

# Massive Pelvic Hematoma After Atrial Septal Defect Closure Via Femoral Vein Cannulation

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## ABSTRACT

We report a rare case of pelvic hematoma caused by iatrogenic external iliac artery hemorrhage following transfemoral venipuncture for atrial septal defect closure. By means of urgent femoral arteriography, bleeding in the branches of the external iliac artery was confirmed and occlusion of the bleeding branches was performed, thus avoiding the need for surgical laparotomy. The patient recovered well, and the hematoma significantly was reduced 2 months after surgery.

## INTRODUCTION

Secundum atrial septal defect (ASD) accounts for about 6% to 10% of congenital heart disease in children and 30% of congenital heart disease in adults [Lock 1989; Deanfield 2003]. With the continuous innovation of medical technology and devices, percutaneous ASD closure has become the current preferred treatment strategy for patients with secundum ASD, while traditional surgical methods mainly are used for patients with unsuitable anatomical features or complicated with cardiac malformations [Du 2002]. Although the technique is safe enough, with the widespread use of the device, some late and rare complications have been exposed, such as device thromboembolic events, conduction abnormalities, valve injury, and peripheral vascular injury. ASD via femoral vein approach often has femoral vascular complications, including hematoma, infection, arterial pseudoaneurysm, arteriovenous fistula, thrombosis, and nerve injury [Heintzen 1997]. However, the literature reports of external iliac artery hemorrhage caused by femoral vein puncture are relatively rare. Here, we report a rare case of pelvic hematoma caused by iatrogenic external iliac artery hemorrhage following transfemoral venipuncture for atrial septal defect closure.

## CASE REPORT

A 31-year-old female patient was admitted to the hospital with the chief complaint of "heart murmur detected by physical examination." The patient's vital signs and laboratory tests were normal after admission. Transesophageal echocardiography showed a secundum ASD with a size of 9.0\*5.0mm. After preoperative preparation, we performed closure of the atrial septal defect. The right femoral venipuncture route was selected. After puncture needle puncturing the right femoral vein, guide wire was inserted into the atrial septal defect to the left atrium. The size of the atrial septal defect was determined by transesophageal echocardiography, and a HeartR™ ASD Occluder (Lifetech Scientific, China) with diameter of 14mm successfully was inserted under the guidance of the guide wire and transesophageal echocardiography.

The patient's vital signs were stable during the operation, and she returned to the ward for continued observation after the operation. The patient developed right lower abdominal pain 3 hours after the operation, which gradually became aggravated, accompanied by dysuria. Physical examination revealed distention of the right lower abdomen with tenderness. An indwelling urinary catheter urgently was given. The contrast-enhanced CT of the lower abdomen showed a mass of pelvic fluid, with an area of about 85×106mm. A tubular enhancement focus (active bleeding) was seen in the iliac fossa on the right side, and the bladder obviously was compressed. (Figure 1)

Urgent complete blood count test showed that HGB still was in the normal range, but had decreased from 13.3g/L to 11.8g/L. Considering the possibility of active bleeding in the femoral artery, emergency transcatheter iliac arteriography was performed through the left femoral artery puncture approach by interventional cardiologists. During the operation, the branches of the right external iliac artery were stained in clumps and patches, and the contrast agent spillover could be seen. Active bleeding was considered first. (Figure 2)

A microcatheter was used to superselect to the bleeding artery branches and then the branches were embolized with an appropriate amount of 350 to 560umPVA particles, after which the bleeding vessels were occluded by angiography. (Figure 3) The patient's symptoms were relieved after surgery, and there was no urethral syndrome or change of defecation habits. The general surgery consultation suggested there was no need for surgical evacuation of hematoma. The patient experienced an increase in body temperature, up to 38.0 degrees, hrCRP to 91.3mg/L, but no increase in white

Received December 29, 2022; accepted February 17, 2023

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blood cell count or neutrophil percentage. Considering the absorption of heat caused by hematoma, the patient was given physical cooling and antipyretic drugs. The patient smoothly recovered and was discharged. The patient did not complain of discomfort 2 months after the operation, and pelvic CT examination indicated that hematoma decreased significantly (about 50×38mm). (Figure 4)

## DISCUSSION

Percutaneous closure has become the first-line treatment strategy for secundum ASD in adults and children. Its safety and efficacy have been demonstrated. However, the wide application of occlusion techniques also has brought some complications. These complications include simple hematoma, pseudoaneurysm, retroperitoneal hematoma, arteriovenous fistula, external hemorrhage, groin abscess, fungal aneurysm, femoral nerve palsy, and complications related to the closure device (thrombosis, infection, and embolism) [Assali 2003; Boccalandro 2004]. Its management varies from simple events requiring short-term non-invasive intervention to serious complications requiring invasive techniques or surgical intervention. Studies have shown that although the incidence of femoral artery complications is low, ranging from 0.6 to 9%, a large number of cardiac catheterization examinations have made femoral artery complications a common iatrogenic injury [Castillo-Sang 2010].

We present the case of a patient undergoing atrial septal defect occlusion via the femoral vein route who had an acute external iliac artery branch hemorrhage, due to inappropriate manipulation, resulting in a large hematoma in the pelvis. The postoperative radiological examination also confirmed our judgment. We believe that the most important cause of this complication is inappropriate puncture position and angle. The insertion position of the needle was too close to the inguinal ligament, and the advancement angle of the needle was too low, allowing the needle to reach and injure the incompressible retroperitoneal vessels. Through the anatomy of the groin, Akata et al. found that although the vein (right femoral vein) had a constant anatomical relationship with the medial side of the artery below the ventral femoral ligament (right femoral artery), the vein (right external iliac vein) passed below the artery above the inguinal ligament (right external iliac artery), and finally confluent with the inferior vena cava to the right side of the aorta [Akata 1998]. Therefore, if the puncture point is too close to the inguinal ligament, inserted at a low angle and advanced too far medially, the risk of arterial perforation is greater when parallel to the arterial pulse. Some scholars suggest that the position of the inguinal puncture site should be about 2-3 cm below the inguinal ligament, or two finger widths below it, while most of them recommend advancing the needle at an angle greater than 45 degrees [Kaye 1988; Seneff 1991; Nidus 1974].

On the other hand, with the continuous development of medicine, ultrasound technology widely has been more used. Real-time ultrasound guidance has become the standard treatment for obtaining vascular access in the fields of critical care



Figure 1. The contrast-enhanced CT of the lower abdomen showed a mass of pelvic fluid, with an area of about 85×106mm.

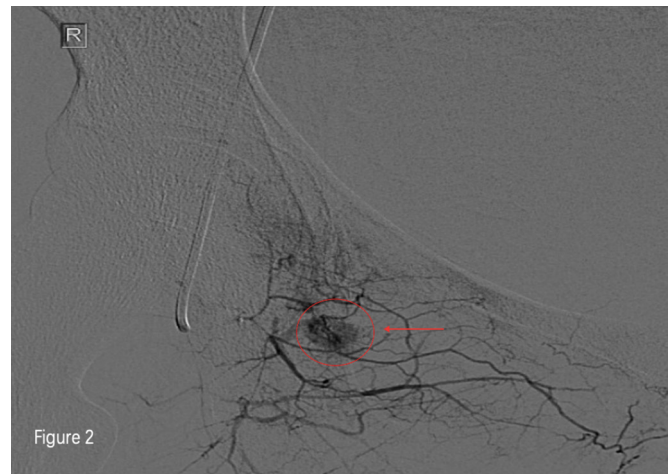


Figure 2. Femoral arteriography showed that the branches of the right external iliac artery showed mass and patchy staining, and the contrast medium spill was visible.

medicine, anesthesia, and interventional radiology. The use of ultrasound allows real-time visualization of blood vessels, improves first-pass success rates, reduces accidental arterial puncture rates, and, more importantly, minimizes vascular complications, resulting in an overall reduction in morbidity and mortality. The results of a meta-analysis conducted by Sobolev et al. [Sobolev 2017] showed that the possibility of major vascular complications was reduced by 60%, and the possibility of minor vascular complications was reduced by 66% when ultrasound-guided femoral vein access was used during electrophysiological surgery. Ultrasound guidance may reduce the risk of vascular access bleeding, especially in patients receiving anticoagulation. Of course, real-time ultrasound guidance also was applicable to our patient. We punctured the femoral vein by empirical body surface positioning, and because the puncture was relatively smooth, we did not choose to guide it by ultrasound. Of course, it turned



Figure 3. Postoperative angiography revealed occlusion of the bleeding vessels.

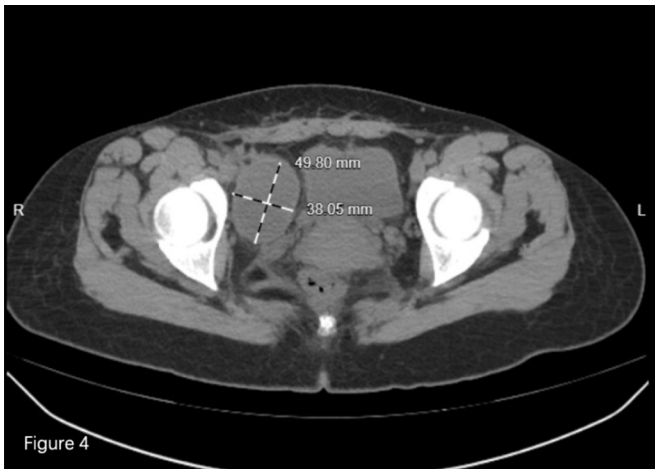


Figure 4. Abdominal CT showed that the pelvic hematoma was significantly reduced two months after surgery.

out that we made the wrong decision. The appropriate puncture position and puncture angle can be determined under the guidance of ultrasound, so as to minimize the risk of massive hemorrhage caused by iatrogenic arterial injury.

## CONCLUSION

In conclusion, femoral vein puncture may result in severe pelvic hematoma, due to iatrogenic external iliac artery injury. We can choose the appropriate puncture position and puncture angle combined with real-time ultrasound guidance, which can reduce the incidence of vascular complications.

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