Trans-Atlantic Debate: External Diameter for Abdominal Aortic Aneurysm (AAA) Size Versus Volume

The abdominal aortic aneurysm (AAA) diameter is a key component in the surveillance of AAAs for the assessment of aneurysm progression. AAA external diameter has been shown to be a reliable method for repeated measurements in cases near the threshold for surgical referral. Other measures, such as volume or wall stress, have, until now, had limited value in clinical practice. This argument was well developed by Kitagawa and Mastracci in this debate. But with reported mean annual growth rates of 2–3 mm in diameter, a high reproducibility is required to allow detection of small changes in AAA diameter. In a systematic review of ultrasound measurement of the abdominal aorta diameter, Beales et al. reported intra- and interobserver values greater than the 5-mm level regarded as acceptable by the UK and USA screening programmes. These differences may have had a significant clinical impact on screening and surveillance. In addition, even though ultrasound diameter imaging has been used for years, no standardised image acquisition exists. This limitation has been emphasised by Bredahl et al., who showed the importance of a standardised protocol including electrocardiogram-gating and subsequent off-line reading with minute caliper placement to reduce variability. Grondal et al. have also shown that measurement of the maximum external AAA diameter by ultrasound is influenced by the pulse wave propagation with an average difference of 1.9 mm between diastole and systole, and a wide range in variation (0–4.7 mm). This explains why ultrasound has been supplanted by computed tomography (CT) angiography with the use of centre-lumen of flow by post-processing software to estimate the AAA diameter with greater accuracy.

As discussed by our debaters, assessment of the AAA volume is another parameter beyond diameter. It allows measurement of contour changes of the AAA and intraluminal thrombus volume. Using segmentation software permits accurate measurements of the AAA volume, even using non-contrast-enhanced CT scans. Volumetric measurements also have a higher sensitivity for AAA growth than diameter measurements. In addition three-dimensional ultrasound permits quantification of the intraluminal thrombus without any risk of contrast agent or radiation.

As shown by van Keulen et al., aortic volume measurement may be particularly useful for surveillance after EVAR. In their study, sac expansion was detected by volumetry in 32 patients, although an increase in sac diameter was seen in only 14 of the patients. Despite ample evidence, volume assessment is still not carried out in most institutions. The reasons are many. Volume assessment is time consuming and requires dedicated software and skilled technicians, and may be difficult to organise in high-volume centres. Furthermore, observer variability still exists in multiplanar reconstructions. Finally, the ability of aortic volume to predict rupture has not been established.

In conclusion, even if volumetric measurements are likely to be of value in assessing the efficacy of new therapies for small AAAs, we need more evidence to revise our guidelines, based, until now, on diameter thresholds.

REFERENCES


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