Unplanned Coronary Angiography After Transcatheter Aortic Valve Replacement
(Incidence, Predictors, and Outcome)

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Background

- Coronary artery disease and aortic stenosis are frequently found together
- TAVR prostheses may cause difficulties in coronary cannulation and exacerbated when revascularization is needed urgently
Objectives

- Incidence of unplanned coronary angiography after TAVR
- 5-year Prediction model of the need for coronary angiography

Method

All patients underwent TAVR between July 2015 - December 2021

Excluded
- Aborted procedure
- Patient without device success according to VARC-2 criteria

Outcome: Incidence of unplanned coronary angiography
Excluded: planned angiography/PCI decided prior to TAVR
Angiography performed at the same procedure as TAVR

Retrospective, single center study
Result

- **1,444** patients, median time follow up 26 months
  - Mean age of 81 years old, STS-PROM 3.40, 64% of balloon-expandable use

Incidence of unplanned coronary angiography

<table>
<thead>
<tr>
<th>Indication of coronary angiography</th>
<th>Total n = 97</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEMI</td>
<td>7 (7.2%)</td>
</tr>
<tr>
<td>UA/ NSTEMI</td>
<td>41 (42.3%)</td>
</tr>
<tr>
<td>Chronic coronary disease</td>
<td>41 (42.3%)</td>
</tr>
<tr>
<td>Others</td>
<td>8 (8.2%)</td>
</tr>
</tbody>
</table>

49.5% ACS

Baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Without unplanned CAG (n=1,347)</th>
<th>With unplanned CAG (n=97)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs</td>
<td>81 (76.0 – 86.5)</td>
<td>78.0 (72.0 – 83.0)</td>
<td>0.001</td>
</tr>
<tr>
<td>Men - no. (%)</td>
<td>777 (57.5)</td>
<td>69 (71.1)</td>
<td>0.010</td>
</tr>
<tr>
<td>Hypertension - no. (%)</td>
<td>1154 (85.7)</td>
<td>85 (87.6)</td>
<td>0.654</td>
</tr>
<tr>
<td>Diabetes - no. (%)</td>
<td>447 (33.2)</td>
<td>42 (43.3)</td>
<td>0.045</td>
</tr>
<tr>
<td>Dialysis - no. (%)</td>
<td>29 (2.2)</td>
<td>5 (5.2)</td>
<td>0.084</td>
</tr>
<tr>
<td>Permanent pacemaker - no. (%)</td>
<td>179 (13.3)</td>
<td>12 (12.4)</td>
<td>0.878</td>
</tr>
<tr>
<td>Coronary artery disease - no. (%)</td>
<td>648 (48.1)</td>
<td>76 (78.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prior CAGB - no. (%)</td>
<td>223 (16.6)</td>
<td>37 (38.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Prior PCI, no. (%)</td>
<td>413 (30.7)</td>
<td>56 (57.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STS-PROM, (%)</td>
<td>3.40 (2.19 - 5.40)</td>
<td>3.35 (2.20 - 5.26)</td>
<td>0.989</td>
</tr>
</tbody>
</table>
Patient with CAD had a higher rate of unplanned CAG

In CAD group: higher CAG in Multivessel and CABG
5-year survival

Factors association with the unplanned CAG
5-year prediction model

(cause-specific cox regression)

a) calibration plot and b) receiver operating characteristic (ROC) curve

Clinical application

- Considering the challenges and risk of unplanned coronary angiography, those patients with risk factors for subsequent unplanned coronary angiography need to be carefully evaluated and attempted to minimize the occurrence of the event.
Take home message

Unplanned coronary angiography

- **Occurrence was 6.6%** of patients after TAVR
- **Acute coronary syndrome** was the most common indication in 50%
- **Patient with significant CAD has 3 fold higher needed**
- Younger age, dialysis, and low mean aortic gradient associated with higher needed
- A comprehensive strategy for lifetime care in those patients is needed.

In-vivo CT sizing for redo-transcatheter aortic valve replacement in Evolut valves


Minneapolis Heart Institute Foundation
Transcatheter aortic valve (TAV) designs

- SAPIEN3 / SAPIEN3Ultra (S3)
  - Balloon expandable valves
  - Short valves
- Evolut PRO+ / Evolut FX (Evolut)
  - Self expandable valves
  - Tall valves

TAV-in-TAV (Redo TAV)
2 x 2 combination
How should we plan?

Background

S3-in-Evolut: a common combination

- How to decide the second TAV size is not fully understood
- Recent reports: uniform S3 size used in in-vitro bench testing (“bench-sizing”)

Is there a better way to decide the S3 size?
Hypothesis / Aims

- Using a *uniform* bench sizing may be inappropriate since
  1. Evolut valves have a “waist”
  2. Evolut is often underexpanded *in-vivo*

- Second TAV (S3) size impacts
  - risk to coronaries (i.e. feasibility of Redo-TAV)
  - may cause harm if oversized: possible annulus rupture

- Aim: evaluate the usefulness of applying *in-vivo* CT sizing using post TAVR CTs on
  1. second TAV size
  2. risk to coronaries (redo-TAV feasibility)
  3. estimated risk of prosthesis-patient mismatch (PPM)

Methods
### Study population

- **Study population**
  - Post TAVR CTs of 290 patients treated with Evolut R/PRO/PRO+

- **CT simulation: S3-in-Evolut in 3 implant positions**
  - *i.e.* neoskirt plane: NSP

#### Methods

#### Method of CT sizing for S3-in-Evolut

- **average of 4 areas** of Evolut stent frame on post TAVR CT
  - at the Neoskirt plane (NSP) and 3 nodes below

<table>
<thead>
<tr>
<th>Implant Size (mm)</th>
<th>3 DCMPs (mm)</th>
<th>100% Area-Diameter (mm)</th>
<th>100% Area Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10.0-15.0</td>
<td>275-345</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>20.7-26.4</td>
<td>300-400</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>23.4-26.4</td>
<td>320-440</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>26.2-30.5</td>
<td>340-540</td>
<td></td>
</tr>
</tbody>
</table>

- **then averaged area was referenced to S3 sizing tables**
Evaluation of coronary obstruction risk (Redo-TAV feasibility)

- Evaluated by narrowest valve-to-aorta (VTA) distance below NSP
  - >4 mm low-risk, 2-4 mm intermediate-risk, <2 mm high-risk

- Predicted PPM risk
  - estimated using reported EOA values of S3 (Hahn RT, et al. JACC Img 2019;12:25-34.)

Results
Results

Rates of S3 size by CT-sizing smaller than conventional Bench-sizing

By CT-sizing, S3 size was smaller than conventional Bench-sizing in > 80%

Results

Risk to coronaries (feasibility of Redo-TAV)

Risk to coronaries were lower by CT-sizing, compared to Bench-sizing
Predicted risk of prosthesis-patient mismatch (PPM)

Rates of severe PPM were <10% by CT-sizing

Summary of Results

- Applying CT-sizing for S3-in-Evolut resulted in
  - smaller S3 size compared to Bench-sizing in >80% of cases
  - possible consequence of under-expansion and the “waist” shape of Evolut

- Risk to coronaries by CT-sizing were
  - Lower by CT-sizing (higher feasibility for S3-in-Evolut)
    - %Low-risk: 26% at node 6, 55% at node 5, and 80% at node 4

- Predicted risk of PPM after S3-in-Evolut
  - less than 10% by CT-sizing
Conclusions

- Applying CT sizing for S3-in-Evolut
  - Increase the feasibility of Redo-TAV (TAV-in-TAV)
  - Lower the risk of excessive oversizing and subsequent complications

Thank you for your attention
Direct current cardioversion post-LAAC with Watchman devices

Disclosures

• None
Background

Left atrial appendage closure

- LAA is the source of 90% of systemic emboli in AF patients
- LAA closure can be an alternative to oral anticoagulation
- It can be performed percutaneously using occluding devices
- Patients follow recommended OAC regimen post implantation
Direct current cardioversion in atrial fibrillation

• DCCV carries a risk for thromboembolism in AF patients

• Guidelines from Cardiology societies provide a clear roadmap

• Safety and effectiveness of DCCV for AF are well documented

• No clear guidelines on best approach for DCCV after LAAC

Direct current cardioversion after LAAC

• Included 148 patients presenting post-LAAC for DCCV
• All patients had TEE imaging pre-procedure
• DCCV is safe and effective after percutaneous LAAC
• DRT was found in 2.7% of the patients

Sharma et al., JACC. 2019
Methods

Objectives

• Assessment of safety and effectiveness of DCCV on SAPT regimen
  - Safety endpoint was freedom from post-DCCV complications
  - Systemic embolism/Death/Device embolism within 30 days

• Feasibility of DCCV without pre-procedural imaging

• Capturing the incidence of DRT/PDL in cases who had imaging
Selection criteria

1000 AF patients who received a Watchman LAAC device at Allina hospitals

93 Patients received DCCV

Excluding patients presenting less than 6 months post LAAC, and/or on OAC/DAPT prior to DCCV

46 patients

Including:
1. DCCV cases for AF/AFL
2. >1 DCCV procedure for same patient if > 30 days between presentations

62 DCCV cases

Results
Baseline characteristics

- More than half were females 26(56%), 75 years, BMI 32.2 Kg/m²
- CHA2DS2-VASc score 4.6, with 18 patients(39%) having stroke history
- Comorbidities were abundant
- Median time from implantation to DCCV was 20 (12.4-26.9) months

Results

- 54 (87%) cases were on Aspirin 81.mg
- 8 cases were on Clopidogrel 75.mg
- 48 cases (77%) did not get pre-procedural imaging
- No DRT was noticed on imaging
- PDL incidence was high 4 (28%) among those who had TEE/CCT
- Safety endpoint was achieved in all cases
Conclusions

- DCCV could be considered safe while being on SAPT regimen
- Performing DCCV without pre-imaging is still under question
- More studies are needed to optimize DCCV approach post LAAC

THANK YOU
Retrograde CTO PCI via Ipsilateral Collaterals

Ahmed Al-Ogaili
CHIP-CTO Fellow

Background
Background


Background

The Four Stages of Learning CTO PCI

STAGE 1
- Antegrade wire escalation
- Operator skills: Antegrade only

STAGE 2
- Antegrade wire escalation
- Antegrade dissection/re-entry

STAGE 3
- Antegrade wire escalation
- Antegrade dissection/re-entry

STAGE 4
- Retrograde via epicardial collaterals
- Antegrade dissection/re-entry
- Antegrade wire escalation

Lasion complexity/success rates
Background

There is limited data on retrograde chronic total occlusion (CTO) percutaneous coronary intervention (PCI) via ipsilateral epicardial collaterals (IEC).
Methods

Ipsilateral collaterals vs All other collaterals

- Baseline clinical and angiographic characteristics
- Procedural outcomes

14,818 total cases in PROGRESS-CTO registry between 2012-2023.

10,352 cases were excluded [retrograde approach not used, or missing data on crossing strategy]

4,466 retrograde cases included in the study.

Statistical analysis

- Categorical variables were expressed as percentages and compared using the Pearson’s chi-square test.
- Continuous variables are presented as mean ± standard deviation or as median (interquartile range) unless otherwise specified and were compared using the independent-samples t-test for normally distributed variables and the Mann-Whitney U test for non-parametric variables.
- Multivariable logistic regression was used to examine the association between the use of IEC vs other collaterals and procedural complications.
- All statistical analyses were performed using JMP version 14.0 (SAS Institute, Cary, North Carolina). A p-value of <0.05 was considered statistically significant.
Results

Of the 191 IEC cases, the epicardial collateral was successfully wired in 50%.

Baseline clinical characteristics

<table>
<thead>
<tr>
<th>Clinical characteristic</th>
<th>IEC N=191</th>
<th>Other retrograde conduits N=4275</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>66 ± 10</td>
<td>65 ± 10</td>
<td>0.173</td>
</tr>
<tr>
<td>Men</td>
<td>82%</td>
<td>84%</td>
<td>0.739</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>89%</td>
<td>86%</td>
<td>0.276</td>
</tr>
<tr>
<td>Diabetes</td>
<td>49%</td>
<td>43%</td>
<td>0.125</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>87%</td>
<td>89%</td>
<td>0.535</td>
</tr>
<tr>
<td>Hypertension</td>
<td>89%</td>
<td>89%</td>
<td>0.880</td>
</tr>
<tr>
<td>Smoking</td>
<td>44%</td>
<td>41%</td>
<td>0.053</td>
</tr>
<tr>
<td>Prior MI</td>
<td>52%</td>
<td>48%</td>
<td>0.280</td>
</tr>
<tr>
<td>Prior heart failure</td>
<td>39%</td>
<td>29%</td>
<td>0.003</td>
</tr>
<tr>
<td>Left ventricular EF %</td>
<td>47 ± 13</td>
<td>50 ± 13</td>
<td>0.006</td>
</tr>
<tr>
<td>Prior PCI</td>
<td>74%</td>
<td>69%</td>
<td>0.155</td>
</tr>
<tr>
<td>Prior CABG</td>
<td>42%</td>
<td>42%</td>
<td>0.909</td>
</tr>
<tr>
<td>Current dialysis</td>
<td>5%</td>
<td>2%</td>
<td>0.025</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>8%</td>
<td>11%</td>
<td>0.234</td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td>16%</td>
<td>17%</td>
<td>0.689</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>20%</td>
<td>16%</td>
<td>0.204</td>
</tr>
<tr>
<td>Creatinine level, mg/dl</td>
<td>1.03 (0.87-1.23)</td>
<td>1.01 (0.87-1.2)</td>
<td>0.609</td>
</tr>
</tbody>
</table>
### Angiographic characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>IEC (N = 191)</th>
<th>Other retrograde conduits (N = 4275)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Injection</td>
<td>66%</td>
<td>89%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Target Vessel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCA</td>
<td>15%</td>
<td>70%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>LAD</td>
<td>30%</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>LCX</td>
<td>50%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Proximal cap ambiguity</td>
<td>66%</td>
<td>57%</td>
<td>0.012</td>
</tr>
<tr>
<td>Side branch at Proximal Cap</td>
<td>74%</td>
<td>63%</td>
<td>0.002</td>
</tr>
<tr>
<td>Good distal landing zone</td>
<td>58%</td>
<td>58%</td>
<td>0.003</td>
</tr>
<tr>
<td>Moderate or severe calcification</td>
<td>58%</td>
<td>60%</td>
<td>0.675</td>
</tr>
<tr>
<td>Moderate or severe tortuosity</td>
<td>42%</td>
<td>40%</td>
<td>0.500</td>
</tr>
<tr>
<td>In-stent restenosis</td>
<td>14%</td>
<td>13%</td>
<td>0.595</td>
</tr>
<tr>
<td>Prior attempt to open the CTO</td>
<td>23%</td>
<td>22%</td>
<td>0.902</td>
</tr>
<tr>
<td>Bifurcation at distal cap</td>
<td>44%</td>
<td>45%</td>
<td>0.655</td>
</tr>
<tr>
<td>Occlusion length, mm</td>
<td>34 ± 19</td>
<td>40 ± 25</td>
<td>0.0001</td>
</tr>
<tr>
<td>Vessel diameter</td>
<td>2.8 ± 0.5</td>
<td>3 ± 0.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>J-CTO score</td>
<td>3.13 ± 1.23</td>
<td>3.06 ± 1.06</td>
<td>0.456</td>
</tr>
<tr>
<td>Progress CTO score</td>
<td>1.95 ± 1.02</td>
<td>1.27 ± 0.92</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Progress MACE score</td>
<td>5.06 ± 1.72</td>
<td>4.99 ± 1.73</td>
<td>0.568</td>
</tr>
</tbody>
</table>

### Procedural details

<table>
<thead>
<tr>
<th>Strategies</th>
<th>IEC (N = 191)</th>
<th>Other retrograde conduits (N = 4275)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossing Strategies used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWE</td>
<td>75%</td>
<td>68%</td>
<td>0.031</td>
</tr>
<tr>
<td>ADR</td>
<td>37%</td>
<td>29%</td>
<td>0.018</td>
</tr>
<tr>
<td>Retrograde</td>
<td>100%</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>First crossing strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWE</td>
<td>67%</td>
<td>56%</td>
<td>0.007</td>
</tr>
<tr>
<td>ADR</td>
<td>3%</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Retrograde</td>
<td>30%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Successful crossing Strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWE</td>
<td>12%</td>
<td>10%</td>
<td>0.004</td>
</tr>
<tr>
<td>ADR</td>
<td>19%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Retrograde</td>
<td>49%</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>20%</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Guide-extension assisted reverse CART</td>
<td>4%</td>
<td>13%</td>
<td>0.0001</td>
</tr>
<tr>
<td>IVUS use</td>
<td>70%</td>
<td>60%</td>
<td>0.007</td>
</tr>
</tbody>
</table>
Results

Wires used in ipsilateral collaterals crossing

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saph E3</td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td>SLIM</td>
<td>29%</td>
<td>21%</td>
</tr>
<tr>
<td>SLIM Back</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MC used in ipsilateral collaterals crossing

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corsair</td>
<td>40%</td>
<td>31%</td>
</tr>
<tr>
<td>Tantre PT</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Flamec</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>Corsil Pro</td>
<td>4%</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Ipsilateral collaterals</th>
<th>Other retrograde conduits</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical success</td>
<td>76%</td>
<td>79%</td>
<td>P=0.317</td>
</tr>
<tr>
<td>Procedural success</td>
<td>74%</td>
<td>77%</td>
<td>P=0.261</td>
</tr>
<tr>
<td>MACI</td>
<td>3.90%</td>
<td>4.70%</td>
<td>P=0.037</td>
</tr>
<tr>
<td>Procedural complications</td>
<td>25.80%</td>
<td>16.40%</td>
<td>P=0.005</td>
</tr>
<tr>
<td>Elevation</td>
<td>17.30%</td>
<td>9.00%</td>
<td>P=0.001</td>
</tr>
<tr>
<td>Dissection/pterson-stem wound</td>
<td>3.70%</td>
<td>1.20%</td>
<td>P=0.002</td>
</tr>
<tr>
<td>Perioperative</td>
<td>3.0%</td>
<td>1.20%</td>
<td>P=0.018</td>
</tr>
</tbody>
</table>
Limitations

- Observational study without adjudication of clinical events by an independent committee

- Core laboratory analysis of the study's angiograms was not performed

- The operators in the PROGRESS-CTO registry are more experienced in performing CTO PCI, potentially limiting the external validity of the study's results
Conclusions

- Retrograde CTO PCI through IEC is feasible, similar success rate to other retrograde conduits.
- Higher complication rates, especially perforations.
- Such procedures should be performed by experienced, high-volume CTO PCI operators.

Case continued!
Thank you!

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Results

• 54 (87%) cases were on Aspirin 81.mg
• 8 cases were on Clopidogrel 75.mg
• 48 cases (77%) did not get pre-procedural imaging
• No DRT was noticed on imaging
• PDL incidence was high 4 (28%) among those who had TEE/CCT
• Safety endpoint was achieved in all cases

Conclusions

• DCCV could be considered safe while being on SAPT regimen
• Performing DCCV without pre-imaging is still under question
• More studies are needed to optimize DCCV approach post LAAC
THANK YOU
Disclosure of Relevant Financial Relationships

I, Athanasios Rempakos DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

Crossing strategies for CTO PCI
When should we use primary antegrade wiring?

- **Antegrade wiring (AW)** → most used strategy in CTO PCI
- Crossing algorithms → rely on limited angiographic features & expert opinions

**Aim:** Develop a machine learning model for predicting successful lesion crossing using primary AW during CTO PCI
Data preparation

12,136 primary antegrade cases → Imputed 15,355 values (8%) using missForest → Z-score normalization

Training set: 9,708 (80%)

Test set: 2,428 (20%)

14 variables: blunt/no stump, occlusion length, vessel diameter, aorto-ostial lesion, proximal cap ambiguity, in-stent restenosis, side branch at proximal cap, bifurcation at distal cap, poor distal landing zone, interventional collaterals, calcification, tortuosity, target vessel, prior attempt to open CTO

Five machine learning models

14 predictor variables

Logistic regression with L2 regularization

Gaussian Naive Bayes

Support vector machine

Multilayer perceptron neural networks

Extreme gradient boosting (XGBoost)

Outcome: Successful primary antegrade crossing
XGBoost had the best performance

How does XGBoost work?
XGBoost performance after hyperparameter tuning

Variable importance
How do we use the model?

Antegrade wiring success prediction

- Aorto-ostial lesion:
- Proximal cap ambiguity:
- Side branch at proximal cap:
- Blunt no stump:
- Vessel diameter:
- Occlusion length:
- In-stent lesion:
- Moderate/severe calcification:
- Moderate/severe proximal tortuosity:
- Intervventional collaterals:
- RCA target vessel:
- Poor distal landing zone:
- Distal cap at bifurcation:
- Poor attempt:

Predict primary antegrade success

www.progresscto.org/predict-aw-success
80-year-old man with medically refractory angina and 3 unsuccessful attempts for recanalizing RCA CTO

Epicardial collateral:
LIMA → Diagonal → RPL
Target vessel: RCA

Assessment

<table>
<thead>
<tr>
<th>Proximal cap:</th>
<th>Blunt, side branch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length:</td>
<td>~ 20 mm</td>
</tr>
<tr>
<td>Calcification:</td>
<td>Severe</td>
</tr>
<tr>
<td>Collaterals:</td>
<td>Epicardial from diagonal through LIMA graft</td>
</tr>
<tr>
<td>J-CTO score:</td>
<td>3</td>
</tr>
</tbody>
</table>

Antegrade wiring success prediction

- Acute-ocstial lesion: No
- Proximal cap ambiguity: No
- Side branch at proximal cap: Yes
- Blunt/no stump: Yes
- Vessel diameter: 3
- Occlusion length: 20
- Is-ocent lesion: No
- Moderate/severe calcification: Yes
- Moderate/severe proximal no-suture: No
- Interventions collateral: Yes
- RCA target vessel: Yes
- Poor distal landing zone: No
- Distal cap at bifurcation: No
- Prior attempt: Yes

Likelihood of successful crossing with primary antegrade: 74.65%
Primary antegrade likely to be successful

www.progresscto.org/predict-aw-success
Gaia Next 2 → Gladius Mongo

Final result
Limitations

- Observational study without adjudication of clinical events by an independent committee
- Core laboratory analysis of the study’s angiograms was not performed
- The operators in the PROGRESS-CTO registry are more experienced in performing CTO PCI, potentially limiting the external validity of the study’s results

In summary

- XGBoost best ML model for predicting primary antegrade wiring success (AUC = 0.780)
- Most impactful predictors:
  - occlusion length
  - blunt/no stump
  - interventional collaterals
  - vessel diameter
  - proximal cap ambiguity
The PROGRESS-AW model accurately predicts primary antegrade wiring success

Thank you!


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