The role of minimally invasive surgery in the management of central vascular pathology

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EVAR(Endovascular treatment of abdominal aortic aneurysms)

- aneurysmal disease can affect any segment of the aorta, from the aortic root to the aortic bifurcation

- Aortic disease is the direct cause of close to 10 000 deaths annually in the United States. The goal of aortic aneurysm repair is to prevent the high morbidity and mortality associated with aneurysm rupture.

- Open
- endovascular

Endovascular Repair

- Successful EVAR excludes an aneurysm from blood flow through placement of a bifurcated stent graft, most commonly introduced through the femoral arteries

- Successful treatment requires precise preoperative measuring techniques, as well as extensive knowledge of vascular access techniques,stent graft deployment techniques and troubleshooting, the appropriate use of adjunctive procedures when warranted, and the management of intraoperative troublshooting and complications, including endoleaks

- Diameter and length measurements can be made from CTA, and if the anatomy appears uncomplicated and there is no clinical suspicion of associated occlusive disease, it may be reasonable to proceed

- Before the endovascular era, operative mortality following AAA repair was ≈5%. After the adoption of EVAR, overall AAA repair operative mortality fell to 2.4% in 2008.

Table 2. Patient Factors Favoring Endovascular or Open AAA Repair

Favors Open Repair	Favors EVAR
Younger patient	Older patient
Few medical comorbidities	Multiple medical comorbidities
Connective tissue disorder	Prior aortic surgery
Anatomy not favorable for EVAR	Prior abdominal surgery

AAA indicates abdominal aortic aneurysm; and EVAR, endovascular AAA repair.

- Sac exclusion is dependent on adequate proximal and distal seal between the graft fabric and the vessel wall.

Arterial Access

- When EVAR was first introduced, femoral artery access was obtained through surgical cutdown. However, advances in percutaneous arterial closure devices have facilitated percutaneous EVAR, and bilateral percutaneous access is now used for most cases

Infrarenal aneurysm

- For infrarenal AAAs, the proximal seal zone is the aneurysm neck—healthy aorta distal to the lowest renal artery and proximal to the start of an aneurysm. The distal seal zone is most commonly in the common iliac arteries (CIA).

Endovascular Repair of Common Iliac Artery Aneurysms

- Treatment of concomitant aortoiliac aneurysmal disease has been
- preferentially endovascular since the advent of later-generation
- bifurcated AAA grafts. Continued advancement of these
- technologies has shifted isolated IAA management to an
- endovascular-first approach as well

IBD(iliac branch device)

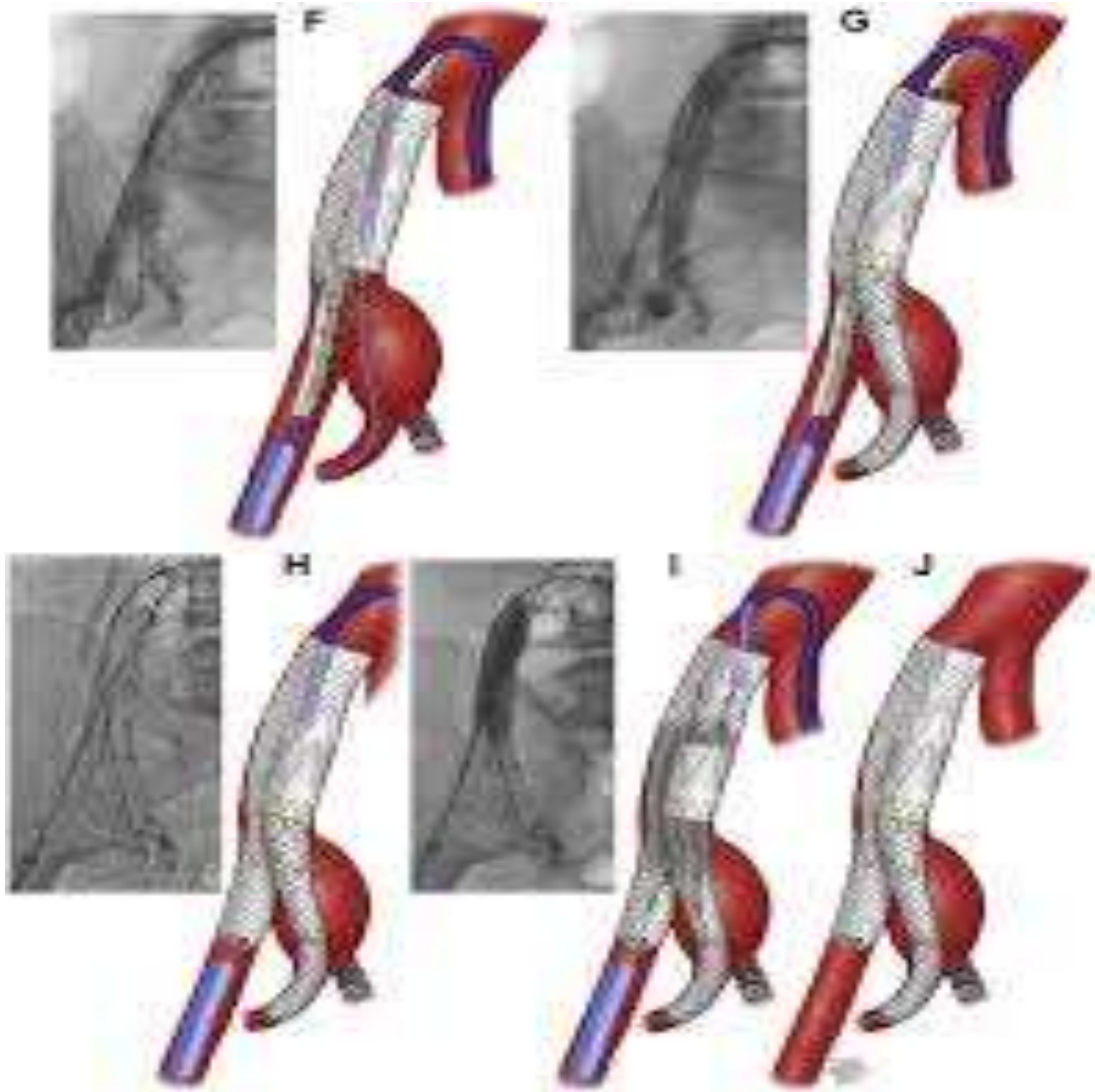
- Infrarenal devices are designed to seal distally in the CIAs. However, aneurysmal CIAs pose a technical challenge by preventing adequate distal seal

- Surgeons have overcome this obstacle with 2 techniques: internal iliac artery (IIA) embolization and branched iliac devices.

- Endovascular IAA management reduces length of hospitalization, operative blood loss, the need for invasive monitoring and intensive care unit care postoperatively, and perioperative complications

- IIA embolization, performed before or concomitantly with EVAR, facilitates extension of the iliac seal zone into the external iliac artery

- The Gore Iliac Branch Endoprosthesis (Gore Medical, Flagstaff, AZ) preserves the IIA in patients with aneurysmal CIAs via a branched iliac component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Rupture aneurysm

- EVAR has become the preferred method of therapy for RAAA repair for those with suitable anatomy

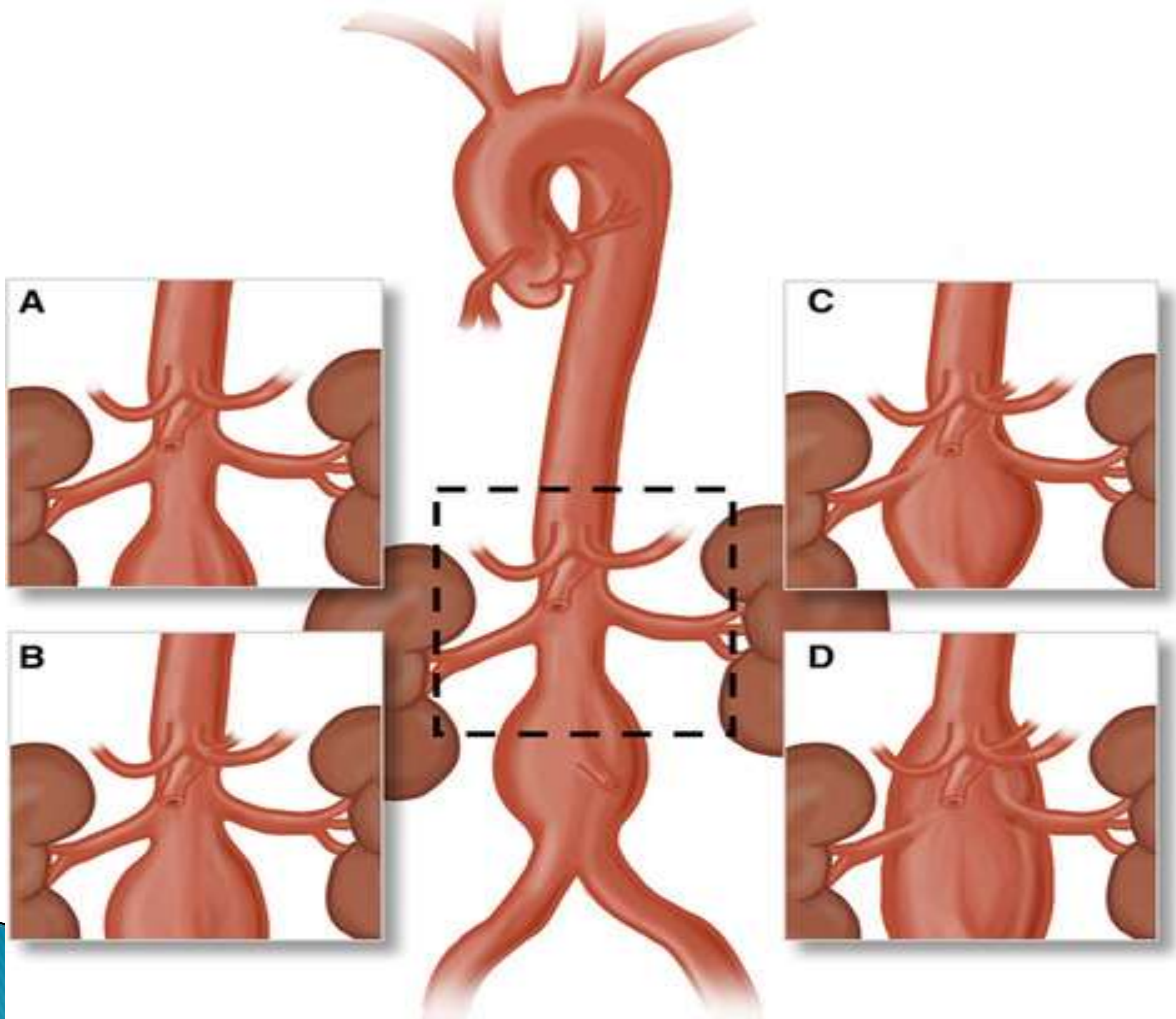
Complex AAAs

- Complex AAAs (CAAA), comprised of juxtarenal AAAs—aneurysms that extend to level of the renal arteries, and suprarenal AAAs—aneurysms that extend above the renal arteries, comprise at least 15% of AAAs requiring treatment.

F/BEVAR

- The goal of fenestrated and branched endovascular aneurysm repair (F/BEVAR) is to reduce the morbidity and mortality associated with complex aortic pathology

- First described in 1999, F/BEVAR has been reported to treat juxtarenal, paravisceral, thoracoabdominal, and arch aneurysms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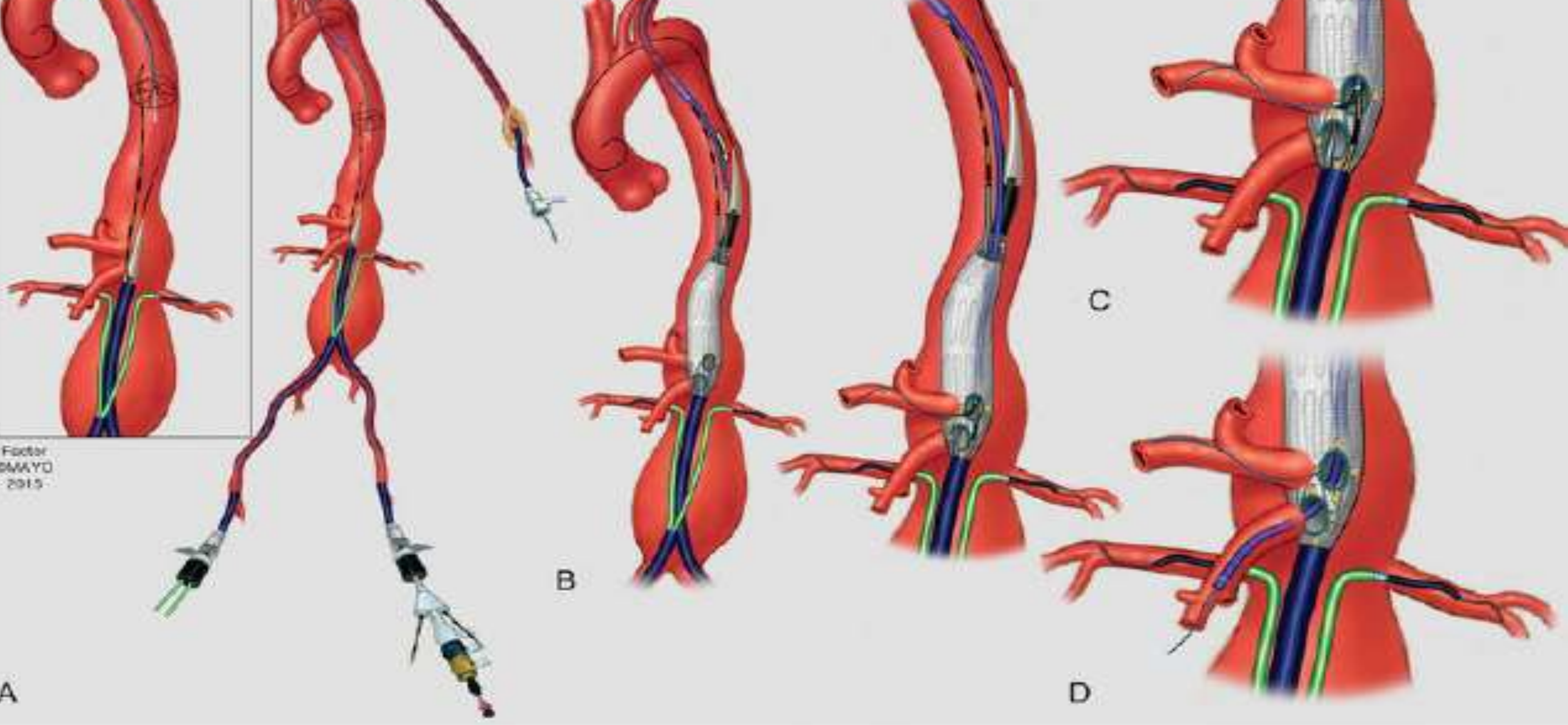


FIGURE 80.5 Demonstration of the Use of Preloaded Catheters During Fenestrated and Branched Endovascular Aortic Aneurysm Repair. Preloaded catheters are loaded through the graft and ipsilateral device delivery system in the left groin and emerge through the top of the endograft. The catheters are snared from a left axillary approach (A). After unsheathing of the proximal endograft, catheters and sheaths can be advanced from the axillary artery over wires placed through the preloaded sheaths, which have been threaded through the fenestrations for the celiac artery and superior mesenteric artery (B). After sheaths have been advanced from above through the graft fenestrations, wire and catheter selection of the branch arteries is performed (C). Sheaths are subsequently advanced over wires through the graft fenestrations and into the branch

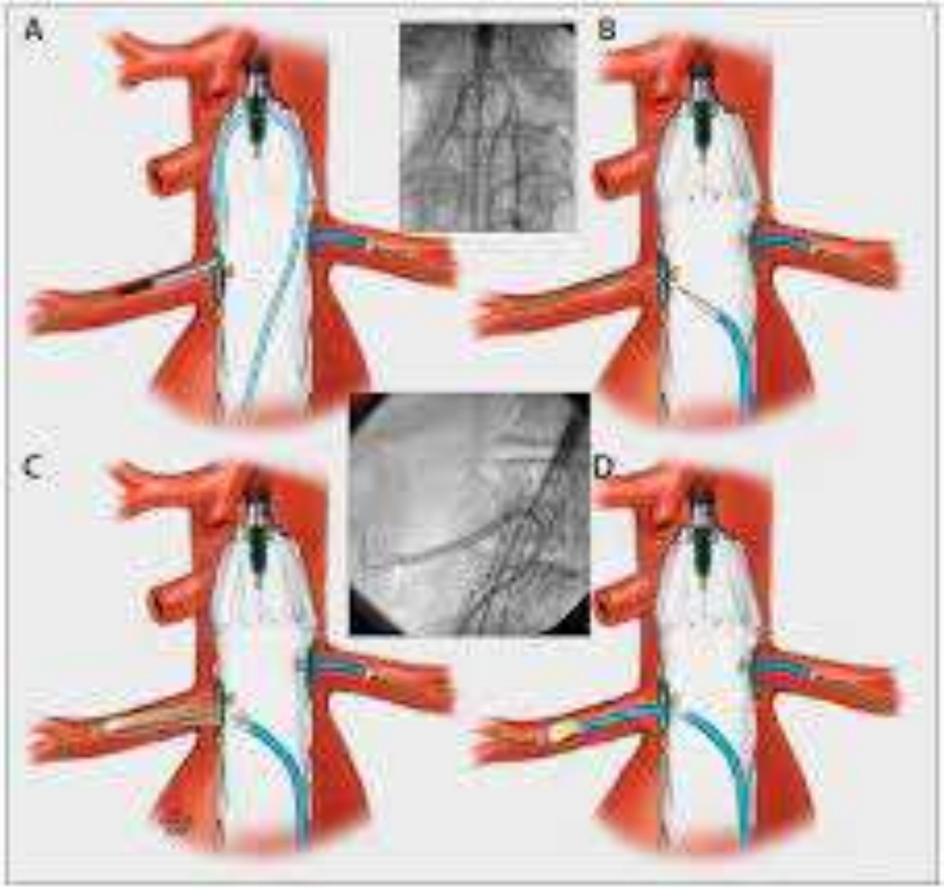
- When considering an endovascular approach, these aneurysms cannot be repaired with standard EVAR because of lack of an infrarenal neck

- Until the past 2 decades, open repair was the only treatment option for CAAA.

- Renal complications are especially common after open CAAA repair as these procedures require suprarenal clamping and occasionally renal artery reconstruction, with postoperative rates of AKI as high as 39%, and new onset dialysis occurring in 3% to 4% of patients

FEVAR

- A Fenestrated Endovascular Aortic Repair, or FEVAR, is a common option for the repair of an aortic aneurysm that is close to, or involving the renal arteries.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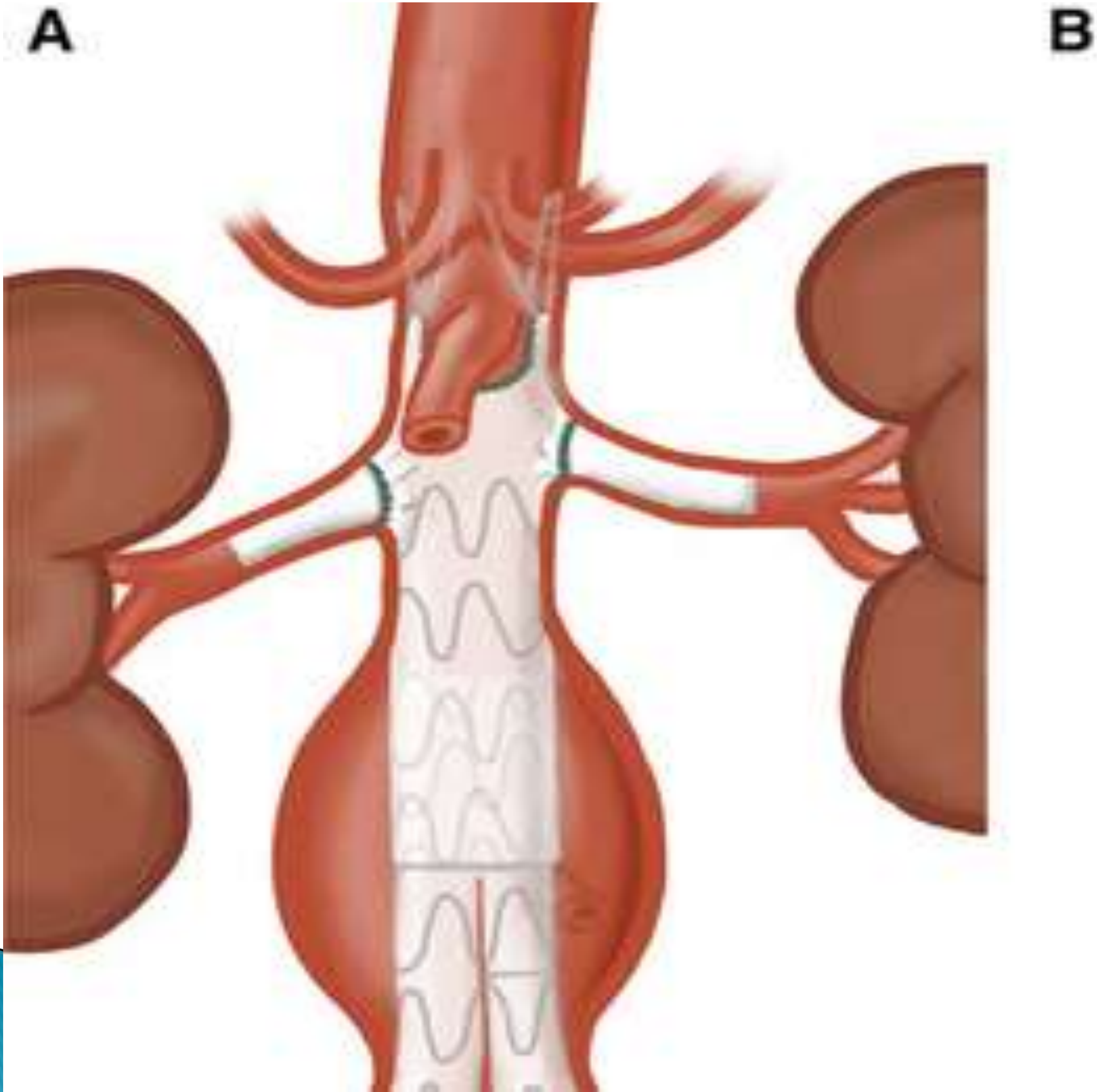
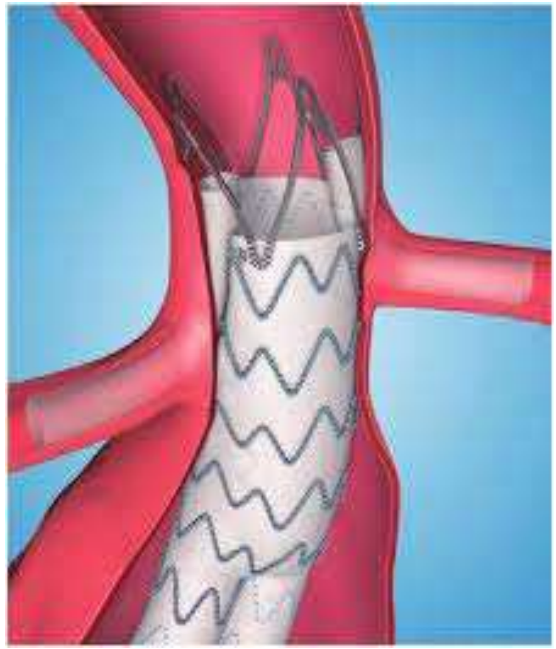


- Stent grafts can be placed through these fenestrations, preserving flow to the target vessel and preventing flow into the aneurysm sac

- Chimney/snorkel EVAR uses a standard EVAR device and extends the seal zone cranially with additional stent grafts placed parallel to the main device, maintaining flow to the target vessels. Like FEVAR, this technique can be performed with high technical success and low-perioperative morbidity and mortality, with pooled 30-day mortality of 3% to 4%



- This device is indicated for juxtarenal AAA and incorporates up to 3 visceralls. The device is custom made for a patient’s anatomy and requires 6 weeks for manufacturing and delivery.

- Use of this device for elective juxtarenal AAA repair is associated with high technical success, low-perioperative morbidity and mortality, and excellent long-term target vessel patency.

Thoracic Aortic Aneurysms

- Thoracic aortic aneurysms (TAA) include aneurysms of the root and ascending aorta, the aortic arch, and the descending aorta, with some aneurysms involving multiple segments

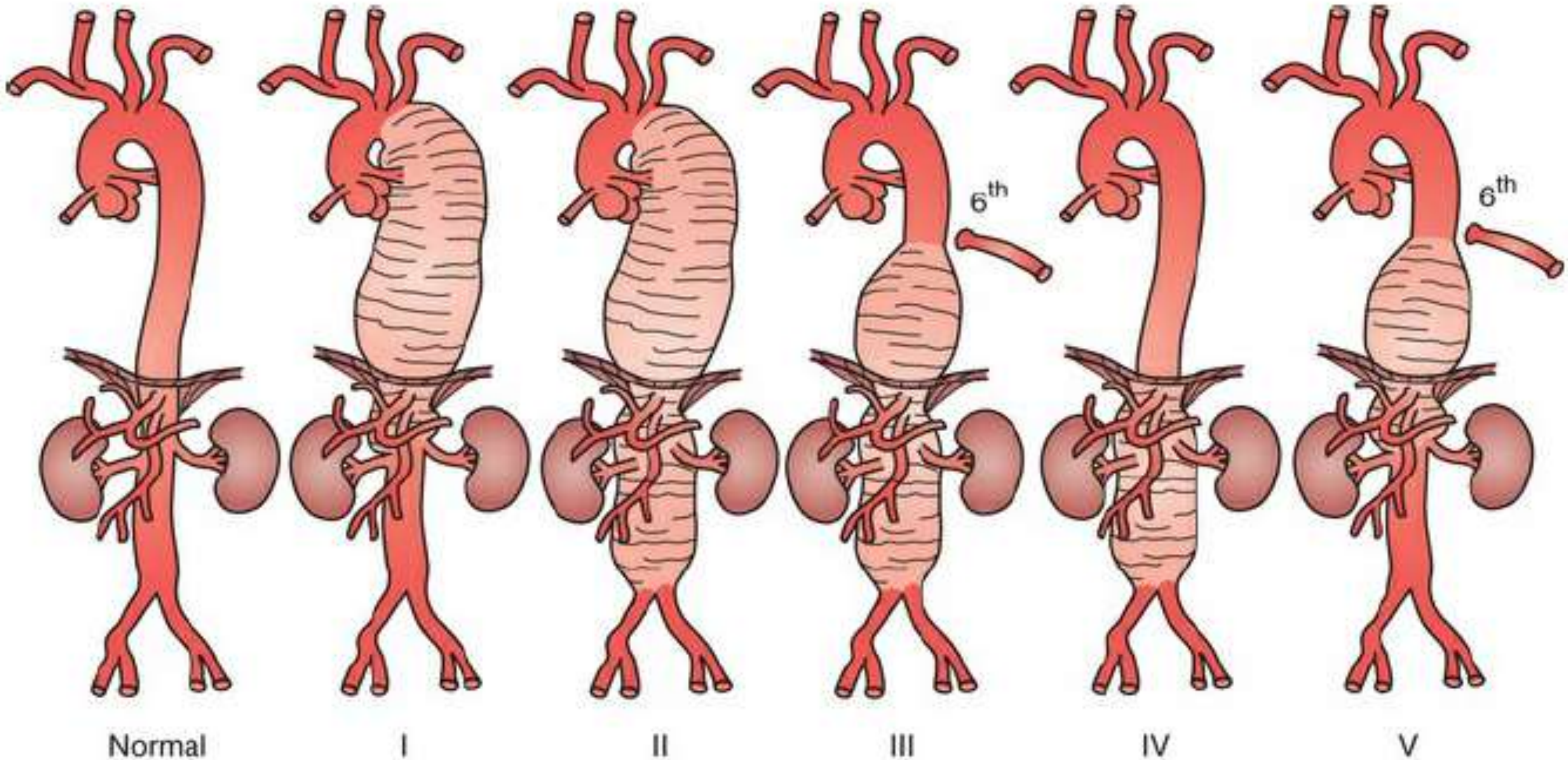
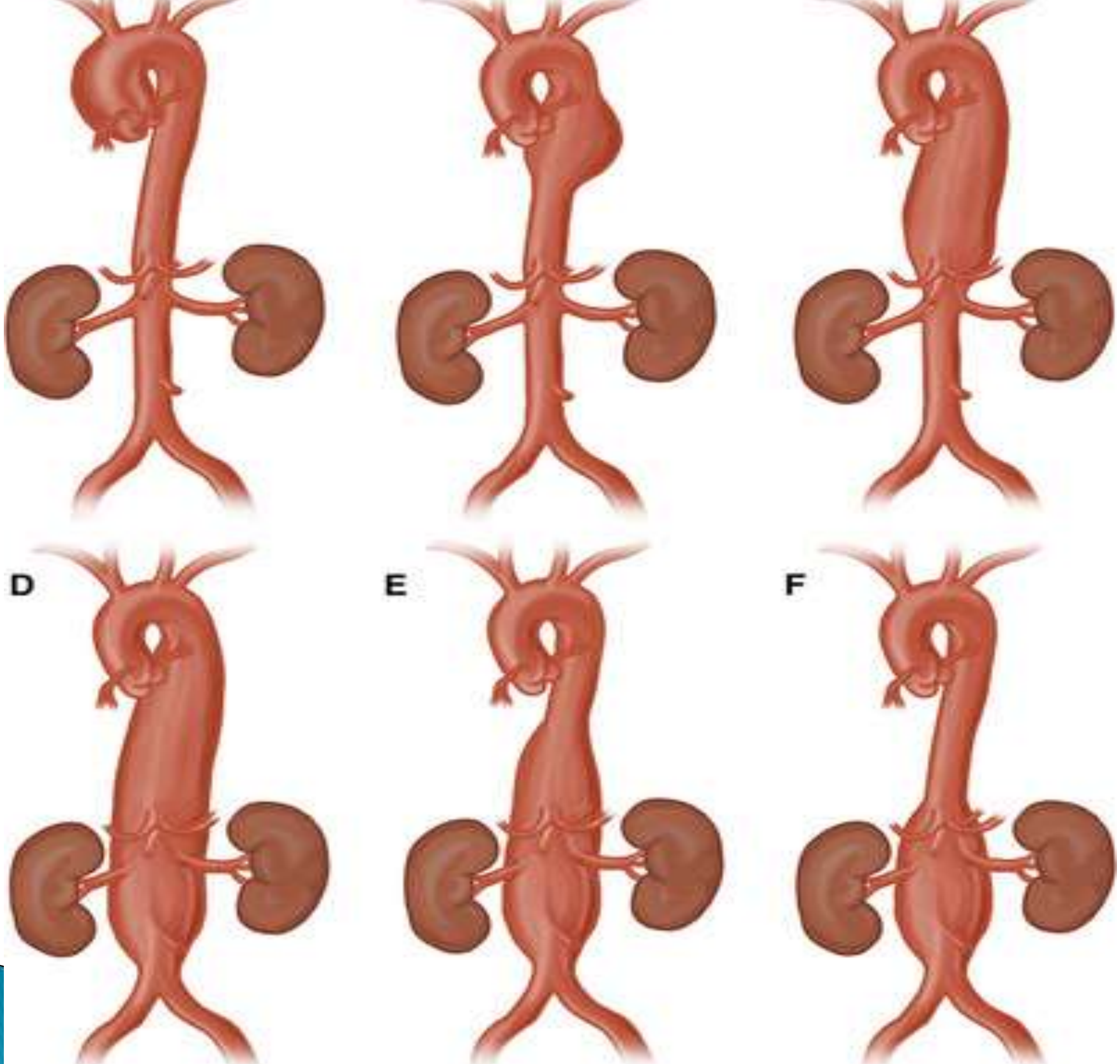


FIGURE 76.5 Crawford classification of thoracoabdominal aortic aneurysms. Type I, distal to the left subclavian artery to above the renal arteries. Type II, distal to the left subclavian artery to below the renal arteries. Type III, from the sixth intercostal space to the renal arteries. Type IV, entire abdominal aorta. Type V, below the sixth intercostal space to just above the renal arteries.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- The American College of Cardiology and American Heart Association guidelines recommend surgical repair of asymptomatic aneurysms of the ascending aorta and the aortic arch with maximum diameter $\geq$5.5 cm. For DTAAs, these guidelines recommend repair if the maximum diameter is $\geq$5.5 cm for endovascular repair or if the maximum diameter is $\geq$6.0 cm when open repair is required.

- TEVAR was associated with lower rate of perioperative morbidity complications.

TEVAR Repair

- The principles of TEVAR are similar to those of EVAR—successful repair depends on proximal and distal seal.

- The proximal seal zone is normal caliber descending thoracic aorta distal to the left subclavian artery (LSA). The distal seal zone of an isolated DTAA is normal caliber distal thoracic aorta or supraceliac abdominal aorta

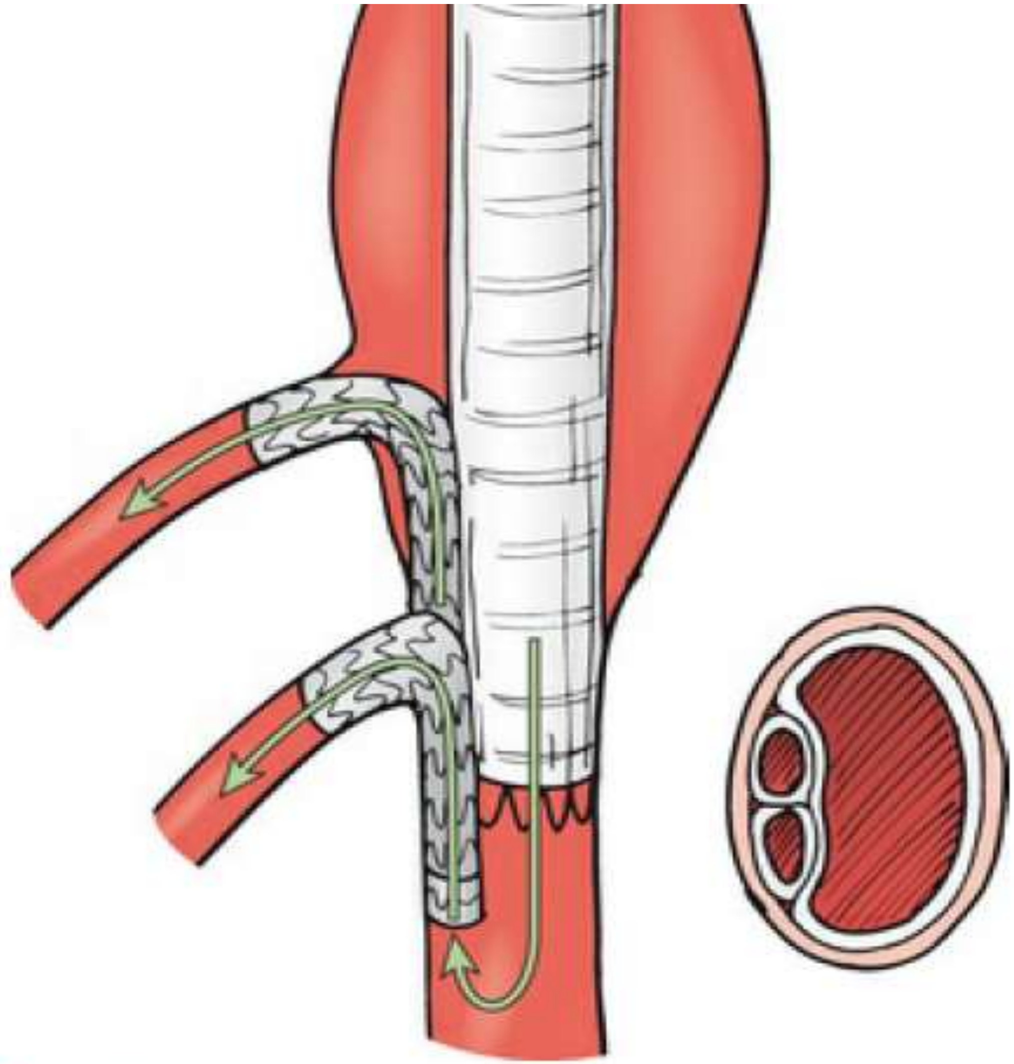


FIGURE 78.10 Thoracic aortic endovascular repair with downward periscope graft in the celiac artery and superior mesenteric artery.

- As indicated previously, in the modern era, aneurysms confined to the DTA are usually treated with endografts if suitable landing zones are present or can be created

- TEVAR is generally performed with one or more tube stent grafts and choice of device depends on anatomic characteristics and surgeon/institution experience and preference.

T-Branch

- For thorachoabdomial aorta anuerysm

5. The t-Branch multibranched stent graft is design
r directional branches for the celiac axis, SMA, and
nal arteries. The operation is performed using bilat
and left brachial access (A). One of the target vess
terized (B) to guide deployment of the multibranch
aft (C). The distal bifurcated device and iliac limbs
and flow is restored to the lower limbs (D).

- Currently approved thoracic stent grafts require ≥20 mm proximal seal zone, however, the proximal aneurysm extent encroaches within 20 mm of the LSA in up to 40% of cases. In these cases, coverage of the LSA is necessary to provide adequate proximal seal.

- Three treatment options exist for these patients: LSA coverage without revascularization, LSA coverage with open revascularization, and LSA coverage with endovascular revascularization

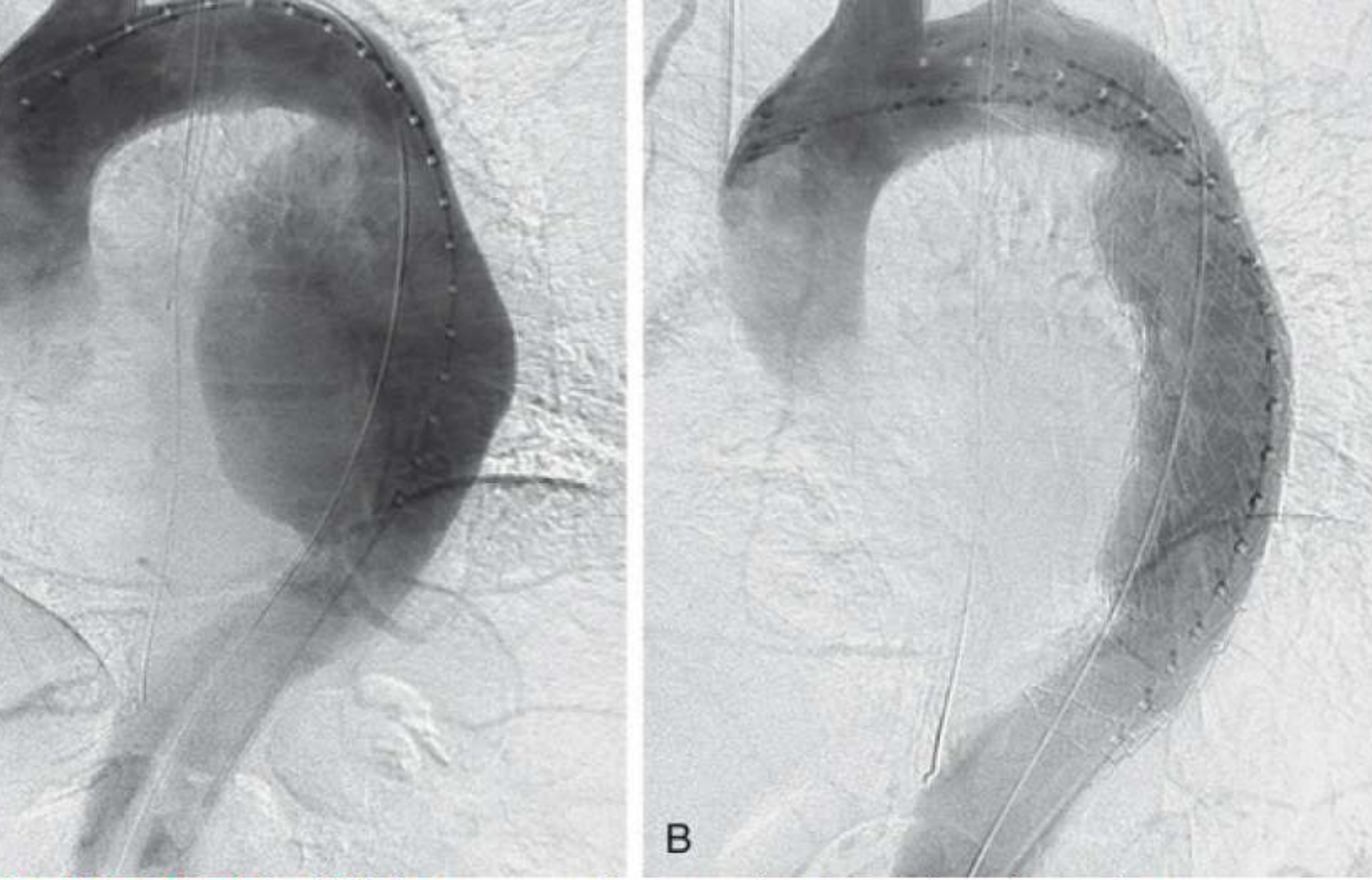
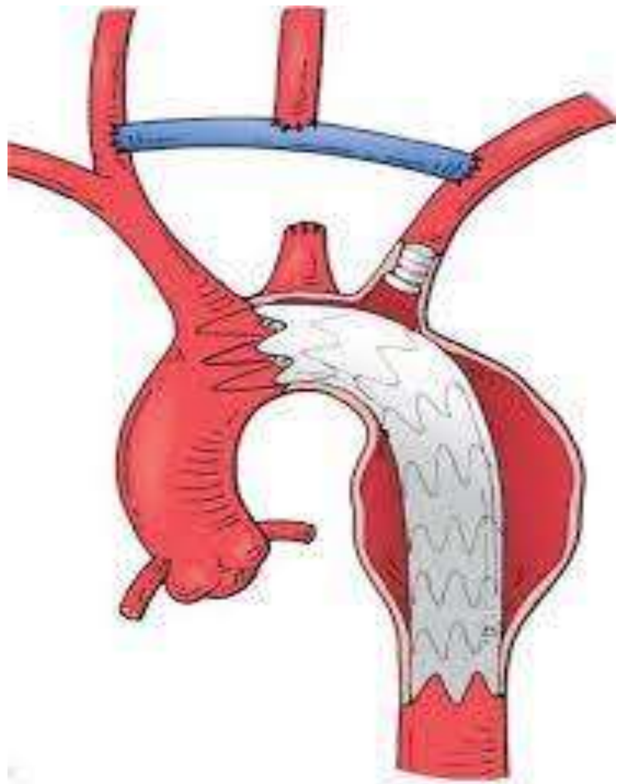


FIGURE 78.11 **(A)** Intraoperative angiogram showing a large fusiform descending thoracic arotic aneurysm. **(B)** Two TAG stent grafts are deployed to exclude the aneurysm.

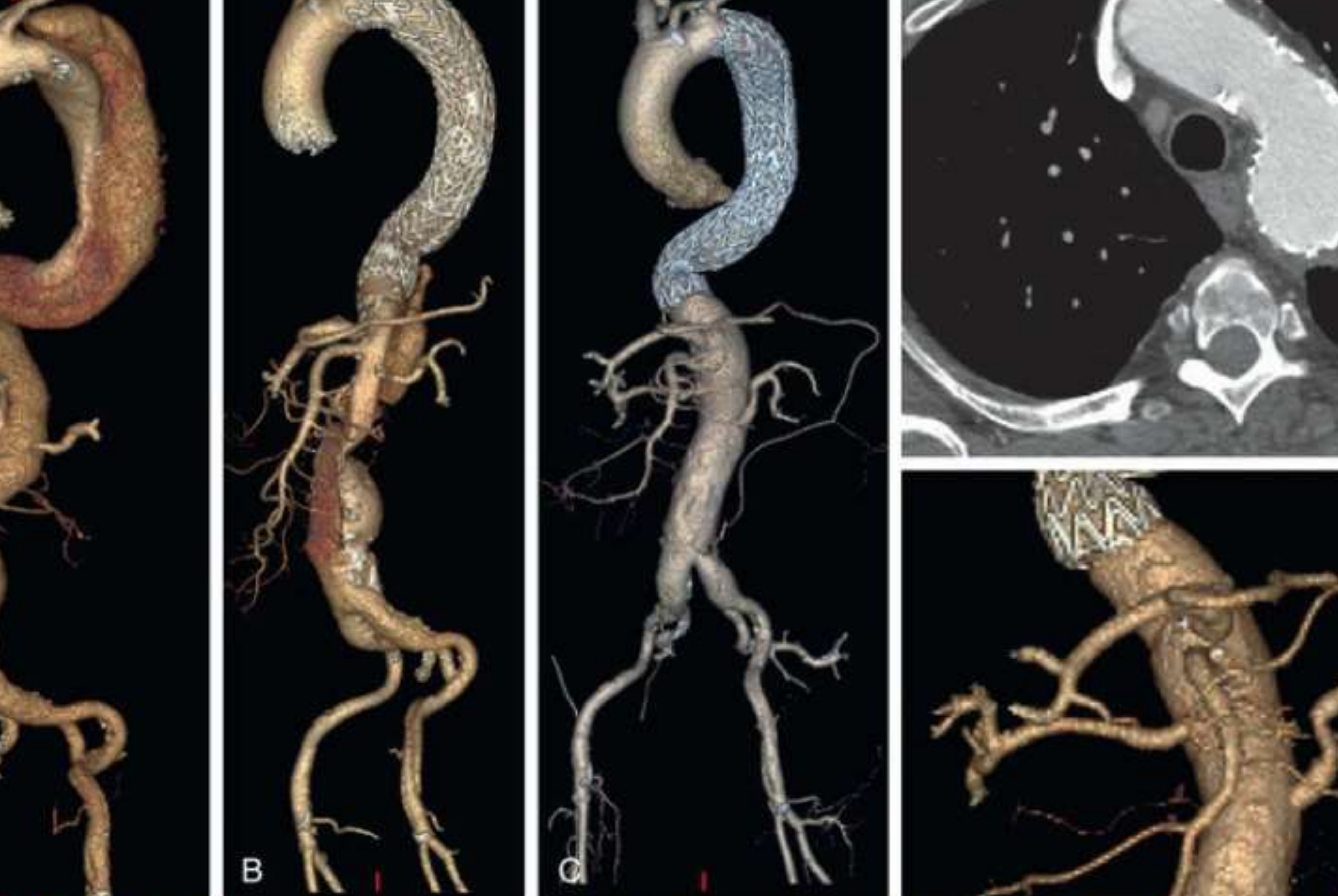
- The Society for Vascular Surgery guidelines recommend prophylactic preoperative LSA revascularization in patients undergoing elective TEVAR with anticipated LSA coverage.



- multiple techniques for endovascular LSA revascularization have been described: LSA chimney graft, in situ laser fenestration of the TEVAR device, and use of a physician–modified fenestrated device.

Aorta dissection

- In aortic dissection, TEVAR may greatly simplify treatment in patients who eventually need surgical repair by converting a Crawford type 2 repair to a type 4 repair



GURE 77.13 (A) An example of complete treatment of a
pidly expanding type B aortic dissection with (B) TEVAR

- Recent trials report a 30-day mortality of 1% to 2%, which is significantly less than the 7% mortality of open surgical repair

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