Three-Dimensional Quantitative Coronary Angiography versus 'Gold-Standard' Intravascular Ultrasound Assessment: A Comparative Lesion Analysis

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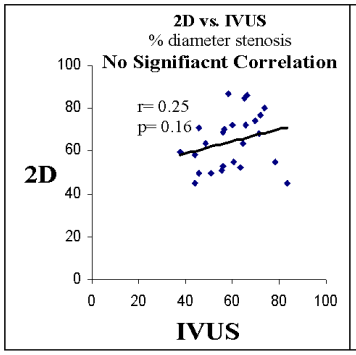
Background: In recent years, several types of three-dimensional (3D) reconstruction softwares have been developed to assess the coronary vasculature. However, 3D reconstruction measurements have not been evaluated against intravascular ultrasound (IVUS), currently the "gold-standard" modality for coronary lesion analysis.

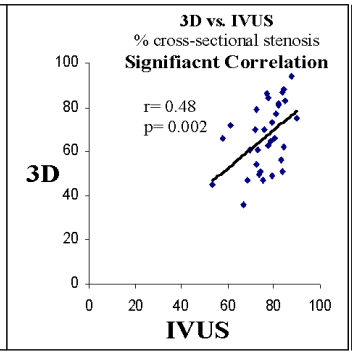
Objectives: To investigate the accuracy of 3D coronary reconstruction vs. IVUS measurements and to identify its possible merits compared to conventional two-dimensional (2D) analysis.

Methods: Thirty-two de-novo coronary lesions were evaluated using conventional coronary angiography. 2D quantitative coronary angiography analysis was performed with the McKesson^{TM} Telemedicine QCA system. For 3D reconstructions, the CardiOp-B package (Paieon Inc.) was used. All segments were further evaluated with IVUS (Volcano Corp.).

Results: When IVUS was used as the reference modality, 3D reconstruction was more accurate than 2D analysis, which poorly correlated with IVUS measurements of lesion length and minimal lesion diameter (r=0.14, p=0.92 and r=-0.25, p=0.16, respectively). There was no significant difference between 3D and IVUS in measurements for minimal lesion diameter and minimal lesion area (p=0.92, p= 0.90, respectively), although the correlations were not significant (r=0.11, p=0.95 and r=0.20, p=0.32, respectively). In all relative stenosis evaluations (diameter. cross-section, plaque-volume), 3D analysis yielded significantly lower values than IVUS (all p<0.001), which were nevertheless significantly correlated with the IVUS assessment (r=0.38, p=0.03; r=0.48, p=0.002; r=0.39, p=0.03).

Conclusions: 3D reconstruction analysis is more accurate against IVUS than 2D analysis, especially for lesion diameter and length. Results for lesion severity are lower with 3D reconstruction than with IVUS.





	2D	3D	IVUS
Minimal Lesion Diameter (mm)	1.16 ± 0.42	1.76 ± 0.46	1.76 ± 0.13
Diameter Stenosis (%)	53.6 ± 13.2	48.5 ± 14.4	60.3 ± 10.8
Lesion Length (mm)	17.0 ± 9.3	21.1 ± 14.8	26.4 ± 14.6
Minimal Lesion Area (mm^2)	-	2.85 ± 1.31	2.83 ± 0.43
Cross Sectional Stenosis (%)	-	66.6 ± 15.1	76.3 ± 8.4
Plaque Volume (%)	-	43.9 ± 7.9	59.0 ± 8.2