Guide Catheter Selection
Sponsored and Authored by Medtronic CardioVascular
Learning Objectives

• State the function of a guide catheter

• Describe the important features of a guide catheter

• List five considerations for guide catheter selection

• Select curve styles optimal for a given anatomical configuration
Functions of a Guide Catheter

- Support for device advancement
- Conduit for device and wire transport
- Vehicle for contrast injection
- Measurement of Pressure
Important Features of a Guide Catheter

- Atraumatic tip
- Preformed curves & configurations
- Torque control
- Kink resistance
- Radiopacity
- Support
- Device Compatibility
Optimal Performance

- **Outer jacket**
- **Stainless Steel**
- **Inner Liner/Coating**

### Specifications
- **Strength**
- **Support**
- **Kink resistance**
- **Flexibility**

- **1:1 Torque**
- **Kink resistance**

- **Large lumen**
- **Lubricious Material**
- **Device Compatibility**
Guide Catheter Configurations

JL, SL, FL, JCL, VL, GL, XB, JR, FR, SR, SCR, JCR, DA75, DA90, VR, AL, SAL, AR, ALR1-2, CAS, MB1, HS, EL GAML, DC, LCB, RCB, IMA, EBU
Curve Selection Considerations

- Anatomical Approach
- Access Site Issues
- French Size Influence
- Active vs. Passive Support
- Aortic Width
- Coronary Anatomy
- Native Coronary vs. CABG/IMA
- Location and Severity of Lesion
- Amount of Calcium in Target Vessel
Anatomical Approach

- Femoral
- Radial
- Brachial
Access Site Issues

- Tortuosity
- Surgical Graft
- Scar Tissue
- Diseased Iliacs
- Limb Loss
French Size Influence

- Historically, 8F guides were necessary to deliver devices because of their larger internal lumens.
- Current 6-7F catheters have internal lumens just as large as previous generation 8F catheters.
- Small guides require ‘back-up” curves more frequently for added support.
- Large guides require side-holes more frequently to improve perfusion.
French Size Influence

6 FR Guides

• **PROS**
  - Small arterial puncture
  - Brachial/radial access
  - Permit active support
  - Less contrast

• **CONS**
  - Smaller internal lumen
  - Less visualization

7-8 FR Guides

• **PROS**
  - Better passive support
  - Better visualization
  - Better torque transmission

• **CONS**
  - Larger arterial puncture
  - Pressure dampening
  - More contrast

• 1 FR = .013” = .33 mm
Back-Up Support

The ability of the guiding catheter to remain in position and provide a stable platform for the advancement of interventional equipment.

There are two methods of support:

• Passive Support

• Active Support
Passive Support

Passive support user typically:

- Relies on properties of the shaft and tip to maintain position in the ostium
- Support provided by either anatomy or catheter composition/curve shape
- Rarely deep-seat the catheter
- Minimal manipulation of the guide is required
Active Support

Active Support users typically:

• Uses aortic root to form desired curve shape and provide backup support

• Relies on active manipulation of guiding catheter to:
  • Obtain stable position
  • Seat coaxially
  • Pre-select LAD or LCX

• Rotates the catheter and/or actively engages the catheter (deep-seating maneuver)
## Considering Active or Passive Support

<table>
<thead>
<tr>
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<th>Requires precise curve selection and sizing</th>
<th>Requires large ostia</th>
<th>Requires disease free ostia</th>
<th>Take-off orientation must match curve</th>
<th>Width of aorta must match curve</th>
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<tbody>
<tr>
<td><strong>Active Support</strong></td>
<td>No</td>
<td>Yes, unless sideholes used</td>
<td>Yes</td>
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<td>Yes</td>
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</table>
Aortic Width

- **< 3.5 cm**
  - Narrow

- **3.5 - 4.0 cm**
  - Normal

- **> 4.0 cm**
  - Dilated
The Proper Fit (JL)
Normal Aorta

Proper fit is a $45^\circ$ angle at the primary curve, and buttressing against the contralateral wall.
The Improper Fit (JL)

Normal Aorta

Too long
The Improper Fit (JL)

Normal Aorta

Too short
Coronary Anatomy
Ostial Origins

The point at which the ostium is attached to the aortic root.

- Ascending Aorta
- Sinuses of Valsalva
- Right Coronary Ostia
- Left Coronary Ostia
- Aortic Valve
  - Left Cusp
  - Posterior Cusp
  - Right Cusp
Coronary Anatomy
Ostial Origins

**Left Main** - usually arises anterior, inferior and leftward from the left coronary sinus

**LAD** - usually arises in an anterior and superior position

**LCX** - usually arises posterior and inferior from the left main

**RCA** - usually arises anterior from the right aortic cusp

**SVGs** - usually arise from the anterior portion of the heart
Coronary Anatomy
Ostial Variations

Coronary ostial location:
• high
• low
• anterior
• posterior

Coronary ostial orientation:
• superior
• horizontal
• inferior
• shepherd’s crook (RCA’s only)
Coronary Artery Variations

1. RCA - normal
2. RCA - high, anterior
3. RCA - Left sinus, posterior
4. LCA - normal
5. LCA - high, anterior

LAO 40º
Coronary Ostial Origins
High

Coronary artery departs the aorta at an abnormally high distance above the aortic valve
Coronary Ostial Takeoffs

- Horizontal
- Inferior
- Superior
Common Takeoffs- Left Coronary Artery

- Horizontal
- Inferior
- Superior
Common Takeoffs
Right Coronary Artery

Horizontal

Inferior

Superior
Coronary Ostial Takeoffs

Shepherd’s Crook (RCA only)
Bypass Grafts

Grafts are anastomosed to the anterior wall of the ascending aorta with the exception of the LIMA.
Bypass Grafts

Left Vein Graft  Right Vein Graft  Internal Mammary
Types of Guide Catheters

- Standard
- Support
- Extra Support & Specialty Curves
Left Coronary Curves
Short Left Curves
Right Coronary Curves
Short Right Curves
Bypass Graft Curves

LCB  RCB  IMA
Amplatz Coronary Curves
Short Amplatz Curves
Multipurpose Curves

Hockey Stick III II I
El Gamal
MB2
MB1
EBU (Extra Backup) Curves

- Broad secondary curve braces against the contralateral wall for superior backup
RBU (Right Back Up)

- Works best for normal inferior takeoffs where a lot of backup is required
- Rests against the contralateral wall
- Will deep seat 10-12 mm into ostium
MAC (Multi-aortic curve)

- Can be used in both left and right coronary arteries
- Mechanical support provided from aortic root & contralateral wall
- Femoral or radial access
ECR
Right Coronary Back-Up Support
Champ Curves

For superior oriented arteries and saphenous grafts

Right Coronary Artery
Champ1.0

Saphenous Grafts
Champ2.0

LAD/LCX
Champ3.0
Guide Catheter Selection*

* MOST IMPORTANT REQUIREMENT: CO-AXIAL ALIGNMENT
Co-Axial Alignment

Non-Coaxial

Coaxial

Guide Catheter Selection
Guiding Catheter Selection

CO-AXIAL ALIGNMENT

Complex anatomy, difficult lesion, tortuosity, need for extra support

YES

EXTRA SUPPORT GUIDE
Support from opposite wall of aorta

SUPPORT GUIDE
Support from Sinus of Valsalva

NO

ANY CO-AXIAL GUIDE
Guide Catheter Selection and Support

**Standard guide for most patients; Minimal support**
- Catheters reside above or barely in Sinus of Valsalva
  - JL, JR, LCB, RCB

**Support derived from Sinus of Valsalva**
- Catheters reside deep in ipsilateral Sinus of Valsalva
  - AL, AR, Hockey stick, El Gamal, Champ, MP

**Power guides, Extra support**
- Maximum support derived from opposite wall of aorta
  - Voda®, XB, EBU, Arani

Guide Catheter Selection
Guiding Catheter Support

**JR4**
Simple coaxial alignment, without support

**Hockey Stick**
Coaxial alignment, with extra support from Sinus of Valsalva

**EBU**
Coaxial alignment, with power support from opposite wall of aorta

Guide Catheter Selection
Curve Length Considerations

**Shorter curve:** may be useful for vessels with superior orientation

**Longer curve:** May be useful for vessels with inferior orientation
Guide Catheter Construction

Primary Curve

Secondary Curve

tip
Curve Length

Judkins Left

Curve Length = P-S distance (cm)

P = Primary Curve
S = Secondary Curve
Curve Length

Judkins Right

Curve Length = P-S distance (cm)
P = Primary Curve
S = Secondary Curve
Guiding Catheter Selection
Left Coronary Artery
## Guiding Catheter Selection - LCA

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<thead>
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<th>Guiding Catheters</th>
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<tr>
<td><strong>Aortic root</strong></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>• JL4, AL2, VL4, GL4, XB3.5, EBU4</td>
</tr>
<tr>
<td>Dilated</td>
<td>• JL (\geq 5), AL (\geq 2), VL (\geq 4), GL (\geq 4), XB (\geq 4), EBU (\geq 4)</td>
</tr>
<tr>
<td>Narrow</td>
<td>• JL3.5, VL3.5, GL3.5, XB3.0, EBU3.5</td>
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### Orientation*

- Normal, Anterior  • JL, AL, VL, GL, XB, EBU
- Posterior         • AL, VL, GL, XB, EBU
- Superior          • JL, VL, GL, XB, EBU

*Size of curve depends on aortic root diameter*
Guiding Catheter Selection - LCA

- **Normal:** JL4
- **Dilated Root:** JL5, VL4, GL4, EBU
- **Superior Origin:** AL3, VL4, GL4, EBU, Champ
- **Short Left Main:** JL4 Short Tip, JL3.5
High Left Takeoff- LCA

AL 1.5

Other Recommendation: FL/JL 3.5

EBU 3.5
Guiding Catheter Selection
Right Coronary Artery
# Guiding Catheter Selection - RCA

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<td>• Normal</td>
<td>• JR4, AL1, AR1</td>
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<tr>
<td>• Dilated</td>
<td>• JR ≥ 5, AL ≥ 2, AR ≥ 2</td>
</tr>
<tr>
<td>• Narrow</td>
<td>• JR 3, AL ≤ 0.75</td>
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<tr>
<td>• Normal</td>
<td>• JR, AL, AR</td>
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<td>• Anterior, Superior</td>
<td>• AL, HS, MP</td>
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<tr>
<td>• Inferior</td>
<td>• MP, AR, JR</td>
</tr>
<tr>
<td>• Shepherd Crook</td>
<td>• AL, SCR, VR, VRSC, ELG, HS, IMA Champ</td>
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<tr>
<td>• Horizontal</td>
<td>• JR, HS, AR, VR</td>
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*Size of curve depends on aortic root diameter*
Guiding Catheter Selection: RCA

- Normal: JR4
- Inferior Orientation: Modified Right Amplatz
- Anterior Origin (Right cusp): Multipurpose
Guiding Catheter Selection: RCA

Shepherd’s Crook:
Arani 75°, Champ

Superior Origin:
MAC, Champ, Multipurpose

Dilated Root:
Left Amplatz 2
Right Lateral Takeoff

FR 4.0
AL 1.0/2.0

Other Recommendations: AR 2.0; MAC 3.0; ECR 4.0
Right Inferior Takeoff

Other Recommendations: El Gamal, ECR, Short Amplatz
Right Shepherd Crook

- **Arani 75°** - Support from aorta
- **Amplatz** - Support from sinus
- **El Gamal, Hockey Stick** - Support from sinus
- **Right Voda®** - Support from aorta
- **JR4** - Avoid; no support
Right Shepherd Crook

SCR 4.0

HSII

Other Recommendations: MAC 3.5; Hockey Stick I
Guiding Catheter Selection
SVG’s & LIMA
Guide Catheter Selection: SVG’s & IMA
1. Superior - HS, LCB, MP, ELG, SCR

2. Horizontal - JR, AR, MP, AL
SVG to LCx

Other recommendations:
Champ 2.0
MB 1.0
MAC
HS

LCB
SVG to RCA (or LPDA)

1. Horizontal - JR4, RCB, AR, AL MP
2. Inferior - MP, AL, AR, RCB

LAO 30°
SVG to RCA

Other recommendations:
SR 4.0
MB 1.0

RCB
Internal Mammary Artery

LCB

IMA

Guide Catheter Selection
Deep-Seating Maneuver*

* Rarely necessary with contemporary equipment
Arterial Pressure Tracings From Guiding Catheter

Normal    Ventricularization    Damped

Note: Side holes allow perfusion, but don’t prevent guiding catheter injury to the ostium
Case Reviews
Left Main Stenosis

**ISSUES:** Co-axial alignment
Power guide not necessary

GUIDE: JL4
LCx: Right Angle Takeoff

**ISSUES:** Co-axial alignment and extra support

**GUIDE:** MAC, VL, GL, EBU, XB, AL

- Right angle takeoff
- Significant tortuosity
- Distal target lesion
LAD: Total Occlusion

ISSUES:
Co-axial alignment
Extra support may be needed if occlusion is chronic.

GUIDE: JL4
Simple lesion

Anomalous LCx

ISSUES:
Co-axial alignment
JR4 may point inferiorly
Extra support not necessary

GUIDE: JR4 ST, JR 3.5, AR 1
RCA: Horizontal Takeoff

**ISSUES:**
- Co-axial alignment
- Extra or power support because of tortuosity

**GUIDE:** AR, HS MAC 3.0 RBU

Very tortuous vessel
RCA: High-Anterior Origin

**ISSUES:**
Co-axial alignment
Anomalous origin is challenging for JR4

**GUIDE:**
AL/AR 1-2
Hockey stick
Multipurpose
RCA: Simple Lesion

ISSUES:
Co-axial alignment

GUIDE:
AL, Hockey stick, Multipurpose
Ostial RCA: Inferior Takeoff

**ISSUES:**
Co-axial alignment is crucial

**GUIDE:** JR4, JR4 ST, JR 3.5
RCA: Shepherd Crook

ISSUES:
Co-axial alignment
“Simple” lesion, so extra-support is not necessary

GUIDE:
Hockey stick, IMA, VRSC, Champ
SVG to PDA:
Inferior Takeoff

ISSUES:
Co-axial alignment
Aggressive guide may make it more difficult to treat the ostium

GUIDE: MP, AR, AL

AL-2 diagnostic catheter; MP diagnostic catheter would not “seat”
Summary

• Reviewed the functions of a guide catheter
• Discussed important features of a guide catheter
• Discussed considerations for guide catheter selection
• Identified optimal curve styles for a given anatomy
Sponsored and Authored by Medtronic CardioVascular
# Evaluation

## Guide Catheter Selection

To what extent do you agree with the following statements about today’s program?

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To what extent did today’s program help you accomplish the following objectives?

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To what extent did each presenter demonstrate the following?

**Presenter A**

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**Presenter B**

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What information would you recommend be added or deleted from this program? __________________________

________________________________________________________________________________________

How might the speaker(s) improve his/her presentation? _________________________________________

________________________________________________________________________________________

Please record any additional comments or suggestions on the reverse side.

Return your completed evaluation to the presenter. Thank you for your participation.
1. Which of the following is true of passive placement curve designs?
   a) Use aortic root to form desired curve shape and provide support.
   b) Catheters are softer, more flexible and can reshape in-vivo.
   c) Require minimal manipulation of the guide catheter.
   d) Use shaft support/curve configuration to maintain ostial position.
   e) Both C & D

2. Which of the following defines ostial origin?
   a) The coronary artery’s angle of departure from the aorta.
   b) The point where the ostium is attached to the aortic root.
   c) Origin of bypass grafts when inserted.
   d) The first side-branch access in coronary arteries.

3. The following statements regarding the Judkins Left (JL) and Judkins Right (JR) coronary catheters in a normal aorta are true or false? When the guide tip has an inferior orientation below the ostium, the curve is too large. When the guide tip has a superior orientation above the ostium, the guide is too small.
   a) True
   b) False

4. The MAC (Multi-Aortic Curve) catheter can be used in both right and left coronary arteries.
   a) True
   b) False

5. A JL series guide is best suited for active guide placement.
   a) True
   b) False
6. A narrow aortic root is accommodated best by a larger curve on a guide catheter.
   a) True
   b) False

7. The most common problem(s) with active guide support is (are):
   a) Decreased coronary flow
   b) Ventricularized arterial pressure pattern
   c) Coronary spasm
   d) Dampened arterial wave form
   e) All of the above

8. One to one torque transmission is an important feature of guide catheters.
   a) True
   b) False

9. Co-axial placement is the most important requirement of the guide catheter.
   a) True
   b) False

10. Which of the following catheters is an example of a catheter that derives its support from the Sinus of Valsalva?
    a) JL
    b) Amplatz
    c) LCB
    d) JR