

Is Ultrasound More Accurate than Axial Computed Tomography for Determination of Maximal Abdominal Aortic Aneurysm Diameter?

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Objective(s):

Clinical assessment of maximal abdominal aortic aneurysm (AAA) diameter assumes clinical equivalence between duplex ultrasound (US) and axial computed tomography (CT). Three-dimensional (3D) CT reconstruction allows for the assessment of AAA in the perpendicular plane to flow and avoids oblique cuts due to AAA angulation. This study was undertaken to compare concurrent maximal AAA diameter by US, axial CT, and centerline directed perpendicular CT, and to assess the effect that AAA angulation has on each measurement.

Methods:

Maximal AAA diameter by US (US max), axial CT (axial max), and centerline directed perpendicular CT (perpendicular max) along with aortic angulation and minor axis diameters were measured concurrently, defined as less than 60 days between studies. Spiral CT data was processed by Metrix Media Solutions (West Lebanon, NH) to produce computerized axial CT and reformatted perpendicular CT images. The US and CT interpretations were performed in a blinded fashion and all measurements were performed independently.

Results:

Fifty-seven patients were analyzed. Mean axial max (54.8 mm) was significantly larger ($P < 0.0001$) than US max (50.9 mm) or perpendicular max (51.2 mm). The difference

between US max and perpendicular max (0.3 mm) was insignificant ($P > 0.05$). When aortic angulation was $< 25^\circ$, axial max (49.4 mm), US max (47.4 mm), and perpendicular max (47.3 mm) were similar ($P > 0.05$); however, when aortic angulation was $> 25^\circ$, axial max (56.3 mm) was significantly larger ($P < 0.001$) than US max (51.8 mm) and perpendicular max (52.3 mm). The limits of agreement (LOA) between axial max and both US max and perpendicular max was poor and exceeded clinical acceptability (± 5 mm). The variation between US max and perpendicular max was minimal with an acceptable LOA of -3.4 to 3.9 mm.

Conclusion:

Compared to axial CT, US is a better approximation of true perpendicular AAA diameter as determined by centerline directed perpendicular CT. When aortic angulation is greater than 25° axial CT becomes unreliable. However, US measurements are not affected by angulation and agree strongly with perpendicular CT measurements. With this in mind, we would propose that ultrasound be used for routine follow up for AAA disease and that reformatted perpendicular CT be used for preoperative planning. Moreover, this study questions the accuracy of natural history data and guidelines for therapy of AAA disease given the obviously inaccurate axial CT diameters demonstrated here.