In this article...

● Life-threatening potential of abdominal aortic aneurysms (AAAs)
● Successes and limitations of the current AAA screening strategy
● How advanced nurse practitioners can help improve AAA detection rates

Early identification and detection of abdominal aortic aneurysms

Key points

1 An abdominal aortic aneurysm (AAA) that remains undetected or untreated, and progresses to a ruptured state is a life-threatening emergency.

2 In men, the dominant risk factors for AAA development are age, white race, smoking and a family history.

3 Most clinically significant AAAs can be discovered through focused abdominal palpation.

4 Advanced nurse practitioners have a key role to play in identifying patients at risk and detecting AAA early.

5 If ANPs suspect an expansile aorta but lack ultrasonography skills, they should refer the patient to a vascular consultant for further investigation.

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Abstract An abdominal aortic aneurysm (AAA) is an under-diagnosed, potentially life-threatening condition. Greater awareness and earlier detection are needed to prevent premature deaths from a ruptured aneurysm. The current national AAA screening programme only offers initial screening to men aged 65, but many other men and women are at high risk of developing an AAA. This article highlights the risk factors associated with aneurysm development and the benefits of performing opportunistic aortic palpation in at-risk people. It also explores the role advanced nurse practitioners can have in becoming AAA champions.


Abdominal aortic aneurysms (AAAs) are significantly under-detected and underdiagnosed and, as most are asymptomatic, it is not uncommon for clinicians to refer to them as ‘ticking time bombs’ or ‘silent killers’.

As nurses represent the single largest group of health professionals and work in close proximity to the delivery of care, they are well placed to raise awareness of the disease and become AAA champions and patient advocates. Nurses with advanced history-taking and examination skills have a unique opportunity to identify patients at risk and examine them for an expansile aorta, promoting earlier detection and monitoring.

Aetiology and prevalence

An AAA – often called a ‘triple A’ – is a permanent, localised dilatation of the abdominal aorta (Fig 1) that encompasses all three layers of the vessel wall and exceeds 3cm in diameter (Howard et al, 2015). The underlying problem is a weakening in the aortic wall that leads to progressive dilatation and, in some cases, eventually to rupture (Nordon et al, 2009). A ruptured aorta is life threatening and causes 2% of all male deaths in the UK (Public Health England, 2015).

The risk of developing an AAA increases dramatically after 60 years of age (Aggarwal et al, 2011). Around one in 70 men in England have an AAA (PHE, 2014).

Due to the ageing of the population, the incidence of AAAs is rising by 2-4% per decade (Vascular Society of Great Britain and Northern Ireland et al, 2014). The increasing life expectancy may also result in a longer lifespan during which the disease can develop, so the age at which AAAs become clinically significant may increase.

Early detection and surveillance

An AAA that remains undetected or untreated and progresses to a ruptured state is a life-threatening emergency that will result in immediate severe hypotension (Aggarwal et al, 2011). If rapid surgical or endovascular intervention is not performed, the patient is unlikely to survive. Indeed, approximately 80% of patients with a ruptured AAA will die of sudden cardiovascular collapse, and ruptured AAAs account for 6,000 deaths per year in the UK (PHE, 2015).
However, not all AAAs will rupture so, when an AAA is diagnosed, it is crucial to monitor its rate of expansion to help reduce the threat of premature death from aneurysm rupture. AAAs have an average expansion rate of 0.3-0.4cm per year; if the aneurysm is found to be expanding by >1cm per year, it is considered to be at high risk of rupture (Led-erle, 2011); as such, surveillance is key.

The frequency of surveillance correlates with the aneurysm’s diameter and risk of rupture (Table 1). For AAAs ≥4.4cm, one annual check alone is sufficient, as the rate of rupture is very low and they are unlikely to become clinically significant during the patient’s remaining lifetime (Moneta, 2012). Current national guidance recommends the following surveillance intervals:
- AAA = 3.0-4.4cm (small): repeat scan every 12 months;
- AAA = 4.5-5.4cm (medium): repeat scan every three months;
- AAA > 5.5cm (large): refer to vascular surgeon to consider elective repair (PHE, 2015).

For aneurysms ≥5.5cm, elective surgery is the mainstay of treatment, as the risks associated with rupture at that point outweigh the risks of surgery (Lovell et al, 2006).

If the aneurysm is detected early, the patient can be referred to the vascular surgeon and either be placed under surveillance or undergo early surgical intervention; this has a more favourable outcome and a greatly reduced mortality rate of just 2%, as opposed to the 80% mortality rate without intervention (PHE, 2015).

The optimal clinical strategy for advanced nurse practitioners is to focus on identifying their patients with AAA risk factors, physically detecting AAAs early, and arranging a prompt referral to the secondary care vascular team for ongoing surveillance or elective surgical repair.

AAA screening programme
In light of the improved outcomes of early surgical intervention, the NHS and PHE put in place a national screening programme – the NHS AAA Screening Programme (NAAASP) – to try to detect AAAs earlier. Started in 2009, it was fully implemented across England in 2013. All men in their 65th year are invited by their GP to have a single ultrasound scan of their aorta (PHE, 2015).

Jacomelli et al’s (2016) review revealed that, since 2009, the mean percentage uptake of the NAAASP has been approximately 78%. Around 22% of the cohort (some 22,000 men per year) did not attend for screening, of whom around 5% (approximately 1,100 per year) may have had an undetected AAA.

Moreover, because screening is limited to men aged 65 (the cohort deemed at highest risk) there is still a key group with known AAA risk factors who are not screened. This means there is a strong argument in favour of ANPs, and other nurses with advanced examination skills, to complement the NAAASP, by being aware of the existence of at-risk patients, both male and female, in their own sphere of practice, and opportunistically assessing them for an AAA.

The NAAASP is a successful public-health initiative that is considered worthwhile. A 2012 systematic review and meta-analysis, undertaken as part of the UK Multicentre Aneurysm Screening Study, showed screening targeted at all asymptomatic 65-year-old men was cost effective (Ferket et al, 2012) and helped halve AAA-related mortality rates (Roberts, 2014).

Howard et al (2015), however, argue that ultrasound screening programmes that entail only one round of screening and only target 65-year-old men will miss most acute AAAs, as current evidence shows that nearly two-thirds occur at age ≥75 years, with a higher case fatality than at younger ages. So, as more people are living longer, we must ask whether the NAAASP needs to consider widening the net to include older male cohorts, as well as women with identifiable AAA risk factors.

Widening the net: AAA risk factors
If it is only currently feasible to offer a first ultrasound screening to men aged 65, ANPs have an even more important role in identifying people with factors that predispose them to AAAs (Box 1). In men, the dominant risk factors are age, white race, smoking, hypertension and a family history of AAA; there are also known associations with peripheral arterial disease, hyperlipidaemia and chronic obstructive pulmonary disease (Xiong et al, 2016). In comparison, people with diabetes have been found to have a lower incidence rate of AAA and a negative association with AAA development and growth (De Rango et al, 2014).

On the whole, most risk factors for AAAs are the same as for atherosclerotic conditions, so it is useful for ANPs to be aware of this, and for all nurses with prescribing skills to take the opportunity to educate their AAA patients on lifestyle changes and consider initiating secondary prevention as well as best medical therapy.

Smoking
Smoking is the most dominant risk factor for aneurysm formation, growth and rupture (Hirsch et al, 2006). It increases the growth rate by 20-25% (Moneta, 2012) and is considered responsible for around 75% of all AAAs of ≥4cm. Smokers are nearly eight times more likely to have an AAA than non-smokers; ex-smokers are three times more likely to have an AAA than non-smokers (Norman and Curci, 2013).

Interestingly, the literature suggests there is also an increased prevalence of COPD in patients with an AAA, but this relationship appears to be independent of smoking (Meijer et al, 2012). COPD often remains undiagnosed in AAA patients: as screening for disease risk factors and early signs of illness is part of the ANP’s role (Royal College of Nursing, 2012), it seems relevant and worthwhile for ANPs not only to discuss smoking cessation, but also to consider additional screening for COPD.

AAAs in women
In the general population, AAAs are 4-6 times more common in men than in women (Aggarwal et al, 2011). Some women, however, are at a substantially increased risk of aneurysmal disease, as they have several risk factors known to increase the likelihood of aneurysm development in their gender. These include: being ≥65 years, smoking, hypertension (which, in women, has a strong link with AAAs) and cerebrovascular disease (Norman and Curci, 2013). There is also a familial risk factor: the prevalence of AAAs in women from families with a history of AAAs has been suggested to be as high as 8.3% (Le Hello et al, 2005).

More importantly, despite the lower overall prevalence in the female population, women have been shown to have a faster rate of aneurysm enlargement and are at an increased risk of death from an AAA due to a higher risk of rupture occurring from...
smaller aneurysms (Norman and Powell, 2007). For example, women are four times more likely than men to have an AAA of 5.0-5.9 cm rupture, and evidence suggests that a lower threshold for surgery should be considered. Many hospital vascular teams consider surgical intervention in women with AAAs of 5.0 cm, as opposed to 5.5 cm for men.

Considering all the above, targeted screening of women with known risk factors appears justifiable. Indeed, 10 years ago, Derubertis et al. (2007) argued that women with identifiable AAA risk factors should be considered for ultrasound surveillance screening.

Genetic influence

The genetic influence on AAA development is significant, with almost 30% of AAA patients having a first-degree relative who also has an AAA (Linne et al., 2012). Interestingly, male first-degree relatives of patients with a known AAA, particularly brothers, are 10-12 times more likely to develop one compared with the general population (Sakalihasan et al., 2014).

Hypotheses have been made about what genetic disorder could cause this higher incidence of AAAs among males of affected families. Some suggested alpha-1-antitrypsin deficiency could be a factor (Pulinx et al., 2011), while others noted that connective tissue disorders — such as Ehlers-Danlos syndrome and Marfan syndrome — are strongly linked with familial AAAs, particularly in younger age groups (Sandford et al., 2007).

Peripheral arterial disease

Although PAD is not considered to be a key risk factor for AAA development, the prevalence of AAAs has been found to be much higher in people with PAD (Barba et al., 2009) than in the highest risk group for AAA in the general population (5%) (Moneta, 2012).

Table 1. Estimated annual rupture rates of AAAs, by size

<table>
<thead>
<tr>
<th>Diameter (cm)</th>
<th>Estimated annual rupture rate (%)</th>
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<tr>
<td>&lt;4</td>
<td>0</td>
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<tr>
<td>4-5</td>
<td>0.5-5</td>
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<td>7-8</td>
<td>20-40</td>
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<tr>
<td>&gt;8</td>
<td>30-50</td>
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AAA = abdominal aortic aneurysm


Approximately 40% of asymptomatic AAAs can be detected upon physical examination, which, when performed correctly, will reveal a pulsatile, expansile mass in or above the umbilical region (Aggarwal et al., 2011). The ideal technique for detecting an AAA with abdominal palpation is as follows:

- The patient should be placed in a supine position with knees raised and abdominal muscles relaxed (Carpenter, 2005).
- The aortic pulse should be sought just above and to the left of the umbilicus using a deep palpation technique with both hands;
- Once the walls of the abdominal aorta are felt, the examiner should proceed to feel the aorta pulsate against their fingers during each heartbeat. This is normal as all arteries are pulsatile but, if the pulse is strong enough to move the fingers away from their original position, it can indicate expansility of the aorta (walls of the aorta abnormally stretched outwards) and should raise suspicion of an aneurysmal aorta.

Abdominal palpation is considered the only examination of demonstrated value in detecting an abnormal expansion of the aorta. Moreover it is recognised as safe, as it does not appear to harm the patient or precipitate rupture (Lederle and Simel, 1999). The larger the aneurysm, the greater the detection rate, especially in slim people. Aneurysmal aortas are easier to detect in slim people and more difficult to feel in those who are obese (Fink et al., 2000).

Venkatasubramaniam et al. (2004) argued that abdominal examination by a nurse with advanced clinical examination skills is of great value to detect or exclude a significant AAA, and should be promoted as a useful adjunct to screening by ultrasound. Indeed, aortic palpation by an experienced clinician is reasonably accurate in diagnosing AAAs, with a sensitivity of 76% in aneurysms of 5 cm (Lederle, 2011).

To enhance detection rates obtained with aortic palpation, the physical examination should be specifically aimed at finding a potential aneurysm; in other words, there must be an intention to look, otherwise it is unlikely that even a large aneurysm will be detected (Lederle and Simel, 1999). When using the aortic palpation technique, ANPs should, therefore, approach patients with a view to determining whether or not these have an expansile aorta. Fink et al. (2000) found that clinicians who palpate the abdomen looking for aortic aneurysms may be in the
minority, and that those who perform the examination without a focused intention (ie, who palpate the abdomen in a non-specific manner) can often miss aneurysms, even those considered to be large.

ANPs have the skillset to detect atherosclerotic aortas. However, any clinician performing aortic palpation should audit their own rates of suspected and detected AAAs. Auditing and critically appraising one’s skills is one of the four pillars of advanced practice (National Leadership and Innovation Agency for Healthcare, 2010) and can help highlight any areas of learning that need addressing (RCN, 2012).

Further management

If ANPs suspect an expansile aorta and do not possess ultrasonography skills, they should refer the patient to a vascular consultant. To confirm the diagnosis, an ultrasound of the aorta will be performed: it has a 99% sensitivity and 99% specificity for detecting AAAs. The ultrasound can also determine the size of the aneurysm (Rubano et al, 2013), which the vascular surgeon will use to guide treatment.

If the AAA is surgically significant (≥5.5cm in men, ≥5cm in women), the surgeon will weigh the risk of elective repair against that of rupture, and assess the likelihood of death from other causes. In an ageing population, this is important: some older patients will be good candidates for surgery, while others might be too frail and so more likely to benefit from ongoing surveillance.

Asymptomatic patients may view the AAA diagnosis as a ‘ticking time bomb’, resulting in additional stress and anxiety, so nurses need to be prepared to offer patients detailed, informed explanations and reassurance about the disease process.

Conclusion

AAAs remain significantly underdetected and underdiagnosed with life-threatening consequences. Detecting an AAA late – or not at all – could be catastrophic. The main benefit of early identification and detection is reduced aneurysm-related mortality.

The NAAASP is successfully identifying and reducing AAA mortality but there is scope for ANPs to significantly improve detection rates in undiagnosed high-risk patients. Identification of AAA risk factors and focused physical examination of the aorta by nurses with advanced examination skills are essential, as they help detect AAAs (Fox et al, 2014; Lovell et al, 2006). A low-cost, high-impact opportunistic assessment process can improve detection rates and, most importantly, enhance patient safety and help save lives. Moreover, nurses can play a crucial role in helping to raise awareness of AAAs in their clinical environment and provide much-needed education to patients and colleagues about this life-threatening disease.

As ANPs are identified as innovative change agents in healthcare, they will be increasingly relied on for their advanced clinical and decision-making skills to lead the way in raising awareness, promoting education and identifying diseases earlier (Rolfe, 2014). There is compelling evidence of their potential to become AAA champions. However, this can only be realised with increased awareness, strong clinical leadership from ANPs and further investment in staff nurses wishing to expand their scope of practice. NT

References


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