Views, Catheters and Wires

Meera Kondapaneni, MD, FACC, FSCAI
Assistant Professor of Medicine, Case Western Reserve University School of Medicine
Director, Cardiac Catheterization Laboratory
Director, Cardiovascular Disease Fellowship Program
Vice Chairperson of Medicine for Gender Equity, Diversity and Inclusion
MetroHealth Medical Center
Keys to successful planning of PCI

• Optimal Coronary Angiographic views

• Guiding catheters

• Guide wires
Coronary Angiography

- Lesion location and severity
- Defining precise lesion length
- Degree of calcification
- Presence of thrombus
- Relationship to side branches
- Distribution of collateral supply
Optimal angiographic projections for PCI

- Guide catheter selection
- Visualizing the target vessel course
- Identifying optimal angle for treatment
- Estimating the true dimensions of index vessel
Coronary Anatomy
Coronary anatomy: Relative to Interventricular septum and Atrioventricular Valve Planes

Anterior descending (LAD) and posterior descending (PDA) arteries lie in the interventricular plane

Right (RCA) and circumflex (Cx) coronary arteries lie in the atrioventricular plane
RAO 30° Projection: looking down the AV valves (Atrioventricular Groove plane)

The interventricular septum plane seen en-face

The two artia and the two ventricles are superimposed

The proximal circumflex and proximal RCA are well visualized as they follow the course of the atrioventricular groove
LAO 60° Projection
looking down the interventricular and interatrial septum plane

AV valves are seen en face

All left-sided cardiac chambers appear to the viewer's right

The LAD and PDA are seen coursing vertically in the middle of the cardiac silhouette following the path of the interventricular septum.
Standard Angiographic Views
Left Coronary artery
Standard Views

- Shallow RAO/AP Cranial
- LAO Cranial
- RAO Caudal
- LAO Caudal

Images adapted from "Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine"
Left Coronary artery: optional views

Optional LAD view

Optional Circumflex View
Right Coronary artery
Standard Views

RAO Straight
AP/LAO Cranial
LAO Straight
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<tbody>
<tr>
<td>LM ostium</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+++</td>
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<tr>
<td>LM bifurcation</td>
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<tr>
<td>LAD proximal</td>
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<tr>
<td>LAD mid</td>
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<td>++</td>
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<tr>
<td>LAD distal</td>
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<td>+++</td>
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<tr>
<td>LAD/diagonal</td>
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<tr>
<td>LCX proximal</td>
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<td>LCX distal</td>
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<tr>
<td>OM bifurcation</td>
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<td>+++</td>
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<tr>
<td>RCA proximal</td>
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<tr>
<td>RCA mid</td>
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<tr>
<td>RCA distal/crux</td>
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<td>PDA</td>
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<td>PLV</td>
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<td>+++</td>
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<td>+</td>
<td>–</td>
<td>++</td>
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<tr>
<td>LIMA anastomosis</td>
<td>+</td>
<td>–</td>
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<td>–</td>
<td>+++</td>
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* View not recommended; + occasionally useful; ++ very useful; +++ ideal view.

AP, anteroposterior; LAD, left anterior descending; LAO, left anterior oblique; LCX, left circumflex; LIMA, left internal mammary; OM, obtuse marginal; PDA, posterior descending artery; PLV, posterior left ventricular; RAO, right anterior oblique; RCA, right coronary artery.
Coronary Saphenous Vein Graft Angiography

• At least two views (LAO and/or RAO)

• Lay out aortic anastomosis, body of the graft, and distal anastomosis

• Distal runoff and collaterals if present
Coronary Saphenous Vein Graft Angiography

Match the graft angiography view with the native vessel views

- RCA graft: LAO cranial/RAO and lateral

- Circumflex (and obtuse marginals) grafts: LAO and RAO caudal

- LAD graft (or internal mammary artery): lateral, RAO cranial, LAO cranial, and AP (the lateral view is especially useful to visualize the anastomosis to the LAD)
Left coronary angiography: Left lateral

60° to 90° LAO

Best for visualizing
• Mid LAD
• Mid Circumflex
Take home message
Guiding Catheters
Guiding catheter

- Supportive conduit for advancement of guidewires and devices
- A vehicle for contrast injection
- Monitor blood pressure
Characteristics of a Guiding Catheter

- Atraumatic tip
- Proper preformed shape (co-axial with vessel)
- Torque control
- Kink resistance
- Radiopacity
- Support
- Device compatibility
Guiding catheter: Parts

- **Tip**
  - Atraumatic
  - Length influences stability in target vessel and maneuverability in Aorta

- **Primary Curve**
  - Angle of target vessel from Aorta

- **Secondary Curve**
  - Width of the Aorta

- **Tertiary Curve**
  - Normal curvature of Aorta

- **Length**
  - 100-110 cm for native vessels
  - 90 cm for LIMA graft or long SVG intervention
Factors Influencing Guide Selection

Patient factors
  • Body habitus
  • Age

Anatomy
  • Ascending aorta and aortic root
  • Coronary artery anatomic variants

Approach
  • Femoral Vs Radial
  • Co-axial Vs non-coaxial Vs deep intubation
  • Ipsilateral Vs Contralateral back up support

Target vessel
  • Native coronary artery Vs bypass graft
  • Degree of tortuosity
  • Calcification in the coronary artery

Target lesion
  • Ostial Vs proximal Vs distal
  • Bifurcation disease
Guide Selection based on Aortic Configuration

**Narrow**
- **Left Coronary**
  - EBU/XB 3-3.5
  - JL 3-3.5
- **Right Coronary**
  - JR3
  - LIMA

**Normal**
- **Left Coronary**
  - EBU/XB 3.5-4
  - JL4, AL 1.5-2
- **Right Coronary**
  - JR 3.5-4
  - AL 0.75-1 & AR 1
  - Hockey Stick

**Dilated**
- **Left Coronary**
  - EBU/XB 4
  - JL4.5 or >
- **Right Coronary**
  - JR 4-4.5
  - AL 1.5-2 & AR 2
Guide Selection Based on Coronary Anatomy

A Normal origin

- Standard choice: Judking right
- Poor back up: Amplatz left 1, 2 or Amplatz right 1, 2

B Shepherd’s crook origin

- Standard choice: Internal mammary or Amplatz left 1, 2

C Low origin with horizontal course

- Standard choice: Judking right or Amplatz right 1, 2

Normal left main standard choice

- XB, EBU or Amplatz left

Short left main standard choice

- Judking JL

Hockey stick
Guide Selection for Right Coronary Artery

Anterior Take-off

- Right Judkins
- Right Judkins or Hockey Stick
- Hockey Stick or Left Amplatz
- Left Amplatz or Left Judkins

Back up Support

- Hockey Stick
- Amplatz
- Left Venous Bypass Graft
- Arani or XBRCA
Guide Selection for Left Coronary Artery

JL Fit in Normal Aorta

<table>
<thead>
<tr>
<th>Proper Fit</th>
<th>Too Long</th>
<th>Too Short</th>
</tr>
</thead>
</table>

Extra Back up Catheter (XB/EBU) Fit in Normal Aorta

<table>
<thead>
<tr>
<th>Lateral Takeoff</th>
<th>Inferior Takeoff</th>
<th>Superior Takeoff</th>
</tr>
</thead>
</table>
Guide Selection for Grafts

Right Grafts:
- JR4
- Right Coronary Bypass
- Multipurpose

Left Grafts:
- Left Coronary Bypass
- Hockey Stick
- Amplatz Left

LIMA Graft:
- IMA
- JR4
- LCB
Femoral vs Radial Approach

Femoral

Right Radial

Left Radial
Guiding Catheter Support

Standard Guide
Minimal Support
JL, JR, RCB & LCB

Support Guides derive support from ipsilateral SOV
AL, AR, Hockey stick & Multipurpose

Extra Support Guides derive support from Opposite wall of Aorta
XB, EBU
Active Support

• Manipulation of guide into a configuration conforming aortic root

• Deep Seating of the guide into coronary artery

Passive Support

• Rely on inherent shape of the catheter and stiffness

• Minimal manipulation is needed
# Guide Catheter Size

<table>
<thead>
<tr>
<th>5-6 French Guides</th>
<th>7-8 French Guides</th>
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<tbody>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td>Small arterial puncture</td>
<td>Larger arterial puncture</td>
</tr>
<tr>
<td>Brachial/radial access</td>
<td>Pressure dampening</td>
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<tr>
<td>Permit active support</td>
<td>More contrast</td>
</tr>
<tr>
<td>Less contrast</td>
<td>Risk of vessel injury</td>
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<tr>
<td>Allows deeper engagement</td>
<td></td>
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<table>
<thead>
<tr>
<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
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<tbody>
<tr>
<td>Better passive support</td>
<td>Larger Rotablator Burrs (&gt; 2 mm)</td>
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<tr>
<td>Better visualization</td>
<td></td>
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<tr>
<td>Better torque transmission</td>
<td></td>
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<tr>
<td>Kissing balloon/stents, covered stents</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
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</thead>
<tbody>
<tr>
<td>Smaller internal lumen</td>
<td></td>
</tr>
<tr>
<td>Less visualization</td>
<td></td>
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<tr>
<td>Less torque</td>
<td></td>
</tr>
<tr>
<td>Risk of kinking</td>
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Guiding Catheter with Side holes

- Useful with
  - Small ostia
  - Dampening or ventricularization of pressure
  - Need to deep-seat
- False sense of security
- Do not prevent guiding catheter injury
- Suboptimal opacification
- Reduction in back up support; weak shaft
- Risk of kinking at side holes
Introduction to Wires
Characteristics of a Coronary Guide Wire

- **Trackability**: Ability of the wire to follow down the vessel
  - Design of the tip
  - Material of core wire
- **Torqueability**: Ability to transmit the rotational force applied
- **Flexibility**: Ability to flex on longitudinal axis
- **Crossability**: Ability to cross a lesion with least resistance
  - Interaction between lesion and wire
  - Lubricity
- **Supportability**: Ability to deliver equipment
- **Opacity**: Level of visibility under fluoroscopy
Guidewire Parts

- **Tip**
  - Platinum
- **Central Core**
  - Stainless steel
  - Durasteel
  - Nitinol
- **Covers**
  - Polymer cover
  - +/- Coils
- **Coatings**
  - Hydrophilic
  - Hydrophobic
Tip Style

One Piece Core Design: Core to Tip

Precise steering

Two Piece Core Design: Shaping Ribbon

High flexibility atraumatic
Core Diameter

- SMALLER
- LARGER

flexibility

diameter
Core Taper

Long core taper

- Enhanced vessel tracking

Short core taper

- More prone to prolapse
- Prolapse
Core Material

Stainless Steel
- Good support
- Good push and torque
- Less flexible

Nitinol
- Kink resistant & Super-elastic
- Excellent flexibility and steering
- Durable
- No memory
Covers

• **Coils**
  - Tactile feedback
  - Resilient tip
  - Radiopacity

• **Polymer/Plastic covers**
  - Lubricity
  - Crossability
  - Smooth tracking

• **Micro-cut Nitinol Sleeve**
  - Precise steerability
  - Torque transmission
Coatings

Polymer cover with hydrophilic coating

Hydrophilic coating

Hydrophobic coating with silicone

Hydrophobic coating with PTFE/Teflon

No coating

Lubricity

Tactile Response
Wire Classification

Tip Load

• Floppy: < 0.5 g
• Balanced: 0.5-0.9 g
• Stiff: > 0.9 g

Wire Support

• Light Support
• Moderate Support
• Extra Support
## Selection of Guide Wires

<table>
<thead>
<tr>
<th>Workhorse</th>
<th>Frontline Finesse</th>
<th>Extra Support</th>
<th>Specialty</th>
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<tbody>
<tr>
<td>BMW</td>
<td>Whisper</td>
<td>Grand Slam</td>
<td>Miraclebros 3-12</td>
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<tr>
<td>BMW Universal</td>
<td>Pilot 50</td>
<td>Buddywire</td>
<td>Confianza Pro 9-12</td>
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<tr>
<td>Advance</td>
<td>Fielder FC, XT</td>
<td>Iron Man</td>
<td>Cross-it 100 XT</td>
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<td>Prowater</td>
<td>Prowater</td>
<td>All Star</td>
<td>Pilot 150, 200</td>
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<td>Runthrough</td>
<td>Wiggle</td>
<td>Gaia</td>
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<td>Sion</td>
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<tr>
<th>Simple</th>
<th>Angulated/Tortuous</th>
<th>Heavy-Support</th>
<th>Challenging</th>
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Lesion type and vessel tortuosity
Guide Wire Selection: Vessel Anatomy

**Straight Forward Anatomy**
- Start with a workhorse wire
- If unable to deliver a balloon or stent, consider an extra support wire alone or as a buddy wire

**Tortuous or Calcified Anatomy**
- Start with a hydrophilic/polymer jacketed wire for reduced friction
- If unable to deliver a balloon or stent, consider using a Wiggle wire
Wire Selection: CTO

0.009” wire and/or hydrophilic coating
Less rail support
Risk of perforation

Consider stiff tip
Increased risk of dissection & perforation
Wire Nuggets

Dos

• Appropriate tip shape for lesion/vessel
• Maintain free movement of wire tip
• Prolapsing soft wires can aid in avoiding side branches

Do not

• Undue Force
• Excessive rotation
• Losing wire position
Thank you

Questions?