Methods: Between October 2003 and June 2010, a total of 1509 consecutive patients who underwent PCI for CTO defined as the presence of TIMI 0 flow within an occluded arterial segment of greater than 3 months standing. The population characteristics were compared regarding the presence of per and post-procedural tamponade.

Results: A cardiac tamponade occurred in 181059 patients (1.2%). As opposed to patients with a tamponade-free procedure, patients who have experienced cardiac tamponade were numerically older (68.6 vs. 63.4) and had similar risk factors (diabetes in 27% and dyslipidemia in 64%). Cardiac tamponade occurred more frequently in experienced operators reflecting more complex procedures. Absence of visible stump was associated with higher rate of cardiac tamponade (50% vs. 24.8% for patients without tamponade, *p* = 0.02). There were no significant differences regarding other angiographic characteristics between the two groups (calcifications, proximal tortuosity, lesion length). The use of a torus device and a retrograde approach were associated with higher rates of cardiac tamponade (0.17% vs 0.02% *p* = 0.01, and 0.28% vs 0.02, respectively). Procedural duration was longer in patients in whom a cardiac tamponade occurred (124±24 minutes, vs. 92±37 minutes, *p* = 0.01) and success rate was equal (0.77 vs 0.70, *p* = 0.61, respectively). Importantly, in-hospital stay was longer (7.2±3.6, vs. 3.1±3.3, *p* = 0.001, respectively), and rate of in-hospital death was higher among patients who have experienced cardiac tamponade compared to those without per and post-procedural tamponade (11% vs 1%, *p* = 0.01, respectively).

Conclusions: Cardiac tamponade occurred in 1.2% of a broad population of consecutive patients treated by PCI for chronic total coronary occlusion. Absence of visible stump and use of aggressive devices and strategies were more frequently associated.

TCT-377
Myocardial Performance Index After Successful Recanalization of Chronic Total Coronary Occlusions
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Background: Percutaneous recanalization of chronic total coronary occlusions (CTO) tends to show a positive effect on LV remodeling and ejection fraction (EF). Nevertheless, its effects on global cardiac functions are yet to be fully understood. Myocardial performance index (MPI) is likely to be more effective for analysis of global cardiac function than systolic and diastolic measures alone. The aim of this study was to evaluate the effects of recanalization of CTO on global cardiac functions by using MPI.

Methods: We evaluated 25 patients (20 men, mean age 57±14.1 years) who had ischemia on myocardial perfusion imaging and underwent successful percutaneous coronary intervention of right coronary artery (RCA) CTO. All patients underwent transthoracic echocardiography before (basal), 24 hours after (early) and at three months (late) of successful PCI. The MPI was calculated by using pulse wave tissue Doppler (TD) echocardiography.

Results: There was no difference between basal, early and late ventricular ejection fraction values (53.1±10.2, 53.3±9.5, 53.3±11.2, respectively). The MPI at 3rd month was significantly increased compared to the basal and early MPI (0.61±0.09 vs. 0.53±0.07; *p* = 0.001 and 0.60±0.08 vs. 0.53±0.07; *p* = 0.001, respectively). On the other hand, there was no significant difference between basal and early MPI (0.61±0.09 vs. 0.60±0.08; *p* = 0.84, respectively). Also, TD MPI within 3 months was significantly increased when compared to others (0.58±0.09 vs. 0.53±0.08; *p* = 0.003, 0.57±0.07 vs. 0.53±0.8; *p* = 0.001, respectively for TD MPI septal and 0.59±0.08 vs. 0.51±0.07; *p* < 0.001, 0.58±0.08 vs. 0.51±0.07; *p* < 0.001, respectively for TD MPI lateral).

Table 1. MPI values before and after of RCA CTO

<table>
<thead>
<tr>
<th>Time</th>
<th>Basal</th>
<th>Early</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>2d MPI</td>
<td>0.61±0.09</td>
<td>0.60±0.08</td>
<td>0.53±0.07</td>
</tr>
<tr>
<td>TD septal MPI</td>
<td>0.58±0.09</td>
<td>0.57±0.07</td>
<td>0.53±0.08</td>
</tr>
<tr>
<td>TD lateral MPI</td>
<td>0.59±0.08</td>
<td>0.58±0.08</td>
<td>0.51±0.07</td>
</tr>
</tbody>
</table>

Conclusions: In this study, we have shown that successful recanalization of CTO results in increased MPI-Indicated global cardiac functions within 3 months, while the EF values remain unchanged.

TCT-378
Drug eluting stents with bioresorbable polymer – short and long term clinical outcomes in the treatment of CTO lesions
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Background: New generation drug eluting stents (DES) significantly improved short and long-term vessel patency after CTO recanalization. Data on the performance of

TCT-376
Is Cardiac Tamponade Associated With Adverse Outcome in Patients Treated by PCI for Chronic Total Occlusions? Insight From a Large French Registry Including More than 1,500 Patients
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Background: PCI of chronic total occlusion (CTO) has become more and more aggressive during the last decade, especially because of frequent use of hydrophilic, hard and stiff wires, which have increased the rate of success. Indeed, the incidence and clinical consequences of cardiac tamponade in contemporary practice remain relatively unknown.
DES with biodegradable polymer in this setting are limited and therefore the Norbori DES/CTO registries were conducted.

Methods: In 2 large, prospective, multi-center registries, 504 out of 1434 patients treated with Nobori DES had at least one CTO lesion revascularized. All adverse events were adjudicated by an independent clinical event committee. The primary endpoint was Target Lesion Failure (TLF) at 1 year.

Results: CTO patients were treated at 60±11 years old, 82.9% males, having prior MI, prior PCI and previous cardiac surgery in 46.9%, 27.9% and 6.4% of patients. Multiple vessels were treated in 35.5% of patients (2.1±1.40 lesions per patient) with an average 1.49±0.77 stents per lesion. Antegrade approach and single wire technique were most frequent choice. Other techniques used included CTO dedicated wires, OTW balloon, microcather, rotational atherectomy and cutting balloon. Mean diameter stenosis before procedure was 91±16 and TIMI 0 and 1 were recorded in 59% of all lesions treated (not all were CTO). Mean fluoro time was 37±38 minutes and contrast volume was 276±155 mL. After procedure, mean diameter stenosis was 7±17% and TIMI1 and 0 were observed in only 3% of the lesions. Up to 1-month, there was 1 death, 3 MIs (0.6%) and no TLR. Four CD (1.2%) and three TLRs (0.9%) were reported up to one year follow-up bringing the total TLR rate in 2 patients (0.6%). Only one probable subacute stent thrombosis (0.2%) occurred. In the cohort of patients followed at 3-year, 3 patients suffered a CD (3.1%), 1 had an MI (1.0%), 3 underwent TLR (3.1%) and TLR rate was 6.2% with no late or very late stent thrombosis.

Conclusions: Treatment of CTO with Nobori DES showed excellent outcomes. Particularly appealing is that stent thrombosis was very rare despite the multiple overlapping stents. The low rate of procedural complications and adverse events up to 3 years suggests that this stent is a valuable treatment option for patients with CTO who are considered candidates for PCI.

TCT-379

A Comparison of the Success Rates and Long-Term Outcomes after percutaneous coronary intervention Between In-stent Restenosis and de novo Chronic Total Occlusion lesions

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Background: In-stent restenosis (ISR) chronic total occlusion (CTO) lesions have been known as one of the most challenging subsets for percutaneous coronary intervention among the CTO population. There have been few reports about ISR CTO intervention. Therefore, we compared the success rates and long-term outcomes after PCI between ISR and de novo CTO lesions.

Methods: The data for 368 patients undergoing intervention for CTO from 1998 to 2012 were analyzed. We compared the target lesion revascularization (TLR) success rate and 5-years follow up outcomes including major adverse cardiovascular and cerebrovascular event (MACCE) between the patients underwent PCI for ISR CTO (n=40) and de novo CTO (n=328) lesion. TLR success was defined as recovery of Thrombolysis in Myocardial Infarction (TIMI) grade 3 and residual stenosis diameter below 30%.

Results: No significant difference was observed in clinical and angiographic characteristics excepting deployed stent length (20.8±3.3 vs 21.2±3.0, p=0.006) and used contrast dose (220±92.2ml in ISR vs 269.3±111.1ml in de novo group, p=0.003) between both groups. Success rate of TLR was 80% of the ISR CTO group and 83.8% of de novo group (p=0.50). In the ISR CTO group, the success rate of re-stenosed drug eluting stent (DES) using provisional PCI was to be superior than that of re-stenosed bare metal stent (BMS) using provisional PCI in the patients, but it’s not significant (85.7% vs 71.4%, p=0.576). The 5-year MACCE-free survival of ISR CTO group was significantly lower than de novo group (61.6% vs 89.8%, p=0.034). On multivariate analysis, ISR CTO was associated with higher incidence of MACCE (hazard ratio 2.29, 95% confidence interval 1.046 to 5.030).

Conclusions: Procedural success rate for ISR CTO lesion was similar to that of de novo CTO lesion. But, ISR CTO group showed worse long term clinical prognosis than de novo CTO group.

TCT-380

The Prolyl Hydroxylase Inhibitor BIQ(FG-2216) Stabilises HIF-1α and Upregulates VEGF in vitro: A Potential Strategy For Difficult CTO Lesions in Patients

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Background: Up to 30% chronic total occlusions (CTO) cannot be revascularized by conventional angioplasty. Therapeutic enhancement of the collateral circulation may offer a novel solution. Previously, we investigated stimulation of vascular endothelial (EC) angiogenesis via stabilized hypoxia inducible factor (HIF) utilizing two prolyl-hydroxylase inhibitors. We reported di-methyl oxalylglycine (DMOG) increased collateral neovascularization in a porcine CTO model and showed BIQ(FG-2216), trialled for use in man for alternative indications, induced a dose-dependent pro-angiogenic response in primary human EC in vitro. We now report molecular mechanisms underlying the novel action of BIQ.

Methods: Human ECs (HUVEC) were treated with 50μM BIQ for up to 24 hours. (100μM CoCl2 was used as a positive control for HIF-1α stabilization). Expression of HIF-1α protein from cell lysates was analyzed by Western blotting. Quantitative PCR was used to examine the expression of vascular endothelial cell growth factor (VEGF) mRNA from treated EC.

Results: Stabilization of HIF-1α protein was demonstrated in EC after treatment with BIQ, along with a 1.45 fold increase in VEGF mRNA expression, after one hour of treatment (Figure).

Conclusions: We have confirmed that BIQ(FG-2216) upregulates HIF-1α in EC and shown evidence for a mechanism involving the angiogenic factor VEGF; implications of which we plan to translate this therapy. On-going work includes the development of polymer-coated BIQ eluting stents with in vitro and in vivo evaluation to develop an effective treatment for difficult CTOs in man.

TCT-381

The Safety And Efficacy Of The "Hybrid Approach" To Chronic Total Occlusions: Insights From A Contemporary Multicenter US Registry


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Background: The hybrid approach to coronary chronic total occlusion (CTO) crossing was developed to optimize procedural efficacy, efficiency, and safety. Methods: We examined the procedural techniques and outcomes of 287 consecutive CTO cases performed using the hybrid approach between August 2011 and June 2013 at 4 US centers: Appleton Cardiology, Appleton Wisconsin; St. Joseph Medical Center, Bellingham Washington; St. Luke’s Health System’s Mid-America Heart Institute, Kansas City, Missouri; and VA North Texas Healthcare System, Dallas, Texas.

Results: Mean age was 64±10.2 years and 89% of the patients were men, with high prevalence of diabetes mellitus (45%), peripheral arterial disease (17%), prior percutaneous coronary intervention (60%) and prior coronary artery bypass graft surgery (36%). Most target CTOs were located in the right coronary artery (60%), followed by the left anterior descending artery (21%), left circumflex (17%), posterior descending artery (1%) and left main coronary artery (1%). Dual injection was used in 74%. Overall, antegrade wire escalation was used in 63%, antegrade dissection re-entry in 38% and retrograde in 45%. Among successful cases, the final successful crossing technique was antegrade wire escalation in 41%, antegrade dissection an re-entry in 27%, and retrograde in 32%. The initial crossing strategy was successful in 60% of the patients, whereas 33% required an additional 1 to 4 crossing strategies. Technical success was achieved in 93% and major procedural complications occurred in 2% (death in 2 patients, one due to tamponade and one due to vascular access complication; and myocardial infarction in 3 patients). Mean contrast volume, fluoroscopy time, and air kerma radiation exposure were 275±149.0 ml, 45.9±30.7 minutes, and 3.87±2.25 Gray, respectively.

Conclusions: Application of the hybrid strategy to CTO crossing resulted in high success and low complication rates among a varied operator group and hospital structure, further supporting the value of the hybrid approach in crossing these challenging coronary lesions.