perioperative period and heart rate control was adequate with stable hemodynamics [10].

The incidence of WPW syndrome in the operating room is low, the potential for mismanaging the tachyarrhythmias that can result are high and have the potential for devastating consequences. Management of these patients in the postoperative period continues to be crucial. Adequate pain reduces in adrenergic output thereby lowering the possibility of tachyarrhythmias. Cardiac emergencies like PSVT, AF or VT and VF can occur anytime during the perioperative period and management is same like non-operative setting. Early detection of such arrhythmias and management is pivotal to have successful outcome.

We conclude that patients with WPW syndrome can be managed successfully under general anesthesia. We prefer the prophylactic use of Dexmedetomidine in the perioperative period to have successful outcome without any cardiac complications.

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