Abdominal aortic aneurysms

Part 1: Assessment and surveillance

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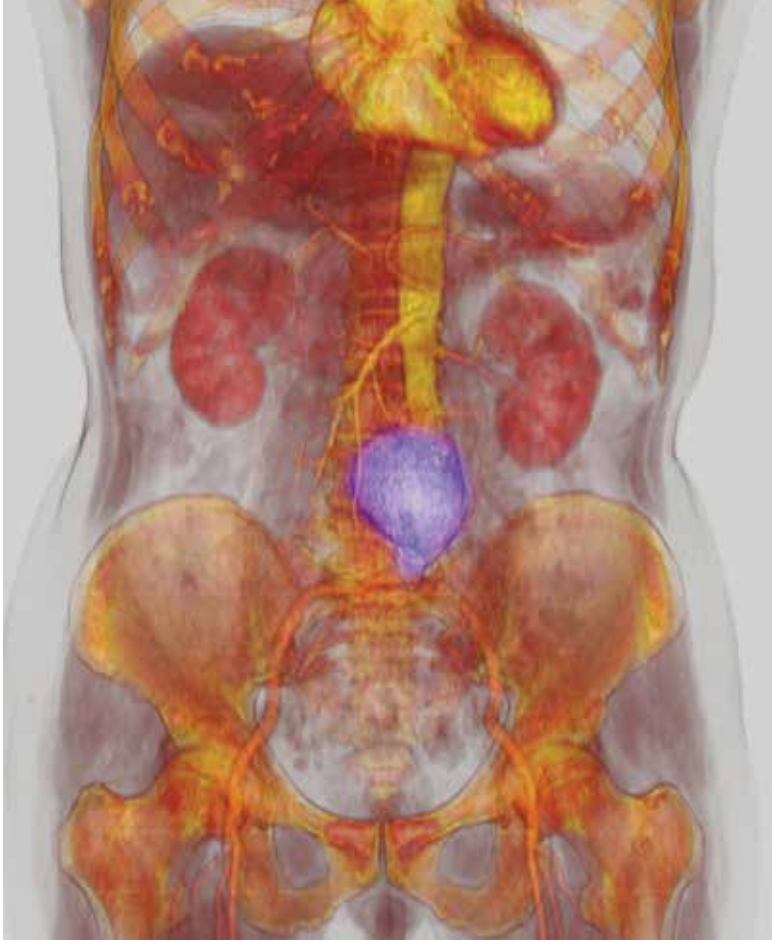

Abdominal aortic aneurysms are often asymptomatic, with common risk factors including older age, male gender, smoking and hypertension. It is essential to identify, monitor and repair these aneurysms before they rupture. This first part of a two-part article discusses assessment, surveillance protocols, screening and indications for prophylactic repair of abdominal aortic aneurysms.

Aortic aneurysms are a common incidental finding in elderly patients in general practice. The definition of an aneurysm is an artery that has enlarged, by at least 50% of its normal diameter and a 3 cm threshold marks the transition from an enlarged aorta to one that is aneurysmal.[1] Although causative and predictive factors for rupture of an aortic aneurysm are not fully understood, the most commonly used clinical predictor is absolute size. Rupture of an aortic aneurysm is catastrophic and carries a very high mortality of greater than 50%.[2] It is therefore essential to identify, monitor and repair aneurysms before they rupture and the

Key points

- **Aortic aneurysms are a common incidental finding in elderly patients and are often asymptomatic.**
- **Aortic aneurysms are most commonly found in the abdominal aorta, but are also found in the thoracic aorta, aortic arch and ascending aorta.**
- **Common risk factors for abdominal aortic aneurysms (AAAs) include older age, male gender, smoking and hypertension.**
- **There is a strong familial prevalence of AAA and screening should be considered in patients from 50 years of age with a familial history of AAA.**
- **AAA screening is currently not routine in Australia, but has been shown to reduce mortality in selected groups (e.g. men aged 65 to 75 years who smoke).**
- **Ultrasound is a useful noninvasive investigation for initial diagnosis and surveillance of AAA, whereas computed tomography is useful for anatomical detail and decision-making for operative intervention.**
- **After a diagnosis of AAA has been made, the patient should be placed on a surveillance program to monitor the size.**
- **Once an AAA reaches 5.5 cm in men or 5.0 cm in women, the risk of rupture is generally greater than the risk of operative morbidity and mortality. Rapid growth of an AAA (>1.0 cm per year) or local symptoms are indications for consideration of repair.**

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GP can play a vital role in this process. Repair can be achieved by either open surgery or minimally-invasive endovascular surgery. With the advancement of endovascular surgery, more patients may now be eligible for surgery who may previously have been contraindicated for open surgery.

Aortic aneurysms can be broadly classified based on the anatomical location as follows:

- abdominal aortic aneurysms (AAAs), which are further classified with respect to the origin of the renal arteries:
  - infrarenal (aneurysm begins below the origin of the renal arteries)
  - suprarenal (aneurysm begins above the origin of the renal arteries)
  - juxtarenal (aneurysm begins around the origin of the renal arteries generally necessitating a suprarenal clamp)
- thoracic descending aortic aneurysms
- aortic arch aneurysms
- ascending aortic aneurysms.

This article focuses on the abdominal component of the spectrum of aortic aneurysms.

Prevalence and risk factors of AAA

AAAs usually affect people over 50 years of age, and the prevalence then rises sharply with increasing age. They are two to six times more common in men than women. Approximately 1 to 2% of women and 4 to 7% of men over the age of 65 years have an infrarenal aortic diameter greater than 3 cm.[3-7] Other established risk factors for the development of AAA are shown in the Box. There is evidence that the prevalence of AAA and mortality from rupture are decreasing due to better medical management of cardiovascular risk factors, reduced smoking and increased availability of diagnostic imaging resulting in earlier treatment.[8]

Pathophysiology

The pathogenesis of AAA is complex and not completely understood. A combination of atherosclerotic disease, immune-modulated enzymatic weakening of the aortic wall and possibly infection all play a significant role in the pathogenesis of AAA. In familial and vascular connective tissue disorders there may be a defect in connective tissue or collagen cross-linking within the wall of the aorta leading to aneurysmal change.[9]

Clinical presentation

Incidental finding

Typically patients are found to have a AAA while being investigated for other pathology. Imaging such as ultrasound or computed tomography scan can typically detect an enlarged aneurysm and instigate further investigation.

Family history

A family history of a primary relative with AAA, particularly if detected at a young age or in women, should trigger a lower threshold for ultrasound surveillance. Of patients with a AAA, 15 to 25% will have a first-degree relative with a AAA, and the likelihood increases if the relative with a AAA is female.[10]

Established risk factors for the development of abdominal aortic aneurysms

- Older age
- Male gender
- Smoking
- White race
- Positive family history
- Hypertension
- Hypercholesterolaemia
- Peripheral vascular disease
- Coronary artery disease
- Peripheral artery aneurysm
- Vascular connective tissue disorder

Pulsatile mass

A pulsatile mass can be a true aortic aneurysm or a transmitted pulse. It can be a normal finding in a young, thin patient; however, an aorta that is clinically enlarged should be investigated.

Peripheral embolisation/blue toe syndrome

Lower limb ischaemia can result from embolisation of thrombotic debris from within the AAA sac and this can present with an ischaemic limb, distal necrosis or blue toe syndrome.

Tenderness/local symptoms

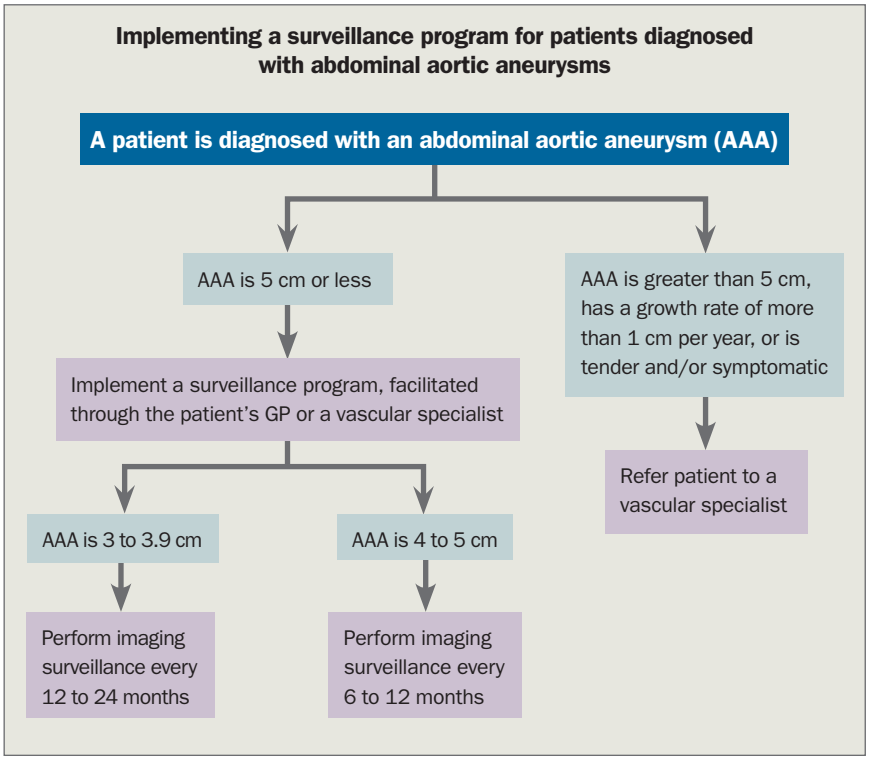
A tender, pulsatile abdominal mass is an important red flag. This can be an indicator of potential rupture and affected patients should be referred to a vascular specialist immediately. Tenderness over the aneurysm without any other cause of pain is treated as a symptomatic aneurysm and is repaired as a matter of urgency. Large aneurysms can occasionally present with local compressive symptoms such as nausea, vomiting and early satiety from compression of the gastrointestinal tract.

Rupture

Patients with a ruptured aneurysm have a poor prognosis and generally present with collapse, hypotension and a pulsatile abdominal mass. These patients should be referred immediately to a hospital emergency department with vascular surgery services.

Assessment for other aneurysms

Patients with an AAA have an increased rate of synchronous or metachranous aneurysms, particularly of the femoropopliteal segment. Popliteal aneurysms are the most common with an approximate 50% association with AAAs.[11] Femoral aneurysms are the next most common and have an association of up to 80% with AAAs.[12] Upper extremity, cerebrovascular, splanchnic and renal aneurysms are significantly less prevalent and have different aetiologies. Peripheral aneurysms should be examined for in all patients



with AAA. There is also a case for radiological screening for thoracic aneurysms.[13]

Investigation

There are two main imaging modalities that can be used to confirm the diagnosis of AAA. Physical examination is extremely unreliable, therefore imaging is very important in the diagnosis of AAA and any clinical suspicion should be confirmed with an imaging modality.

Ultrasound

Abdominal B-mode ultrasound is a noninvasive, low-cost examination often used to confirm the diagnosis of a suspected AAA. The disadvantages of ultrasound are interobserver variability, poor visualisation due to body habitus and bowel gas, and the tendency for ultrasound to underestimate the diameter when compared with CT.[14] Ultrasound can generally be used to identify and monitor AAAs until they approach a size at which repair may be considered.

Computed tomographic angiography

Computed tomographic angiography (CTA) involves ionising radiation exposure and intravenous contrast injection. It is the most accurate method of measuring the diameter of the AAA. There is significantly less interobserver variability when compared with ultrasound although interobserver interpretation of the CTA can lead to varying measurements.[15] CTA can aid in the planning of both open and endovascular operations and identify incidental findings that may be significant in the decision and approach to operative intervention. CTA should be performed when the AAA is approaching a size whereby intervention may be appropriate (5.0 to 5.5 cm in men and 4.5 to 5.0 cm in women).

Surveillance program

Once the diagnosis of AAA has been confirmed on ultrasound or CTA, a surveillance program can be implemented. This will depend on the size of the AAA and can be facilitated through the patient's GP or a vascular specialist (Flowchart). Surveillance should be performed at intervals based on size criteria (Table 1),[7] and protocols may vary depending on local practice and availability of diagnostic imaging services and expertise. Ultrasound avoids ionising radiation and exposure to potentially nephrotoxic intravenous contrast, and can be safely performed for surveillance. Aneurysms approaching threshold for repair (5.0 to 5.5 cm in men or 4.5 to 5.0 cm in women) should be investigated with CTA for further characterisation.

When to refer?

Patients can be referred to a vascular specialist for ongoing surveillance of an asymptomatic AAA. A vascular specialist may be more comfortable with the ongoing management and surveillance of the AAA, providing patient information, counselling and advice.

Patients who are under surveillance by their GP should be referred to a vascular specialist once the aneurysm reaches threshold size (5.0 to 5.5 cm in men or 4.5 to 5.0 cm in women), if the aneurysm has been increasing in size at an accelerated rate (>1.0 cm per year), or if the aneurysm becomes tender or symptomatic.

Complex cases involving a strong family history or patients with connective tissue disorders should be managed by a vascular specialist. Individualised and tailored management and surveillance programs can be developed for ongoing care of these patients.

Indications for prophylactic repair

Elective prophylactic repair of AAAs is based on balancing the risk of rupture against the risk of morbidity and mortality from the repair (Table 2).[16] Open repair carries a mortality of up to 5%, whereas endovascular repair is roughly 1%.[17]

Indications for repair include the size of the AAA being greater than 5.5 cm in men or greater than 5.0 cm in women. This size-based

Table 1. Suggested imaging surveillance for abdominal aortic aneurysms (AAAs)[7]	
Size of AAA (diameter in cm)	**Surveillance interval (months)**
3.0–3.9	12–24
4.0–4.5	12
4.6–5.0	6
>5.0	3 in men, consider surgery in women

Table 2. Consensus guidelines on the annual risk of rupture based on size of abdominal aortic aneurysm (AAA)[16]	
Size of AAA (diameter in cm)	**12-month risk of rupture (% per year)**
3.0–3.9	<0.5
4.0–4.9	0.5–5
5.0–5.9	3–15
6.0–6.9	10–20
>7.0	>20

criteria for repair is not absolute and there are exceptions based on various patient factors. Rapid growth of AAA by more than 1.0 cm a year can also be a determining factor for repair. Symptomatic aneurysms should be treated regardless of size.

Prophylactic open repair of small asymptomatic aneurysms (<5.5 cm in men or <5.0 cm in women) have not shown to have a survival benefit as the morbidity and mortality associated with elective open repair is greater than the risk of rupture.[18] Whether this threshold should change has not yet been determined in the context of endovascular repair of aortic aneurysms. Decision-making in AAA repair is complex and the patient may have many comorbidities or anatomical constraints that may preclude or restrict open or endovascular approaches. Ultimately the decision to operate is the balance between the risk of rupture and operative mortality.

AAA screening in the community

Currently, there are no recommended guidelines in Australia for the screening of individuals for detecting an AAA. In the US, screening guidelines have been recommended for men aged 65 to 75 years of age who have ever smoked in lieu of a moderate reduction in AAA specific mortality seen in this group. A smaller benefit has been seen in the nonsmoking cohort of men of the same age. There was insufficient evidence to recommend screening in women.[19,20]

Issues to consider when screening include the extent of overdiagnosis and over-treatment of AAA, patient anxiety and cost effectiveness, which are currently in contention.

A suggested screening program should be considered for both men and women with a familial history of AAA, from 50 years of age or at an age of 10 years younger than the index case.

Role of the GP

The role of the GP in managing patients with AAAs is important in establishing the primary diagnosis and surveillance plan. Knowledge about the treatment options, size thresholds for repair and surveillance are the keys to safe, ongoing management. Surgical management and postoperative care of patients with AAA will be discussed in part 2 of this series.

Patients with AAA often have significant comorbidities and cardiovascular risk factors. Risk-reduction strategies include lowering cholesterol levels, blood pressure control and smoking cessation, which are all important in the overall management of these complex patients.

Conclusion

AAAs are a common incidental finding in elderly patients and are often asymptomatic. Having a thorough understanding of the common presenting symptoms, associated findings, surveillance protocols, and treatment algorithm of AAAs can expedite referral of the patient to a vascular specialist for prompt management and surgical consideration. **CT**

References

A list of references is included in the website version of this article (www.cardiologytoday.com.au).

COMPETING INTERESTS: None.

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Part 2 on surgical management and postoperative care of abdominal aortic aneurysms, to be published next year in *Cardiology Today*.

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