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■ Case report ■

Use of an Amplatzer Vascular Plug to occlude a tubular type of patent ductus arteriosus

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= Abstract =

Patent ductus arteriosus (PDA) is a common congenital heart defect. All PDAs, regardless of size or degree of symptoms, require occlusion. Transcatheter PDA occlusion features fewer complications than trans-thoracic closure. It is also more cost-effective and has an excellent occlusion rate. Therefore, transcatheter PDA occlusion is accepted as the standard treatment option for PDA. However, tubular-type PDAs are difficult to close with ordinary detachable coils or the Amplatzer Duct Occluder; thus, these lesions remain a challenge for transcatheter closure. We attempted to occlude a tubular-type PDA by using an oversized Amplatzer Vascular Plug, which allowed intraluminal packing of the ductus. By using this treatment method, PDA occlusion was achieved safely with an excellent final outcome. We suggest that this approach may be a good option for transcatheter closure of a tubular-type PDA. (Korean J Pediatr 2009;52:1035-1037)

Key Words : Ductus arteriosus, Patent, Heart Catheterization, Device

Introduction

Since the first catheter-based closure of a patent ductus arteriosus (PDA) reported by Porstmann et al.[1] in 1971, transcatheter closure has become the preferred method of treatment for the majority of patients with PDA. Various types of device can be used, but the choice of device largely depends on the shape of PDA. Generally, small PDAs are closed with Cook detachable coils (Cook Cardiology, Bloomington, IN, USA) and the Amplatzer Duct Occluder (ADO; AGA medical Golden Valley, MN, USA) has become the most popular device for medium sized or large sized PDAs[2]. However, the tubular-type PDAs still remain a challenge to transcatheter treatment. In this report, we describe successful closure of a tubular PDA using an Amplatzer Vascular Plug (AVP; AGA medical Golden Valley, MN, USA).

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Case report

A 3-year-old boy was transferred to our institute for treatment of his known congenital heart defect. He diagnosed as ventricular septal defect (VSD) and PDA at his birth during the evaluation of cardiac murmur. He had no symptoms, but his parents wanted the opinion of our institute. Echocardiography showed a small perimembranous VSD and a small PDA. The size of VSD was about 2.5 mm and there was no evidence of aortic regurgitation. A thoracic roentgenogram showed no definite cardiomegaly or increased pulmonary vascularity. We decided to close his PDA first, and a cardiac catheterization was performed. Angiography revealed a long tubular PDA (Krichenko classification[3] type C). The largest dimension was 3.1 mm and the length was 10.6 mm. The calculated Qp/Qs ratio was 1.3 and the mean pulmonary arterial pressure was 19 mmHg. After discussing about the choice of device, we decided to occlude his PDA with an AVP. The general recommendation for selecting the size of AVP is approximately 30-50% larger than the vessel diameter. We tried to close the ductus by using a 4 mm AVP, but we retrieved it because there was significant amount of residual PDA flow. Subsequently, an oversized AVP (6 mm, 100% larger than the PDA dimension) was tried with

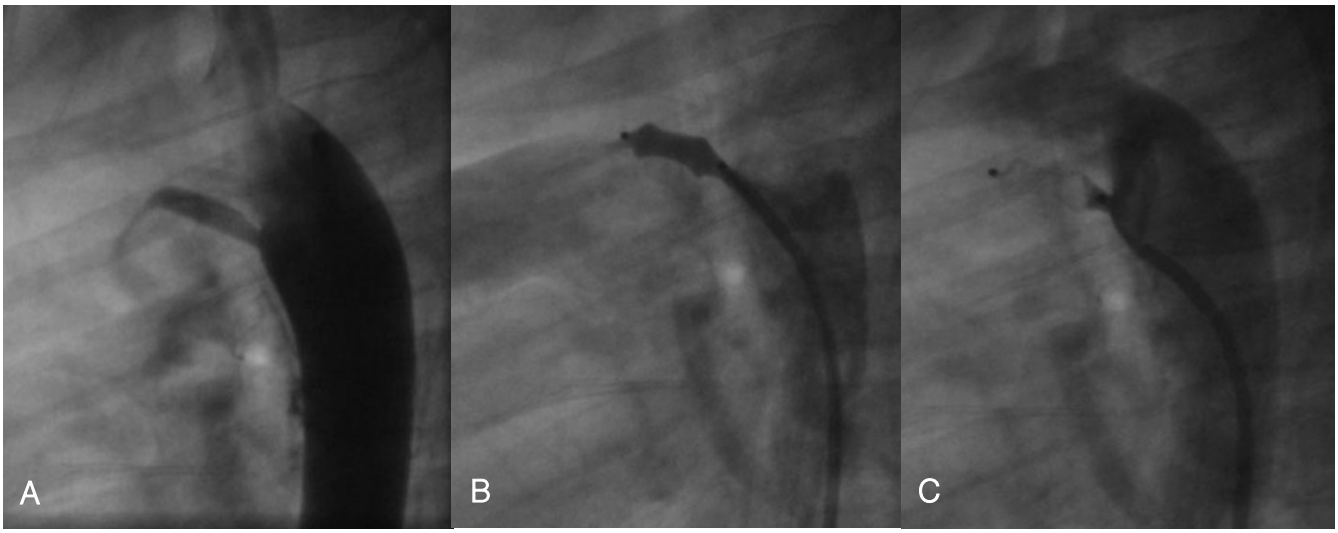

Fig. 1. A) Initial angiography revealing a long tubular PDA with 2.5-3.1 mm width and 10.5 mm length. B) After positioning of the 4-mm Amplatzer Vascular Plug®, there was significant PDA flow through the device. C) A 6-mm Amplatzer Vascular Plug® completely packed a tubular-type PDA, and there was no residual PDA flow.

expectation that a larger device would compact the lumen of ductus. The device was also delivered via a 5-Fr sheath. The device didn't go through pulmonic end of PDA. It only packed the lumen of tubular-type PDA. After detachment, angiography showed no PDA flow through the occlusion device (Fig. 1). The patient had no acute complications associated with cardiac catheterization. Follow-up echocardiography on the following day confirmed complete closure of PDA without residual shunt.

Discussion

PDA is one of the most common congenital cardiac defect[4, 5]. There is no controversy about recommending closure of all PDAs, regardless of their size or severity[5]. Small PDAs, lessor than 2 mm, are generally closed with detachable embolization coils. Detachable coils have many advantages in such that they can be placed by using a smaller sheath, they are easy to reposition and they have a low rate of complication as well as a low cost[6, 7]. On the other hand, an ADO is a preferable device for larger PDAs more than 4 mm in size. The ADO comes in various sizes and it has an excellent occlusion rate[8, 9]. Unfortunately, there are wide variety of size and shapes of PDA, so no one device is optimal or applicable for all PDAs. The tubular-tye PDAs, especially, are still a challenging entity for the interventional cardiologist. In these cases, ADO is not suitable and the use of coils bears a high risk of complications such as residual leakage or embolization of the coil. In spite of the use of AVPs on a large scale[10-12], some reports have claimed that the use of an AVP is contraindicated for the large tubular-type of PDA[13]. In this case, we tried using a larger size of AVP than is generally recommended and that brought about packing of the PDA. An AVP is a self-expanding, cylindrical device that is made out of nitinol wire mesh and unlike other Amplatzer occlusion devices, it has no occlusive fabric. Therefore it has previously been considered unsuitable for embolization of high flow lesions such as PDA. According to our experience with the tubular-type PDA, especially those with a narrow pulmonic end, AVPs may be a reasonable option in carefully-selected cases.

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한글 요약

원통형 모양 동맥관의 경피적 폐쇄술에서의 Amplatzer Vascular Plug 의 사용

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최은영 · 장소익 · 김수진

동맥관 개존증은 선천성 심질환 중 비교적 흔한 질환이며, 크기나 중등도에 상관없이 폐쇄가 필요한 질환이다. 경피적 동맥관 폐쇄술은 개흉술에 비하여 합병증의 위험이 적고 경제적으로도 바람직하며, 치료 성적도 우수하여 최근에는 표준적인 치료법으로 받아들여지고 있다. 하지만 원통형 모양의 동맥관 개존증은 흔히 사용하는 분리형 코일이나 ADO로 시술하기에는 여러 가지로 어려운 점이 많다. 저자들은 이러한 형태의 동맥관을 폐쇄하기 위하여 일반적으로 추천되는 것보다 큰 크기의 AVP를 이용하여 원통형 동맥관이 메워지도록 하는 방법을 이용함으로써, 성공적인 동맥관 개존증 폐쇄술을 시행하였기에 이를 보고하는 바이다.

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