Aortic valve area: meta-analysis of diagnostic performance of multi-detector computed tomography for aortic valve area measurements as compared to transthoracic echocardiography

Shah RG, Novaro GM, Blandon RJ, Whiteman MS, Asher CR, Kirsch J

CRD summary
This review concluded that multidetector computed tomography is an accurate method for obtaining aortic valve area measurements in patients with aortic valve stenosis. Areas of concern included: potential for missed studies and error and bias during the some parts of the review process; small sample sizes; and lack of study details. Hence, the results should be treated with some caution.

Authors' objectives
To evaluate the accuracy of computed tomography (CT) planimetry to measure the aortic valve area.

Searching
PubMed and a second unnamed database via the OVID gateway were searched to May 2008 without language restrictions; search terms were reported. Bibliographies of retrieved articles and reviews are scanned.

Study selection
Studies that evaluated the accuracy of multidetector CT (MDCT) and used a minimum of 16 detector rows compared to a reference standard of transthoracic endocardiography in the same patients to detect the presence of aortic valve stenosis (using the aortic valve area) were eligible for inclusion. Where reported, included studies used 16, 40 or 64 detector CT scanners. Mean age of participants was 68.8 years. The proportion of males was 60%. Beta-blockers were used prior to MDCT in most studies.

Inclusion criteria were applied by two independent reviewers; differences were resolved by consensus.

Assessment of study quality
The authors did not state that they assessed study quality.

Data extraction
The mean aortic valve area and Pearson's correlation coefficient for the relationship between the two technologies, along with their corresponding 95% confidence intervals (CI), were extracted for each diagnostic technology from each study. The mean difference in aortic valve area and 95% CI were calculated.

The authors did not report the number of reviewers who performed the data extraction.

Methods of synthesis
Pooled weighted estimates of the mean aortic valve area, mean difference and Pearson's correlation coefficients were calculated using a fixed-effect model where statistical heterogeneity was not observed; random effects were used where heterogeneity was present. Heterogeneity was assessed using the Cochran Q statistic.

Results of the review
Nine studies met the inclusion criteria (n=437, range 29 to 103). All studies conducted the two diagnostic techniques within a four-week period, which limited progression bias.

The overall mean aortic valve area was 1.02 (95% CI 0.76 to 1.28; eight studies) for CT and 0.92 (95% CI 0.71 to 1.12; eight studies) for transthoracic endocardiography. The overall weighted mean difference between CT and transthoracic endocardiography was 0.03 (95% CI -0.06 to 0.12; nine studies). The summary correlation coefficient was 0.89 (95% CI 0.84 to 0.93; eight studies); statistically significant heterogeneity was observed for this outcome.
Authors' conclusions
Multidetector CT was an accurate method for obtaining aortic valve area measurements in patients with aortic valve stenosis.

CRD commentary
The authors addressed a clear research question supported by appropriate inclusion criteria. The search for published studies was limited; OVID was stated as a database searched, but this is a gateway to a number of databases and it was unclear which were searched. There was no specific search for unpublished studies, so publication bias could not be ruled out. There was no formal quality assessment, although the potential for progression bias was indicated. Study selection was conducted in duplicate; it was unclear whether similar methods were used to reduce error and bias in other parts of the review process. Study quality was not assessed and so the quality of the available evidence was unclear. There were few study details, so it was difficult for the reader to assess the quality of the included studies or the clinical heterogeneity that may have been present. The results for analyses of aortic valve area for the two technologies and the mean difference between these were statistically homogeneous. But, there was substantial statistical heterogeneity across studies in the reported correlation between the two technologies, which indicated some clinical differences between the studies that was not apparent from the limited study details provided. The review was based on few studies with small sample sizes and 19% of participants included in the analyses did not have the target condition. The authors stated implications for practice for target conditions that were not formally assessed in the review. Given the concerns regarding the review process and the size, quality and clinical differences of the included studies, the results and implications for practice should be treated with some caution.

Implications of the review for practice and research
Practice: The authors stated that multidetector CT can provide useful ancillary information regarding coronary artery disease, aortic valve morphology and aortic disease; these conditions were not formally assessed in the review. The authors stated that multidetector CT should not be considered a reference method for determining aortic valve area, but can be an ancillary or confirmatory modality when transthoracic endocardiography was equivocal.

Research: The authors did not state implications for research.

Funding
Not stated.

Bibliographic details

PubMedID
19421893

DOI
10.1007/s10554-009-9464-z

Original Paper URL
http://dx.doi.org/10.1007/s10554-009-9464-z

Indexing Status
Subject indexing assigned by NLM

MeSH
Aged; Aortic Valve /radiography /ultrasonography; Aortic Valve Stenosis /radiography /ultrasonography; Echocardiography; Echocardiography, Transeosophageal; Female; Humans; Male; Middle Aged; Predictive Value of Tests; Reproducibility of Results; Sensitivity and Specificity; Severity of Illness Index; Tomography, X-Ray Computed
Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.