WHAT WOULD YOU DO?

Suprarenal AAA With an Angulated Neck and Large Common Iliac Arteries

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PANEL: RICHARD CAMBRIA, MD; TARA M. MASTRACCI, MD, MSc, FRCSC, FACS, FRCS; AND BERNARDO C. MENDES, MD

CASE PRESENTATION

An 80-year-old woman with a 60 pack-year smoking history presents with a 7.4-cm suprarenal abdominal aortic aneurysm with an angulated neck and large common iliac arteries (3.5 cm on the right, 2.5 cm on the left; Figures 1–5). She is active, is not on oxygen at home, and can climb stairs without chest pain or shortness of breath. She has a negative cardiac history and a normal creatinine level. On review of the images, an atrophic right kidney is noted. She has had no prior surgeries.

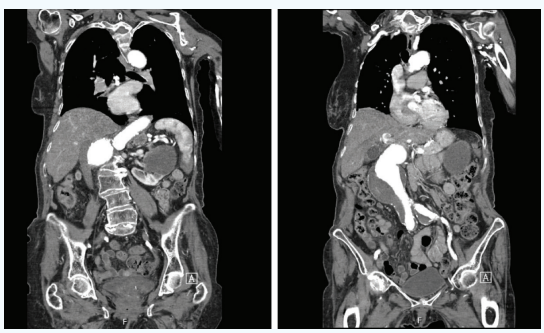

Figure 1. Coronal CT images.

Figure 2. Sagittal CT image.

What would your operative approach be and why?

Dr. Cambria: The chronologic age of the patient is of less importance than the patient's physiologic characteristics. In this age group, the patient's functional status and results of objective cardiac testing are the principal determinants of suitability for open repair; the other important variable in this case is the normal serum creatinine level. Given the extreme angulation to the right side, I would use an anterior approach with a clamp above the left renal artery and would repair the iliac aneurysms as well.

Dr. Mastracci: This is challenging anatomy, but given the patient's smoking history and age, I would consider a complex endovascular repair. With this approach, I would anticipate a landing zone a few centimeters above the celiac artery and plan to preoperatively image the right kidney with angiography with an aim of either preoperatively stenting but more likely performing embolization. The iliac arteries are large, but I believe it would be possible to land above the internal iliac artery on the right, leaving the need for an iliac branch on the left side. Because the patient is a woman, I would counsel the patient regarding potential complications related to iliac access but also address the risks for renal dysfunction and spinal cord ischemia and complications with embolization.

Dr. Mendes: This is an octogenarian patient with an overall acceptable cardiovascular risk and a large,

Figure 3. Axial CT images.

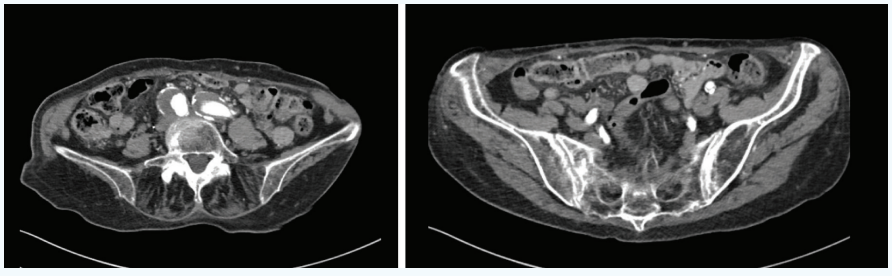

Figure 4. Axial CT images of the pelvis.

complex abdominal aortic aneurysm. The anatomic challenges presented in the figures include a narrow and angulated juxtarenal aorta, single left functioning kidney with a large left accessory renal artery originating from the aneurysmal segment, and bilateral common iliac artery aneurysms. If an endovascular repair is being considered, this anatomy should be carefully analyzed using centerline-of-flow imaging to determine the ideal proximal landing zone. Based on the figures, the aorta at the level of the celiac axis and superior mesenteric artery (SMA) is not aneurysmal; however, it is not normal, with significantly irregular walls and thrombus, and would not be a suitable landing zone. For those reasons, my recommendation would be to repair this complex aneurysm with a patient-specific fenestrated/branched stent graft designed with two sealing stents above the celiac axis, two preloaded large fenestrations for the celiac axis and SMA, one small reinforced fenestration for the single left renal artery, and one directional branch for the left accessory renal artery, if it proves to be larger than 3 mm. The right renal artery seems to be occluded in the CTA, but I would confirm that with a preoperative renal angiogram.

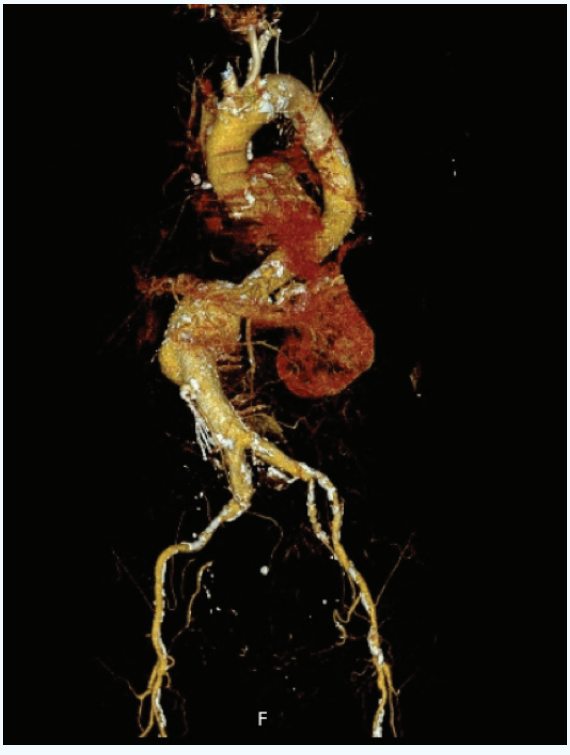

Figure 5. Three-dimensional reconstruction image.

I would anticipate the main left renal artery to be the most challenging of the target vessels due to the narrow aortic diameter at that level and the orientation of the vessel as it originates in an anterior aspect in the aorta. A single- or double-diameter–reducing tie would be paramount to facilitate this step of the procedure, increasing the room for maneuverability in this narrow aortic segment. The directional branch would be my choice for the accessory renal artery because it originates

from an aneurysmal segment of the aorta, in which case directional branches are favored over fenestrations.

Finally, I would always attempt preservation of both internal iliac arteries when a long segment of aorta is covered, which may be feasible by using a flared iliac limb on the right side (if the distal landing zone proves to be appropriately long on centerline imaging) and an iliac branch endoprosthesis on the left side (due to an apparently short distal landing zone), although the specific diameters and lengths should be evaluated. If access is adequate, I would perform this procedure through a bilateral percutaneous femoral approach and use a right brachial surgical approach for the directional branch and the celiac and SMA fenestrations.

If your operative approach was influenced by the fact that the patient is of advanced age, what would your approach have been if the patient was age 55 years and why?

Dr. Mendes: In a young patient with acceptable perioperative cardiovascular risk and complex anatomy, my approach would be more directed toward open surgical repair. Based on the figures, the patient has a thin body habitus, which would be helpful for exposure of the visceral segment of the aorta. Depending if the patient has a narrow or wide costal margin, the exposure could be preferentially performed through a wide midline laparotomy, which would provide adequate exposure for both proximal and distal anastomoses; if the patient has a narrow costal margin, the incision can be extended toward the left costal margin to assist with exposure of the visceral and supraceliac segments of the aorta. Repair through a left retroperitoneal incision would be challenging due to the aneurysm angulation toward the right side. Additionally, repair of the right common iliac aneurysm would be very difficult.

Angulated necks combined with large aneurysms, such as in this patient, often pose challenges for dissection of the juxtarenal aorta. Depending on the size and quality of the suprarenal and supramesenteric aorta, it seems feasible to place the aortic clamp immediately proximal to the left renal artery and perform the proximal anastomosis at the level of that vessel, which I would reinforce with a felt strip given the morphology of the aorta at that level. The main body of the graft would be cut a few centimeters longer in this case to 4 to 5 cm, considering the young age and possible progression of proximal aortic disease, in which case there would be a distal landing zone for a fenestrated stent graft if this is ultimately necessary in the future. For that reason, I would reimplant the left accessory renal artery in the cephalad aspect of the aortic graft. Finally, I would complete the repair by carrying a bifurcated graft to the level of the internal iliac origins bilaterally, which should both be preserved.

Dr. Cambria: My approach would be the same as previously mentioned because the chronologic age of the patient is not as important in determining the approach to repair as the physiologic characteristics.

Dr. Mastracci: In a younger patient, I would be far more likely to consider open surgery. This would require a workup that is more specific than I previously described. I would want to assess for structural heart disease and determine whether pulmonary rehabilitation, smoking cessation, and structured exercise might improve function prior to surgery. My rationale for considering open surgery in a younger person is twofold: first, the durability may be higher in such angulated anatomy, and second, the presence of such a large aneurysm at a young age would give some concern for an undiagnosed connective tissue disorder.

If the patient had a colostomy in the left lower quadrant from a sigmoid colectomy, what would your operative approach be?

Dr. Mastracci: The presence of a colostomy would not influence my approach in this patient, even if the patient were younger. However, it may increase my sensitivity to inform that patient that an endovascular approach may have a slightly higher risk of bowel ischemia because of the large inferior mesenteric artery.

Dr. Cambria: My approach to repair would not change. I would still use an anterior approach with a clamp above the left renal artery as well as repair the iliac aneurysms. A left lower quadrant colostomy would not interfere with my previously described surgical approach.

Dr. Mendes: This scenario would not change my original preference of repairing this aneurysm with a fenestrated/branched stent graft as specified in the first question. In fact, generally speaking, I tend to consider the presence of a colostomy as a relative contraindication for open aortic aneurysm repair. For an open exposure, a midline laparotomy can still be performed as specified in the second question; however, the left iliac dissection and anastomosis would potentially be more technically challenging due to a more limited exposure, but in general, this is still feasible.

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APPROACH OF THE MODERATOR

First, I want to thank all of the experts in this case scenario; the case plans were sophisticated, well thought out, and borne out of leaders in our field. The patient's angulated anatomy and accessory left renal and bilateral iliac artery aneurysms gave pause for a complex endovascular approach. Although the patient was 80 years old, her cardiac testing revealed that she was a suitable candidate for open repair. The retroperitoneal approach would not have been ideal in this situation, as alluded to, given the cant of the aorta to the right of the abdomen. In addition, repair of the right common iliac artery aneurysm would have been challenging from the retroperitoneal approach. As such, a midline laparotomy was used to perform repair of the aortic aneurysm and both common iliac arteries. ■

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