계명의대학술지 제35권 1호
Keimyung Med J
Vol. 35, No. 1, June, 2016

The Operative Management of Embolized Septal Occluder at Ascending Aorta

Jae Bum Kim, M.D., Jae Hyun Kim, M.D., Woo Sung Jang, M.D.

Department of Thoracic & Cardiovascular Surgery, Keimyung University School of Medicine, Daegu, Korea

Received: March 16, 2016
Revised: May 23, 2016
Accepted: June 02, 2016
Corresponding Author: Jae Bum Kim, M.D.,
Department of Thoracic & Cardiovascular Surgery,
Keimyung University School of Medicine,
56 Dalseong-ro, Jung-gu, Daegu 41931, Korea
Tel: +82-53-250-8049
E-mail: juggang@dsmc.or.kr

• The authors report no conflict of interest in this work.

Percutaneous device closure of secundum atrial septal defect (ASD) has become a definite therapy in selected patients. However the more transcatheter device was implanted, the more complication was developed. Especially, the device embolization remains a major complication requiring immediate intervention. We report a case of a displaced ASD occluder in the ascending aorta. We were successfully removed the device through a total circulatory arrest and closed the ASD.

Key Words: Atrial septal defect, Device embolization, Percutaneous septal occlusion

Introduction

Secundum atrial septal defect (ASD) form 6% to 10% of all cardiovascular malformations. The incidence of early device embolization after transcatheter ASD closure with Amplatzer septal occluder is approximately 0.5% [1]. The more transcatheter device was implanted, the more complications were developed.

Case Report

A four-year-old girl was admitted with known ASD that was diagnosed 2 years ago.

Transthoracic echocardiography demonstrated a 8 mm-sized secundum ASD with a large left-to-right shunt (Qp/Qs = 2.2) seen by color flow doppler. Percutaneous transcatheter septal closure was then scheduled. In the cardiac catheterization laboratory, the ASD was measured to be 8 mm in diameter with a balloon under fluoroscopic

guidance after induction of general anesthesia. A 9 mm Amplatzer septal occluder (AGA Medical, Golden Valley, MN, USA) was delivered through delivery sheath to the left atrium, and deployed. During the implantation of the device, it detached from its screw and embolized into the left atrium. The patient was emergently taken to the operating room. Cardiopulmonary bypass was initiated with aortic and bi-caval cannulation. Aorta was cross-clamped and the heart was arrested with antegrade cardioplegia. Right atriotomy was performed and the secundum ASD was found to be 7 × 8 mm in size. The rim of the ASD was well marginated. The Amplatzer septal occluder device was not located in left atrium and ventricle. After portable chest X-ray, we found the Amplatzer septal occlude at ascending aorta between aortic cross clamp and aortic cannula (Fig. 1). After total circulatory arrest, the device was successfully retrieved through aortotomy and the retrieved specimen showed structural integrity of the device (Fig. 2). The ASD was closed with direct. The patient was weaned from cardiopulmonary bypass without difficulty. The patient was then discharged in good condition.

Discussion

Surgical repair was the primary treatment of ASD until 1976, when King and Mills reported the first

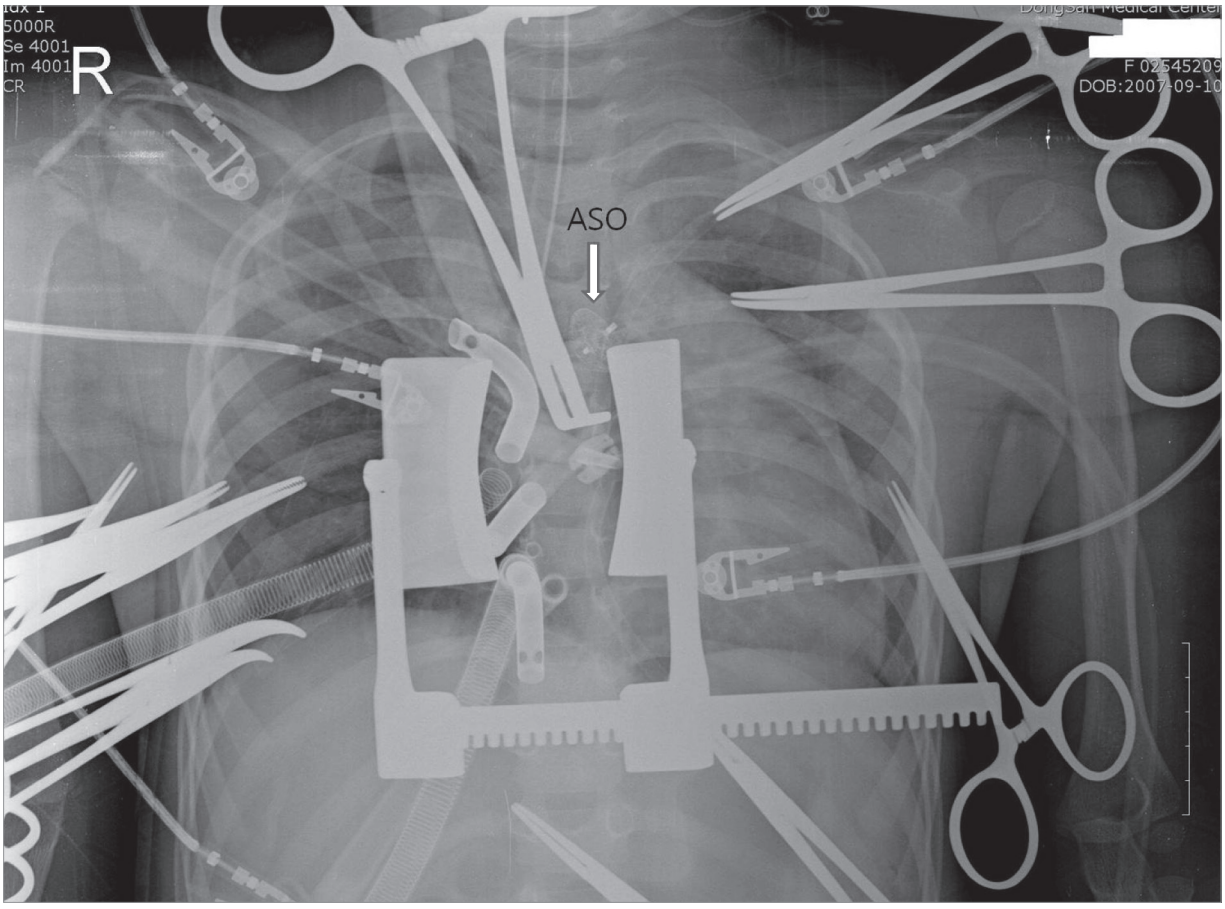

Fig. 1. The ASO embolized at ascending aorta between aortic cross clamp and aortic cannula. ASO: amplatzer septal occlude.

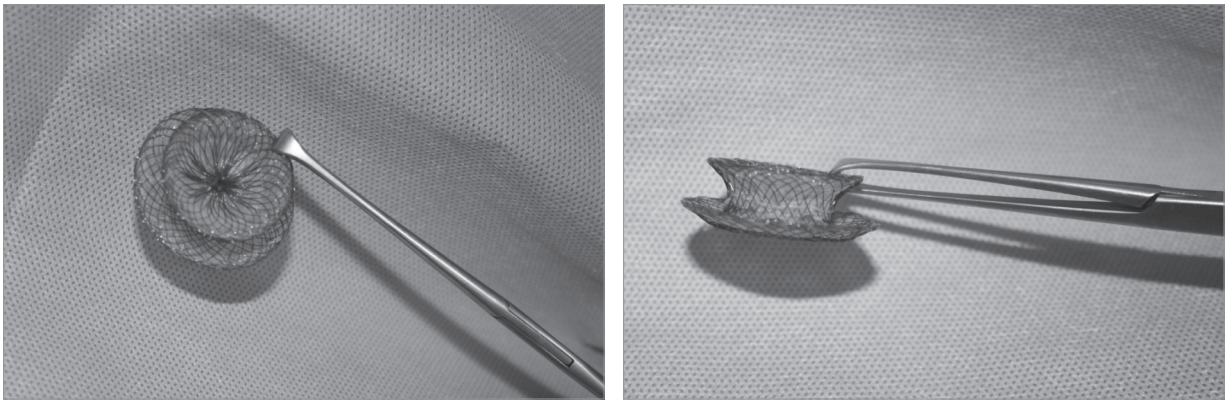

Fig. 2. Retrieved amplatzer septal occluder device.

transcatheter ASD closure [2]. Since the report of first successful implantation of Amplatzer septal occluder (ASO) in 1995, this ASO is current device of the most commonly used for percutaneous closure of ASD [3]. Although low morbidity and mortality and recent improvements of surgical techniques with smaller incisions and reduced both length of hospital stay and costs in surgical repair of ASD, the advantages of the percutaneous transcatheter device closure have led device closure to become the major treatment option for most secundum ASD [4].

Transcatheter implantation of the ASO is becoming the primary method of closing secundum ASD when the anatomy is suitable (including location of defect and width of rim, ASD size). The advantages of percutaneous transcatheter septal occlusion are less or no wound, avoidance of cardiopulmonary bypass, reducing blood transfusion, shortening intensive care unit and hospital stay, and early discharge.

In spite of progressive improvement of techniques and devices, the ASO procedure has concomitant failure and complications. The reported complications of the ASD device are including atrial arrhythmias, transient ST-T elevation in the inferior leads, hemolysis, thrombus formation, infective endocarditis, device impingement on caval veins (or on the right upper pulmonary vein or on the mitral and tricupsid valves), atrioventricular valve regurgitation, device embolization into the left atrium (or right atrium, right ventricle and pulmonary arterial tree), thromboem-bolization (into the central nervous system or extremities), malpositions and dislocations of device, injury of groin vessels at the place of a puncture, left atrial thrombus formation and systemic embolism due to late device dislocation, erosion and perforation of the heart, failure to retrieve a misplaced device necessitating surgery, residual shunt due to incomplete closure of the ASD and sudden death have been reported [5].

Device dislocation or embolism was the most frequently reported complication of transcatheter closure, with rates ranging from 4% to 21%, requiring surgery in approximately 70% to 100% of cases. The most important reasons of acute failure were poor case selection or inappropriate device selection. The other suggested mechanisms were operator-related failure resulting from inadequate experience, inadequate defect rim to hold the device, anatomic features of the ASD (size and quality of the rim, an ASD with a large diameter). The most frequent indication for surgery was device malposition or embolism (80%), occurring in 8 (6.5%) of 124 patients [5].

Severeal authors insisted that the embolized

devices should be retrieved by percutaneously [6]. However most of authors believe that an embolized device should always be retrieved surgically because it allows inspection of intracardiac structures that may have become damaged [7]. Also, the device of our case was retrieved surgically as soon as we knew the device dislocation. At operation field, we did inspect an intracardiac structure which was not damaged.

Short-term and mid-term studies have shown the device to be safe and effective. But, information on long-term complications is being collected now [8]. The more transcatheter device was implanted, the more complications were developed. Our experience suggests that this device should only be inserted in hospitals, where cardiac surgical support is immediately available.

References

1. Amin Z, Hijazi ZM, Bass JL, Cheatham JP, Hellenbrand WE, Kleinman CS. Erosion of Amplatzer septal occluder device after closure of secundum atrial septal defects: review of registry of complications and recommendations to minimize future risk. *Catheter Cardiovasc Interv* 2004;**63**:496-502.
2. King TD, Thompson SL, Steiner C, Mills NL. Secundum atrial septal defect. Nonoperative closure during cardiac catheterization. *JAMA* 1976;**235**:2506-9.
3. Mashman WE, King SB, Jacobs WC, Ballard WL. Two cases of late embolization of Amplatzer septal occluder devices to the pulmonary artery following closure of secundum atrial septal defects. *Catheter Cardiovasc Interv* 2005;**65**:588-92.
4. Kim YH, Kim H, Kim SJ, Kang JH, Chung WS, Shin JH, *et al*. Emergent surgical intervention for embolization of atrial septal defect closure device. *Korean J Thorac Cardiovasc Surg* 2012;**45**:320-2.
5. Berdat PA, Chatterjee T, Pfammatter JP, Windecker S, Meier B, Carrel T. Surgical management of complications after transcatheter closure of an atrial septal defect or patent foramen ovale. *J Thorac Cardiovasc Surg* 2000;**120**:1034-9.
6. Shirodkar S, Patil S, Pinto R, Dalvi B. Successful retrieval of migrated Amplatzer septal occluder. *Ann Pediatr Cardiol* 2010;**3**:83-6.
7. Kim JJ, Hijazi ZM. Clinical outcomes and costs of Amplatzer transcatheter closure as compared with surgical closure of ostium secundum atrial septal defects. *Med Sci Monit* 2002;**8**:CR787-91.
8. Knepp MD, Rocchini AP, Lloyd TR, Aiyagari RM. Long-term follow up of secundum atrial septal defect closure with the amplatzer septal occluder. *Congenit Heart Dis* 2010;**5**:32-7.