1

The elective repair of an abdominal aortic aneurysm

1 What are the indications for the elective repair of an abdominal aortic aneurysm (AAA)?

According to the UK Small Aneurysm Trial the repair of asymptomatic infrarenal aneurysms between 4 and 5.5 cm in size proved to be of no survival benefit when compared to patients who just had regular ultrasound scans.

Therefore an AAA should be repaired if:

- The aneurysm is symptomatic
- The aneurysm is over 5.5 cm in size or
- The aneurysm shows a rapid rate of expansion (over 1 cm/annum)

2 What pre-operative measures should be taken?

- Investigations: These patients usually have significant co-morbidity therefore their renal, lung and cardiac function must be assessed closely with the anaesthetist. They may require lung function tests, echocardiograms, thallium scans and exercise tolerance tests.

An ultrasound scan is a useful screening tool and is also the investigation of choice for monitoring the size of an aneurysm. CT with contrast enhancement is the gold standard investigation in preparing the patient for repair since it delineates the aneurysm's anatomy and its relation to the renal arteries. Intra-arterial digital subtraction angiography (IADSA) is used in suprarenal aneurysms or in those patients with renal impairment.

- Cross-match 8 units of blood.
- Insert two venous cannulae, a catheter and an arterial line (early involvement of intensive care support).
- Peri-operative broad-spectrum antibiotics.
- Informed consent.

3 How do you perform an open repair of an AAA?

Position The patient is placed supine and the abdomen is prepared as for a laparotomy.

Incision Long midline laparotomy incision.

Procedure Expose the aorta (pack small bowel up to the right and dissect off the peritoneum). Define the extent of the aneurysm. Place clamps across the neck and lower end of the aneurysm. Open the sac and suture the lumbar vessels from within.

Replace the aorta between the renal arteries and the bifurcation with a Dacron prosthesis (occasionally it may be necessary to bring a "Trouser graft" down to the femoral arteries).

Cover the graft with the aneurysm sac.

Repair the peritoneum, check for distal limb pulses.

Closure This is in layers as for laparotomy (see Chapter 24, Laparotomy and abdominal incisions).

4 What are some of the complications specific to an AAA repair?

- Immediate
  - Haemorrhage
  - Distal limb embolisation (trash foot)
  - Distal limb arterial thrombosis
- Early
  - Spinal cord ischaemia
  - Acute sigmoid colon ischaemia (mesenteric)
  - Acute renal failure, myocardial infarction, cerebrovascular accident
- Late
  - False aneurysm formation
  - Graft infection
  - Aorto-duodenal fistula formation
  - Impotence

5 What do you know about the "endoluminal repair" of abdominal aneurysms?

This involves the introduction of an endoprosthesis into the aorta via the femoral artery under fluoroscopic guidance. The procedure requires 1.5 cm of healthy aorta proximally and 1 cm distally. Suprarenal aneurysms cannot be repaired in this way. This repair is ideal for "inflammatory" aneurysms.

The complications of endoluminal repair include: "endoleaks" (caused by back bleeding from lumbar arteries), graft migration and infection, and as with open repair, distal embolisation.

6 What is the mortality for elective AAA repairs?

The mortality rate remains at 5% (but is higher for inflammatory aneurysms).

7 What are the surface markings of the abdominal aorta?

- The abdominal aorta begins at the aortic hiatus in the diaphragm. This is at the level of the 12th thoracic vertebra or an inch above the transpyloric plane of Addison (a plane midway between the suprasternal notch and the pubic symphysis).
- It ends at the 4th lumbar vertebra, or 1.5 cm to the left of the midline at the supracristal plane (a plane joining the highest points of the iliac crests) where it bifurcates into the common iliac arteries.
- Its three unpaired branches are:
  1 T12: The coeliac axis
  2 L1: The superior mesenteric artery
  3 L3: The inferior mesenteric artery

8 What is the significance of the artery of Adamkiewicz?

This is a major radicular artery that supplies a great proportion of the spinal cord. It usually arises from the posterior intercostal arteries and is left sided in 80% of subjects. It can however arise from the lumbar arteries which are oversewn during an AAA repair. This may then lead to cord ischaemia and paralysis.

2

Adrenalectomy

1 What are the common indications for an adrenalectomy?

- Phaeochromocytoma
- Cushing's syndrome
- Conn's syndrome
- Carcinoma

2 What is the arterial supply of the adrenal glands?

The glands have a rich blood supply from three main sources:

1 The inferior phrenic artery via a number of small *superior* adrenal arteries
2 The aorta via one or more *middle adrenal* arteries
3 The renal artery via one or more *inferior adrenal* arteries

3 What is the venous drainage of the adrenal glands?

The right gland is drained via a short adrenal vein directly into the inferior vena cava (IVC). The left gland drains via a longer left adrenal vein into the left renal vein which in turn drains into

the IVC. Laparoscopic dissection and clipping of the right adrenal vein is therefore more challenging than the left.

4 Peri-operative preparation of a patient prior to adrenalectomy for a phaeochromocytoma is particularly challenging. What special measures are taken?

- Pre-operative alpha (e.g. phenoxybenzamine) and beta (e.g. propanalol) blockade for at least 4 weeks
- Careful and invasive monitoring of blood pressure and volume during and after surgery
- Gentle handling of the tumour to avoid sudden release of catecholamines
- Intravenous nitrates to control hypertensive episodes during surgery
- Colloid replacement in case of hypotension

5 Name some of the approaches used to perform an adrenalectomy

- Transperitoneal approach: large transverse upper abdominal incision, which gives an excellent exposure. This is suitable for large or bilateral tumours.
- Thoraco-abdominal approach.
- Laparoscopic adrenalectomy.
- Posterior extra-peritoneal approach similar to the approach used for a nephrectomy.

6 List some of the complications of adrenalectomy

- General
  - Wound infection
  - Damage to surrounding organs and vessels

- Haemorrhage
- Thrombosis
- Ileus
- Incisional hernia

- Hormonal
  - Hypertensive crisis during surgery (phaeochromocytoma)
  - Hypotensive crisis following surgery (phaeochromocytoma)
  - Addisonian crisis following surgery (Cushing's)

7 When is a conventional open adrenalectomy preferred to a laparoscopic procedure?

Minimally invasive procedures are gaining more popularity in the recent days. Open procedures require large incisions to allow accurate dissection and are therefore associated with long recovery times. The absolute contraindication to laparoscopic adrenalectomy is the presence of malignancy or clinical/radiological characteristics of malignancy. In these cases a greater exposure and more aggressive surgery precludes laparoscopic surgery. Large tumours of >10 cm are also best excised by an open approach primarily because they are at a greater risk of being malignant but also because of technical considerations.

3

Amputation (below knee)

1 What are the indications for limb amputation? Which is the commonest in the UK?

- Lower limb ischaemia secondary to atherosclerosis and/or diabetes is by far the commonest indication for amputation in the UK
- Trauma which is the commonest indication in the Third World
- Infection
- Malignancy
- Congenital deformity

2 What types of lower limb amputation do you know?

- Hip disarticulation or hindquarter amputation
- Transfemoral or above knee amputation (AKA)
- Through knee amputation
- Transtibial or below knee amputation (BKA)
- Through ankle or Syme's amputation
- Partial foot amputations

3 What pre-operative measures should be taken?

This is an entirely multidisciplinary process. All the members of the team (physiotherapy, occupational therapy (OT), rehabilitation specialist, prosthetic specialist, nursing staff, psychologists as well as the surgeon) must be involved and if possible meet the patient prior to surgery.

The level of amputation must be decided upon. This depends on the patients "rehabilitation potential", degree of tissue compromise, and severity and pattern of the vascular disease.

Finally a careful anaesthetic assessment is made, bearing in mind that these patients may have atherosclerosis affecting their renal, coronary and cerebral vasculture as well as other co-morbid factors such as hypertension and diabetes. They may even be heavy smokers with associated pulmonary compromise.

4 Name two common techniques used for a BKA

1 Long posterior flap (the Burgess and Romano technique)
2 Skew flap

5 How do you perform a BKA?

Position This is supine with the affected leg in a knee-flexed position.

Incision The preferred level is 10–14 cm below the tibial tuberosity. This skin incision is marked such that a long posterior skin flap is obtained. This must be at least twice as long posteriorly as it is anteriorly.

Procedure The skin incision is made through skin, subcutaneous fat and the muscles of the anterolateral compartments. All

vessels are identified and ligated prior to division. All the nerves are cut under tension. The tibia and fibula are then sawed and bevelled smooth. The fibula can be shortened to a higher level than the site of the tibial transection by about 2–3 cm. The posterior compartment is then attended to. The flap is fashioned by thinning the gastrocnemius muscle. The soleus is excised and is not normally included with the flap as it can increase the bulk of the stump.

Closure The flap is closed after achieving haemostasis. Interrupted non-absorbable sutures are preferred.

6 What are the complications that are specific to a BKA?

- Early
  - Stump haematoma
  - Infection
  - Flap necrosis (may necessitate revision to a higher amputation level)
- Late
  - Painful neuromas
  - Infection
  - Bony erosion and stump ulceration
  - Pain and phantom pain
  - Ill-fitting prosthesis due to poorly fashioned stumps or stump atrophy
  - Psychological problems
  - Knee-joint contractures

7 What contraindications are there to a BKA?

- Poor mobility and the possibility of wheel-chair dependence. The BKA patient is prone to developing pressure sores