has been conducted. A recurring debate still exists regarding its optimal dose. The aim of the present study sought to establish the dosage of IC adenosine associated with minimal side-effects and above which no further increase in flow can be expected.

METHODS In 30 patients, Doppler-derived flow velocity measurements were obtained in 10 right coronary arteries (RCA) and 20 left coronary arteries (LCA) free of stenoses greater than 20% in diameter. Flow velocity was measured at baseline and after 8 mL bolus administration of 9 escalating doses of adenosine (4 to 500 μg). The hyperemic value was expressed in percent of the maximum flow velocity reached in a given artery (Q/Qmax, %).

RESULTS Q/Qmax did not increase significantly beyond dosages of 60 μg for the RCA and 160 μg for LCA. Heart rate did not change, while mean arterial blood pressure decreased by a maximum of 7% (p < 0.05) after bolus injections of IC adenosine. The incidence of transient A-V blocks was 40% after injection of 100 μg in the RCA, and was 15% after injection of 200 μg in the LCA. The duration of the plateau reached 12±4 s after injection of 100 μg in the RCA and 21±8 s after the injection of 200 μg in the LCA. A progressive prolongation of the time needed to return to baseline was observed.

CONCLUSIONS This wide-ranging dose-response study indicates that IC adenosine bolus injection of 100 μg in the RCA and 200 μg in the LCA induces maximum hyperemia while being associated with minimal side effects.

CATEGORIES IMAGING: FFR and Physiologic Lesion Assessment
KEYWORDS Adenosine, Fractional flow reserve, Hyperemia

TCT-294
Contrast-induced microvascular dilatation: implications for fractional flow reserve measurements
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BACKGROUND The use of adenosine is sometimes considered as a limiting factor for fractional flow reserve (FFR) measurements. The present study sought to quantify the potential of contrast medium (CM) to induce microvascular dilatation as assessed by the changes in Doppler flow velocity measurements.

METHODS In 30 patients, Doppler-derived flow velocity measurements were obtained in 10 right coronary arteries (RCA) and 20 left coronary arteries (LCA) free of stenosis greater than 20% in diameter. Flow velocity was measured at baseline and after 8 mL intracoronary (IC) bolus administrations of arterial blood at body temperature, saline and CM compared to maximum hyperemia induced by escalating dosages of adenosine (4 to 500 μg) at room temperature. The hyperemic value was expressed in percent of the maximum flow velocity reached in a given artery (Q/Qmax, %). To translate the IC adenosine dose into its effect on FFR, a model based on standard coronary physiology linked the degree of hyperemia to the relative distal coronary pressure (Pd/Pa).

RESULTS Doppler flow velocity varied among 8 mL IC boluses of arterial blood, saline and contrast (p < 0.001), and all pairwise comparisons were significant (p < 0.001 for blood and contrast; p = 0.041 for saline and blood; and p = 0.013 for saline and contrast). Hyperemic response after injection of 8 mL of CM reached 59±17% of that achieved maximum hyperemia. While Baseline, arterial blood and saline achieved respectively 38±12%, 45±14% and 51±14% of Q/Qmax. Heart rate did not change, while mean arterial blood pressure decreased by a maximum of 7% (p < 0.05) after bolus injections of IC adenosine. The incidence of transient atrioventricular blocks was 38% after injection of 200 μg, while it was not observed with CM. According to our theoretical model, when CM reach 59±17% of that achieved maximum hyperemia after adenosine in Doppler flow velocity it correspond to a Pd/Pa ratio of 0.85, where FFR is 0.79 and the resting Pd/Pa is 0.90.

CONCLUSIONS CM reaches approximately 60% of the maximal flow velocity as compared to Adenosine IC. This corresponds to a difference of only 6% when ‘translated’ in terms of FFR.
**TCT-296**

Validation of FFR measurement using a new ultra-thin monorail catheter based system

Hitoshi Matsuo,1 Yoshiaki Kawase,2 Kikuchi Jun,3 Itta Kawamura,4 based system

**BACKGROUND**

FFR measurement is beneficial to evaluate the functional significance of coronary artery stenosis and guiding coronary interventions. The ACIST Navvus Microcatheter is a rapid exchange intravascular catheter that can be passed into the coronary tree over any 0.014" guidewire. The Navvus catheter has an in-lesion mean distal shaft diameter of 0.022" with a maximum profile of 0.036" at the pressure sensor near the distal tip.

**METHODS**

We compared FFR values measured with a new catheter based pressure sensor to those measured with a traditional 0.014" wire-based system (Volcano) across a wide range of stenosis severities in 17 patients with ischemic heart disease. After diagnostic angiography, FFR was obtained by both commercially available 0.014" pressure wire (Volcano Verrata®) and catheter based pressure sensor (ACIST Navvus®). Values were obtained in a sequential fashion over several minutes under separate vasodilator administration, with sensors placed independently in similar locations.

**RESULTS**

Among 29 measurements (pre-PCI:20, post-PCI:9), successful FFR measurement was obtained in 28/29 cases with the microcatheter system, and 28/29 cases with the wire based system. Both cases where FFR was unsuccessful involved tortuous lesions. The correlation of FFR values between both system was quite good and acceptable across the wide range of stenosis severities (see figure), with a predicted bias at the 0.80 cut point of 0.004, wire-based system higher, (95% CI -0.02 to 0.02), by Passing-Bablok analysis.

**CONCLUSIONS**

Navvus can navigate difficult anatomy with minimum drift phenomenon. FFR correlation was quite good even in very severe stenosis.

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

**KEYWORDS** Fractional flow reserve, Ischemic heart disease, Pressure wire

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**TCT-297**

Safety and Efficacy of Intracoronary Nicorandil as Hyperemic Agent for Invasive Physiological Assessment: Patient-Level Pooled Analysis of Current Evidence

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**BACKGROUND**

Fractional flow reserve (FFR) has become standard invasive assessment for determining the functional significance of coronary artery stenosis. Intravenous (IV) infusion of adenosine is the gold standard method for the induction of hyperemia. Intracoronary bolus injection of nicorandil, a coronary vasodilator which acts on both macro- and microvascular systems, has been reported to be safe and cardioprotective in patients with coronary artery disease.

**METHODS**

We performed a patient-level pooled analysis of 5 previous studies, which compared FFR measurement using IV adenosine/adenosine triphosphate (ATP) and IC nicorandil. A total of 480 intermediate coronary lesions from 429 patients were analyzed to evaluate the safety and efficacy of IC nicorandil as an alternative choice of hyperemic agent for invasive physiologic studies.

**RESULTS**

IC nicorandil showed significantly earlier achievement of maximum hyperemia (time-to-the lowest FFR: 18.0s [IQR 15.6-21.5] vs. 44.0s [IQR 36.0-60.0], p<0.001) with similar hyperemic efficacy, compared with intravenous (IV) adenosine/ATP (FFR 0.82[0.75-0.87] vs. 0.82[0.74-0.88], p=0.207). FFR measurements with both agents showed excellent correlation and classification agreement (CA) for FFR>0.80 (r=0.941, ICC 0.980, CA 90.8%, Kappa=0.814, AUC of nicorandil 0.980, all p<0.001). Only 3 patients (0.7%) showed changes in classification across the gray zone (0.75-0.80). IC nicorandil produced fewer changes in blood pressure (BP) and heart rate (HR) and showed less chest pain than IV adenosine/ATP (all p<0.001). When comparing ΔFFR according to ΔBF or ΔHR between IV adenosine/ATP and IC nicorandil, there were no correlations, either between ΔFFR and ΔBF (r=-0.114, p=0.091), or between ΔFFR and ΔHR (r=1.000, p=0.151).

**Abbreviations:** IMR, index of microcirculatory resistance; VAS, visual analogue scale; AV, atrioventricular