# A Novel Use of Aortic Stent Graft Components in Massive Venous Retroperitoneal Hematoma

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**ABSTRACT:** Venous retroperitoneal hematoma (VRH) can present as a sudden-onset life-threatening condition. Unlike arterial hematoma, VRH is difficult to treat because of anatomic and structural considerations. Moreover, because VRH is rare and iatrogenic, there are no commercially available devices to treat this problem. We present a novel use of aortic stent graft components to treat a large, life-threatening VRH.

## INTRODUCTION

Retroperitoneal hematoma (RH) is a life-threatening condition that has become more common with the advent of arterial and venous catheter-based procedures. Spontaneous iliac vein rupture in particular is an uncommon cause of RH. As of 2009, 35 patients with this condition have been reported. Almost 79% of them had concomitant deep venous thrombosis or thrombophlebitis, just as in our case report.[1] Although surgical and endovascular interventions have been described, there is no clear consensus for treatment because of the rarity of this condition.

## CASE REPORT

A 51-year-old male with a history of obesity, factor V Leidin deficiency, chronic obstructive pulmonary disease, and prior deep venous thrombosis (DVT) presented with sudden onset of bilateral lower extremity leg pain, flank pain, and difficulty walking. Approximately 15 years ago, the patient had an inferior vena cava (IVC) filter placed during a trauma admission but could not recall if he had taken anticoagulants at that time. On physical exam, he was noted to have extensive edema of both lower extremities. A bilateral venous ultrasound showed bilateral extensive femoral vein DVT. This patient had no known contraindications for thrombolytics.

After getting informed consent, we proceeded with bilateral venograms using a popliteal vein approach. The venogram revealed massive bilateral iliofemoral vein thrombus extending from the proximal femoral vein to just past the IVC filter. We then proceeded with placing bilateral EKOS catheters (EKOS Corporation). After positioning the distal end of each catheter just past the proximal extent of the thrombus, we initiated an infusion of alteplase at 1mg/hour via each catheter, according to our hospital protocol. After approximately 3 hours, the patient started complaining of severe left-sided abdominal and flank pain. Fibrinogen was found to be 250 mg/dL and hemoglobin was down to 10 g/dL from 15 g/dL. The patient became hypotensive, requiring pressor support. Alteplase was discontinued and a stat computed tomography (CT) angiography of the abdomen/pelvis was ordered; it showed a massive left-sided retroperitoneal hematoma. No active extravasation was seen. Blood was typed and crossed and the patient was taken to the operating room for exploration. An incision was made in the left lower quadrant and the retroperitoneal cavity was opened. A large hematoma was evacuated. Massive venous bleeding was noted.

Next, the external and common iliac vessels were isolated. We observed a tear in the proximal left common iliac vein. During exposure, this tear was extended. Eventually the tear was partially controlled using 4-0 Prolene sutures. In the operating room, the hospital's massive transfusion protocol was initiated, and the patient ultimately received approximately 30 units of packed red blood cells. Although we were able to obtain partial control, bleeding continued, so we packed the retroperitoneal cavity with laparotomy pads and took the patient to the intensive care unit (ICU) for resuscitation. Over the next few hours, the patient required 8 more units of blood.

We took the patient to the endovascular suite after he was somewhat stable. He had massive swelling of his lower extremities and was quite deep on ultrasound evaluation. Because the greater saphenous vein was easily accessible, we decided to use it as our access point. Ultrasound-guided puncture of the greater saphenous vein was obtained using an 8F sheath. A venogram showed a patent iliac vein with some stenosis near the takeoff of the hypogastric vein. No clear extravasation point was identified.

A Volcano intravascular ultrasound catheter (Phillips Corp.) was inserted and used to measure the common iliac vein (22-mm diameter) and external iliac vein (18-mm diameter). From the venogram, length of the visualized tear, and diameter measurements, we determined that we needed to stent graft

most of the common iliac vein and land into the external iliac vein to adequately seal the tear; this would require two aortic stent graft component limbs. To ensure adequate oversizing, we proceeded with exchanging for an 18F sheath and selected a 24-mm by 82-mm component limb from the Reliant II Medtronic aortic stent graft system (Medtronic), which was deployed from the mid external iliac vein into the distal common iliac vein. The second piece—a 28-mm x 82-mm component limb—was telescoped through the first piece with adequate overlap. The proximal end of this second stent graft was positioned 1 to 2 cm distal to the confluence of the iliac veins (Figure 1).

Post-dilation was not performed. We opened the retroperitoneal incision and removed all the packs. No bleeding was seen, so the wound was irrigated and closed over two large Blake drains, and the patient was taken back to the ICU. He went into nonoliguric renal failure and dialysis was initiated. Over the next few days, the patient was stabilized, and no further transfusions were required. On postoperative day (POD) 5, both Blake drains were removed. The patient was extubated on POD 7 and discharged from the hospital to a rehabilitation unit on POD 12. After approximately 3 weeks, dialysis was discontinued and the patient was discharged home.

The patient has been seen multiple times after discharge. After 1 month, he presented to the office with a seroma in the left flank incision. The seroma required operative drainage and has subsequently resolved. After resolution of the seroma (in approximately 1 month), he was started on riboxavarin. He still complains of edema in his lower extremities but has significantly improved with the use of compression stockings. He has been able to return to his full-time job as a foreman.

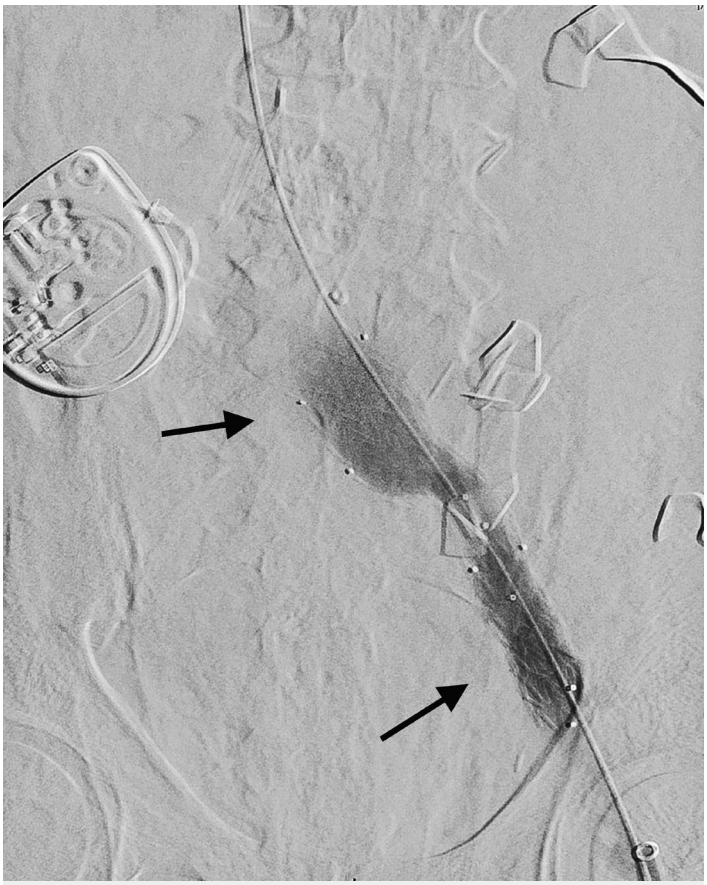

*Figure 1.*
Completion venogram showing stent graft components extending from the mid-left external iliac vein to the proximal common iliac vein (arrows).

## DISCUSSION

Venous retroperitoneal hematomas (VRH) are rare and can occur spontaneously or iatrogenically. In the case of spontaneous VRH (SRH), statistics show that minor unobservable trauma such as coughing might play a part.[2] Activities that suddenly increase venous pressure may also contribute to the weakening of the vessel's walls.[3] These hemorrhages, mostly observed in older women, are correlated with pain in the left abdomen and lower extremities.[2,4] It is thought that the loss of estrogen that comes with age reduces plasticity of veins and thereby increases the chances of hemorrhage.[2] May-Thurner syndrome has also been linked to spontaneous iliac vein ruptures in a number of case reports.[1,2,5,6] Given the correlation between DVT and SRH, there has been speculation in the literature as to whether DVT causes SRH or whether the SRH causes DVT.[3] In the era of endovascular techniques, VRH can also be iatrogenic, with causes ranging from accidental puncture of vessels with catheters to stenting.[2]

Spontaneous iliac vein bleeds are especially dangerous because they have varied presentations and require rapid, accurate diagnosis. Some patients come to the emergency department with abdominal pain, whereas others arrive in hypovolemic shock (which has previously been misdiagnosed as traumatic surgical cases such as abdominal aortic aneurisms and retroperitoneal tumors).[1,7] In many instances, contrast CT fails to identify the location of the venous hemorrhage and the rupture is only correctly diagnosed in surgery, which in and of itself increases morbidity and mortality. In our case, the bleed presented after the initiation of thrombolytic therapy.

With regard to treatment, the literature describes conservative management, endovascular treatment, and surgical repair. The first approach is conservative management, which can be employed when there is an early diagnosis, hemodynamic

stability, limited-size hematoma, absence of nerve impingement, and no active bleeding. There are three cases of successful conservative treatments in the literature,[3,5,8] although one showed that this approach can lead to repeated thrombosis.[9] Traditionally, surgical management was used to treat massive VRH. However, now the general consensus in the literature is that surgical exploration is inadvisable due to visibility issues, risk of further injury, postoperative thromboembolic complications, and increased mortality.[1-3,8-10] Moreover, the overall flimsiness of the iliac vein makes it a difficult target for suturing.

Thus, the more modern approach is endovascular management. This approach involves the use of stent grafts, which can quickly and safely stop bleeding yet maintain vessel integrity. One pitfall of the stent approach is appropriate sizing, which we abetted by using an IVUS catheter. In extreme circumstances, proper sizing may be difficult to obtain. In addition, most hospitals do not stock these stent grafts, so obtaining the proper size may be time consuming in an emergency. Furthermore, no stent grafts have been approved by the FDA to manage VRH. There have been limited reports in the literature of stent grafts in VRH. Of the three cases that used stent placement, one stent graft remained functional after an 8-month follow-up with no DVT,[6] another patient was asymptomatic to begin with,[1] and the third had "favorable outcomes."[11]

The venous system is a low-flow system with a theoretical risk for stent graft thrombosis, although there are few reports in the literature on this topic. We chose to use a stent graft after an open surgical attempt failed to control massive hemorrhage in a morbidly obese patient with deep anatomy. Given the ease of deployment and potential to avoid massive blood loss, we believe that this option is a first-line treatment for life-threatening traumatic injury to the iliac veins and accept the potential morbidity of stent graft thrombosis.

## CONCLUSION

VRH can be a dangerous clinical problem. It is often life threatening, difficult to treat, and associated with poor outcomes. In the previous era, surgical management was the mainstay of treatment, but it often led to poor outcomes. We present a novel endovascular approach to address this vexing problem. The use of stent grafts for the emergency management of massive VRH is a useful addition to the clinician's armamentarium.

*Keywords:*
venous retroperitoneal hematoma, VRH, aortic stent graft

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