Abdominal Aortic Aneurysms

These aneurysms can be approached through trans-peritoneal and retroperitoneal incisions. Retroperitoneal approach requires 45 degree R lateral decubitus positioning but hips should remain as flat as possible. Arm is supported across the chest.

Repair inevitably requires aortic cross-clamping; most of the time it can be done infrarenally. If suprarenal clamping is needed, fluid loading and manitol may be given prior to renal arterial flow interruption. Proximal anastomosis takes anywhere between 15 min to 45 min to complete depending on how complex a restoration is required. Kidney can tolerate up to 1 hour of warm ischemia time. With suprarenal clamping, pressure will go up, but not as significantly as with supraceliac clamping.

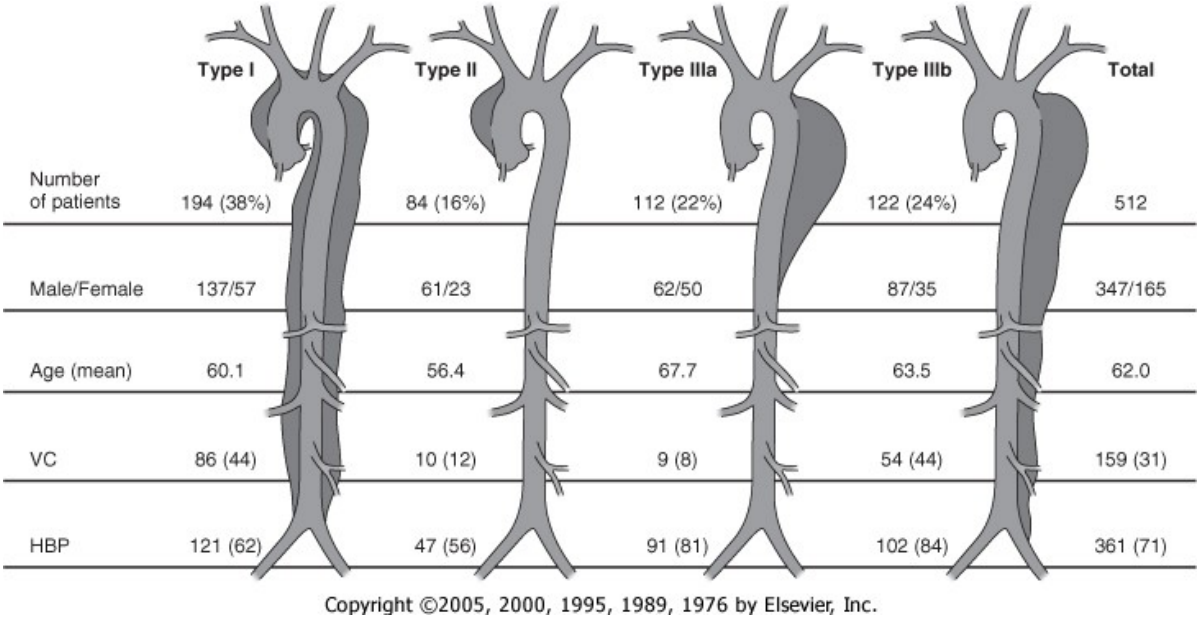
Prior to completion of distal anastomosis, a surgeon should give a 5 minute warning prior to unclamping. Blood pressure drop can be somewhat offset by step wise unclamping as well as in cases where bifurcated graft is used - each limb is reperfused sequentially. It is important to have patient adequately fluid loaded prior to unclamping as hypotension may be profound.

Some surgeons do not reverse heparin after completion of the repair, whereas others make it a routine practice, so it does not hurt to ask. Fresh frozen plasma is generally not required unless there has been a substantial blood loss (in excess of 2 litres). In those cases, the need for FFP as well as platelets may be discussed with the surgeon. In cases of massive blood loss, a case for 1:1 replacement with PRBC and FFP can be made in an attempt to improve coagulopathy associated with massive transfusions.

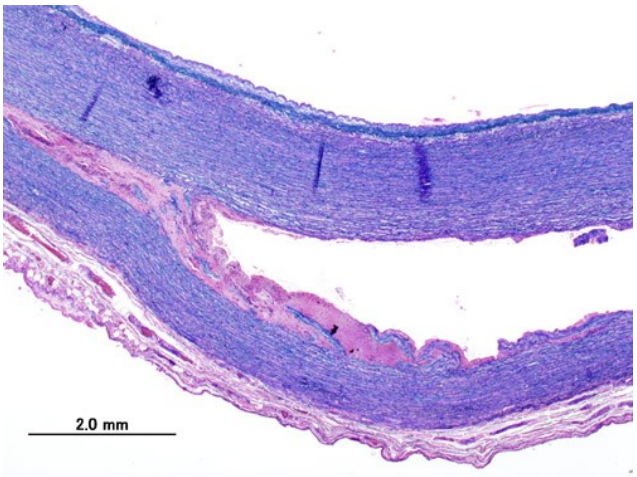
Endovascular approach greatly improved safety of AAA repair and absolute reduction in mortality can be between 2-8% compared to open repair. EVAR can be carried out under local and regional anaesthesia. There is no clamping (except temporary occlusion with the balloon at the end when ironing out the graft). If done under sedation, patient should be awake enough to be able to follow commands with regard to breath holding.

Thoracic Dissections

There two way to classify a dissection. ***S***imple one (***S***tanford) breaks it down into Ascending (A) and the Descending/Ascending & Descending combinations (B). Difficult one (Debakey) is as following:



For type B, origin is usually in the descending aorta and intima is torn away from the media as the rip travels down. Two luminae are created, false (expanded) and true (collapsed).



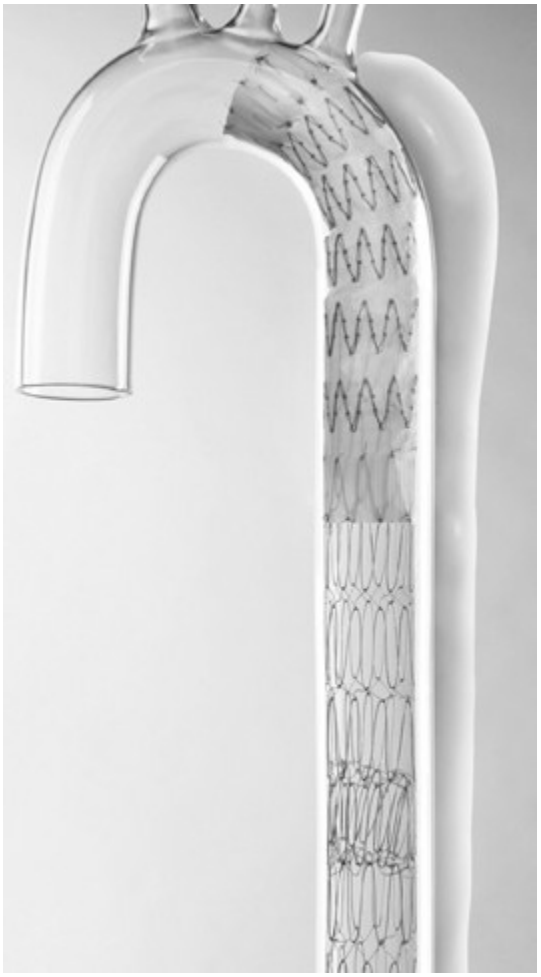
Ascending dissection is managed by cardiac surgeon - go to OR for aortic root reconstruction surgery. However, if there is concomitant mesenteric ischemia – it will need to be fixed first as.

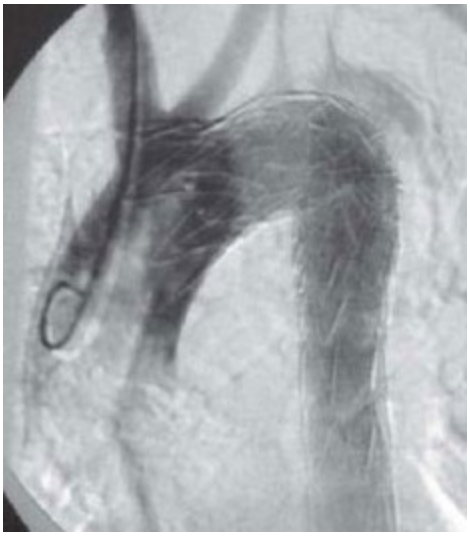
Most of Type B is managed medically with impulse reduction therapy. Role of surgical management is limited to 3 situations:
1. acutely expanding aneurysm
2. ruptured aneurysm
2. visceral arterial occlusion leading to mesenteric or renal ischemia.

Goal of surgery is to create a passage between two luminae equalizing them. Open surgical approach involves replacement of infrarenal aorta with a tube graft plus fenestration and tacking of the flap of intima in the visceral portion of the abdominal aorta - to decompress renal and visceral vessel orifices. Exposure requires either Left Retroperitoneal approach, or thoracoabdominal approach. Overall, this operation is done very infrequently.

Aortic wall is extremely friable, mortality of open repair is high, hence minimally invasive options for type B - and hybrids (debranching, thus, staying away from friable aorta followed by stenting) are getting more limelight.

With endovascular approach, the most common goal of management is to deploy stent over the origin of the dissection and cover the false lumen. This reconstitutes flow to the true lumen and averts visceral ischemia. Occasionally, this is not sufficient, and either individual renal/visceral orifice stenting is needed, or endovascular fenestration - division of the partition between false and true lumen is required.

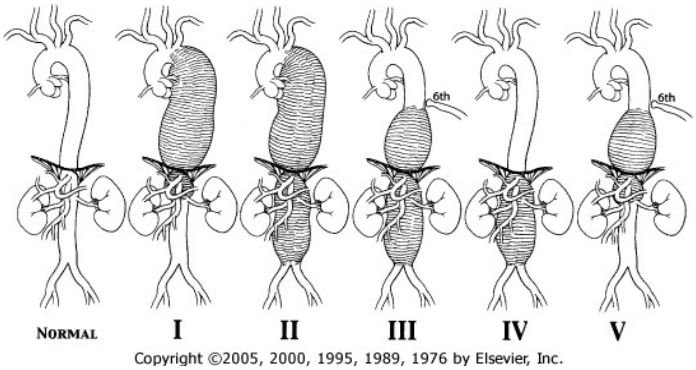




Thoracic Dissections - Issues pertinent to anesthesia:

1. Possible massive bleeding and acidosis. This is particularly an issue with Type A dissections where profound 18-degree C hypothermia is required. Monitor esophageal/bladder (core temp) and tympanic temp (brain temp).
2. Supraceliac clamp time leading to hepatic ischemia (coagulopathy), mesenteric, and renal ischemia.
3. Injury to n. vagus and recurrent laryngeal nerve with proximal clamping
4. Spinal ischemia if clamping and repair above T9 is required – use spinal drain, keep MAP up, drain for 3 days and keep spinal fluid pressure under 10 cc water.
5. Use of TEE may help to visualize the origin of the flap, as well as assess success of endovascular management of the dissection (check for flow in lumen).
6. Prolonged supraceliac clamp (>60 min) translates to cardiac dysfunction, hepatic dysfunction (coagulopathy), electrolyte imbalance and renal ischemia. Therefore, aim to keep patient warm, replace coagulation deficits with FFP/PRBC 1:1 ratio. In preparation for a supraceliac clamp consider giving manitol and judicious fluid loading. If repair of thoracic aorta is planned, place a spinal drain.
7. Also, during stent deployment, a period of controlled hypotension (60-70 mm Hg systolic BP) may be requested by the surgeon. This is needed for precise position of the stent distal to the L subclavian artery. Occasionally, L carotid subclavian bypass precedes stenting if origin is too close to LSA. TEE is useful in orchestrating deployment over the thoracic portion of the graft. Controlled hypotension can be achieved by rapid ventricular pacing or pharmacologically.
8. Contrast load is anticipated hence bicarbonate/D5W bolus is given if renal function is borderline. Sodium bicarbonate usefulness in ischemia-related nephropathy had been questioned. Meta-analysis show benefit for dye-contrast related nephropathy only.

Thoracoabdominal Aneurysms



These can be approached through traditional open or hybrid (with stenting) approaches. No definitive mortality advantage has been demonstrated for either approach, even though hybrid debranching intuitively seems less morbid compared to open approach.

Exposure for open approach requires thoracoabdominal approach, unless it is type 4, which can be done through L retroperitoneal approach.

All of these require supraceliac clamping and re-implantation of the visceral and, sometimes, intercostal vessels.

Start fluid loading shortly before unclamping.

Normothermia, spinal protection (spinal drain, keeping MAP high), timely coagulation abnormality correction are essential. Cross clamping may be prolonged; hence cardiac bypass is often required. Some utilize visceral cooling (15 degrees Celsius for kidney) and visceral organ shunting. Shunting has been shown to improve liver function, but no definitive effect on renal ischemia has been demonstrated.

Debranching involves two-stage approach. At first operation, no aortic cross-clamping is needed. All visceral vessels are bypassed off iliac arteries. In the second operation, long stent is deployed over the diseased portion of the aorta. This may require spinal protection (MAP high, drain) and controlled hypotension during proximal deployment.

Peripheral Vascular Disease

Very few hemodynamic disturbances as no central clamping are required.

Issues:
1. prolonged course - hypothermia
2. underlying CAD and decreased functional activity, cardiac ischemia. Consider judicious beta-blockade initiation while avoiding hypotension and anemia. Statin therapy has been argued to improve perioperative outcomes.
3. choice of regional vs general: some studies suggest advantages to regional anesthesia, others don't, so it is difficult to make a recommendation here. Postoperative pain control may be better with epidural and this should be discussed with the patient and the surgeon.

Preoperative intervention for borderline abnormal nuclear imaging has been question by two large RCT - CAPRI (CABGE before surgery) and COURAGE (PCI preop).

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References:

1. Vascular Surgery, 6th edition, Rutherford
2. Anesthesiologist's Manual to Surgical Procedures, 3rd edition, R. Jaffe