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A New Angiographic Tool for Assessing the Hemodynamic Significance of Intermediate Coronary Lesions: Correlation with Fractional Flow Reserve

Jaffe, R; Khader, N; Rubinshtein, R; Danon, A; Merdler, A; Flugelman, M; Shahla, J; Asmir, E; Halon, D; Lewis, B
Carmel Medical Center, Haifa, Israel

Background: Angiographic percent stenosis does not reflect the hemodynamic significance of intermediate coronary lesions. Fractional flow reserve (FFR) <0.8 reliably identifies functionally significant lesions however this technology is invasive, expensive and not routinely available. On the basis of the Poiseuille equation we hypothesized that the quotient of lesion length and minimal lumen diameter (MLD^4) measured by quantitative coronary angiography (QCA) would correlate with FFR measurement. Methods: All FFR studies at our center were analyzed. Exclusion criteria included: LV ejection fraction <40%, left main stenosis >50%, tandem coronary lesions, Q-wave myocardial infarction in the coronary territory, recent MI (<5 days), collateral flow distal to the assessed lesion and significant valvular disease, angiography with a <6F catheter and without IC nitroglycerine. FFR measurement (Brightwire, Volcano) was performed following IC adenosine up to 120 mcg or achievement of FFR<0.8. Results: Sixteen lesions were included in the current analysis. Mean lesion length was 14.8±9.0 mm (range 4.3-38.8), MLD 1.4±0.5 mm (range 0.7-2.3), lesion stenosis 52.3±15.1 % (range 28.2-74.5) and FFR 0.89±0.08 (range 0.72-1.00). FFR did not correlate with percent stenosis, had weak correlation with MLD (R^2=0.2536, p=0.0467) and correlated with lesion length (R^2=0.3504, p<0.02). Best correlation was with quotient of length/MLD^4 (R^2=0.5768, p<0.001) for which a cut-off value of 20 identified 2 of 3 pts with abnormal FFR and confirmed all normal FFR values. Conclusions: The QCA-derived quotient of lesion length and fourth power of MLD correlates well with FFR. This angiographic tool may enable reliable assessment of the hemodynamic significance of intermediate coronary lesions without need for the more invasive and expensive use of pressure wire measurements.