

Pulmonary Air Embolism During Cryoballoon Ablation of Atrial Fibrillation: A Disastrous Complication and An Extra Ordinary Management

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Abstract

Pulmonary air embolism is a potentially lethal complication of catheter ablation of cardiac arrhythmias. We present a 50 year old man with pulmonary embolism during cryoballoon ablation of atrial fibrillation. Deep breath of patient while inserting the sheath into left atrium from right femoral vein was main cause of pulmonary air embolism. Air bubble was dispersed by hitting on it with the pigtail catheter and pulmonary flow was achieved. The patient was discharged without any sequelae.

TITLE PAGE

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Introduction

Acute procedural complications and managements of pulmonary vein isolation with cryoballoon ablation (CBA) for patients with atrial fibrillation (AF) has been exhibited in the past.¹ Air embolism is one of these complications and is seen unfrequently. It may cause lethal complications due to inadequate collateral supply. Major adverse events are changing localization of emboli and volume of air bubble.² Coronary artery air embolism has been reported previously during AF cryoballoon ablation.³ Here, we present a first case with pulmonary air embolism during CBA of AF and its extraordinary management in literature.

Case Report

A 50 year old man with paroxysmal AF was admitted to our hospital for AF cryoballoon ablation. Electric cardioversion was done two times with medical treatment including propafenone and amiodarone for one year. AF attacks were resistant all therapies. His body mass index was 32 kg/m². Further he had history of hypertension for 5 years. Medical treatment was ramipril 5 mg once a day, rivaroxaban 20 mg once a day and propafenone 150 mg twice a day. The patient was taken to electrophysiology laboratory after informed consent. The procedure was started under conscious sedation with midazolam. 6F and 8F sheaths were placed into right femoral vein. Also, 6F sheath was inserted into left femoral artery. A pig tail catheter was placed in the right coronary cusp of aortic root and a decapolar catheter was placed into coronary sinus. After transseptal puncture an 8F SL1TM (St.Jude Medical) sheath was inserting into the left atrium from right femoral vein, suddenly the patient took a deep breath after a short period of apnea. We heard a vacuum voice. Blood pressure and oxygen saturation started to drop. We saw a mobile, large air bubble in main pulmonary artery with total occlusion of all lumen of the vessel on screen (**Video 1**). Intravenous unfractionated heparin (100 U/kg) and 100 % oxygen was administered immediately. Another pigtail catheter was taken. The pigtail catheter was inserted into pulmonary artery via 8F sheath from right femoral vein. Air bubble was dispersed by hitting on it with the pigtail catheter and pulmonary flow was achieved in a few seconds. Air bubble was disappeared (**Video 2**). Hemodynamic instability was recovered. The transthoracic echocardiography (ECHO) did not show any abnormality and procedure was gone. The transseptal sheath (8F SL1, St. Jude Medical) was inserted into the left atrium and sheath was replaced with a FlexCath Advance sheath (Medtronic) by controlling for any air. The isolation of all 4 pulmonary veins with cryoballoon catheter (Medtronic) was finished without any problem after hemodynamic stability (**Video 3**). ECG was taken and transthoracic ECHO was performed after procedure. Incomplete right bundle branch block (RBBB) was seen on ECG (**Figure 1A-B**). But ECHO did not show any abnormality including tricuspid regurgitation, right ventricular dysfunction or pericardial effusion. The patient had no any symptoms including dyspnea, chest pain or palpitation after procedure. The incomplete RBBB was disappeared three hours later after procedure (**Figure 1C**). The computed tomography of pulmonary angiography was taken after procedure and it showed no abnormality (**Figure 2**). Also, pulmonary ventilation-perfusion scintigraphy was taken and there was no obvious pulmonary embolism findings (**Figure 3**). The patient was taken lower molecular weight heparin intravenous twice a day during hospital stay for three days. He was discharged from hospital treatment with ramipril 5 mg once a day, rivaroxaban 20 mg once a day.

Discussion

To the best of our knowledge, this is the first case presentation of pulmonary artery air embolism during pulmonary vein isolation with cryoballoon ablation catheter and acute management of it with pigtail catheter. Embolism of air to the vessel tree may be due to inserting catheters into the circulatory system or may be occurring of atrial-esophageal fistula during and/or after AF ablation.³⁻⁵ This is a disastrous complication which can lead to death. The catheters are major reason of air embolism in acute settings. Deep sedation, several catheter exchanges, rapid removal of dilators and catheters, long apne periods with deep breaths, and loosened or air-opened hemostasis valves are conceivable mechanisms of air embolism from inserting catheters due to negative pressure and air passage through the catheter into low pressure cardiac chambers.^{6,7} In this

case, the most possible cause of air entry was deep breath and suction of air into catheter while 8F SL1TM (St.Jude Medical) sheath was inserting into the left atrium from right femoral vein. Also, the most likely mechanism of deep breathing is a short period of apnea induced by sedation. The management of the complication was dispersing of bubble by hitting on it with a pigtail catheter. It might cause distal micro embolization of air bubbles. But it was too large for mechanic thrombus aspiration catheter and air aspiration was not applied in our case.⁸ The clinical symptoms and signs vary according to location of air embolism. If air enters the circulatory system, it forms bubbles occluding vessel and impairs circulation.² Embolization of air may be treated by several methods, such as 100 % oxygen therapy to maximize end organ damage and reducing the size of air embolus, aspiration of the air or hyperbaric oxygen therapy.^{3,5,8} A different and extraordinary treatment approach is using pigtail catheter to disperse too large air bubble as our case. Numerous manipulations to prevent air embolism are removal of catheters and dilators slowly, continuous flushing with heparinized saline, avoiding deep sedation, decreasing number of catheter exchanges, reevaluate hemostatic valves, and sheath flushing at slow speeds.

Conclusion

Sedatives in which less depressant effect on the respiratory system should be used to avoid air embolism during CBA of AF. A pigtail catheter can be used to disperse too large air bubble by hitting on it in pulmonary system.

Disclosures

None.

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Video legends

Video 1: Mobile, large air bubble in main pulmonary artery

Video 2: Dispersing of air bubble by hitting on it with pigtail catheter.

Video 3: Disappearance of air bubble and continuation of procedure.

