Inferior Vena Cava Stent-Graft Sepsis

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We present the case of a patient with a complicated medical history, which included stent grafting as a life-saving measure for an iatrogenic inferior vena cava (IVC) injury. For persistent sepsis secondary to stent-graft infection, the patient underwent extraction of 2 IVC stent grafts, primary repair of a duodenal–caval fistula, and repair of the IVC with an allograft vein patch. Discussion of this case sought to shed light on the intricacies involved in medical decision making in an era of advanced medical technology.

We present the case of a patient with a complicated medical and surgical history, which included endovascular stent grafting to control life-threatening hemorrhage from an iatrogenic inferior vena cava (IVC) injury. The technological strides of the late 20th and early 21st century have enabled us to treat disease processes that were previously not only difficult but also, sometimes, even impossible. However, only through understanding the potential pitfalls of these innovations can we most appropriately prescribe these treatments, while avoiding the detriment of patients.

CASE REPORT

Our patient is a 49-year-old woman with a surgical history significant for an attempted retroperitoneoscopic right adrenalectomy performed at an outside institution for the treatment of a symptomatic neoplasm 3 years earlier. Her initial operative course was complicated by significant bleeding from the right adrenal vein, the right renal vein, and the IVC. Despite converting to laparotomy, and performing a right adrenalectomy and right nephrectomy, the operating surgeons were unable to stop the bleeding. Vascular surgery was emergently consulted, and after plegetted repair of several avulsed lumbar veins, it was clear that most bleeding stemmed from the retrohepatic IVC. Alternative approaches to control hemorrhage at this time include an atriocaval shunt as initially described by Schrock in 1968, complete IVC ligation, and/or endovascular means, as was chosen. Citing poor visualization and technical difficulty, an endovascular approach was used, starting with a right femoral vein cutdown. Through a 12F sheath, over a Benson wire, a Reliant balloon was advanced to temporarily control hemorrhage. Although this was unsuccessful in controlling the bleeding, the presence of the inflated Reliant balloon created a pathway that enabled the Benson wire to cross the lesion. The Reliant balloon was then removed, and a marker pigtail catheter was advanced cephalad to the injured segment. Using the marked pigtail to size the IVC, through a 22F sheath, a 32 × 115-mm Talent-covered stent graft (Medtronic, Inc., Santa Rosa, CA) was deployed to cover the injury. Postplacement venogram demonstrated persistent extravasation superior to the stent graft. For that reason, a 34 × 158-mm Talent-covered stent graft was placed cephalad, overlapping the first. Repeat postplacement venography demonstrated complete coverage of the injured segment and a patent IVC.[1] During this operation, the patient received 90-L crystalloid, 6-L albumin, 146 units packed red blood cells, 48 units of fresh frozen plasma, 13 packs of platelets, and 12 units cryoprecipitate.

Her postoperative course was further complicated by respiratory failure requiring prolonged ventilator support, acute renal failure demanding renal replacement therapy, and acute cholecystitis with choledocholithiasis necessitating cholecystostomy tube, and endoscopic retrograde cholangiopancreatography with sphincterotomy. The

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treating physicians at the outside institution proceeded with an interval cholecystectomy and a choledochoduodenostomy. Despite long-term antibiotics, the next year and a half were marked by persistent episodes of polymicrobial infections, secondary to cholangitis and infected IVC stent grafts.

Given the patient's deteriorating course, she was transferred to our institution for further care. It was clear that she needed surgical treatment for both recurrent cholangitis and the infected IVC stent grafts. Preoperative work-up included a repeat CT scan for operative planning that had pathognomonic findings of an infected IVC stent graft (Fig. 1). We chose to stage our operation, and elected to proceed first with a hepaticojejunostomy with the intent of treating the recurrent cholangitis, and allow time for nutritional optimization.

After an 8-week interval, she underwent explantation of the stent grafts. Preoperatively, we placed a left femoral vein central line and a large right internal jugular central line for possibility of venovenous bypass. After an extensive lysis of adhesions, the right lobe of the liver was mobilized to expose the IVC. We identified the right hepatic, middle hepatic, and left hepatic veins and obtained control of the hepatic hilum for possible vascular exclusion of the liver should that have become necessary. Distal control of the IVC was performed as well as exposure of the infrarenal aorta. The dissection was carried cephalad into the IVC until it was clear that the sweep of the duodenum was attached and adherent to the IVC. This was taken down, revealing a large defect in the IVC communicating with a large defect in the duodenum. This was clearly a duodenal–caval fistula, with the defect in the IVC measuring 5 cm in diameter, with the stent graft visible within it. Proximal and distal control of the IVC was achieved, and the first thoracic stent graft (Fig. 2) was then extracted. The lumbar veins had been oversewn previously. The lumen of the IVC was remarkable for a large amount of chronic appearing thrombus, and this was extracted under direct vision. The indwelling left femoral catheter was exchanged for a 7F sheath, and the Berenstein catheter and a guiding Benson wire were passed into the IVC, and a venogram was performed. This was significant for the second thoracic stent graft (Fig. 2) within the IVC, and showed there was no flow through the stent graft into the atrium. Cephalad to the area where the first stent graft was visualized, careful finger fracture was used to lyse the adhesions within the lumen of the stent graft to avoid further IVC injury from the exposed bare wires, and the entire stent graft was extracted. The cephalad aspect of the stent graft had formed a Web of chronic appearing thrombus or scar tissue that was obstructing or nearly obstructing the lumen. Copious forward and backbleeding and a vein patch angioplasty (Fig. 3) was completed. Given the significant bowel wall edema, the abdomen was kept open. She was extubated on postoperative day 2, and skin closure of the abdomen was completed by postoperative day 12. Pathology of the specimen showed an atheromatous plaque with luminal acute fibrinoinflammatory thrombus that was consistent with infected graft contents with positive cultures for *Escherichia coli*, *Candida albicans*, coagulase negative *Staphylococcus*, and *Enterococcus faecium*. The patient was placed on a 6-week course of intravenous antibiotics and discharged to acute rehabilitation on postoperative day 16. It has been 2 years now, and the patient is home and doing well. She is now followed with annual ultrasound surveillance of the IVC.

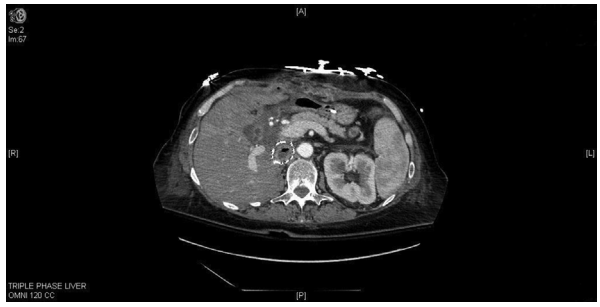

Fig. 1. Computed tomography abdomen: IVC-infected stent graft with chronic thrombus.

DISCUSSION

We presented a complicated case of persistent sepsis that required extensive medical and surgical interventions. We support the off-label use of an IVC stent graft as a definitive intervention for a near-fatal intraoperative hemorrhage. This treatment, although life saving, can introduce significant morbidity. The known risks associated with endovascular stenting include graft infection, stent-graft migration, vascular-enteric fistula, graft occlusion, and endoleaks. Although graft infection is rare, the mortality rate is as high as 25%.[2] Causes of death are usually graft-related sepsis, leaking of the blood vessel, or development of a fistula.[3,4] In our patient, it was clear that the etiology of the stent-graft infection was because of a combination of the biliary drainage procedures and duodenal–caval fistula. Classically, patients with fistulas between the digestive tract and vascular tree have an association of sepsis and digestive tract bleeding.[5] Although 70% of the patients with duodenal–caval fistulas complained of at least one of these signs, only 45% demonstrated both sepsis and bleeding. The risk factors of duodenal–caval fistulas include migrating caval filter, right nephrectomy and radiotherapy, peptic ulcer, foreign body, abdominal injury, and colon cancer.[6] Our patient had a foreign body in the form of an IVC stent graft exposed to bowel wall, which certainly contributed to the fistula development and stent-