Hybrid treatment of a dislocated atrial septal occluder device at the bifurcation of the left and right common iliac artery

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Abstract

Percutaneous closure of secundum atrial septal defects (ASDs) with atrial septal occluders (ASOs) avoids sternotomy and cardiopulmonary bypass, and thus is commonly preferred to open heart surgery. However, rare reports of dislocation of the ASO into the systemic circulation do exist. We report the use of an emergent hybrid procedure in the dislocation of an ASO at the bifurcation of the left and right common iliac arteries. The dislocation was diagnosed 7 days after percutaneous closure of an ASD.

Keywords: Septal occluder device • Heart septal defects • Atrial • Blood circulation

INTRODUCTION

Atrial septal defect (ASD) is a common form of heart disease accounting for \( \sim 10\% \) of all congenital cardiac defects. Transthoracic and transcatheter closure of an ASD with an atrial septal occluder (ASO) is a minimally invasive method that is becoming increasingly popular. The main advantages of this closure method include small incision, quick recovery and avoiding a cardiopulmonary bypass. Complications include arrhythmia, haemopericardium and device embolization. The estimated incidence of occluder dislocation is \(<1\%\) \cite{1}. Most previous reports described the dislocation of the ASO mainly in the right pulmonary arteries or the right atrium; dislocation of the occluder into the systemic circulation is rare. We report the dislocation of an occluder (Kewei Medical Instrument Co., Dongguan, China) at the bifurcation of the left and right common iliac artery. We used a hybrid procedure to successfully remove the occluder.

CASE REPORT

A 31-year-old man was admitted to our hospital with a cardiac murmur. Echocardiography revealed a secundum-type ASD with a diameter of 18 mm. We performed transthoracic closure of the ASD, using an occluder device (Kewei Medical Instrument Co.). Implantation of the 22 mm ASO device was guided by transthoracic echocardiography through a right minimal fourth intercostal parasternal incision. Echocardiography confirmed the correct position of the device and the patient recovered uneventfully. However, on the routine follow-up examination 7 days after the initial implantation, both echocardiography and chest roentgenography failed to identify the occluder device at the interatrial septal position. Systemic roentgenography showed that the device was dislocated approximately at the bifurcation of the left and right common iliac arteries (Fig. 1).

Removal of a dislocated ASO device and closure of the ASD pose several problems. Removing the ASO device with a laparotomy has a high risk of complications and causes greater patient trauma. Laparoscopic extraction of the ASO device appears to be a minimally invasive method, but extraction of the ASO device through an aortic incision requires a higher level of surgical skill. Once uncontrolled bleeding occurs, the procedure must be replaced rapidly by a laparotomy. If an ASD closure is performed using cardiopulmonary bypass, systemic heparinization may lead to bleeding in the abdominal region where the ASO device was removed. If a percutaneous ASO device is implanted again in the same patient, it could dislocate again. At the time of our patient’s surgery, it was difficult for patients to undergo two operations in China. We hoped to remove the device and close the ASD simultaneously, so a hybrid procedure with only a thoracic incision was recommended. The patient was immediately referred to the hybrid operating room; we performed a standard midline sternotomy and established cardiopulmonary bypass with an aortic and two separate caval cannulas. A purse string suture was placed in the aorta proximal to the aortic cannula. Guided by roentgenography, we placed a gastroscopy-type soft biopsy clamp into the aorta through the purse string suture and then slowly moved it towards the ASO device. The ASO device was then pulled back to the aortic cannula and fixed. After optimal inflow perfusion, we clamped the aorta between the ASO device and the aortic cannula and removed the ASO device through an aortic incision (Fig. 2). After cardioplegic arrest through the right and left coronary artery, the ASD was closed with a pericardial patch through a right atriotomy and the aortic incision was closed. The overall operation time was 118 min with...
38 min of cardiopulmonary bypass and 22 min of aortic cross-clamping. After 16 h in the intensive care unit and 5 days of postoperative hospitalization, the patient was discharged uneventfully. One year after the surgical procedure, the patient was doing well and the ASD remained closed without residual shunting across the interatrial septum.

COMMENT

Since King and Mills first reported percutaneous occlusion of a secundum ASD with a transcatheater double-disk device in 1976, this technology has grown in popularity. Patients with an ASD of the ostium secundum type and with a distance >5 mm from the margins of the defect to the mitral and tricuspid valves, the superior vena cava, the right upper pulmonary vein and the coronary sinus are eligible for percutaneous closure. There are two minimally invasive methods for percutaneous ASD closure: transthoracic and transcatheter.

Dislocation of an ASO device is rare and the estimated surgical reintervention rate is <1%. Dislocation of the ASO device into the systemic circulation is even rarer, with only a few case reports discussing such complications. Colacchio et al. [2] documented total laparoscopic extraction of an ASO device at the level of the aortic bifurcation. Jahrome et al. [3] proceeded with a medial laparotomy to remove an ASO device at the level of the coeliac axis. Tsilimingas et al. [4] removed an ASO device dislocated to the aortic arch when cardiopulmonary bypass was discontinued at systemic hypothermia of 28°C.

In our patient, the dislocation of the ASO device was at the most distal end of the aorta. The advantages of our hybrid procedure, in comparison with laparotomy or laparoscopy, include avoiding abdominal trauma and completing the ASD closure and removing the dislocated ASO device simultaneously. Five days of postoperative hospitalization and 1 year of follow-up demonstrate that this hybrid procedure is both feasible and accurate. However, there are risks involved with this procedure, including the risk of aortic injury that may induce iatrogenic aortic dissection. In addition, our procedure required a sternotomy. The margins of the ASD were very soft and the ASD was near the superior vena cava in our patient. This patient was not suitable for percutaneous ASD closure, but at the time, mini-thoracotomy was not very popular in China and not developed in our hospital, even though a mini-thoracotomy was preferable. Finally, there is a risk of stroke. In our report, the dislocation time was short and anticoagulation was performed after the first percutaneous ASD closure, so thrombus formation on the ASO device did not occur.

Conflict of interest: none declared.

REFERENCES