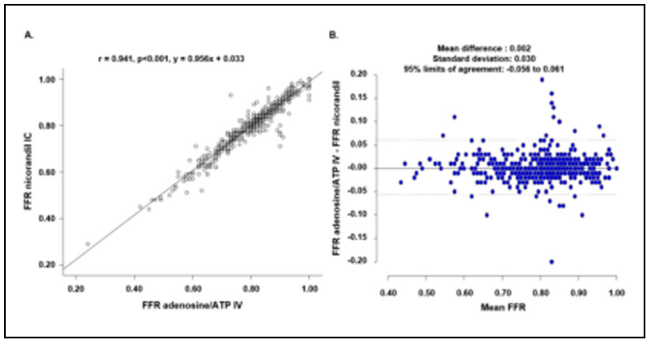


CONCLUSIONS Nicorandil IC bolus injection is a simple, safe and effective way to induce maximal hyperemia and can be used as a substitute for adenosine.

CATEGORIES **IMAGING:** FFR and Physiologic Lesion Assessment

KEYWORDS Adenosine, Fractional flow reserve, Nicorandil

TCT-298

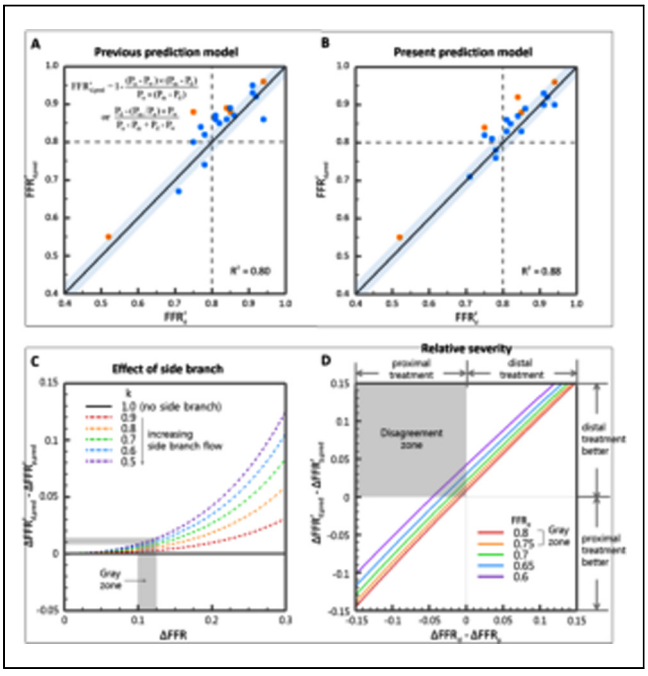
In Vivo Validation of Mathematically-derived Fractional Flow Reserve for Assessing Hemodynamics of Coronary Tandem Lesions

Jihoon Kweon,[1] Young-Hak Kim,[1] Dong Hyun Yang,[1] June-Goo Lee,[1] Seong-Wook Park[1]
[1]Asan Medical Center, Seoul, Korea, Republic of

BACKGROUND The aim of this study was to provide and validate a mathematical model of tandem lesion for the prediction of post-stenting fractional flow reserve (FFR) across the remaining stenosis without a repeated FFR measurement.

METHODS Following treatment of either proximal or distal stenosis, the residual FFR gradient across the remaining lesion ($\Delta FFR'_{d,pred}$ or $\Delta FFR'_{p,pred}$) was calculated as ΔFFR_d / (1-w×ΔFFR_p) or ΔFFR_p/(1-kw×ΔFFR_d), respectively. Considering ΔFFR_O (ΔFFR across the proximal segment to the proximal stenosis), the predicted FFR'_d was [1-ΔFFR_O -$\Delta FFR'_{pred}$]. For in vivo validation, twenty patients with a tandem lesion (DS>50% for each stenosis) were evaluated. After stenting a stenosis with a larger ΔFFR, post-stenting FFR'd was re-measured and compared with the calculated $FFR'_{d,pred}$. The accuracy was also compared with a previous model that did not consider a side branch flow.

RESULTS $FFR'_{d,pred}$ using our model (vs. previous model) showed a closer correlation with the measured FFR'_d (R^2=0.88 vs 0.80) and a greater prediction power in terms of mean absolute error (0.03±0.02 vs 0.04±0.03, p=0.045), (Figure A and B). When FFR gradients across proximal and distal stenosis were equal (ΔFFR_p=ΔFFR_d), prioritizing treatment of distal (vs. proximal) stenosis was more effective to reduce the residual FFR gradient (Figure C). Especially in tandem lesions with a big side branch and a large sum of ΔFFR_d and ΔFFR_p, even with a slightly larger ΔFFR_p (vs. ΔFFR_d), consequent FFR recovery was less effective compared to distal stenosis treatment ('disagreement zone' in Figure D).



CONCLUSIONS Our prediction model accurately predicts FFR'_d after treatment of a stenosis and is useful to optimize treatment strategy in tandem lesion.

CATEGORIES **IMAGING:** FFR and Physiologic Lesion Assessment

KEYWORDS Coronary artery disease, Fractional flow reserve, Modeling

TCT-299

Adenosine Versus Regadenoson In Assessing Fractional Flow Reserve, A Meta Analysis

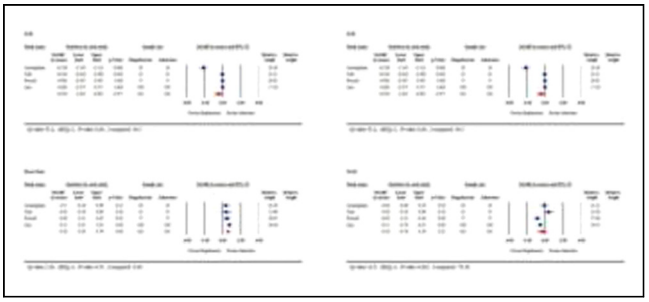
Muhammad S. Azzouz,[1] Alok Saurav,[1] Mohsin Salih,[2] Toufik Mahfood Haddad,[1] Mohamed Ayan,[1] Aiman Smer,[1] Abhilash Akinapelli,[1] Saurabh Aggarwal,[1] Manu Kaushik[3]
[1]Creighton University School of Medicine, Omaha, NE; [2]St Lukes hospital, Chesterfield, MO; [3]Creighton University School of Medicine, Omaha, NE

BACKGROUND Fractional Flow Reserve (FFR) has become the standard method of assessing the physiological severity of intermediate coronary artery stenosis. It requires maximum hyperemia. Traditionally Adenosine has been used. Regadenoson, a selective A2A receptor agonist, is an approved hyperemic agent for pharmacological stress imaging, its role for measuring FFR is unknown. We therefore systematically reviewed published literature to compare the efficacy and safety between those two drugs in measuring FFR.

METHODS We searched PubMed, Cochrane Library & Web of Science for randomized controlled trials (RCT) comparing the use of Adenosine versus Regadenoson in measuring FFR. The primary endpoint was the correlation of FFR values using those two drugs. We also assessed the change in mean blood pressure, heart rate, and development of advanced heart block as safety outcomes. Odd ratio and 95% confidence intervals were used to evaluate categorical variables. Standard difference in the mean and 95% confidence intervals were used to evaluate continuous variables. All the analysis was done with the Der Simonian and Laird random effect model. Sensitivity and cumulative analysis were performed for each outcome.

RESULTS A total of 4 RCT with a total of 202 patients were included. Each patient underwent FFR measurement using IV Adenosine first then with IV Regadenoson. A strong linear correlation of FFR was noted in between the two methods. The pooled mean correlation factor was R 0.981. There was no statistically significant difference in mean FFR values between both groups (Sdm -0.87, CI = [-1.08,-0.09], P= 0.07). The standard mean difference was lower with sensitivity analysis but remained statistically insignificant (Sdm -0.008, CI = [-0.21,1.9], P=0.94). Change in heart rate were less in Adenosine arm

(Sdm 0.58, CI = [0.38, 0.78] P =0.00). Changes in MAP were not statistically significant (Sdm -0.3, CI = [-0.78, 0.18] p 0.22), more drop in MAP with Regadenoson arm (Sdm -0.53, CI = [-.89, -0.17] P=0.004) was seen with sensitivity analysis. There was more high degree AV block with Adenosine (OR 0.19 [0.04,0.9], P = .04).



CONCLUSIONS Regadenoson is effective in measuring FFR. It is associated with less high degree AV block. Large RCT are needed to further demonstrate the clinical outcomes and cost effectiveness of it. Its use in complex multiple lesions needing serial FFR measurements is to be studied.

CATEGORIES IMAGING: FFR and Physiologic Lesion Assessment

TCT-300

Combining baseline distal-to-aortic pressure ratio and fractional flow reserve in the assessment of coronary stenosis severity

Mauro Echavarria-Pinto,[1] Tim P. van de Hoef,[2] Martijn A. van Lavieren,[3] Sukhjinder S. Nijjer,[4] Borja Ibañez,[1] Stuart J. Pocock,[5] Alicia Quirós,[6] Justin E. Davies,[7] M. Meuwissen,[8] Patrick W. Serruys,[9] Carlos Macaya,[10] Jan Piek,[11] Javier Escaned[12]
[1]Hospital Universitario Clinico San Carlos, Madrid, Spain; [2]Academic Medical Center - University of Amsterdam, Amsterdam, Noord Holland; [3]Academic Medical Center, Amsterdam, Noord Holland; [4]Imperial College London, London, London; [5]London School of Hygiene and Tropical Medicine, London, United Kingdom; [6]Hospital Universitario Clinico San Carlos, Madrid, Madrid; [7]Imperial College London, London, United Kingdom; [8]Amphia Hospital, Breda, Netherlands; [9]Thoraxcenter, Rotterdam, Netherlands; [10]Clinico San Carlos Hospital, Madrid, Spain; [11]Academic Medical Center, Amsterdam, Netherlands; [12]Hospital Clinico San Carlos, Madrid, Spain

BACKGROUND Pd/Pa is always accessible before FFR assessment, and emerging data supports the notion that baseline indices can determine the ischemic potential of coronary stenosis in selected subsets. We sought to understand 1) the physiological basis of baseline distal-to-aortic pressure ratio (Pd/Pa) and fractional flow reserve (FFR) agreement and discordance, using coronary flow reserve (CFR), stenosis resistance (SR) and microcirculatory resistance (MR) measurements; and form there, 2) to investigate the potential value of combining Pd/Pa with FFR in the diagnostic rationale.

METHODS 467 stenosed vessels from 363 patients were investigated with pressure and flow sensors during baseline and hyperemia: 168 vessels (135 patients) with thermodilution-derived flow, and 299 vessels (228 patients) with Doppler-derived flow.

RESULTS Pd/Pa correlated more strongly with CFR than FFR (ρ difference=0.129; p for ρ comparison<0.001). Although Pd/Pa and FFR were closely correlated (ρ =0.798; 95% CI: 0.767 to 0.828), categorical discordance was observed in 19.3% of total vessels. Such discordance was associated with the patients' clinical profile and characterized by contrastive changes in SR, MR and the underlying CFR. Notably, all stenosis with Pd/Pa≤0.83 (n=74, 15.8%) progressed to FFR≤0.80, and although no Pd/Pa cut-off was able to exclude the development of FFR≤0.80 in the high end of values, only 15 (10.1%) vessels with Pd/Pa≥0.96 (n=149, 31.9%) developed FFR≤0.80, from which none had definite ischemia, as defined by CFR≤1.74.

CONCLUSIONS Combining baseline Pd/Pa with FFR seems to provide a more comprehensive physiological examination of stenosed coronary arteries, and a closer pressure-based appraisal of the flow reserve of the downstream myocardial bed.

CATEGORIES IMAGING: FFR and Physiologic Lesion Assessment

KEYWORDS Fractional flow reserve

TCT-301

Lesion-specific myocardial mass: A new index for diagnosis and treatment of coronary artery disease

Jin-Ho Choi,[1] Hyung Yoon Kim,[2] Hong Seok Lim,[3] Joon Hyung Doh,[4] Chang-Wook Nam,[5] Bon-Kwon Koo,[6] Jin-Ho Choi[1]
[1]e-CTO investigators, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, NJ; [2]Samsung Medical Center, seoul, Korea, Republic of; [3]Ajou University School of Medicine, Suwon, Korea, Republic of; [4]Inje University Ilsan Paik Hospital, Goyang-si, Korea, Republic of; [5]Keimyung University Dongsan Medical Center, Daegu, Korea, Republic of; [6]Seoul National University, Seoul, Korea, Republic of

BACKGROUND Accurate quantification of the myocardial mass by coronary computed tomography angiography (CCTA) has become available. And lesion-specific myocardial mass (LMM) could be estimated with clinical applications of allometric scaling law. The aim of this study was to estimate the influence of the amount of lesion-specific myocardial mass (LMM) on the diagnostic performance of % DS or MLD to predict functional ischemia defined as fractional flow reserve (FFR) < 0.80.

METHODS CCTA and FFR were performed to evaluate 208 lesions in 132 patients. Index of myocardial ischemia was defined as FFR < 0.80. Total and lesion-specific myocardial mass was estimated using CCTA measurements based on allometric scaling method. And the LMM was defined as each myocardial mass per each supply vessel. Bivariate analysis was performed to estimate correlation between FFR and %DS or MLD in accordance with the amount of LMM.

RESULTS Ischemia was observed in 102 lesions. The mean FFR value was 0.63 ± 0.13. Mean total myocardial mass of CCTA was 108.20 (g) and mean LMM was 36.51 (g). Lesions with positive FFR had larger mean LMM. %DS and FFR showed modest negative correlation with high sensitivity but low specificity was observed. At the same anatomical severity of stenosis, lesions with larger LMM tend to produce more functionally significant ischemia. Interestingly, this tendency was not observed according to the reference diameter. At the same MLD, functionally significant ischemia was produced at lesions with larger LMM. Further, based on these slope of regression lines, lesions can be divided into 2 groups according to FFR value. So we assumed that, lesions with larger LMM and/or smaller MLD will produce more significant functional ischemia. We made new index with LMM divided by MLD and assessed its diagnostic performance to predict functionally significant ischemia. With the best cut-off value of 38.4, the AUC of the ROC were 0.82 with 62% of sensitivity and 90% of specificity. And the diagnostic performance of LMM/MLD was higher than that of %DS.

CONCLUSIONS Lesion-specific myocardial mass (LMM) can be calculated from CT by allometric scaling law. The larger the amount of LMM, the better the correlation between FFR and MLA was observed in this study. LMM showed weak correlation with RD and MLD, and weak negative correlation with DS%. A new index, LMM/MLD was predictive for ischemia as well as DS%(FFR <0.8). Our study suggests that 1mm of MLD CT can supply 34.8(g) of myocardium. In conclusion, functional severity of coronary artery stenosis depends on the amount of lesion-specific myocardial mass of the index vessel.

CATEGORIES IMAGING: FFR and Physiologic Lesion Assessment

TCT-302

Comparison Between Thermodilution And Doppler Flow Velocity Derived Quantification Of Microvascular Function After Acute Myocardial Infarction

Guus A. de Waard,[1] Paul F. Teunissen,[2] Paul Knaapen,[2] Niels van Royen[2]
[1]VU University Medical Center, Amsterdam, Noord Holland; [2]VU University Medical Center, Amsterdam, Netherlands

BACKGROUND The prognostic value of the quantification of coronary microvascular function following an acute myocardial infarction is becoming increasingly acknowledged. Invasive interrogation of coronary microvascular function can be performed using either a thermodilution based technique to quantify coronary blood flow or Doppler flow to assess coronary flow velocity. For the contemporary