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Original Article

Practical management for fast atrial fibrillation during video-assisted thoracoscopic thymic surgery in patients with coronary heart disease: a case report

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Abstract: Postoperative fast atrial fibrillation is a serious perioperative cardiac arrhythmia and a marker of increased morbidity and stroke risk. We report here a successful management of fast atrial fibrillation following video-assisted thoracoscopic thymic surgery in a patient with coronary heart disease. A 67-year old woman presented with heart palpitation and atypical chest pain for 9 months. CT coronary angiography demonstrated a 50% coronary stenosis in the right coronary artery (RCA) with proximal tube wall plaques. Our observations indicate that preoperative assessment, intraoperative monitoring, and pharmacological therapy play important role in the anesthetic management of thymic surgery in patients with coronary heart disease. The authors present physiological and pathophysiological discussions for clinical management of atrial fibrillation following thoracic surgery.

Keywords: Anesthetic management, fast atrial fibrillation, coronary heart disease, video-assisted thoracoscopic thymic surgery

Introduction

Perioperative atrial fibrillation (AF) was defined as new occurred AF during surgery and anesthesia, requiring electrocardiography monitoring and pharmacological therapy. Perioperative AF may involve cardiac and non-cardiac causes. Fast AF is a serious perioperative cardiac arrhythmia and a marker of increased morbidity and stroke risk [1-3]. Despite recent advances in the understanding of AF, the pathophysiologic underpinnings of fast atrial fibrillation during anesthesia remain largely unknown. We described a patient who developed fast AF during video-assisted thoracoscopic thymic surgery and required pharmacological treatment. During reverting to sinus rhythm, she remained hemodynamically stable. We also presented physiological and pathophysiological discussions for clinical management of atrial fibrillation following thoracic surgery.

Case presentation

The patient was a 67-year-old woman with a medical history notable for coronary heart disease, hypertension, in Tongji Hospital. She complained of heart palpitation and atypical chest pain for 9 months. 20 days ago, she was admitted to another hospital with chest discomfort but without fever, breathing difficulty or cough. CT coronary angiography demonstrated a 50% coronary stenosis in the right coronary artery (RCA) with proximal tube wall plaques but no plaques in left anterior descending coronary artery (LAD) or left circumflex coronary artery (LCX) (**Figure 1**). On examination, ECG was within normal limits (**Figure 2A**) and there was thymus neoplasm.

After obtaining written consent, she was placed in a surgical position, and an intravenous cannula was inserted for the administration of anesthetic drugs. Routine intraoperative monitoring methods including noninvasive blood pressure, electrocardiogram, pulse oximetry, and end-tidal capnography were performed on her. Bispectral index for measuring depth of anesthesia was carried out. Neuromuscular monitoring was performed using the TOF-Watch® SX, in agreement with guidelines for Good Clinical Research Practice in pharmacodynamic studies of neuromuscular blocking

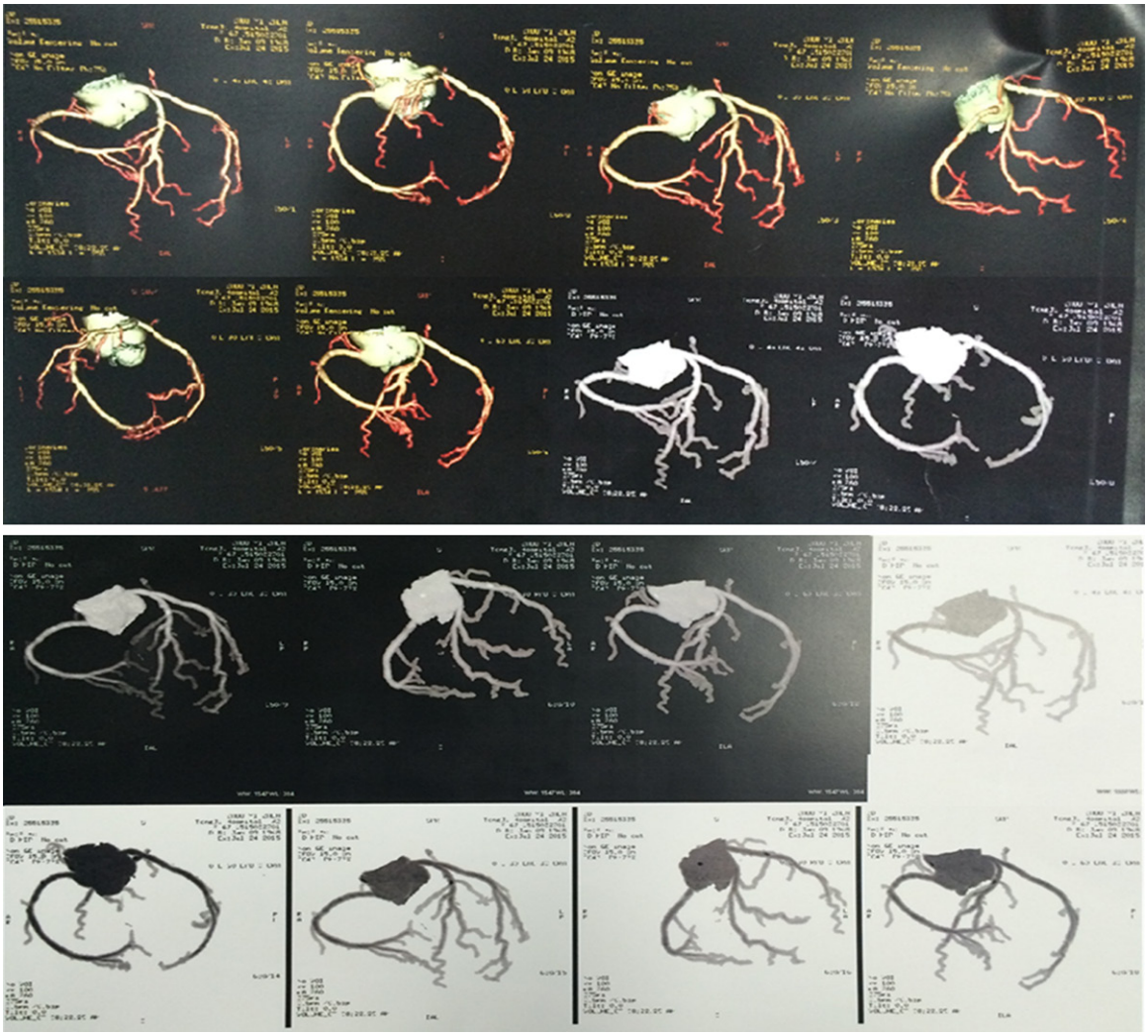

Figure 1. Cardiac computed tomography (CT) perfusion imaging. CT coronary angiography in a 67-year-old female patient with atypical chest pain demonstrating a 50% coronary stenosis in the right coronary artery (RCA) with proximal tube wall plaques, and normal left anterior descending coronary artery (LAD) and left circumflex coronary artery (LCX) with no plaques.

agents [4, 5]. She was lightly sedated with 2 mg intravenous midazolam in the operating room, and next left radial artery cannulation and right internal jugular vein cannulation were performed under local anesthesia.

After preoxygenation, intravenous induction of anesthesia was accomplished with 12 mg etomidate, 40 mg rocuronium, and 50 μg sufentanil. The tracheal intubation was then performed with a 37 left double lumen endotracheal tube under the McGrath Series 5 videolaryngoscope (Cormack and Lehane grade I) and position confirmed by fiber-optic bronchoscopy [6]. General anesthesia was maintained with the appropriate propofol and isoflurane, accompanied with an end-tidal CO_2 pressure ($PaCO_2$) between 35-40 mmHg [7-16]. Intermittent doses of vecuronium were used to maintain skeletal muscle paralysis [17, 18]. The depth of general anesthesia was monitored by using bispectral index (BIS) [19-21].

One hour after the start of operation, during the final removal of thymus neoplasm, the ECG suddenly displayed atrial fibrillation and fast heart rate of 160-178 bpm. A bolus dose of 4 mg of beta-adrenergic blocker Esmolol was administered followed by continuous infusion at the rate of 150 μg/kg/min. Meanwhile, arterial blood gas analysis (ABG) showed: PH 7.365, PCO_2 44.3 mmHg, Hb 11.2 g/L, Hct 33.5%, Na^+

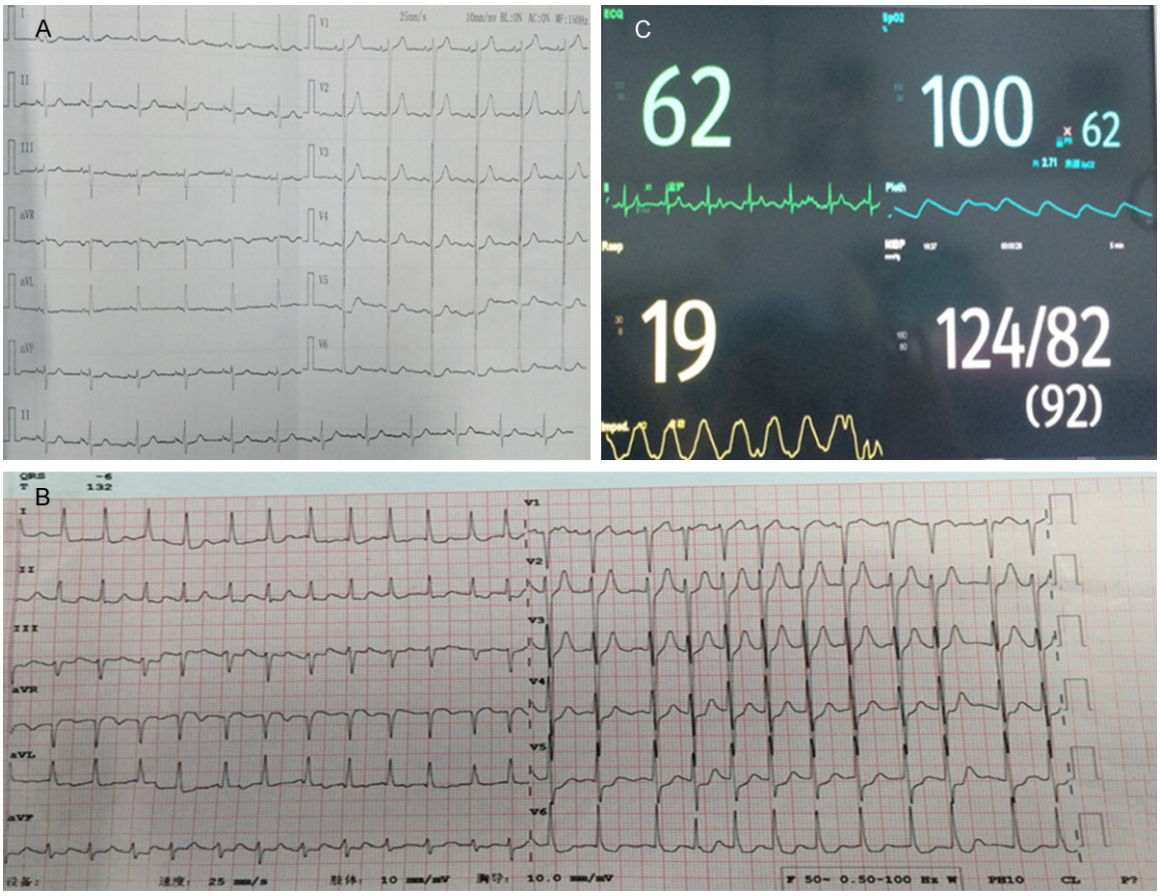

Figure 2. The electrocardiography (ECG) data. A. Preoperative electrocardiogram demonstrating sinus heart rate and normal ECG. B. The ECG showing fast atrial fibrillation and heart rate of 135-155 bpm. C. The ECG showing sinus heart rate and normal ECG, after intravenous infusion of Amiodarone 150 mg (10 mg/min) and Diltiazem 10 mg (10 mg/30 min).

142 mmol/L, K^+ 3.96 mmol/L, Ca^{2+} 1.85 mmol/L, HCO_3 32 mmol/L, BE 4. Esmolol was soon proved to be ineffective because HR didn't improve (128-145 bpm). After the operation and confirmation of neuromuscular recovery, the patient woke from anesthesia within 15 min and successfully extubated. After the vital signs of patient were stable, the patient was transported to post anesthesia care unit (PACU). In PACU, her HR was observed to be irregular with varying HR between 131 to 160/min with no discrete "p" waves, suggesting fast AF which was confirmed on 12 lead ECG (**Figure 2B**). A bolus dose of 50 mg of Amiodarone was administered followed by intravenous continuous infusion of Amiodarone 150 mg (10 mg/min). The ECG showed sinus heart rate and normal ECG (**Figure 2C**), 20 min after intravenous infusion of Diltiazem 10 mg (10 mg/30 min). Atrial fibrillation did not re-occur in 3 days after operation. Then she left the hospital without any additional complication, but with an advice of regular follow up for further evaluation and management.

Discussion

In the present report, we introduced the practical management for fast atrial fibrillation after thymic surgery in patient with coronary heart disease. Our observations indicated that intraoperative monitoring and pharmacological therapy played an important role in the anesthetic management of thymic surgery in patient with coronary heart disease.

The incidence of postoperative AF varies according to the different type of thoracic surgery. Ivanovic et al. [22] reported the incidence of atrial fibrillation after pulmonary resection was about 11.8% (43/363). A study of Park et al. indicated that video-assisted thoracic sur-

gery did not reduce the incidence of postoperative AF after pulmonary lobectomy [23].

Assessing the risk of atrial fibrillation during the preoperative period may be helpful to the prediction, diagnosis and management of postoperative atrial fibrillation. Jideus et al. documented that previous history of atrial fibrillation, advanced age, structural heart disease, discontinuation of beta-blockers, prolonged operation time are all the factors facilitating the occurrence of atrial fibrillation. A study of Ivanovic et al. reported that age, coronary artery disease and extent of surgery/stage increase the risk of atrial fibrillation after pulmonary resection [22].

A great deal of effort has been devoted to reduce the incidence of perioperative AF by targeted prophylaxis and identifying patients with elevated risk. Toufektzian et al. presented important data on the relationship between brain natriuretic peptide (BNP) and predicting AF in patients undergoing non-cardiac thoracic surgery [2]. Many findings support that increased BNP or N-Terminal pro-BNP levels may identify the risk of postoperative AF after thoracic surgery such as lung resection or oesophagectomy [2, 24-28]. Mirhossein et al. have identified that preoperative serum creatinine is not associated with duration and frequency of recurrence of AF [29]. Of note, myocardial ischemia, electrolytes imbalance, acid base abnormalities and surgical treatment within thorax or mediastinum are important factors to induce the onset of AF during thoracic surgery.

Although the development of arrythmias is common during the perioperative period, onset of new fast AF is less common. Many studies have perceived that AF is associated with an increased risk for thromboembolic cardiopulmonary complications and stroke [30, 31]. Some retrospective observational studied reported spontaneous conversion to sinus rhythm of recent-onset atrial fibrillation [32-35] and found that presentation with symptoms of <24 h duration (from sinus rhythm to atrial fibrillation) was the best predictor of spontaneous conversion [34]. We indicated that pharmacological treatment played an important role in fast AF following thoracic surgery. Arsenault et al found a significant reduction in postoperative AF with amiodarone use by 33 trials (5402 patients) [36]. Garg et al. reported that AF reverted back to normal sinus rhythm 4 h after amiodarone 150 mg was infused over 30 minutes twice followed by an infusion of 1 mg/kg/h [37]. Mitchell et al. recommended that non-dihydropyridine calcium antagonists were used for the treatment of postoperative AF [38]. Burgess et al. found that magnesium (Mg) with a concomitant beta-blocker also had an effect on the reduction in postoperative AF [39].

Disclosure of conflict of interest

None.

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