EMERGENT EMBOLIZATION OF A RUPTURED INTERNAL ILIAC ARTERY ANEURYSM WITH AN AMPLATZER VASCULAR PLUG

Jer-Shen Chen, Jih-Hsin Huang, Kuan-Ming Chiu, Shu-Hsun Chu

Abstract

We shared our experience of endovascular treatment for a ruptured internal iliac artery aneurysm. A 70-year-old man was brought to the emergency department with the presentation of abdominal pain and profound shock. Computed tomography disclosed a ruptured internal iliac artery aneurysm. He was quickly stabilized by the blood flow occlusion in the abdominal aorta with two parallel balloons. Internal iliac artery embolization was performed with an Amplatzer Vascular Plug. Because of bleeding tendency, the adequately positioned vascular plug could not induce complete thrombosis. Temporary balloon occlusion of the iliac artery induced stasis of blood and facilitated the thrombosis process. Complete thrombosis was finally attained. This was the first report of using an Amplatzer Vascular Plug for emergent internal iliac artery embolization.

Key words: Internal iliac artery aneurysm, Rupture, Amplatzer Vascular Plug

Introduction

Endovascular therapy is gaining popularity in treating vascular diseases during recent years. Lots of thoracic and abdominal aneurysms could be completely excluded by endografting. In difficult aortic anatomies with insufficient landing zone, hybrid operations, which combined “debranching” and endografting, were also performed worldwide to lower the peri-operative morbidity and mortality. In the treatment of the peripheral artery disease surgical bypass is also replaced by balloon angioplasty in many situations.

In the past, the principal way to deal with a ruptured aneurysm was open surgical repair. Since we have been more and more familiar with the endovascular techniques, we have tried to apply these techniques to the treatment of ruptured aneurysms. By inflating a balloon proximal to the bleeding segment, the bleeding can be controlled quickly. Through the reduction of shock severity and duration, the patient’s outcome will certainly be improved. In suitable anatomies, open wound can even be avoided to reduce the patient’s suffering. As a result, the operation can be less stressful in emergent situations.

Case Report

The 70-year-old man was presented to the
emergency department (ED) due to abdominal pain. He underwent anterior resection for rectal cancer several years ago. His abdomen was severely distended. Tachycardia and low blood pressure were also noted. Hypovolemic shock due to internal bleeding was impressed. Abdominal computed tomography showed a ruptured right internal iliac artery aneurysm with retroperitoneal hematoma (Fig. 1). Because he had a history of abdominal surgery, endovascular embolization was considered as the priority of treatment modality avoiding the time-consuming surgical adhesionlysis. He was sent to the operation room immediately.

Hemodynamics deteriorated rapidly after anesthesia induction and intubation. The blood pressure measured by arterial line decreased to 50/30mmHg. In order to limit the hypovolemic shock and buy time for subsequent procedure, we inserted two 7 French introducer sheaths through right femoral artery percutaneously. Two 12 × 40mm non-compliant balloons were placed to the abdominal aorta in parallel under mobile C-arm system (OEC 9800, GE Medical Systems, Salt Lake City, Utah, USA). After inflation of both balloons to 10atm, the patient’s blood pressure returned to 80/50mmHg (Fig. 2). Subsequently, we inserted the third 7 French introducer sheath to left femoral artery. A 6 French Judkins Right guiding catheter was used for crossover and engagement of the orifice of right internal iliac artery. Angiography demonstrated active bleeding via the internal iliac artery aneurysm (Fig. 3A). A 12mm Amplatzer Vascular Plug (AGA Medical, Plymouth, MN, USA) was used to embolize the right internal iliac artery. Because of profound shock and bleeding tendency, the plug could not induce complete thrombosis (Fig. 3B). We removed one balloon in the abdominal aorta, and drew the other to the common and external iliac artery junction. The balloon was inflated again to temporarily occlude the iliac artery to facilitate thrombosis process in the vascular plug (Fig. 3C). Angiography was repeated every five minutes after deflation of the balloon. Twenty minutes later, angiography showed complete thrombosis of the internal iliac artery (Fig. 3D). The patient’s systolic blood pressure rose to 110mmHg gradually. He was then transferred to the intensive care unit (ICU) for further care.

In the ICU, transfusion was no more needed.
However, because of the accumulated retroperitoneal hematoma, his abdomen remained severely distended. Decompressive laparotomy was suggested for the abdominal compartment syndrome. His family refused to put a large open wound on his abdomen. Multi-organ failure ensued and he passed away one day later. Positive blood culture of gram-negative bacilli was reported on the next day of his expiration.

**Fig. 3.** A 6 Fr Judkins Right guiding catheter engaged in right internal iliac artery (arrow) and demonstrated active bleeding (A). A 12mm Amplatzer Vascular Plug was precisely deployed in right internal iliac artery (arrow) with only partial thrombosis in the plug (B). Temporary balloon occlusion of the common and external iliac artery junction was shown (C). Stasis of blood in the internal iliac artery facilitated complete thrombosis after 20 minutes (D).
Discussion

Isolated internal iliac artery aneurysm is a rare disease. In a large series of aorto-iliac aneurysms, only seven of 440 patients had isolated internal iliac artery aneurysm. Proximal neck ligation with obliterator endoaneurymorrhaphy, which involves overseeing each collateral vessel in the aneurysm sac, was reported to successfully treat this disease. However, the internal iliac artery is deeply located in the pelvis. It is difficult to gain the distal control during open repair. As a result, bleeding poses a significant problem in addition to extensive bowel manipulation during the operation. In the situation of rupture, it is almost infeasible to control the neck of this deeply-seated aneurysm within the massive retroperitoneal hematoma. Therefore, endovascular treatment has become the favorable option for internal iliac artery aneurysm during recent years.

With the advance of endovascular techniques, balloons, which were designed for dilatation of vascular stenosis, has become more and more versatile. Balloon pericardiotomy, septostomy, valvuloplasty, and etc. could all be accomplished with reasonable risk profile. The balloon was also widely used to temporarily occlude an artery to control bleeding. In the field of vascular surgery, it’s especially useful in obtaining prompt proximal control in emergent situations such as aneurysm rupture.

In this case, the sympathetic compensatory mechanism was lost after anesthesia induction. Systolic blood pressure decreased to 50mmHg. We should immediately control bleeding to reduce the severity of shock. Because of previous rectal cancer surgery, intra-peritoneal adhesion would make surgical approach of abdominal aorta quite difficult. Moreover, the internal iliac artery was deeply seated in the pelvis, which was not a readily accessible locus even in a fresh case. According to the computed tomography, the diameter of abdominal aorta was around 20mm (Fig. 1). Large balloon of more than 20mm in diameter was not readily available in many operation theaters. A large introducer sheath of 11 or 12 French was required to insert such a large balloon. Femoral artery cut-down may be necessary to repair the arterial defect due to bleeding tendency. Therefore, we used two smaller balloons to temporarily occlude the aorta to reduce bleeding. If this management failed, the alternative way for us would be posterolateral thoracotomy to clamp the descending aorta.

Amplatzer Vascular Plug (AGA Medical, Plymouth, MN, USA) is a relative new device for vascular embolization. It has been used in various vascular territories. Its use in internal iliac artery embolization to prevent type II endoleak in elective situations, such as endografting of an abdominal aortic aneurysm, was well-documented. The neck of internal iliac artery can be occluded by a single vascular plug. When coil embolization was used, a lot of coils are needed. In a French study, the cost of internal iliac artery embolization by Amplatzer Vascular Plug was roughly two-third of that with embolization with coils. In the scenario of aneurysm rupture, vascular plug allows a single-step procedure to occlude the vessel, which is more time-saving. Covered stent is the other reasonable option. It also provides a single step procedure for a ruptured internal iliac artery aneurysm.

Because a large-sized covered stent up to 12mm in diameter was not readily available in our operation room, we used the Amplatzer Vascular Plug to treat the patient. As described in above, technically speaking, it was not difficult to deploy the plug at the internal iliac artery. However, because of massive bleeding and profound shock, the patient had bleeding tendency, which hindered thrombosis process in the plug. We never gave systemic heparin while dealing with a ruptured aneurysm. Continuous transfusion of all kinds of blood products was also ongoing to correct the bleeding tendency. We introduced a method to assist thrombosis in the vascular plug. One balloon in the aorta was deflated and removed. The other one was drawn back to the common and external iliac artery junction. Temporary occlusion of iliac artery with balloon could induce stasis of blood.
Stasis would facilitate the thrombosis process. Every five minutes, the balloon was deflated and angiography was repeated. Gradual occlusion of the internal iliac artery was observed. Complete thrombosis was finally attained after 20 minutes. In the literature review, there was no report describing the emergent embolization of a ruptured internal iliac artery aneurysm with an Amplatzer Vascular Plug. Thus, we shared our experience here.

**Conclusion**

Endovascular techniques can be applied in many ways in the treatment of a ruptured aneurysm. Using these techniques, we have a better chance to improve the patient’s outcome.

**References**


緊急使用Amplatzer Vascular Plug栓塞破裂的內腸骨動脈瘤

陳哲伸，黃日新，邱冠明，朱樹勳

摘要

內腸骨動脈瘤位於骨盆腔深處，其動脈瘤的治療本就相對難易。動脈瘤破裂時，後腹腔血腫會讓手術治療更為困難。我們報告一位70歲男性，因右側內腸骨動脈瘤破裂而休克。他曾接受直腸癌手術，又有急性破裂的休克狀態，因此不選擇傳統手術治療。我們先用氣球阻斷主動脈血流，減緩出血、減輕休克，再使用Amplatzer Vascular Plug栓塞右側腸骨動脈，最後成功止血。患者最終因腹部腔室症候群及敗血症而死亡。

關鍵詞：Amplatzer Vascular Plug，內腸骨動脈瘤，破裂