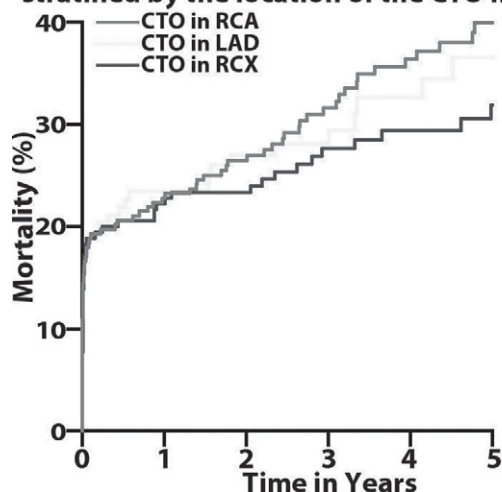


Figure 1: Long term mortality in STEMI patients stratified by the location of the CTO in a non-IRA

Conclusion: STEMI patients with a CTO in a non IRA have an increased mortality, regardless of the coronary location.

TCT-5

Drug-Eluting Stents for the Treatment of Chronic Total Occlusion: A Comparison with Sirolimus, Paclitaxel, Zotarolimus (Endeavor Resolute), BiolimusA9, EPC Capture and Everolimus-Eluting Stent: Multicenter Registry in Asia

Sunao Nakamura¹, Hisao Ogawa², Jang-Ho Bae³, Yeo H Cahyadi⁴, Wasan Udayachalerm⁵, Damras Tresukosol⁶, Sudaratana Tansuphaswadikul⁷
¹New Tokyo Hospital, Chiba, Japan; ²Kumamoto University Hospital, Kumamoto, Japan; ³Konyang University Hospital, Daejeon, Republic of Korea; ⁴Husada Hospital, Jakarta, Indonesia; ⁵King Chulalongkorn Memorial Hospital, Bangkok, Thailand; ⁶Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand; ⁷Chest Disease Institute, Nontaburi, Thailand

Background: The aim of this study is to compare the safety and efficacy of Sirolimus (SES), Paclitaxel (PES), Zotarolimus (ZES-R/ Endeavor Resolute), BiolimusA9 (BES), EPC capture (ECS) and Everolimus-eluting stent (EES) on the outcome of patients with chronic total occlusion (CTO).

Methods: A prospective analysis of 1576 patients with 1738 CTOs (396 SES, 526 PES, 219 ZES-R, 209 BES, 148 ECS, 240 EES) in six high volume Asian centers after successful recanalization of CTO was performed. The study endpoints were 30 days and 12 months major adverse cardiac events (MACE), 12 months angiographic restenosis and target lesion revascularization (TLR).

Results: See table for clinical results.

	SES	PES	ZES-R	BES	ECS	EES
Number of patients/lesions	365/396	482/526	199/219	188/209	123/148	219/240
LAD/LCX/RCA (%)	54/23/23	52/24/24	50/18/32	46/21/33	52/18/30	53/21/26
Procedural success (%)	100	100	100	100	100	100
MACE at 30 days (%)	0.5	0.6	0.5	0	0.8	0
Proximal RD (mean: mm)	2.86	2.80	2.85	2.84	2.92	2.87
MLD at baseline (mean: mm)	2.65	2.54	2.60	2.78	2.62	2.67
12 months MLD (mean: mm)	2.50	2.30	2.49	2.66	2.10	2.58
Restenosis rate (%)	7.1	9.4	7.0	6.4	21.1*	4.5
TLR (%)	5.5	8.3	7.0	5.9	17.9*	4.5
MACE (%)	7.1	8.7	7.5	5.9	19.5*	4.5

RD: reference diameter, MLD: minimum lumen diameter, *p<0.05 vs. others.

Conclusion: The use of drug-eluting stents in patients with CTO was safe with low acute complication. Patients treated with 2nd generation DES such as ZES-R, BES and EES showed lesser rate of restenosis compared with 1st generation drug-eluting stents.

TCT-6

Long-Term Clinical Outcomes after Percutaneous Coronary Intervention for Chronic Total Occlusions in Insulin and Non-Insulin Dependent Diabetes Mellitus: Five-Year Outcomes from a 1,791 Patient Multi-National Registry

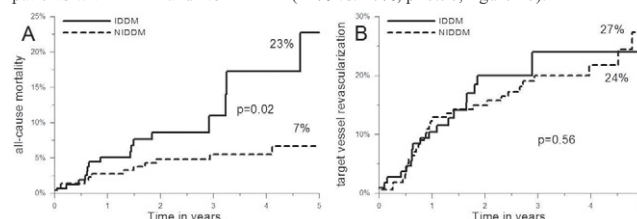
Bimmer E Claessen^{1,2}, Cosmo Godino³, Kotaro Obunai¹, Sunil Kanwal¹, Mauro Carlino³, Young-Hak Kim⁴, Carlo DiMario⁵, José P Henriques², Seung-Jung Park⁴, Gregg W Stone¹, Martin B Leon¹, George D Dangas¹, Antonio Colombo³, Roxana Mehran¹

¹Cardiology, Cardiovascular Research Foundation, New York, NY; ²Academic Medical Center - University of Amsterdam, Amsterdam, Netherlands; ³San Raffaele Scientific Institute, Milan, Italy; ⁴Asan Medical Center, Seoul, Republic of Korea; ⁵Royal Brompton Hospital, London, United Kingdom

Background: There is a paucity of data on long-term clinical outcomes of patients with insulin dependent diabetes mellitus (IDDM) compared with non-IDDM undergoing percutaneous coronary intervention (PCI) for chronic total occlusions (CTO).

Methods: Between 1998 and 2007, a total of 1791 pts with 1852 CTO underwent PCI at three centers in the US, Italy and South Korea. Time-to-event analyses were performed using Kaplan-Meier statistics and the log-rank statistic was used to test for differences between pts with and without DM. Cox regression was used for multivariate analysis.

Results: A total of 395 (23%) patients had DM, 164 had IDDM (42%) and 231 had non-IDDM (58%). Procedural success was similar in pts with IDDM and non-IDDM (68% vs. 71%, p=0.48). After a successful procedure, stents were implanted in 106 patients with IDDM (87% DES) and 159 patients with Non-IDDM (69% DES). Median follow-up duration was 1080 days. Five-year mortality was significantly increased in patients with IDDM (23% vs. 7%, p=0.02, figure 1a). After multivariate adjustment, IDDM remained an independent predictor of mortality (HR 2.25, 95% CI 1.04-4.87, p=0.04). Other independent predictors were age (HR 1.1, p<0.01) and procedural success (HR 0.44, p=0.03). Five-year TVR rates after successful PCI were similar in patients with IDDM and Non-IDDM (24% vs. 27%, p=0.56, figure 1b).



Conclusion: In diabetic patients undergoing CTO PCI, IDDM was an independent predictor of 5-year mortality. After a successful procedure, TVR rates were similar in patients with IDDM and non-IDDM.

TCT-7

MSCT Guided Co-registration for CTO Procedures - A Pilot Feasibility Study

Ravit Barkama, Giora Weisz, Fernando Sosa, Angelica Castaneda, Diane Weber-Cannone, Lauren Privitera, Sunil Kanwal, Ahmed Hassanin, Varinder Singh, Michael Collins, Martin B Leon, Jeffrey W Moses
 Columbia University Medical Center, New York, NY

Background: Since traditional coronary angiography provides images of the coronary vessel lumen, chronic total occlusions (CTO) segments are not visible using this modality. Multislice Computed Tomography (MSCT) provides information on the soft tissue surrounding the vessel lumen, so it can be used to identify morphological features such as actual length of the occluded segment, tortuosity and the amount of calcification. The 3D nature of MSCT allows accurate measurements of length that do not suffer from calibration limitations and foreshortening. The purpose of this study was to evaluate the feasibility and operator-perceived added value of advanced software that provides real time fusion of MSCT images onto the live fluoroscopy during CTO recanalization.

Methods: In this feasibility study, a software prototype (GE Healthcare, Waukesha, US) allowing MSCT image fusion with fluoroscopy was used. Manual registration was performed using anatomical landmarks, such as the vessel ostia and calcifications. This initial phase of image fusion enabled the operator to plan the procedure. Visualized portions of the occluded vessel were displayed over the fluoroscopy image in real time, using ECG gating to match the cardiac phase of the two modalities. The 3D soft tissue reconstruction of the occluded lumen was displayed on a separate screen allowing real-time comparison, side by side, between fluoroscopy and MSCT co-registration.

Results: MSCT guided co-registration was performed for a total of 21 CTO procedures. Real-time registration was successful in all cases and aided in selection of the view that would provide the least foreshortening and minimal vessel overlapping. Successful CTO recanalization was achieved in 16 (76%) of the cases. Post-procedural assessment by the operators ranked the device usefulness as "Very High" in 5 of the cases, "High" in 9, "Moderate" in 4 and of "Little or No Value" in 3.

Conclusion: This pilot feasibility study demonstrated that MSCT co-registration is feasible, easily integrated into the standard procedure and is perceived in the majority of cases as a highly useful tool for CTO recanalization. Further research is warranted

to determine whether the use of MSCT co-registration will result in improved procedural success rate.

TCT-8

Increased Radiation Exposure in Percutaneous Coronary Interventions for Chronic Total Occlusions

Sunil Kanwal¹, Giora Weisz², Stephen Balter¹, Ahmed Hassanin¹, Varinder P Singh¹, Ravit Barkama¹, Lauren Privitera¹, Michael B Collins¹, Roxana Mehran², Gregg W Stone¹, Martin B Leon¹, Jeffrey W Moses¹
¹Columbia University Medical Center, New York, NY; ²Mount Sinai School of Medicine, New York, NY

Background: Radiation exposure of over 7Gy at International Electric Commission reference point [Air Kerma (AKR)] increases the risk of radiation injury. Limited data exist on the predictors of high AKR in complex coronary chronic total occlusion (CTO) PCI.

Methods: We reviewed the AKR in 310 consecutive CTO recanalization attempts in 303 patients. Radiation exposure was measured during the procedure.

Results: Procedural success was 73.1%. Mean fluoroscopy time was 38.4±21.4min. Mean radiation was 5.6±3.1Gy and 328±186Gycm². As compared to successful PCI, failed attempts were associated with longer fluoroscopy duration (44.6±22.4min vs 36.1±20.6min; p=0.001) and higher radiation (6.2±3.3Gy vs 5.4±3.0Gy; p=0.05). Patients with AKR above and below 7Gy are compared in the Table. Multivariable analysis identified body surface area [OR 6.91 (95%CI 1.92, 24.83 p=0.003)], male gender [OR 2.83 (95%CI 1.00, 8.00 p=0.0495)], calcification [OR 2.49 (95%CI 1.31, 4.71 p=0.005)] and dual injection technique [OR 2.43 (95%CI 1.32, 4.46 p=0.004)] as independent predictors of AKR >7Gy. There were no statistically significant differences in AKR according to CTO coronary artery or proximal vs. distal lesions.

	AKR <7Gy (n=214)	AKR ≥7Gy (n=87)	p-value
Age, yr	63.90 ± 10.80	63.67 ± 11.57	0.8669
Male Gender	76.6% (164/214)	88.5% (77/87)	0.0194
Prior Q-wave MI	20.5% (35/171)	31.5% (23/73)	0.0636
History of Smoking	8.4% (18/214)	2.3% (2/87)	0.0536
Weight	84.30 ± 18.52	93.08 ± 21.32	0.0007
Body Surface Area	1.96 ± 0.24	2.07 ± 0.26	0.0011
CTO Length	20.20 ± 13.79	23.03 ± 14.96	0.1301
Blunt Occlusion	15.8% (25/158)	22.4% (15/67)	0.2389
Bridging Collaterals	30.8% (52/169)	29.6% (21/71)	0.7973
Calcification	25.1% (43/171)	43.7% (31/71)	0.0044
Dual Injection	40.8% (82/201)	62.5% (50/80)	0.0010
Procedure Success	74.8% (160/214)	69.0% (60/87)	0.3036
Dissection	5.8% (12/207)	8.2% (7/85)	0.4429
Perforation	5.6% (12/214)	2.3% (2/87)	0.2166
In-Hospital MACE	1.9% (4/214)	1.1% (1/87)	0.6578
2yrs Follow-up MACE	12.6% (27/214)	18.6% (16/87)	0.1808

Conclusion: Recanalization of complex CTO lesions is associated with high patient radiation exposure to radiation. Risk factors for increased radiation include large body surface area, male gender, calcification, and dual injection technique. When these factors are present, increased vigilance is warranted to employ strategies that reduce radiation exposure.

TCT-9

Management Of Procedural Complications Related To Percutaneous Coronary Intervention Of Chronic Total Occlusions Via The Retrograde Approach. A Toyohashi Experience

Masashi Kimura, Etsuo Tsuchikane, Osamu Katoh, Nobuyoshi Tanaka, Kenya Nasu, Yoshihisa Kinoshita, Tatsuya Ito, Mitsuyasu Terashima, Yasushi Asakura, Takahiko Suzuki
Toyohashi Heart Center, Toyohashi, Japan

Background: The recanalization of chronic total occlusions (CTOs) in native coronary arteries no doubt represents one of the most technically challenging of interventional procedures. Despite recent high success rates owing to the development of new strategies such as the retrograde approach, complications and their management during percutaneous coronary intervention (PCI) of CTOs have not been fully evaluated.

Methods: The aim of this study was to investigate in-hospital outcomes, including complications, with the retrograde approach.

Results: Out of 943 cases involving 1,014 CTOs undergoing attempted recanalization between 2005 and 2010, 278 cases (29.4%) were attempted using the retrograde approach. The overall procedural success rate was 85% (862/1,014). CTO lesions were most frequently located in the right coronary artery (n=166) followed by the left anterior descending artery (n=80), and the left circumflex artery (n=33). Septal, epicardial, and saphenous vein graft collaterals were used in 67.3%, 24.8%, and 7.9% of cases involving the retrograde approach, respectively. Specific complications with the retrograde approach were observed in 36 cases (14.7%) and were recovered in the cath-lab with the exception of 1 case as shown in the table.

Complications	N (total 41)	Treatment (N)
Perforation: Septal channel (N=20) Epicardial channel (N=14) Coronary artery (N=2)	36	
Class I	23	Observation (23)
Class II	10	Reversal of anticoagulation (8) Embolization with fat/tissue or coil (2) Balloon inflation (6)
Class IIICS	0	
Class III	3	Cardiocontusion (3) Balloon inflation (3) Stent implantation (1)
Myocardial Ischemia	4	
Thrombus injection from donor artery	1	Aspiration (1) Balloon inflation (1)
Micro-catheter in collateral	3	Stent implantation (1) Balloon inflation (3)
Device stuck in coronary artery	1	Emergency CABG (1)
Cardiac Death	0	

Abbreviations: Class I, extraluminal crater without extravasation; Class II, pericardial or myocardial blushing; Class III, perforation > or = 1-mm diameter with contrast streaming; and cavity spilling
CABG: coronary artery bypass graft

Conclusion: Although the complication rate during the retrograde approach was around 15%, all cases were solved with optimal treatments. A safe procedure with careful wire manipulation and appropriate management should be required for the retrograde approach.

TCT-10

Development of a High-Volume, Multiple-Operator Program for Percutaneous Chronic Total Coronary Occlusion Revascularization: Procedural, Clinical and Cost-Utilization Outcomes

Dimitri Karpaliotis¹, Nicholas Lembo¹, Anna Kalynych¹, Harold Carlson¹, William L Lombardi², Chad L Anderson¹, Sarah L Rinehart¹, Ben L Kirkland¹, Phillip L Chambless¹, Kathie L Shemwell¹, Zhen Qian¹, David Edward Kandzari¹
¹Piedmont Heart Institute, Atlanta, GA; ²PeaceHealth St. Joseph Medical Center, Bellingham, WA

Background: Development of a specialized chronic total coronary occlusion (CTO) revascularization program attentive to procedural guidelines, quality oversight and cost/resource utilization has not been described.

Methods: A single-center CTO interventional program was initiated requiring: didactic training, on-site proctorship, determination of case appropriateness, adherence to procedural safety guidelines and a 2-operator/case approach. Clinical and angiographic characteristics, procedural outcomes, in-hospital clinical events and cost/resource utilization were examined.

Results: Among 145 patients, 160 consecutive CTO revascularization procedures were attempted between October 2009 and December 2010. Procedural and technical characteristics included: bilateral femoral access, 90.0%; planned retrograde guidewire placement, 37.5%; re-entry catheter, 10.0%; re-attempt, 10.6%; fluoroscopic time, 67.4±45.5 minutes; contrast volume, 403±215 mL. Average stent number and total stent length per CTO vessel were 2.6±1.1 and 64.7±30.7, respectively. Overall CTO success rate was 85.6% (137/160). In-hospital adverse outcomes included: death 0.6%; emergency bypass surgery, 0.6%; tamponade, 0.6%; myocardial infarction, 1.9%. Compared with patients undergoing non-CTO PCI, procedural and total hospital costs per patient were significantly higher among the CTO cohort despite overall similar contribution margins (\$5,173±12,052 CTO vs \$5,730±8,958 non-CTO, P=0.58).

Conclusion: Following initiation of a dedicated program with implementation of quality and performance guidelines, complex CTO revascularization may be safely performed with outcomes comparable to reports from established centers. Despite higher resource utilization, CTO revascularization is associated with a positive contribution margin similar to that of non-CTO procedures. Requirement of educational and performance standards, mentorship from experts, consensus review for appropriateness and provision of catheterization laboratory policies may represent a model for program development.

Drug-Eluting Balloons and In-Stent Restenosis

Room 130

Tuesday, November 8, 2011, 10:15 am - 12:25 pm

(Abstract nos 11 - 20)

TCT-11

In-Stent Restenosis is Not a Benign Clinical Entity, Presenting As Acute Coronary Syndrome In 40 % Of Cases

Jonathan Michael Behar, Huda Abu-Own, Eva Sammut, Krishnaraj S Rathod, Mc Gill Laura-Ann, Dan A Jones, Ajay Jain, Charles J Knight, Anthony Mathur, Andrew Wragg
The London Chest Hospital, Barts and the London NHS Trust, London, United Kingdom

Background: In-stent restenosis (ISR) following stent implantation may occur in 10-20% of the cases according to patient and lesion complexity. We aimed to determine the different clinical presentations of ISR in a large cohort of consecutive, non-selected