CARDIOLOGY SYMPOSIUM
2015

CAROLINA CARDIOLOGY CONSULTANTS OF GHS
STENT, OPERATE, OR MEDICATE?

DIFFERING PERSPECTIVES ON CORONARY REVASCULARIZATION

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CORONARY ARTERY DISEASE

• Extensively documented as a leading cause of morbidity/mortality

• Readily identifiable with coronary calcium scores, coronary CTA, and coronary angiography

• Assessable non-invasively with stress/pharmacologic nuclear, echo or PET imaging and invasively with FFR/iFR, IVUS, and OCT
CORONARY ARTERY DISEASE: Treatment options

- 1) Risk management
- 2) Medical therapy
- 3) Percutaneous Intervention
- 4) Surgical revascularization, CABG
- 5) All of the above
- 6) Answers 1 & 2
- 7) Answers 1, 2, 3
- 8) Answers 1, 2, 4
MEDICAL THERAPY

• LIPID MANAGEMENT
• ANTIHYPERTENSIVE THERAPY/DEMAND REDUCTION THERAPY
• ANTIPLATELET THERAPY
• NITRATES/ANTI-ANGINAL THERAPY
PERCUTANEOUS INTERVENTION

- PTCA: balloon angioplasty
- Stenting: bare metal, drug-eluting, and absorbable (in trials)
- Aspiration thrombectomy
- Atherectomy
CABG

- LIMA/arterial conduit
- SVG
- Hybrid procedures
CORONARY ARTERY DISEASE:

- WHAT FACTORS INFLUENCE THERAPY OPTION DECISIONS

- Coronary Anatomy
- Comorbidities
- Urgency/Timing
- Patient preference
CORONARY ARTERY DISEASE: Treatment

• The Goal: To obtain the best revascularization for symptomatic and functional benefit appropriate for the individual patient
CORONARY ARTERY DISEASE: Revascularization decisions

• Evidence-based medicine has given assessment tools to help guide decision-making

• SYNTAX SCORE utilizes coronary anatomy findings to assess prognosis with CABG and PCI
The SYNTAX Score: an angiographic tool grading the complexity of coronary artery disease

• Clinical research
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SYNTAX SCORE DEVELOPMENT

- Pre-existing classifications
  1. The AHA classification of the coronary tree segments modified for the ARTS study
  2. The Leaman score
  3. The ACC/AHA lesions classification system
  4. The total occlusion classification system
  5. The Duke and ICPS classification systems for bifurcation lesions
  6. Consultation of experts

- Each of these classifications has been focusing on specific functional and anatomical parameters of the lesions. Thus, the development of a global classification system that would take into account all the variables was necessary.
THE SYNTAX SCORE: key points

- Angiographic score to quantify the complexity of coronary artery disease (CAD).
- Originally developed for patients with left main or three-vessel disease (application in patients with less complex CAD has been established)
- Lesion based.
- Available at: http://www.syntaxscore.com
- Consists of 11 questions: two questions are about the anatomy, 8 are about each lesion, and one about diffuse disease.
- The higher the score, the more complex the CAD.
THE SYNTAX SCORE ALGORITHM

1. Dominance
2. Number of lesions
3. Segments involved per lesion

Lesion Characteristics
4. Total occlusion
   i. Number of segments involved
   ii. Age of the total occlusion (>3 months)
   iii. Blunt Stump
   iv. Bridging collaterals
   v. First segment beyond the occlusion visible by antegrade or retrograde filling
   vi. Side branch involvement
5. Trifurcation
   i. Number of segments diseased
6. Bifurcation
   i. Type
   ii. Angulation between the distal main vessel and the side branch <70°
7. Aorto-ostial lesion
8. Severe tortuosity
9. Length >20mm
10. Heavy calcification
11. Thrombus
12. Diffuse disease/small vessels
   i. Number of segments with diffuse disease/small vessels
<table>
<thead>
<tr>
<th>SEGMENT No.</th>
<th>RIGHT DOMINANCE</th>
<th>LEFT DOMINANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 RCA proximal</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2 RCA mid</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3 RCA distal</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4 Posterior descending artery</td>
<td>1</td>
<td>n.a.</td>
</tr>
<tr>
<td>16 Posterolateral branch from RCA</td>
<td>.5</td>
<td>n.a.</td>
</tr>
<tr>
<td>16a Posterolateral branch from RCA</td>
<td>.5</td>
<td>n.a.</td>
</tr>
<tr>
<td>16b Posterolateral branch from RCA</td>
<td>.5</td>
<td>n.a.</td>
</tr>
<tr>
<td>16c Posterolateral branch from RCA</td>
<td>.5</td>
<td>n.a.</td>
</tr>
<tr>
<td>5 Left Main</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6 LAD proximal</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>7 LAD mid</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>8 LAD apical</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9 First diagonal</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9a First diagonal(a)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10 Second diagonal</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>10a Second diagonal(a)</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>11 Proximal circumflex artery</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>12 Intermediate/ anterolateral artery</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12a Obtuse marginal(a)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12b Obtuse marginal(b)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13 Distal circumflex artery</td>
<td>.5</td>
<td>1.5</td>
</tr>
<tr>
<td>14 Left posterolateral</td>
<td>.5</td>
<td>1</td>
</tr>
<tr>
<td>14a Left posterolateral(a)</td>
<td>.5</td>
<td>1</td>
</tr>
<tr>
<td>14b Left posterolateral(b)</td>
<td>.5</td>
<td>1</td>
</tr>
<tr>
<td>15 Posterior descending</td>
<td>n.a.</td>
<td>1</td>
</tr>
</tbody>
</table>
Definition of the coronary tree segments

1. RCA proximal: From the ostium to one half the distance to the acute margin of the heart.
2. RCA mid: From the end of first segment to acute margin of heart.
3. RCA distal: From the acute margin of the heart to the origin of the posterior descending artery.
16. Posterolateral branch from RCA: Posterolateral branch originating from the distal coronary artery distal to the crux.
16a. Posterolateral branch from RCA: First posterolateral branch from segment 16.
16b. Posterolateral branch from RCA: Second posterolateral branch from segment 16.
16c. Posterolateral branch from RCA: Third posterolateral branch from segment 16.
5. Left main: From the ostium of the LCA through bifurcation into left anterior descending and left circumflex branches.
6. LAD proximal: Proximal to and including first major septal branch.
7. LAD mid: LAD immediately distal to origin of first septal branch and extending to the point where LAD forms an angle (RAO view). If this angle is not identifiable this segment ends at one half the distance from the first septal to the apex of the heart.
8. LAD apical: Terminal portion of LAD, beginning at the end of previous segment and extending to or beyond the apex.
9. First diagonal: The first diagonal originating from segment 6 or 7.
9a. First diagonal a: Additional first diagonal originating from segment 6 or 7, before segment 8.
10. Second diagonal: Originating from segment 8 or the transition between segment 7 and 8.
10a. Second diagonal a: Additional second diagonal originating from segment 8.
11. Proximal circumflex artery: Main stem of circumflex from its origin of left main and including origin of first obtuse marginal branch.
12. Intermediate/anterolateral artery: Branch from trifurcating left main other than proximal LAD or LCX. It belongs to the circumflex territory.
12a. Obtuse marginal a: First side branch of circumflex running in general to the area of obtuse margin of the heart.
12b. Obtuse marginal b: Second additional branch of circumflex running in the same direction as 12.
13. Distal circumflex artery: The stem of the circumflex distal to the origin of the most distal obtuse marginal branch, and running along the posterior left atroventricular groove. Caliber may be small or artery absent.
14. Left posterolateral: Running to the posterolateral surface of the left ventricle. May be absent or a division of obtuse marginal branch.
14a. Left posterolateral a: Distal from 14 and running in the same direction.
14b. Left posterolateral b: Distal from 14 and 14 a and running in the same direction.
15. Posterior descending: Most distal part of dominant left circumflex when present. It gives origin to septal branches. When this artery is present, segment 4 is usually absent.
CORONARY SEGMENT IDENTIFICATION
LESIONS ADVERSE CHARACTERISTIC SCORING

- Total occlusion x5
- Significant lesion (50-99%) x2
- Total occlusion (TO)
- Age >3months or unknown +1
- Blunt stump +1
- Bridging +1
- First segment visible beyond TO +1/ per non-visible segment
- Side branch (SB) - Yes, SB <1.5mm** +1
- Yes, both SB < & ≥ 1.5mm +1

Trifurcations
- 1 diseased segment +3
- 2 diseased segments +4
- 3 diseased segments +5
- 4 diseased segments +6

Bifurcations
- Type A, B, C +1
- Type D, E, F, G +2
- Angulation <70° +1
Aorto ostial stenosis +1
Severe tortuosity +2
Length > 20mm +1
Heavy calcification +2
Thrombus +1
“Diffuse disease”/small vessels +1/ per segment number
Bifurcation classification (modified from Duke and ICPS classifications systems)

**Type A:** Pre-branch stenosis not involving the ostium of the side branch.

**Type B:** Post side branch stenosis of the main vessel not involving the origin of the side branch.

**Type C:** Stenosis encompassing the side branch but not involving its ostium.

**Type D:** Stenosis involving the main vessel and ostium of the side branch.

**Type E:** Stenosis involving only the ostium of the side branch

**Type F:** Stenosis directly involving the main vessel (pre-side branch) and the ostium of the side branch.

**Type G:** Stenosis directly involving the main vessel (post-side branch) and the ostium of the side branch.
Figure 3 Long term follow-up of the SYNTAX trial comparing coronary artery bypass grafting (CABG) with percutaneous coronary intervention (PCI) with paclitaxel eluting stents. In patients with low lesion complexity (SYNTAX score ≤22) there was no difference in the rate of major adverse cardiac or cerebrovascular events (MACCE). In patients with SYNTAX scores of 23–32 there was a significant benefit of CABG over PCI, and this was even more profound in patients with high lesion complexity of SYNTAX scores ≥33. LM, left main; 3VD, three-vessel disease. Reproduced with permission from the SYNTAX Investigators.7

MEDICAL THERAPY VS STENTING VS CABG
MEDICAL THERAPY VS STENTING VS CABG
SYMPTOMATIC, SINGLE VESSEL, RIGHT CORONARY DISEASE
AFTER SUCCESSFUL DRUG-ELUTING STENTING
CABG VS STENT
CABG VS STENT
WRITE
Proportions of the study population according to the tertiles of the classic SYNTAX score (SS) (A) and those of the functional SYNTAX score (FSS) (B). After incorporating FFR into the SS to calculate FSS, 32% of patients moved from a higher-risk group to a lower-risk group as follows: 38% of the highest SS tertile moved to the medium- or lowest-risk FSS group, whereas 59% of the medium-risk SS tertile moved to the lowest-risk FSS group.
The rates of death or myocardial infarction (MI) (A), and the rates of major adverse cardiac events (MACE), as composite of death, MI, or any repeat revascularization including repeat percutaneous coronary intervention and coronary artery bypass graft (B) according to the tertiles of SS and FSS. The rate of death or MI as a critical hard endpoint was significantly different in the FSS groups unlike the SS groups. The rate of MACE was accordingly increased for the highest-risk group; this trend was attenuated in the FSS groups compared with the classic SS groups. *p 0.01, **p 0.001.
Kaplan-Meier survival curves for (A) death; (B) the composite of death and reinfarction, and (C) the composite of death, reinfarction and target vessel revascularization. Patients in the highest SYNTAX score tercile have significantly poor outcomes compared to those in the lower 2 terciles.
Current American and European guideline recommendations on the SYNTAX score: key points

- Percutaneous coronary intervention (PCI) is an alternative to bypass surgery in patients with three-vessel disease and a SYNTAX score ≤22.
- Patients with three-vessel disease and a SYNTAX score ≥23 should undergo coronary artery bypass grafting (CABG).
- Patients with low complexity left main (LM) disease defined by a SYNTAX score of ≤22 can undergo PCI.
- CABG and PCI are both treatment options for patients with LM disease of intermediate complexity (SYNTAX score 23–32).
- Decision making should be done through a multidisciplinary Heart Team discussion, which includes a non-interventional/clinical cardiologist, interventional cardiologist, and cardiovascular surgeon.
SYNTAX: simplified

Step 1: Dominance
Step 2: Coronary segment
Step 3: Total occlusion
Step 4: Trifurcation
Step 5: Bifurcation
Step 6: Aorta-ostial lesions
Step 7: Severe tortuosity
Step 8: Length >20mm
Step 9: Heavy calcification
Step 10: Thrombus
Step 11: Diffuse disease / small vessels

SYNTAX Score
write
Finding friends with the same mental disorder as you...

Priceless!