

## A New Method for Patent Foramen Ovale Closure: Delivering Sheath Over Coronary Sinus Catheter into Left Atrium

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Patent foramen ovale (PFO) is a frequent condition. It usually does not pose any threat to life, but in certain circumstances, it can open and serve as a conduit for thrombi causing paradoxical embolism. Herein, we report a case of PFO in a patient with ischemic cerebrovascular accident, due to paradoxical embolism, which could not be passed via general practice; hence it was crossed with coronary sinus catheter, through which the delivery sheath was placed into the left atrium, and it was successfully closed. (**Korean Circ J 2013;43:139-141**)

**KEY WORDS:** Foramen ovale, patent; Amplatzer septal occluder; Coronary sinus catheter.

### Introduction

Patent foramen ovale (PFO) is the persistence of the normal fetal communication between the right and left atria. It is a common benign condition; up to 27% of the population has PFO.<sup>1)</sup> But under certain hemodynamic circumstances, PFOs can open and act as a conduit for thrombi to pass from the systemic venous circulation to the systemic arterial circulation, predisposing to stroke and paradoxical embolism.<sup>2)</sup> Herein, we describe a new method in device closure of PFO, introduction of delivery sheath over coronary sinus catheter into the left atrium in a challenging case.

### Case

A 34-year-old female with cryptogenic stroke was admitted to our hospital. On a physical examination, she had left paraplegia. Her electrocardiography was in sinus rhythm. Transthoracic echocardi-

graphy was normal, except interatrial septal aneurysm. Thus, transeosophageal echocardiography was performed, which revealed interatrial septal aneurysm and PFO (Fig. 1). Hence, percutaneous closure of PFO, under general anesthesia with the guidance of transeosophageal echocardiography (TEE), was planned. A 7 Fr sheath was introduced through the right femoral vein, and 80 U/kg of unfractionated heparin was administered, intravenously. PFO was attempted to cross unsuccessfully with multipurpose, right Judkins, and right Amplatzer diagnostic catheters. After a right atrium angiography, we crossed PFO with coronary sinus catheter to assess the reference entry point, and then another 7 Fr catheter was inserted to the left femoral vein and tried to cross PFO with Multipurpose, right Judkins and Amplatzer diagnostic catheters over normal and hydrophilic guide wires under the guidance of coronary sinus catheter, but could not pass through PFO. Thus, we pulled the catheters and inserted 9 Fr delivery sheath from the left femoral vein, then inserted 7 Fr coronary sinus catheter through the delivery sheath and crossed PFO with coronary sinus catheter (Figs. 1A and 2A), and deployed the delivery sheath over coronary sinus catheter into the left atrium, and pulled back the coronary sinus catheter and inserted the Amplatzer PFO occluder through the delivery sheath, successfully deploying the occluder (Figs. 1B and 2B). The patient was discharged uneventfully with aspirin 100 mg and clopidogrel 75 mg per/day medication.

### Discussion

Patent foramen ovale closure is performed in a standard catheterization laboratory, under physiological monitoring and fluoroscopic guidance. TEE examination is complementary for optimal results.<sup>3)</sup>

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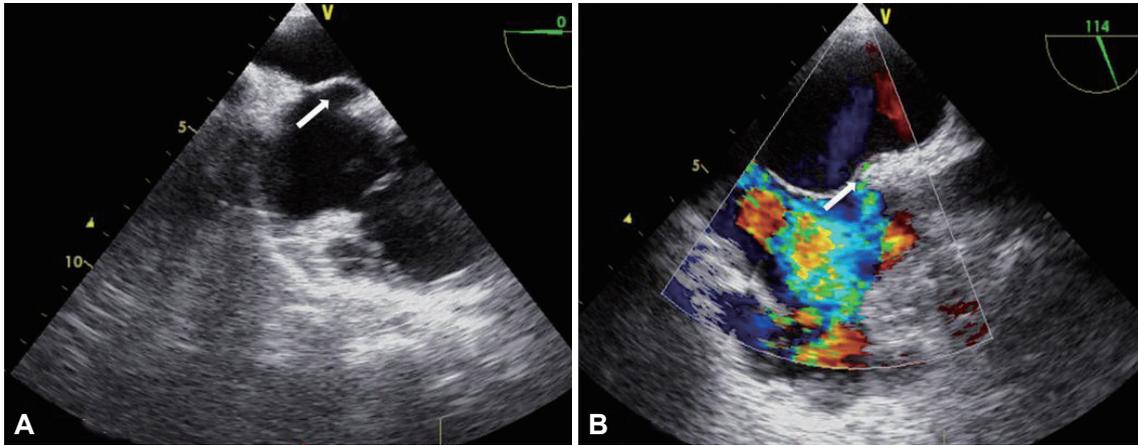
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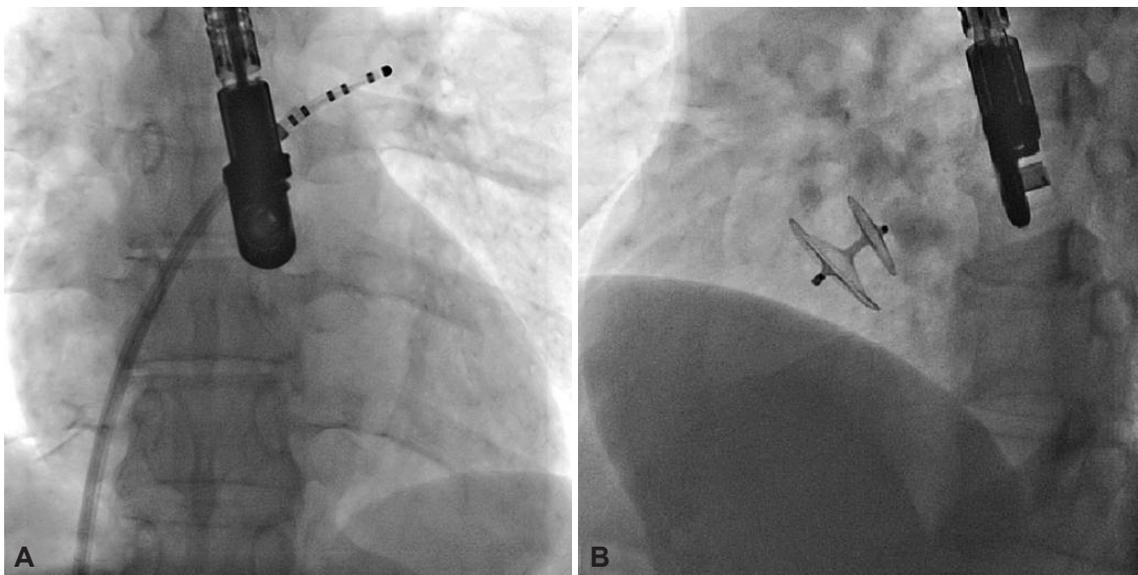
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**Fig. 1.** The transesophageal echocardiographic imaging of patent foramen ovale. A: arrow shows the bulging of interatrial septum to the left atrium which indicates atrial septal aneurysm. B: color Doppler transesophageal echocardiography examination showed passage of flow through a slit like patent foramen ovale from right atrium to the left atrium.



**Fig. 2.** The angiographic views during the crossing of PFA and after the successful deployment of PFO occluder. A: insertion of 9 Fr delivery sheath over 7 Fr coronary sinus catheter through PFO into the left atrium was demonstrated. B: successful deployment of Amplatzer PFO occluder was shown. PFO: patent foramen ovale.

General anesthesia is required for TEE guided procedures. Procedure was performed through the femoral venous access, and intravenous unfractionated heparin 80-100 U/kg was administered. The multipurpose diagnostic catheter is commonly used to cross PFO, but in unsuccessful cases, the right Judkins and Amplatz diagnostic catheters may be used. Right atrial angiography may be performed in challenging cases to understand the atrial anatomy. PFO is frequently crossed with coronary sinus catheter and radiofrequency ablation catheters, during electrophysiological studies. In laboratories that are familiar with electrophysiology procedures, coronary sinus catheter may be used for the localization of PFO; furthermore, it may be used for crossing PFO in order to deploy the delivery sheath into left atrium, for saving time in prolonged cases, in different

atrial anatomy and when usage of classical maneuvers and catheters are unsuccessful.

Moreover, blade septostomy may also be used when classical methods failed, but it is associated with major complications, including cardiac perforation, vascular injury and conduction disturbances. But crossing the PFO, with coronary sinus catheter, is safely used electrophysiology procedures.

In conclusion, this promising method, deploying the delivery sheath over coronary sinus catheter, may be used easily and safely when routine maneuvers fail.

## References

1. Hagen PT, Scholz DG, Edwards WD. Incidence and size of patent for-

- men ovale during the first 10 decades of life: an autopsy study of 965 normal hearts. *Mayo Clin Proc* 1984;59:17-20.
2. Mas JL, Arquizan C, Lamy C, et al. Recurrent cerebrovascular events associated with patent foramen ovale, atrial septal aneurysm, or both. *N Engl J Med* 2001;345:1740-6.
  3. Calvert PA, Rana BS, Kydd AC, Shapiro LM. Patent foramen ovale: anatomy, outcomes, and closure. *Nat Rev Cardiol* 2011;8:148-60.