Three Huge Pulmonary Arteriovenous Malformations: Endovascular Embolization with the Amplatzer Vascular Plug

Üç Dev Pulmoner Arteriovenöz Malformasyon: Amplatzer Vasküler Plug ile Endovasküler Embolizasyon

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ABSTRACT

Pulmonary arteriovenous malformations are abnormal direct communications between pulmonary arteries and pulmonary veins. Transcatheter embolotherapy is the preferred treatment method because of its less invasive nature. There are several methods for the treatment of pulmonary arteriovenous malformations, such as detachable occlusion balloon and coil embolization. The Amplatzer Vascular Plug is a new alternative embolization device which is a self expandable cylindirical nitinol wire mesh used for embolization of the pulmonary arteriovenous malformations. We described two cases (with three huge pulmonary arteriovenous malformations) treated with the Amplatzer Vascular Plug.*(Tur Toraks Der 2011; 12: 168-71)*

Key words: Pulmonary artery, arteriovenous malformation, therapeutic embolization, Amplatzer vascular plug

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ÖZET

Pulmoner arteriovenöz malformasyonlar pulmoner arterler ve venler arasındaki anormal doğrudan bağlantılardır. Transkateter embolizasyon daha az invaziv olması nenediyle bu vakalarda tercih edilen tedavi yöntemidir. Pulmoner arteriovenöz malformasyonların tedavisinde ayrılabilir tıkama balonu ve koil embolizasyon gibi bazı yöntemler mevcuttur. Silindirik nitinol örgü yumağından oluşan kendiliğinden genişleyebilir Amplatzer Vasküler Plug, pulmoner arteriovenöz malformasyonların tedavisinde kullanılan yeni alternatif bir üründür. Amplatzer vasküler plug ile tedavi edilmiş 2 hastayı (Üç dev pulmoner arteriovenöz malformasyon) tanımladık. *(Tur Toraks Der 2011; 12: 168-71)*

Anahtar sözcükler: Pulmoner arter, arteriovenöz malformasyon, terapötik embolizasyon, Amplatzer vasküler plug

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INTRODUCTION

Coil embolization and occlusion balloons are previously used methods to treat pulmonary arteriovenous malformations (PAVMs) [1-4]. *Amplatzer Vascular Plug* (AVP) (Figure 1) is a new device to embolize peripheral arteries and veins [1]. The main advantages of this device are repositionability after final delivery and usage for embolization of large feeding arteries with fewer complications [5-10].

In this report, we described two cases with three huge PAVMs treated with AVP with a follow up at the first week and 6th month.

CASE 1

A 36 year old man with known hereditary hemorrhagic telangiectasia was referred to our department for endovascular embolization of bilateral PAVMs. Pulse oximetry at rest showed 75% oxygen saturation in room air. On his chest x-ray examination there were bilateral large, smooth marginated nodular opacities in the lower lung zones. Contrast enhanced computed tomography (CT) showed two PAVMs, one in the right lower lobe posterior-lateral basal segment (7x4.5 cm in dimension) and other in the left lower lobe antero-medial basal segment (4x3cm in dimension).

Diagnostic pulmonary angiography confirmed the diagnosis of PAVMs in each lower lung lobe (Figure 2). The single feeding artery of the PAVM was derived from the left lower lobe basal segmental artery catheterized selectively with a 5 F multipurpose adult catheter (*Super Torque, Cordis, Miami, USA*) and a 0,035" hydrophilic coated angled tip guidewire (*Glidewire, Terumo, Japan*). Hydrophilic guidewire exchanged with Amplatz Super Stiff J curve 260 cm long guidewire (*Emerald, Cordis, Miami, USA*). A multipurpose catheter was drawn back and replaced with a 8F multipurpose guiding catheter (*Vista Brite Tip, Cordis, Miami, USA*). Selective angiography was carried out and the feeding artery diameter calculated. The feeding artery was 10 mm, therefore an AVP (*AGA Medical Corporation, Golden Valley, MN, USA*) sized 14 mm was chosen for embolization. The

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device was advanced through the guiding catheter into the feeding artery and positioned by pull back technique as used in stent deployment. The final position of the AVP was confirmed with a control angiography. The delivery cable, which was 135 cm long, was rotated counter clockwise and the AVP was released. Repeat angiography showed a complete occlusion of the feeding artery within 5 minutes.

PAVM in the right lower lobe was complex in nature. There were several feeding arteries derived from the posterior basal and lateral basal segmental branches. For this reason we decided to embolize the common trunk of posterior basal and lateral basal segmental arteries. The diameter was 13 mm and we used a 16 mm AVP which was the largest size available in the market. The same technique and same catheters-guidewires were used for embolization as described above. Complete occlusion was obtained within 10 minutes. The final control pulmonary angiography was carried out and the session was completed (Figure 3).

Figure 1. The view of the AVP obtained from the manufacturers (AGA Medical Corporation) web site (http://international.amplatzer.com/)

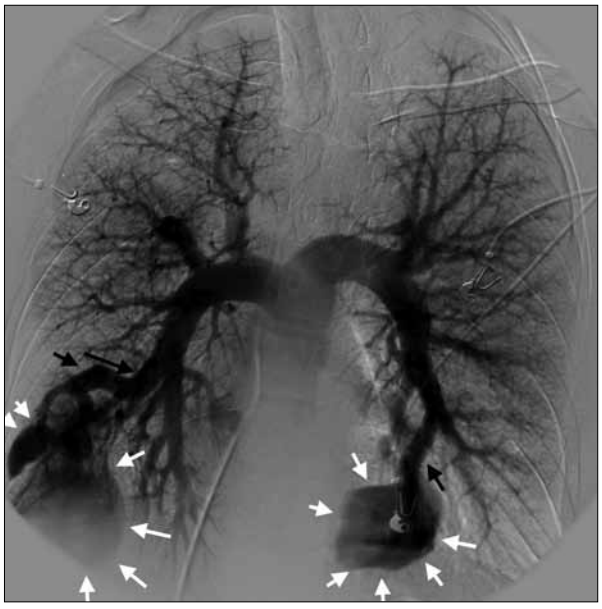

Figure 2. Digital subtraction pulmonary angiography of PAVMs. The white arrows show PAVMs, black arrows show feeding arteries (Case 1)

Follow-up contrast enhanced CT images obtained in the first week revealed complete thrombosis of the treated PAVMs. There was minimal pleural effusion in the right basal side. We did not observe any lung infarction in the remaining parenchyma.

Follow-up contrast enhanced CT images obtained at the sixth month showed a significant diameter reduction of the left PAVM. We did not observe pleural effusion in this control. Complete thrombosis with significantly reduced sac diameter was observed on the right side. The patient had no complaints and pulse oximetry showed 96% oxygen saturation in room air.

CASE 2

A 62-year-old woman with a left sided solitary PAVM was referred to our department for endovascular embolization. Her oxygen saturation at rest was 80% in room air. Contrast enhanced CT showed a PAVM with 6x5 cm dimensions in the right posterior-lateral basal segment. Diagnostic pulmonary angiography confirmed the diagnosis of a huge solitary PAVM in the right lower lung lobe (Figure 4). The PAVM was simple in nature and a single feeding artery of the PAVM was derived from the right lower lobe posterobasal segmental artery. The diameter of the feeding artery was 9 mm and we decided to use a 12 mm AVP. Catheters, guidewires and the technique used for embolization were the same as men-

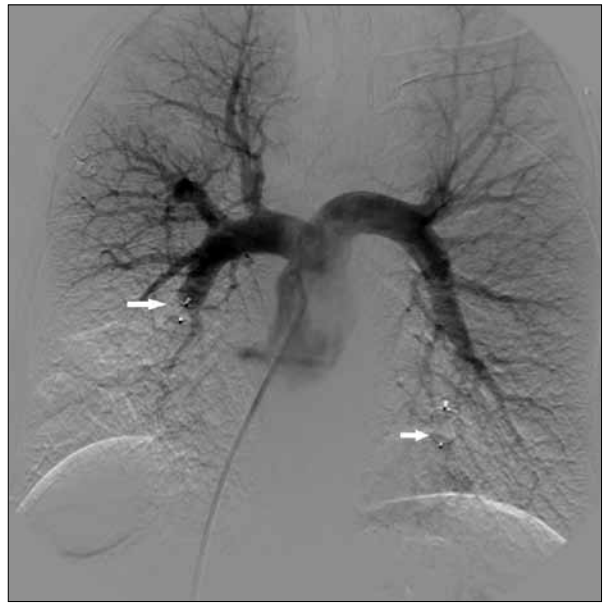

Figure 3. Final control pulmonary angiography shows complete occlusion of main feeding arteries. The arrows show AVPs (Case 1)

tioned above. Complete occlusion was obtained within 5 minutes (Figure 5).

Follow up contrast enhanced CT images obtained at the first week showed complete thrombosis of the PAVM.

At the sixth month of follow-up, contrast enhanced CT revealed complete thrombosis and reduced sac diameter. The patient was free of symptoms and her oxygen saturation was 92% in room air.

DISCUSSION

Pulmonary arteriovenous malformations are abnormal direct communications between pulmonary arteries and pulmonary veins bypassing the capillary circulation with an aneurysmal dilatation [2-4]. This vascular pathology can be acquired or congenital [2-4]. Hereditary hemorrhagic telangiectasia or hereditary generalized angiomatosis are frequent causes of congenital PAVMs. Acquired PAVMs are less frequent and mainly due to inflammatory lung disease, surgical procedures, hepatopulmonary syndrome and injuries. Transcatheter embolotherapy is the preferred treatment method because of its less invasive nature. Embolotherapy indications for pulmonary AVMs include hypoxemia, neurological symptoms (transient ischemic attacks, migraine, stroke, brain abscess), hemorrhage, progressive enlargement of the lesion, and presence of a 3 mm or larger feeding vessel [2-4].

There are several interventional transcatheter methods for the treatment of PAVMs such as, detachable occlusion balloon and coil embolization. Some previously reported potential complications of these methods are air embolism, paradoxical embolization of the device, spontaneous balloon deflation, pleurisy, recanalization and coil migration [5-7]. *Amplatzer Vascular Plug* (AVP) is a new alternative embolization device which is a self expandable cylindirical nitinol wire mesh used for embolization of the PAVMs [8-10]. Magnetic resonance compatibility, easy deployment, repositionability, removability, capability to occlude the larger diameter vessels, faster occlusion time and longer occlusion duration are the advantageous features of the AVP s compared to the other embolization techniques [8-10]. When treating pulmonary AVM s, embolization with AVP is a less time consuming and safe method [8-10]. For this procedure, measuring the target vessel diameter correctly and selecting the suitable AVP that is 30-50% larger than the target vessel diameter is important. This prevents device migration after deployment. In our first case, the feeding artery diameter on the right side was 13 mm. Available maximum diameter of the AVP was 16 mm. So we used a 16 mm size AVP and achieved total occlusion without migration although its percentage (23%) was smaller than the recommended (30-50%). These recommended percentages may be alterable according to the future large clinical studies.

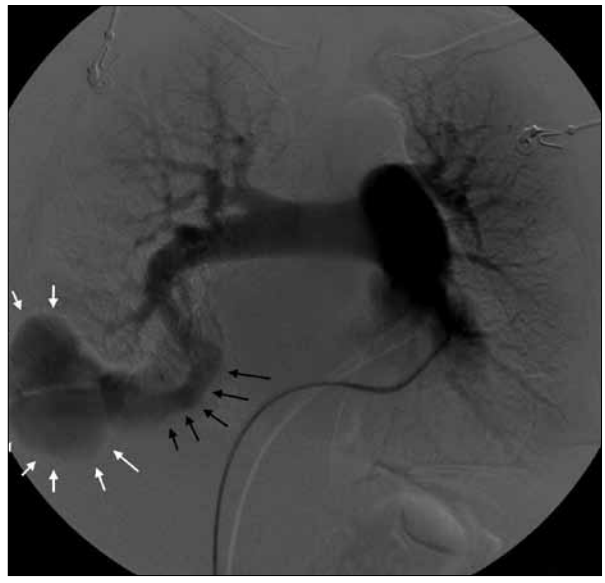

Figure 4. Pulmonary angiography shows PAVM (white arrows). The black arrows show the feeding artery (Case 2)

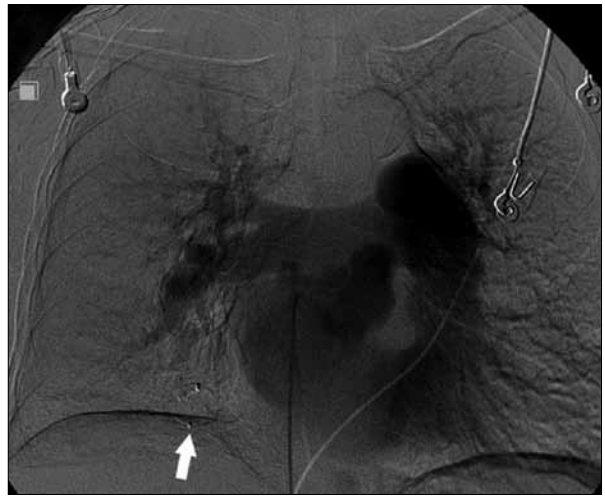

Figure 5. Complete occlusion of feeding artery within 5 minutes and final pulmonary angiography. The arrow shows AVP (Case 2)

In our cases (two patients, three huge PAVMs) we achieved total occlusion of the main feeding arteries after the procedure. We did not observe any major complications, except self limited pleurisy and minimal pleural effusion. Follow up examinations at the 1st week and 6th month with multidetector computed tomography (MDCT) revealed complete thrombosis in all cases. Also, thrombosed sac diameters were significantly reduced.

In conclusion treatment of PAVMs with AVP seems to be a simple and effective method. AVPs enable embolization of large feeding arteries. however, further investigations with long term results are needed for general acceptance of this device in the embolotherapy of PAVMs.

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