Case Report
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Anaesthetic management of a patient with wolff-parkinson-white syndrome for total thyroidectomy: case report

Abstract

Wolff-Parkinson-White (WPW) syndrome is a rare cardiac disorder where an aberrant pathway known as the "bundle of kent" exists between the atria and ventricles. Patients may be asymptomatic or present with symptoms like palpitation and dyspnea; intraoperatively patients may also develop serious cardiac complications like atrial fibrillation, paroxysmal supraventricular tachycardia or ventricular tachycardia. We report a case of a 33-year-old woman with WPW syndrome scheduled for total thyroidectomy under general anesthesia on account of simple multinodular goitre. Management of the present case is a great opportunity to revisit the anesthetic management of WPW syndrome in a patient with thyroid disease. We took all measures to avoid tachycardia perioperatively and made anti arrhythmic drugs available to treat any complications with stringent monitoring which is crucial for a favorable outcome in this patient.

Keywords: general anesthesia, thyroidectomy, wolff-parkinson- white syndrome

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Introduction

Wolff-Parkinson-White (WPW) syndrome is a pre-excitation syndrome caused by an abnormal conductive cardiac tissue between the atria and the ventricles, bypassing the normal atrioventricular (AV) conduction.[1] The AV node utilizes a calcium-dependent slow inward current, while the accessory pathway utilizes a sodium-dependent fast inward current for electrical impulse transmission. The lack of physiological delay in transmission of the sinus impulse via the abnormal path results in a short PR interval, and ventricular excitation being a composite of the two impulses resulting in a fusion beat seen as a "delta wave" and short PR interval with wide QRS complex.[1] WPW syndrome is an uncommon case (first recognized in the 1930s) with a documented incidence of 0.1 to 0.3% of the general population.[2] Patients with WPW syndrome can be asymptomatic or may present with cardiac symptoms such as palpitation or dyspnea on exertion. Individuals with hyperthyroidism are at increased risk of cardiac arrhythmias peri-operatively and during airway manipulation.[3]

The occurrence of atrial fibrillation in patients with an accessory pathway could be detrimental, leading to electrical impulses bypassing the protective AV node and travelling down the accessory pathway and causing ventricular stimulation, which induces ventricular fibrillation.[4] The diagnosis of WPW syndrome is typically made with a 12-lead Electrocardiogram (ECG) and sometimes with ambulatory monitoring (eg telemetry, holter monitoring). Classic ECG features include shortened PR interval (< 120ms in a teenager or adult), slurring in the initial upstroke of the QRS complex (delta wave), widened QRS complex (0.11 secs or more), and ST depression. The patient's history and the above findings on ECG usually confirm the diagnosis of WPW syndrome. The goal during perioperative management of anesthesia of such patients is to avoid factors that increase sympathetic stimulation such as pain, anxiety, fear, stress, pressor response to intubation and extubation, lighter plane of anesthesia, hypovolaemia and anticholinergic drugs. Considering the rarity of the case and limited data for the management of such cases under general anesthesia for total thyroidectomy, we take this as an opportunity to revise the steps needed for successful anesthetic management.

Case report

We report a case of a 33-year-old woman weighing 75kg with an incidental diagnosis of WPW syndrome posted for total thyroidectomy on account of a simple multinodular goitre at the University College Hospital, Ibadan. She presented with a 4-year history of anterior neck swelling which had slowly increased in size since onset. While the patient was asymptomatic at the time of review, she gave a history of palpitation in the past which resolved spontaneously. Her medical history was not relevant for hypertension, diabetes or asthma. The diagnosis of WPW syndrome was made during workup for surgery.

General and systemic examinations were unremarkable with a regular heart rate of 80/min and blood pressure of 110/70 mmHg. A 12-lead ECG requested during her workup revealed a shortened PR interval, delta waves, and nonspecific ST segment and T wave changes (Figure 1, 2) which was consistent with WPW syndrome. She was reviewed by the cardiologist that ordered a repeat ECG and ECHO. Her ECG still showed delta waves but the 2D-ECHO showed normal valvular and ventricular size and function with an ejection fraction (Teicholz/Pombo method) of 66%. The cardiologist thereafter placed her on tab bisoprolol 2.5 mg daily to prevent preoperative arrhythmia. The patient was clinically euthyroid as her TSH (0.838 mIU/L), free T4 (11.2 pmol/L), and Free T3 (4.1 pmol/L) were all within normal range. Thyroid ultrasound revealed a diffusely enlarged gland with increased vascularity and multiple nodules. Preoperative haematocrit was 35.9% and the electrolytes, urea and creatinine were all within normal limits. Chest X-ray (PA) view showed left tracheal deviation while lateral soft tissue X-ray of the neck revealed no evidence of tracheal compression. Assessment of vocal cord function was normal on indirect laryngoscopy.

Patient was adequately counseled, possible complications were explained to the patient thereafter reassured. Consent for surgery and anesthesia was obtained and preoperative fasting guidelines were instituted. Two units of whole blood was group and cross matched ready for the surgery. Premedication with tab diazepam 5mg was given on the night before and 6 am on the morning of surgery (with a

sip of water). In the operating room, standard non-invasive monitoring of the heart rate, peripheral arterial oxygen saturation (SPO2), systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, and end-tidal carbon dioxide was instituted using the Mindray uMEC12 patient multi-parameter monitor. The patient was also attached to a 5-lead ECG using 5 electrodes to monitor the cardiac rate and rhythm from a continuous display from standard limb lead II. We had IV amiodarone, labetalol, lidocaine, and a defibrillator to tackle any episode of re-entrant tachycardia and atrial fibrillation. Under lidocaine 2% infiltration, intravenous (IV) catheter and radial artery cannulation was secured for fluids/medications and invasive blood pressure monitoring respectively. She had an intraoperative baseline HR of 90/min, BP of 130/80 mmHg and SPO2 of 99%.

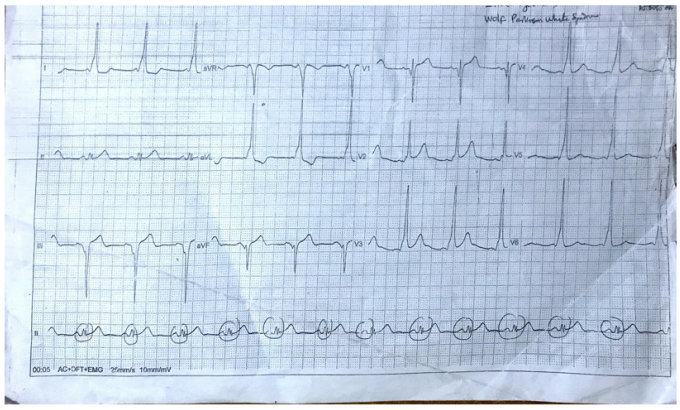

Figure 1 Preoperative resting ECG showing short PR interval, delta waves, LVH (voltage criteria) S(V1) + R(V5) = 43mm(>35mm), isolated T wave inversion in lead avL, upright T wave in V1.

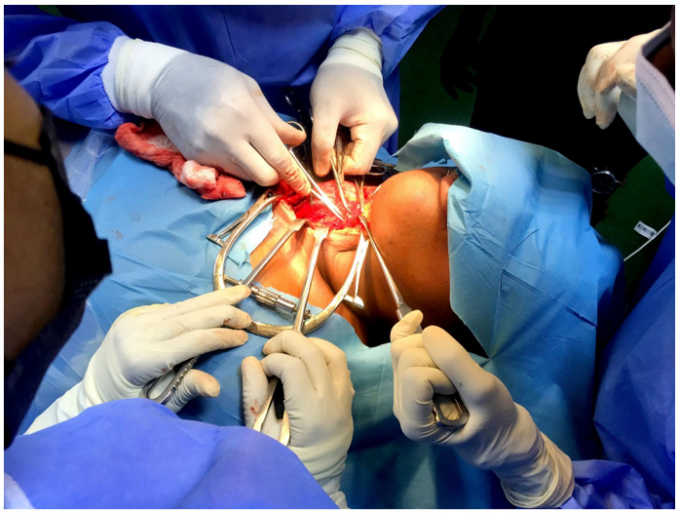

Figure 2 Patient with WPW syndrome undergoing Total Thyroidectomy under general anaesthesia.

Intravenous dexamethasone 8mg and IV fentanyl 100mcg were give while patient was being preoxygenated with 100% oxygen for 3 minutes before induction with a titrating dose of propofol; after induction, anesthetic depth was maintained by commencing isoflurane (MAC 1). Muscle relaxation for intubation was achieved after successful test ventilation by using IV atracurium besylate 30mg. Prior to intubation, 10% lidocaine spray was used to anaesthetize the airway. She was intubated at the first attempt with a size 7.5 mm ID reinforced endotracheal tube which was secured on 21cm mark at her gum line after confirmation of adequate placement by normal thoracoabdominal movement and square waveform capnography. She was then mechanically ventilated. Maintenance of anesthesia was achieved with a background infusion of propofol at 25 mcg/kg/min (0.2mls/min), isoflurane 0.5-1.2 MAC in 50% oxygen and air, atracurium, IV morphine 5mg, and IV paracetamol 1g. There was no normalization of the delta waves and PR interval throughout the duration of the surgery. The trend of the heart rate and blood pressure was summarized in Table 1.

Table 1 Trend of the heart rate and blood pressure during surgery

Time	Heart rate (b/min)	Blood pressure (mmHg)
Baseline -0 min	90	130/80
Pre- induction	85	128/76
After -intubation	81	138/80
Before -incision	82	129/72
Intraoperatively - 20 min	83	126/76
Before extubation	83	128/76
After extubation	88	132/80
In the recovery room	89	130/76

The procedure which lasted for 2 hours proceeded uneventfully. The patient received 2L of 0.9% normal saline and estimated blood loss was 75mls. At the completion of surgery, while the patient was still under anesthesia, gentle suctioning of the oropharynx was done under direct vision. Isoflurane and propofol were then discontinued and the residual neuromuscular blockade was reversed with IV neostigmine 2.5 mg and IV glycopyrollate 0.4 mg. When fully awake and generating adequate tidal volume, patient was extubated and transferred to the recovery room for continued observation and monitoring of vital signs. She was subsequently transferred to the ward after spending 45 minutes in the recovery. Postoperative serum calcium (8.3 mg/dL), phosphate (4.9 mg/dL) and albumin (3.9 g/dL) were all within normal limits. Her further hospital stay was uneventful and she was discharged home on the 3rd postoperative day.

Discussion

The WPW syndrome is of particular interest to the anesthetist because of the electrocardiographic and clinical changes which can occur suddenly and unexpectedly. In WPW syndrome, two common life-threatening arrhythmias that occur are atrial fibrillation (AF) which may lead to ventricular fibrillation and circus re-entrant tachycardia causing paroxysmal supraventricular tachycardia (PSVT) or ventricular tachycardia (VT).[1,5] The clinical presentation reflecting the tachyarrhythmia episode is that of a rapid heart rate starting and stopping abruptly, history of palpitation, dyspnea, angina, pain anxiety, fatigue, or polyuria. Our index patient was asymptomatic at the time of review, although she gave a history of palpitations in the past which resolved spontaneously.

The literature describes a subgroup of patients with surface ECG tracing similar to that of WPW syndrome that are asymptomatic.[6] These patients are also at risk of PSVT or AF in the perioperative period,[7] although, this has been shown from prospective electrophysiological studies to be of very low risk (< 10%).[1] Nonetheless, it is pertinent to elicit the history of the above symptoms in patients showing electrographic features of WPW syndrome. WPW syndrome is divided into two types, type A and B. On ECG, type A resembles right bundle branch block with right ventricular hypertrophy and posterior myocardial infarction, whereas type B resembles left bundle branch block with left ventricular hypertrophy.[7] Although this division may be less emphasized in literature but our patient's ECG tracing as seen

in figure 1 resembled type B having Sokolow-lyon voltage criteria of left ventricular hypertrophy [S(V1) + R (V5/6) > 35mm)].

Thyroidectomy is performed under general anesthesia in our centre (Figure 3). Utilizing other techniques such as cervical epidural anesthesia (CEA) and cervical plexus block may be more advantageous than general anesthesia as multidrug administration, laryngoscopy stimulation, intubation and light planes leading to sympathetic stimulations are avoided. Anesthetic medications tend to change the physiology of AV conduction.[1] For general anesthesia, thiopentone is safe but propofol is preferred since it has no effect on the refractory period of the accessory pathway and there are references showing the disappearances of delta waves after propofol administration.[7,8]

Figure 3 Intraoperative ECG showing shortened PR interval and ST segment elevation.

Anticholinergic drugs (atropine, glycopyrrolate), and ketamine precipitate tachycardia and could result in PSVT or AF and thus, should be avoided. Glycopyrrolate produces adequate inhibition of secretions without producing pronounced tachycardia and for this reason, was chosen in preference to atropine. The addition of 100mcg of fentanyl before intubation also ensured haemodynamic stability by blunting the pressor response from airway stimulation. Opioids like fentanyl have been found to not affect the electrophysiological effects of the accessory pathway.[9] Isoflurane and sevoflurane are known not to affect AV node conduction and this may make these agents preferable to halothane for maintenance of cardio stability under anesthesia after the manifestation of the WPW pattern. Isoflurane also increases the accessory pathway refractory period, unlike halothane which has no such effect.[1] We opted for atracurium as our muscle relaxant agent because of availability, however, vecuronium and rocuronium are cardio stable muscle relaxants but non available in our centre being a resource limited setting though preferred over pancuronium and atracurium which are readily available.[1,7]

Newer muscle relaxant like cis-atracurium is an acceptable choice because of their high autonomic safety ratio and absence of histamine release. In our case, atracurium was delivered as a bolus slowly to minimize the vasodilatory effect of histamine release. Mivacurium, if available, is also a good option as reversal with neostigmine and glycopyrrolate is not required following administration although neostigmine slows AV conduction and may facilitate transmission via the accessory pathway which may cause AF with rapid ventricular rate. Throughout the surgery, the ECG tracing from the multi-parameter monitor (Figure 3) showed no normalization of the PR interval with ST changes despite an ongoing infusion of propofol. This was not the finding in the case report by Gupta et al.[7] & Seki et al.[8] who observed a normalization of the PR interval with background infusion of propofol following induction of anesthesia. There may be a need for more electrophysiological studies to prove the efficacy of infusion propofol because despite the persistence of the ECG changes noticed patient had heamodynamic stability. Patients with symptomatic WPW syndrome and a toxic multinodular goitre are prone to thyrotoxic crisis (thyroid storm) and treatment should begin with IV hydrocortisone, methimazole, metoprolol, amiodarone, and iodine drops though no thyroid storm was observed in our case.

The ultimate treatment of such a patient is radiofrequency ablation of the accessory pathway, but this must only be performed while the patient is biochemically euthyroid.[4] In the event of supraventricular tachycardia with normal QRS complex, beta-blockers (propranolol, metoprolol) should be used because it depresses the AV conduction. Digitalis is contraindicated in these patients as it tends to accelerate conduction through the accessory pathway. In urgent situations with supraventricular tachycardia with extremely rapid response, especially with AF and atrial flutter, DC shock is the treatment of choice. Haemodynamically stable patients with AF should be treated pharmacologically, whereas haemodynamically unstable patients should be treated by cardioversion with 150-200J.[7]

The peculiarity of the surgical procedure and the diagnosis of WPW syndrome requires a well-devised plan for ensuring smooth emergence and extubation to minimize the extubation response. An absolutely "no-touch" awake extubation was performed in our case as extubation was done only when the patient spontaneously woke up without any form of stimulation during emergence from general anesthesia.

Conclusion

To conclude, this case report demonstrates that a diagnosed case of WPW syndrome for total thyroidectomy who was clinically euthyroid can be managed uneventfully under general anesthesia. Patients with WPW syndrome pose significant perioperative challenges to the anesthetist. To ensure safe surgery and anesthesia, there is a need for careful preoperative evaluation, stringent intraoperative monitoring, avoidance of sympatholytic drugs and preparedness for the treatments of atrial and ventricular arrhythmias (if they occur) by having the required resuscitative medications.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgment

None.

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