density difference between stress and rest CTP images) were assessed with the reference to hemodynamically significant stenosis, which was defined as FFR ≤ 0.8 or angiographically tight stenosis judged prospectively by each operator. **Results:** From 210 epicardial arteries, hemodynamically significant stenosis was observed in 86 (41%) arteries. Per-vessel sensitivity and specificity of CTP by visual assessment were 80% and 95% in all patients, 87% and 100% in those with severe coronary calcium, and 75% and 90% in those with multivessel disease, respectively. From quantitative parameters, TPR showed the most accurate diagnostic performances with AUC of 0.759, sensitivity of 75%, and specificity of 71%. Mean radiation dose for CTP and CTA was 6.6 and 6.0 mSv, respectively. **Conclusion:** Stress myocardial CTP appears a feasible method for identification of inducible ischemia in patients with suspected CAD. The diagnostic accuracy of CTP may be improved if both visual and quantitative analytic results are taken into account together.

**TCTAP A-089**

Risk of Stent Fracture, Longitudinal Compression, and In-stent Restenosis After the First- and Second-generation Drug-eluting Stent Implantation: Evaluation Using Coronary CT Angiography

Dong Hwan Yang1, Young-Hak Kim1, Mi Sun Chung1, Jung-Min Ahn1, Jong-Young Lee1, Duk-Woo Park1, Soo-Jin Kang1, Seung-Whan Lee1, Cheol Whan Lee1, Seong-Wook Park1, Joon-Won Kang1, Taehwan Lim1, Dong-Young Park1, Jong-Young Lee1, Duk-Woo Park1, Soo-Jin Kang1, Seung-Whan Lee1, Cheol Whan Lee1, Seong-Wook Park1, Joon-Won Kang1, Taehwan Lim1, Jong-Young Lee1, Duk-Woo Park1, Soo-Jin Kang1, Seung-Whan Lee1, Cheol Whan Lee1, Seong-Wook Park1, Joon-Won Kang1, Taehwan Lim1, Jong-Young Lee1, Duk-Woo Park1, Soo-Jin Kang1, Seung-Whan Lee1, Cheol Whan Lee1, Seong-Wook Park1, Joon-Won Kang1, Taehwan Lim1

1Asan Medical Center, Seoul, Korea (Republic of). 2Sejong General Hospital, Seoul, Korea (Republic of)

**Background:** To evaluate the incidence and clinical impact of stent fracture, longitudinal compression and in-stent restenosis after drug-eluting stent (DES) implantation using the coronary computed tomography (CT) angiography.

**Methods:** A total of 644 coronary lesions from 445 patients who underwent coronary CT evaluation following DES implantation were retrospectively enrolled. CT angiography was taken using a dual source CT (either first or second generation) scanner and was analyzed by two independent radiologists. The first- (sirolimus- and paclitaxel-eluting stents; n=368) and second- (everolimus-, biolimus-, and zotarolimus-eluting stents; n=234) generation DES were used for lesions.

**Results:** The incidences of all stent fracture, complete stent fracture, longitudinal compression and in-stent restenosis were 9.6%, 3.2%, 3.3% and 2.8%, respectively. Lesions with excessive tortuosity showed a higher incidence of stent fracture (all fracture 24.0% vs. 8.3%, p<0.001; complete fracture, 14.0% vs. 2.2%, p=0.001). Longitudinal compression was significantly higher in ostial lesions (24.5% vs. 1.4%, p<0.001). In-stent restenosis was more frequent in a lesion with stent fracture, but the difference was not statistically different (all fracture 17.6% vs. 9.4%, p=0.472; complete fracture 5.3% vs. 2.7%, p=0.959). There was a tendency of a lower incidence of stent fracture (all fracture 9.0% vs. 10.7%, p=0.579; complete fracture 0.4% vs. 4.9%, p=0.004) and in-stent restenosis (1.3% vs. 3.8%, p=0.116), but had a higher incidence of longitudinal compression (8.1% vs. 0.3%, p<0.001) following implantation of the second-generation DES compared with the first-generation DES.

**Conclusion:** Coronary CT is a feasible method to detect stent fracture, longitudinal compression and in-stent restenosis after DES implantation. The second-generation DES appears to have a higher risk of longitudinal compression, but have a lower risk of complete stent fracture.

**TCTAP A-090**

Is Non-enhanced Cardiac Computed Tomography Valuable for Prediction of Distal Embolism During Percutaneous Coronary Intervention?  

Masakazu Okatani, Hiroyoshi Yoshikawa, Naoko Takaoka, Takashi Kitao

Nagoya Tokushukai Hospital, Osaka, Japan

**Background:** Low attenuated plaque (LAP), napkin ring sign (NRS) in coronary Computed Tomography (CT) and attenuated plaque (IVUS-AP) in intravascular ultrasound (IVUS) were reported to be good predictive factors of distal embolism (DE) during percutaneous coronary intervention (PCI). However, Contrast media induce plaque CT density to be higher than in reality and small or small-dense calcification tends to be similar CT density to contrast media. Therefore enhanced CT image has some misunderstood histological diagnosis. We studied possibility of non-enhanced cardiac CT in the matter of prediction of DE during PCI.

**Methods:** Consecutive 79 de novo stable lesions of 56 cases which underwent ECG gated non-enhanced cardiac CT before PCI between April 2011 and November 2013 were studied retrospectively. Rotablator use, abrupt total occlusion, in-stent restenosis and poor CT image lesion was excluded. CT examination was performed by 64 row machine and all PCI was performed with IVUS guidance and coronary stent implantation. Plaque location was identified by comparing to coronary angiogram (CAG) and suspected lesion was checked CT density by color map method. The lesion which minimum CT density is under -200HU component was defined as non-enhanced very low attenuated plaque (NE-LAP) and over 130HU component was defined as calcium.

**Results:** 8 lesions (10%) had DE in this population. Positive predictive value (PPV) and negative predictive value (NPV) of NE-LAP/LAP, NRS and IVUS-AP were 21.6%/100%, 33.3%/95.3% and 50.0%/100%, respectively. In combination prediction of NE-LAP+LAP, NRS+IVUS-AP, NE-LAP+IVUS-AP and NE-LAP+NRS+IVUS-AP were 50.0%/95.7%, 83.3%/95.9%, 66.7%/100% and 100%/95.9%, respectively.

**Conclusion:** Each of NE-LAP, NRS in non-enhanced coronary CT image were good predictor of DE but inferior to IVUS-AP. Combinations of NE-LAP+IVUS-AP and NE-LAP+NRS+IVUS-AP improve the predictive potential of DE compared with IVUS-AP single factor.

**TCTAP A-091**

Effects of Left Atrial Strain on Functional Capacity in Severe Organic Mitral Regurgitation

Li-Tun Yang

National Cheng Kung University Hospital Dou-Liou Branch, Yunlin, Taiwan

**Background:** Decreased left atrial (LA) strain was noted in patients with severe organic mitral regurgitation (MR). However, effects of LA deformation on functional capacity of patients with severe MR were not fully studied. The aim of this study was to investigate the effects of LA deformation on severity of symptoms in patients with severe organic MR.

**Methods:** This study recruited 110 (55% men, 57 ± 16 years) consecutive patients with severe organic MR and preserved left ventricular systolic function who underwent echocardiography in the outpatient clinic. LA deformation including strain and strain rate were assessed by two-dimensional speckle tracking echocardiography with commercialized software. Global peak LA longitudinal strain (LAS), peak strain rate in reservoir phase (LASr), and in conduit phase (LASrc) were identified from strain and strain rate curves. Severity of heart failure symptoms were evaluated by New York Heart Association (NYHA) functional classification.

**Results:** There were 35 (32%) patients in NYHA I, 62 (56%) in NYHA II, and 13 (12%) in NYHA III. Age 50 ± 13, 60 ± 17, 65 ± 16 years; p = 0.004) presence of severe organic MR.
atrial fibrillation (0%, 13%; 31%; p = 0.007), left ventricular mass index (100 ± 28, 106 ± 29, 128 ± 33 g/m²²; p = 0.017), estimated pulmonary artery systolic pressure (31 ± 15, 38 ± 18, 50 ± 30 mmHg; p = 0.011), LAS (29.9 ± 8.9, 25.2 ± 10.1, 18.8 ± 6.4%; p = 0.002), LASRr (2.5 ± 0.5, 2.3 ± 0.7, 2.0 ± 0.8 s⁻¹; p = 0.055), and LASRc (2.4 ± 0.7, 2.1 ± 0.8, -1.7 ± 0.5 s⁻¹; p = 0.015) were changed gradually in respective to NYHA functional class I to III. There were no differences in left ventricular ejection fraction, left atrial volume index, left atrial emptying fraction, effective regurgitation orifice, and regurgitation fraction of MR between NYHA functional classes. After multivariate logistic regression analysis controlling age and status of atrial fibrillation, only LAS (OR 0.891, 95% CI 0.796-0.997, p = 0.044) was an independent factor for predicting severe symptoms of heart failure (NYHA III). Furthermore, we found that age (OR 1.081, 95% CI 1.033-1.132, p = 0.001) and diabetes mellitus (OR 13.379, 95% CI 1.008-106.83, P = 0.049) were independent factors for decreased LAS in these patients.

Conclusion: Patients with severe organic MR, LAS was correlated with severity of heart failure symptoms. Age and diabetes mellitus were independent factors for decreased LAS in these patients.

**TCTAP A-092**

Comparison of Coronary Plaque Characteristics in Stable Angina Patients Between Non-invasive Dual-source Computed Tomography and Invasive Intravascular Ultrasound

Cheng Han Lee
National Cheng Kung University Hospital, Tainan, Taiwan

**Background:** Intravascular ultrasound (IVUS) is now accepted as the standard of reference for detection of atheroma and provides additional information on plaque composition. Recently, virtual histology IVUS enables differentiation of the plaque components with good accuracy. Non-invasively, plaque extent and composition may be evaluated by multi-slice computed tomography (MSCT) coronary angiography. The purpose of our study was to assess MSCT and automated color-coded analysis in the quantification and classification of plaque components, using virtual IVUS as the standard of reference.

**Methods:** This study was approved by the institutional review board and all patients provided written informed consent. They received coronary MSCT, followed by invasive coronary angiography and IVUS. Coronary CT angiography was performed using a dual source 128-slice MSCT system (Definition, Siemens Healthcare, Germany). For each patient, well-defined plaques were selected, and plaque volume was measured with manual tracing at CT and with IVUS. Measurements were compared with paired t test and correlation analysis.

**Results:** 16 patients were enrolled and there were 86 coronary segments analyzed. Among these segments, we could evaluate the features of 117 coronary plaques. We could classify coronary plaques as soft, mixed, and calcified plaques. As IVUS images are regarded as a standard reference, the overall accuracy of MSCT is 94.2%. For soft plaques, the accuracy of MSCT is 95.8%; the accuracy is 82.1% for mixed plaques; the accuracy was 90% for calcified plaques. There was good correlation between plaque volumes (left anterior descending artery) quantified with MSCT and IVUS (r = 0.81, P<0.001). There was good correlation between plaque volumes (left circumflex artery) quantified with MSCT and IVUS (r = 0.90, P<0.001). Besides, there was good correlation between plaque volumes (right coronary artery) quantified with MSCT and IVUS (r = 0.93, P<0.001).

**Conclusion:** The non-invasive dual-source MSCT in our hospital is feasible to analyze coronary plaque characteristics and calculate plaque volume in a semi-automatic mode.

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**Other (Unclassified)**

**(TCTAP A-093 to TCTAP A-095)**

**TCTAP A-093**

Novel Debulting Model for Rotational Atherectomy System Named ATSUSHIKUN

Akihiko Matsumura
Kameda Medical Center, Kamogawa-city Chiba, Japan

**Background:** Rotational Atherectomy (RA) was developed to debulk atherosclerotic plaque. It makes enable to treat the lesion which is difficult to expand with balloon catheter to modify the plaque morphology. There are some tips and techniques to use RA safely, but to learn about them with in vivo was difficult because of the lack of the good stenotic model for debulking. We invented the novel stenotic model for RA named ATSUSHIKUN and performed the training of RA in porcine model.

Methods: Making ATSUSHIKUN: A 2.75 mm Taxus Liberte stent was removed and was cut into 3-4 mm length, then were put on three folds on the center of another Taxus Liberte stent. This stenotic model was named ATSUSHIKUN. ATSUSHIKUN was delivered to coronary artery and inflated at 6 to 8 atm. Intravascular ultrasound guided post dilatation was performed at proximal site of ATSUSHIKUN to achieve adequate stent apposition.

**Results:** After the deployment of ATSUSHIKUN, RA was performed using 1.5mm burr followed by 2mm, 2.15mm burr. Total ablation time of RA with each burr reached more than three minutes and the feeling of burr was resembled just as severe calcified plaque.

**Conclusion:** ATSUSHIKUN enable to train RA in porcine model more effectively.