

Sonodynamic therapy inhibits neo-intimal hyperplasia after stenting

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It was reported that some kind of photosensitizer was activated by ultrasound and inhibited cell growth (sonodynamic therapy, SDT). Therefore, SDT may inhibit neointimal proliferation after stenting. We tested whether SDT with the newly developed sonosensitizer inhibits cell growth in vitro and neointimal proliferation in vivo (rabbit iliac artery stent model). SDT successfully inhibits smooth muscle cell growth in tissue culture model and neointimal hyperplasia after stenting in rabbit iliac artery. Then, the new ultrasound catheter of 6F was developed for SDT. To reduce the thermal effect of ultrasound, the optimal output of ultrasound was 2W (continuous wave) or 4W (50% duty) at 1MHz. Efficacy of SDT using the new ultrasound catheter in pig model is now testing.

Clinical characteristics of patients with late In-stent restenosis

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Background: Late in-stent restenosis (ISR) is a rare event. The purpose of this study was to evaluate the clinical characteristics of the cases with late-ISR. Methods: We studied 314 patients (570 lesions) retrospectively who underwent successful coronary stent implantation and have no restenosis at 6-month and 12-month follow up coronary angiography (FU CAG). Additional CAG was performed properly when ischemic heart disease (IHD) was suspected after the 12-month FU CAG. In case without any sign of IHD, we performed FU CAG more than three years after the stent implantation. Late-ISR was defined as a restenosis occurred more than 12 months after stent implantation. We evaluated the clinical characteristics of the cases with late-ISR (late-ISR group) compared with those without (non late-ISR group). Results: Late-ISR was occurred in 14 cases (4%). 12 of 14 cases (86%) were acute coronary syndrome (ACS) (AMI: 5 cases, UAP: 7 cases). The mean duration from stent implantation to late-ISR was 59 \pm 21 months. Late-ISR group was more likely to have multi-lesions at the first PCI compared with non late-ISR group (3.5 \pm 1.5 v. s. 1.4 \pm 0.7, $p < 0.001$). The type of stent, the size of stent, the level of total cholesterol and blood glucose, and medications after stent implantation were similar between the two groups. Conclusion: Late-ISR was likely to occur in patients with multi-lesions, and most clinical onset form was ACS.

Axial redistribution of atherosclerotic plaque into reference segments after PCI and changes in lumen volume - a prospective ultrasound study

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[Purpose] Lumen enlargement during coronary stenting results from vessel expansion and axial redistribution of plaque along the stented segment and proximal and distal reference segments. Plaque burden in the reference segment predicts stenosis at the stent edge. The aim of this study is to investigate the fate of shifted plaque (PSh) with special reference to whether PSh correlates with late lumen reduction or not.

[Methods] This is a prospective study conducted on 54 consecutive patients underwent coronary stenting. Serial intravascular ultrasound (IVUS) measurements were done at the stented segments and 5mm away from stent struts (108 edges).

[Results] Immediately after intervention, PSh was detected by IVUS in 81.5% of proximal edges vs. in 72.2% of distal edges, $p=0.36$. Mean PSh volume correlated with Δ vessel volume (EEMV) ($r=0.37$, $p<0.001$), and inversely with Δ lumen volume (LV) ($r=0.33$, $p=0.002$). However, at 6-month follow-up, it did not correlate with Δ LV ($r=0.03$, $p=0.8$), Δ EEMV ($r=0.1$, $p=0.3$), or Δ PV ($r=0.09$, $p=0.5$). Changes in lumen volume correlated more strongly with Δ EEMV ($r=0.63$, $p<0.001$), than with Δ PV ($r=-0.38$, $p<0.001$). By multivariate analysis, mean PSh area was an independent predictor of change in lumen area at the postintervention level (partial eta squared=0.21, $p=0.001$), but not at the follow-up level. Two patients who developed proximal stent edge stenosis (3.7%) had no evident PSh after intervention.

[Conclusion] Axial PSh to stent edge was a frequent phenomenon during coronary stenting. Although PSh was responsible for the immediate change in stent edge LV; it did not contribute to the late change.

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Effective DCA debulking in our hospital

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[Purpose] To evaluate the debulking time, the number of cuts and the number of grade up for inflation pressure for DCA in our hospital

[Methods] We classified 55 lesions underwent DCA alone into the following four groups according to lesion length and lesion type: group SE (<=9mm, eccentric lesion), group SC (<=9mm, concentric lesion), group OE (>9mm, eccentric lesion), Group OC (>9mm, concentric lesion).

[Results] In our hospital, the number of cuts for DCA seemed to be fewer, even though it increased according to lesion length and lesion type. The debulking time also seemed to be less similarly. The number of grade up for inflation pressure seemed to be less (No significant difference between the four groups). However, the average of residual %plaque area was small (No significant difference between the four groups).

[Conclusion] Accurate setting of window`s direction and suitable grade up for inflation pressure seem to enable to gain less residual % plaque area in less debulking time and fewer the number of cuts.

	Group SE (n=17)	Group SC (n=8)	Group OE (n=18)	Group OC (n=12)	Whole (n=55)	Significant difference
Balloon diameter (mm)	3.33 ± 0.72	5.68 ± 0.64	5.28 ± 0.63	5.41 ± 0.48	5.38 ± 0.64	-
Lesion length (mm)	6.6 ± 2.8	6.8 ± 2.2	13.3 ± 3.6	18.8 ± 6.7	11.3 ± 6.2	+
No. of cuts	30.8 ± 4.1	16.2 ± 4.0	16.3 ± 6.8	23.2 ± 13.3	16.6 ± 9.3	+
Debulking time (min)	15.5 ± 8.3	28.3 ± 8.4	24.3 ± 6.0	36.8 ± 12.6	24.9 ± 13.9	+
Residual %plaque area	29.0 ± 11.3	25.8 ± 8.4	25.9 ± 9.1	26.8 ± 8.9	27.6 ± 9.6	-
No. of grade up for inflation pressure	1.9 ± 1.2	2.8 ± 1.4	2.8 ± 1.4	2.4 ± 1.4	2.2 ± 1.3	-

Factors preventing restenosis after super-aggressive debulking with directional coronary atherectomy (DCA)

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Objectives: Our study was conducted to estimate factors of preventing restenosis after super aggressive debulking with directional coronary atherectomy (DCA). We defined successful debulking with less than 35% residual plaque as super aggressive debulking. Methods: We evaluated data on 62 lesions with 58 patients (77plusmn;9.2 years old) who underwent super aggressive debulking with DCA in our hospital from 2001 Dec. to 2005 Mar. These patients were performed debulking with almost less than 35% residual plaque and following coronary angiogram on about 6 months later(107plusmn;27 days). We selected some factors which would affect the restenosis, coronary risk factors(smoking, DM, hyperlipidemia, hypertension), reference diameter, lesion length and residual plaque area with IVUS. All data were represented as meanplusmn;SD and calculated using Fisher test between restenosis and no restenosis group. Result: Restenosis rate showed 13% in all patients, but there were no restenosis in the group with bigger than 3.5mm reference. Patients without coronary risk factors(smoking;30%, DM;40%, HL;30%, HT40%), under 10mm lesion length, additional stenting, who performed debulking using DCA, did not show a significant reduction in restenosis rate compared to without them. But significantly lower restenosis rate were indicated in two groups with bigger than 3.5mm reference and with less than 30% residual plaque after debulking against the other group. (p<0.005)Conclusion: Bigger than 3.5mm reference and less than 30% residual plaque after debulking were most important factors with DCA procedure to prevent the restenosis .

Effect of intracoronary nicorandil on coronary myocardial bridging

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[Purpose] Medical treatments of coronary myocardial bridging (CMB) have been explored negative inotropic and/or negative chronotropic agents. Nitroglycerin is known to augment vessel wall squeezing. Nicorandil is a hybrid of a nitrate and a potassium channel opener. However, the effect of nicorandil on CMB is unknown. We evaluated the effect of intracoronary nicorandil on CMB.

[Methods] We analyzed nicorandil reactivity at the site with CMB in 11 patients (12 lesions). Maximal and minimal diameters of CMB during a cardiac cycle were measured by quantitative angiography at baseline and at 60 seconds after intracoronary administration of 200 μ g nicorandil. Angiographically determined percent vessel narrowing of CMB was calculated as $\{(\text{end-diastolic diameter} - \text{end-systolic diameter})/\text{end-diastolic diameter}\} \times 100$.

[Results] The maximal diameter during diastole increased from 2.11 ± 0.43 mm to 2.42 ± 0.45 mm after administration of nicorandil ($P < 0.001$), and the minimal diameter during systole increased from 1.23 ± 0.64 mm to 1.68 ± 0.65 mm ($P < 0.001$). Thus, nicorandil reduced the percent vessel narrowing from 36.1 ± 26.5 mm to 20.9 ± 21.6 mm ($P < 0.001$).

[Conclusion] These results indicate that nicorandil could dilate coronary arteries during diastole as well as systole in patients with CMB. However, precise mechanism of nicorandil on CMB is not known. Further studies are necessary to establish the exact role of nicorandil in therapy of CMB by intravascular ultrasound, intracoronary Doppler ultrasound, and intracoronary pressure devices.

Sleep-disordered breathing is the major coronary risk factor in post-menopausal women

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[Background] In women, morbidity of cardiovascular disease increases after menopause remarkably. Furthermore, it has been reported that SDB suddenly increases after menopause. [Purpose] The aim of this study was to elucidate the relationship between SDB and coronary artery disease (CAD) in postmenopausal women. [Methods] The study subjects were 193 consecutive postmenopausal women (mean age: 70 ± 8 years) who were hospitalized for coronary angiography. They were divided into two groups based on the presence of CAD, and were evaluated for their clinical profiles and coronary risk factors. Sleep study was performed using Apnomonitor, and apnea-hypopnea index was calculated. SDB was defined as apnea-hypopnea index of 10 or more. The risk factors for CAD were assessed by multivariate logistic regression analysis. The variables entered into the model were elderly (age ≥ 65 years), obesity (body mass index ≥ 25 kg/m²), hypertension, hyperlipidemia, diabetes mellitus, smoking and SDB. [Results] Age was significantly older in CAD patients (n=71) than in non-CAD patients (mean age: 72 ± 8 vs. 69 ± 8 years, $p < 0.01$). The incidence of hypertension, hyperlipidemia, diabetes mellitus and SDB (46 vs. 24%, $p < 0.005$) were significantly greater in CAD patients than in non-CAD patients. There were no significant differences in prevalence of elderly, obesity and smoking between 2 groups. In multivariate analysis, SDB was most potent predictor of CAD (odds ratio [OR]=2.87, 95% confidence interval: 1.41-5.86, $p=0.0037$). The other significant variables were elderly (OR=2.55, $p=0.0378$), diabetes mellitus (OR=2.29, $p=0.0480$) and hyperlipidemia (OR=2.14, $p=0.0271$). [Conclusion] In postmenopausal women, SDB may be a stronger marker of CAD than classic coronary risk factors.

3F catheters for diagnostic coronary angiography

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(Background) Recently, 4 Fr catheters (actually size; 4.1 Fr) have been standard for diagnostic coronary angiography. Down sizing of catheters may reduce invasions and complications (particularly access site complications), but there are some problems such as poor catheter conformation and poor angiographic image quality. (Aim) A randomized study was conducted to assess the feasibility of 3 Fr catheters (actually size; 3.4 Fr) for diagnostic coronary angiography and safety of 1-hour compression to obtain hemostasis used by Stepty P (Nichiban Co. Ltd) following angiography. (Methods) Patients were randomized to transradial coronary angiography with 3 or 4 Fr catheters. Length, inner diameter and maximum tolerant pressure of 3 Fr catheters (Trail HF; Fukuda denshi Co. Ltd) were 100 cm, 0.80 mm and 1200 psi. We analyzed the difference of fluoroscopy time, contrast volume, procedural time, number of catheters use, angiographic quality, access site complications and hemostasis time between two groups. (Results) All angiograms using 3 Fr catheters were considered to be diagnostic quality. One-hour compression time was safe to obtain hemostasis following 3 Fr angiography. Good-quality diagnostic coronary angiograms can be achieved using 3 Fr catheters with the advantage of earlier compression time. (Conclusions) Three-Fr catheters would be safe and useful to less invasive diagnostic coronary angiography.

The usefulness of a novel 7.5F sheathless guide-catheter

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We commonly use 6 french guide catheter (GC) for TRI or TBI. The lumen size is often not enough for kissing balloon technique (KBT), a crash stenting, seesaw wire technique (SWT) using micro catheters for CTO and Rotablater etc. In these case we often use larger 7 french GC, but large size GC increases the risk of radial arterial occlusion, bleeding and neural injury. Recently the 7.5 french sheathless guide catheters was developed and came into use. This novel hydrophilic-coated GC is directly and smoothly inserted into the artery without a sheath. The outer diameter is 2.47 mm, as small as that of 5 french sheath, but inner diameter is 2.06mm, as large as that of 7Fr GC. Therefore we expect that this low profile, large lumen sheathless GC enables us to perform PCI more safely and to broaden procedures using various technique via radial artery. The 7.5 french sheathless GC will come into use wide spread for TRI and TBI instead of TFI. We report the experience of the 7.5 french sheathless guide catheter.

Synergistic effects of biventricular pacing and Bachmann pacing on heart failure with atrial arrhythmias

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Biventricular pacing is very effective for severe congestive heart failure. Patients with severe heart failure often have arrhythmias which could deteriorate symptoms or heart failure conditions. A 69-year-old male who had aortic valve replacement for regurgitation had suffered from drug refractory heart failure. He had been admitted for heart failure deterioration when atrial tachycardias or atrial fibrillation developed. He underwent radiofrequency catheter ablation for atrial tachycardias. But he had still developed severe heart failure when atrial fibrillation occurred. Biventricular pacing was finally introduced with Bachmann pacing to prevent atrial fibrillation or atrial tachycardia from deteriorating heart failure. He has improved quality of life and heart failure condition from NYHA IV to II after implantation of biventricular pacing with Bachmann pacing. This report suggests that biventricular pacing with Bachmann pacing may improve heart failure conditions deteriorated with atrial arrhythmias.

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The right atrial isthmus appears to show electrical longitudinal dissociation in patients with atrial flutter

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Purpose: To evaluate conduction properties of right atrial isthmus, anatomical ablation of this tissue was performed during treatment of atrial flutter. Methods: 51 patients (39 Males, 64 ± 10 years old) underwent radio-frequency catheter ablation of a common type of atrial flutter including 2 cases of a reversed common type. Clockwise and/or counterclockwise block through the isthmus was studied when it was gradually ablated starting from the tricuspidal edge of the isthmus all the way to the inferior vena caval edge. Result: In 31 patients having sinus rhythm, coronary sinus pacing was applied during the ablation procedure. 5 of them suddenly exhibited complete bidirectional block of the isthmus when only the initial half isthmus of the tricuspidal side was ablated. The remaining half isthmus of the inferior vena caval side was subsequently ablated in the remaining 26 patients to obtain complete bidirectional block of the isthmus. In 20 patients having persistent atrial flutter, the arrhythmia was terminated in 15 cases when the initial half isthmus of the tricuspidal side was ablated. Since they all showed clockwise conduction in the isthmus, further ablation to the inferior vena caval edge was mandatory to obtain complete bidirectional block. Conclusion: Right atrial isthmus appears to have electrical longitudinal dissociation; the tricuspidal side favoring counterclockwise conduction and the inferior vena caval side, clockwise conduction.

Dual assessment of coronary artery stenosis and myocardial ischemia in adenosine triphosphate stress MSCT

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Background: The aim of this study was to prove our hypothesis that adenosine triphosphate (ATP) stress multi-slice computed tomography (MSCT) can detect both coronary stenosis and myocardial ischemia. **Method:** Seventeen patients with coronary artery disease (CAD) underwent ATP stress MSCT, stress Tl-201 myocardial perfusion scintigraphy (MPS), and 14 patients of them coronary angiography (CAG). Dual-scan was done for stress and rest MSCT images. First scan for the stress image was performed during ATP infusion (0.16 mg/kg/min for 5 min). Twenty minutes after the first scan, nitroglycerin (0.6mg) was administered and the second scan for rest image was done without ATP infusion. Myocardial hypo-perfusion area (HPA) in the stress image and coronary stenosis (>50%) were visually evaluated with MSCT and compared to the results with conventional MPS and CAG. **Results:** In 51 (17 × 3 major coronary arteries) left ventricular territories, MSCT described 39 HPAs, and MPS described 30 redistribution (RD) areas. The agreement of two methods was 78.4 % (40/51). Most of HPAs in the stress images promptly turned to normal in rest images. In 14 patients who underwent CAG, diagnostic CAG proved that: 1) in 26 stenotic vessels, CT-angiography (CTA) detected 16 stenoses in 24 HPA (+) / RD (+) territories; 2) CTA detected 4 of 5 stenoses in 8 HPA (+)/RD (-) territories. CTA was enough to detect culprit coronary stenoses and perfusion CT seemed to be more sensitive than MPS. **Conclusion:** ATP stress MSCT potentially detects both coronary artery stenosis and myocardial ischemia in patients with CAD.