equations logistic regression modeling was used to generate independent variables associated with procedural success and procedural complications. **Results:** During the study period, CTO PCI represented 3.8% of the total PCI volume for stable coronary artery disease (22,365 of 594,510). Overall, patients undergoing CTO PCI required higher contrast volume and fluoroscopy time and had lower procedural success (59% vs. 96%, \( p < 0.001 \)) and higher MACE rate (1.6% vs. 0.8%, \( p < 0.001 \)) than non-CTO PCI patients. On multivariate analysis, several parameters (including older age, current smoking, prior MI, prior CABG, prior peripheral arterial disease, prior cardiac arrest, right coronary artery CTO target vessel, and less operator experience), were associated with lower likelihood of CTO PCI procedural success, while operators’ CTO PCI volume was associated with improved success without significant increase in major complications. **Conclusions:** CTO PCI is currently performed infrequently in the US for stable coronary artery disease and is associated with lower procedural success and higher complication rates compared with non-CTO PCI. Procedural success was associated with several patient factors and operator experience.

**TCT-193**

Long-term follow up after antegrade versus retrograde recanalization of chronic total coronary occlusions

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**Background:** The recanalization success rate of chronic total coronary occlusions (CTO-PCI) can be increased by a retrograde approach. The impact of the retrograde compared to the antegrade PCI on long-term outcome is unknown. Aim was to study whether the long-term MACCE rate (death, myocardial infarction, coronary bypass surgery and stroke) of patients after retrograde versus antegrade PCI.

**Methods:** In a prospective study from January 2008 to June 2012 436 consecutive patients with CTO’s (>3 months old) were enrolled.

**Results:** Mean age was 63.4 ± 10.3 years, 86% were male. The retrograde PCI, which was used only after a failed antegrade intervention, was performed in 18% (n = 79) of patients. Patients with retrograde PCI-CTO had more frequently previous bypass surgery, RCA as target vessel (79.7% vs. 56.8%, \( p < 0.0004 \)), longer lesion length (46 vs. 30 mm, p < 0.001), longer procedure duration (108.2 vs. 63.2 min, p < 0.0001), higher contrast volume (431.6 vs. 267.6 ml, p < 0.0001), longer fluoroscopy time (61.2 vs 30.1 min, p < 0.0001) and higher inflation pressure (285.3 vs. 145.0 Gycm² p < 0.0001). Long-term overall MACCE rate (mean follow up 590 ± 461 days) was not different after retrograde vs. antegrade CTO PCI (14.3% vs. 15.1%). Same was true for the components of MACCE (death 5.7 vs. 8.5%, myocardial infarction 2.8% vs. 2.6%, bypass surgery 8.6 vs. 5.3%, stroke 0 vs. 2.6%). However, patients with failed antegrade PCI had a significantly higher long-term MACCE rate compared to successful antegrade PCI (29.2 vs. 12.5%, p < 0.004), whereas the MACCE rate of failed vs. successful retrograde PCI was not different (14.3 vs. 14.3%).

**Conclusions:** Despite more patients with previous coronary bypass surgery and more complex target lesions and procedures the overall long-term MACCE rate after retrograde CTO-PCI is not different to antegrade CTO-PCI. Why the long-term MACCE rate is higher only after failed vs. successful antegrade but not after failed vs. successful retrograde CTO-PCI deserves further studies.

**TCT-194**

Clinical and Angiographic Outcomes of True versus False Lumen Stenting of Coronary Chronic Total Occlusions: Insights from a Contemporary Multicenter Registry

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**Background:** We evaluated the in-hospital and the long-term clinical and angiographic outcomes of drug-eluting stents (DES) deployed in true versus false lumen of successfully crossed chronic total occlusions (CTO).

**Methods:** Between August 2011 and October 2012, 157 consecutive patients with 173 CTO lesions were successfully recanalized in a single center. All procedures were guided with intravascular ultrasound (IVUS). After successful guidewire crossing, lesions were classified according to IVUS evaluation into 2 groups: (1) true lumen group and, (2) subintimal stenting group; and compared with regards to in-hospital and long term clinical outcomes.

**Results:** In 154 lesions, DES were deployed in the true lumen; and in 19 (11%) lesions, DES were deployed in the subintimal space (95% confidence interval: 6.3% to 15.6%) with a success rate of 96 % and 82.4%, in antegrade and retrograde approaches, respectively. IVUS showed that the prevalence of dissection was two times and intramural hematoma (IMH) was three times higher in the subintimal stenting group (p = 0.01) and p = 0.01, respectively). Subintimal stenting was associated with a significant increase in minor perforations (6/19 (31.6% vs. 8.4%, \( p = 0.002 \)), all were managed conservatively. Kaplan-Meier analysis revealed a similar rates of binary restenosis and target lesion revascularization between groups (p=0.73 and p=0.97, respectively).

**Conclusions:** Subintimal stent deployment in CTO segments, using second generation DES with IVUS guidance, carries a similar success rate and long-term angiographic and clinical outcomes as true lumen stenting.

**TCT-195**

Transradial Approach for Coronary Chronic Total Occlusion Interventions: Insights from a Contemporary Multicenter Registry


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**Background:** Transradial access is often used in percutaneous coronary intervention (PCI) for chronic total occlusions (CTO), however, its efficacy and safety in this setting have received limited study.

**Methods:** We compared the technique and outcomes of transradial vs. transfemoral access among 650 CTO PCI cases performed between January 2012 and March 2014 at 6 US centers.

**Results:** Most patients were men (87%) with high frequency of diabetes mellitus (42%) and prior coronary artery bypass graft surgery (36%). The CTO target vessel was the right coronary artery (59%), left anterior descending artery (20%), and circumflex (17%) artery. TR access was used in 110 (17%) of the 650 cases, as follows: bilateral radial access (63%); bilateral radial access plus unilateral or bilateral femoral access (7%); unilateral radial access plus unilateral or bilateral femoral access (26%); and unilateral radial access (4%). Six and eight French guide catheters were used through the radial and femoral artery, respectively. Compared to transfemoral, transradial cases had similar technical (92.6% vs. 93.0%, \( p = 0.32 \)) and clinical outcomes (92 vs. 120 min, \( p = 0.008 \)) and fluoroscopy (58±10s vs. 49±13 min, \( p = 0.026 \)) time, and number of crossing approach changes (0.7±1.0 vs 0.5±0.7, \( p = 0.008 \)).

**Conclusions:** Transradial approach is currently performed in the US for stable coronary artery disease and is associated with lower procedural success and higher complication rates compared with non-CTO PCI. Procedural success was associated with several patient factors and operator experience.
Conclusions: Transradial CTO PCI can be performed with similar success and complication rates with transfemoral CTO PCI, but is associated with longer procedural and fluoroscopy times.

TCT-196
Meta-Analysis on the impact of percutaneous coronary intervention of Chronic Total Occlusions on Long-term Mortality
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Background: Patients with coronary artery disease with a chronic total occlusion (CTO) are associated with worse clinical outcome compared to patients without a CTO. Percutaneous coronary intervention (PCI) of CTOs may have a beneficial effect on survival. In literature mainly small, observational and predominantly single-center studies exist about successful PCI and the impact on reducing long-term mortality for CTO.

Methods: This meta-analysis compared the long-term mortality of successful versus failed PCI for CTO. Relevant studies were examined and analyzed independently by two investigators. To prevent distortion of the results by the inclusion of (sub-)acute occlusions, a subgroup analysis was performed on only those studies which included patients with a CTO of at least 3 months.

Results: We identified 27 studies eligible for inclusion in this meta-analysis, including 11,085 CTO patients with successful and 4,347 CTO patients with unsuccessful revascularization (mean follow-up duration 1 to 10 years). We did not find any randomized controlled trials between CTO PCI versus medical treatment only. Successful CTO PCI was associated with reduced mortality in comparison to failed CTO PCI (odds ratio (OR): 0.52, 95% confidence interval [CI]: 0.43-0.62, p-value < 0.01). For the subgroup analysis the results remained qualitatively similar (OR: 0.47, 95%CI: 0.35-0.64, p-value < 0.01) (figure 1).

Conclusions: This meta-analysis confirmed previous findings of a reduced mortality after successful versus failed CTO PCI. Randomized controlled trials are needed to confirm the value of PCI in patients with a CTO in reducing the mortality.

Methods: We screened 2,024 consecutive patients with at least one CTO detected on coronary angiogram. Of these, we analyzed data from 738 patients with Retinop 3 grade collateral circulation who were treated with medical therapy alone (n = 236), coronary artery bypass grafting (n = 170) or percutaneous coronary intervention (PCI) (n = 332; 80.1% successful). Patients who underwent revascularization and medical therapy (revascularization-PCI + CABG) were compared to those who underwent medical therapy alone (medication, n = 236) in terms of cardiac death and major adverse cardiac events (MACE), defined as the composite of cardiac death, myocardial infarction, repeat revascularization.

Results: During a median follow-up duration of 42 months, multivariate analysis revealed a significantly lower incidence of cardiac death (hazard ratio [HR] 0.29; 95% confidence interval [CI] 0.15 to 0.58; p < 0.01) and MACE (HR 0.32; 95% CI 0.21 to 0.49; p < 0.01) in the revascularization group compared to the medication group. After propensity score matching, the incidence of cardiac death (HR 0.27; 95% CI 0.09 to 0.80; p = 0.02) and MACE (HR 0.44; 95% CI 0.23 to 0.82; p = 0.01) were still significantly lower in the revascularization group than in the medication group.

Table. Clinical outcomes in all study patients

<table>
<thead>
<tr>
<th></th>
<th>Medication</th>
<th>Revascularization</th>
<th>Adjusted HR (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac death</td>
<td>44 (38.6)</td>
<td>39 (37.3)</td>
<td>0.39 (0.29-0.50)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>MACE</td>
<td>2 (0.8)</td>
<td>4 (0.8)</td>
<td>0.29 (0.16-0.54)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Repeat revascularization</td>
<td>17 (7.5)</td>
<td>21 (10.4)</td>
<td>0.38 (0.24-0.64)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>MACE</td>
<td>59 (29.0)</td>
<td>64 (32.4)</td>
<td>0.30 (0.22-0.40)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Data are presented as n (%).</td>
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</table>

Conclusions: In patients with coronary CTO and well-developed collateral circulation, aggressive revascularization may reduce the risk of cardiac death and MACE. These findings need to be confirmed in randomized controlled trials.

TCT-198
Retрогrade Recanalization Of Chronic Total Occlusions In Europe: Procedural And In-Hospital Outcomes From The Multicenter ERCTO Registry
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Background: The aim of this study was to describe the five-year European experience of retrograde percutaneous coronary interventions (PCI) revascularization for complex chronic total occlusions (CTOs) of coronary arteries.

Methods: Demographic data, procedural outcomes and in-hospital clinical events were collected on 1,582 consecutive lesions of 1,395 patients enrolled between January 2008 and December 2012 having retrograde CTO PCI at 44 European medical centers by 45 experienced interventionist operators. A retrograde J-CTO score was used to better describe success according to lesion difficulty. Data about clinical follow-up were collected.

Results: Patients mean age was 62.0 ± 10.4 years. During the procedure the retrograde approach was used as first line strategy in 76.2% of cases, while immediately after antegrade failed approach in 23.8% of cases. Procedural success was achieved in 75.3% of cases. A major complication occurred in 16 patients (1.0%). In multivariable analysis, age of the patient (per 10-year increase) (OR: 1.19, 95% CI: 1.03-1.37, p < 0.01), lower operator volume (OR: 3.00, 95% CI: 2.41-4.21, p < 0.01) and increased retrograde J-CTO score (OR: 0.42, 95% CI: 0.24-0.74, p < 0.01) were recognized as independent predictors of procedural failure. The mean follow-up period was 24.7 ± 15.0 months. Major adverse cardiac and cerebral events (MACE) occurred in 13.6% of cases (cardiac death 1.9%, myocardial infarction 3.2%; stroke 0.6% and target vessel revascularization 1.3%). By multivariable Cox regression, the independent predictors of MACE were: male gender (OR: 0.47, 95% CI: 0.30-0.74; p = 0.01); prior myocardial infarction (HR: 1.45, 95% CI: 1.01-2.09; p = 0.04); number of previous attempts (HR: 1.63, 95% CI: 1.36-1.95; p < 0.001); CTO length (HR: 1.01, 95% CI: 1.00-1.02; p = 0.004); and total stent length (HR: 0.98, 95% CI: 0.97-0.99; p < 0.01).

Conclusions: In Europe among selected centers dedicated to CTO revascularization, retrograde approach was performed over a 5-year period in 16.5% of these patients.