GUIDE CATHETERS FOR CORONARY INTERVENTION

Sreeyam Srikanth
Diagnostic vs Guide catheters

- Stiffer shaft
- Larger internal diameter (ID)
- Shorter & more angulated tip (110° vs. 90°), non tapering a traumatic tip
- Re-enforced construction (3 vs. 2 layers).
Parts of a Catheter

- Usual length = 100 cm
Catheter size

- Outer diameter = French size (5-10F)
- Inner diameter = Inches
- Length in cm (usually 100 cm)
Cross section of catheter

- **Outer jacket**: Strength, Support/Flexibility, Kink resistance
- **Stainless Steel braid**: 1:1 Torque, Kink resistance, **Stainless steel/Kevlar**
- **Inner Liner**: Internal lumen, Smooth or lubricious material, Device compatibility **PTFE (Polytetrafluoroethylene)** like Teflon
Important features of a guide catheter

- Preformed curves & configurations, optimum support
- Adequate lumen & device compatibility
- Easy to handle, torque control, kink resistance
- A traumatic tip
Side hole vs no side hole

Side holes are useful where the pressure gets frequently damped as in RCA interventions, CTO interventions or sole surviving artery or left main interventions.

Advantages
- Prevent catheter damping (occlusion of the coronary ostium)
- Allow additional blood flow out of tip, to perfuse the artery.
- Avoid catastrophic dissections in the ostium of the artery

Disadvantages
- False sense of security because now, aortic pressure, and not the coronary pressure is being monitored.
- Suboptimal opacification
- Reduction in back up support provided because of weakness of catheter shaft and the kinking at side holes
Guide catheters

- ADROIT® Guiding Catheter-
- VISTA BRITE TIP® Guiding Catheter

Cordis

- Wiseguide™ Guide Catheter
- RunWay™ Guide Catheter
- Mach 1™ Guide Catheter
- Convey Guiding Catheter

Boston scientific

- Launcher Coronary Guide Catheter
- Sherpa NX Active Coronary Guide Catheter
- Sherpa NX Balanced Coronary Guide Catheter

Medtronic
Guide catheters sizes

<table>
<thead>
<tr>
<th>Guide/Manufacturer</th>
<th>Outer lumen size (French)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Launcher / Medtronic</td>
<td></td>
</tr>
<tr>
<td>Vista Brite Tip / Cordis</td>
<td>0.056</td>
</tr>
<tr>
<td>Mach1 / Boston Scientific</td>
<td>NA</td>
</tr>
<tr>
<td>Viking / Guidant Abbott</td>
<td>NA</td>
</tr>
<tr>
<td>Wiseguide / Boston Scientific</td>
<td>NA</td>
</tr>
</tbody>
</table>
Guide catheters are available as standard, large and giant catheters based on the internal diameter.

Table 7.2  Internal diameters of standard, large, and giant lumen guiding catheters

<table>
<thead>
<tr>
<th>French</th>
<th>Standard (in.)</th>
<th>Large (in.)</th>
<th>Giant (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>≤0.061</td>
<td>0.062–0.065</td>
<td>≥0.066</td>
</tr>
<tr>
<td>7</td>
<td>≤0.071</td>
<td>0.072–0.075</td>
<td>≥0.076</td>
</tr>
<tr>
<td>8</td>
<td>≤0.079</td>
<td>0.080–0.085</td>
<td>≥0.086</td>
</tr>
<tr>
<td>9</td>
<td>≤0.089</td>
<td>0.090–0.096</td>
<td>≥0.096</td>
</tr>
<tr>
<td>10</td>
<td>≤0.099</td>
<td>0.100–0.107</td>
<td>≥0.108</td>
</tr>
</tbody>
</table>
Guide selection

• Diagnostic curve selection
• Size of the ascending aorta
• Origin and takeoff of the target artery
• Degree of tortuosity and calcification of the coronary artery segment proximal to the target area
• Device to be utilized during intervention
Smaller vs larger catheter

**Larger guiding catheter**
- Higher bleeding risks; but
- Greater coronary opacification
- Better torque transmission
- Provides more passive support
- More complex PCI possible

**Smaller guiding catheter**
- Lower bleeding risks; but
- Less coronary opacification
- Poorer torque transmission
- Provides less passive support
- Less complex PCI possible
### Table 7.1: Advantages and disadvantages associated with the size of the guiding catheter

<table>
<thead>
<tr>
<th></th>
<th>≤5 Fr</th>
<th>6 Fr</th>
<th>≥7 Fr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>Smaller puncture</td>
<td>Smaller puncture</td>
<td>Increased support</td>
</tr>
<tr>
<td></td>
<td>Small vessel access</td>
<td>Small vessel access</td>
<td>Improved visualization</td>
</tr>
<tr>
<td></td>
<td>Radial access</td>
<td>Radial access</td>
<td>Increased torque</td>
</tr>
<tr>
<td></td>
<td>Deeper engagement possible for active support</td>
<td>Deeper engagement</td>
<td>Facilitate the use of 2 balloons (kissing)</td>
</tr>
<tr>
<td></td>
<td>Smaller quantity of contrast</td>
<td></td>
<td>Allows the use of any covered stent</td>
</tr>
<tr>
<td></td>
<td>Improved patient comfort</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>↓ passive support</td>
<td>↓ support</td>
<td>Larger puncture site/recovery time</td>
</tr>
<tr>
<td></td>
<td>↓ visualization</td>
<td>↓ visualization</td>
<td>Less radial access possible</td>
</tr>
<tr>
<td></td>
<td>↓ torque</td>
<td>↓ torque</td>
<td>Pressure dampening</td>
</tr>
<tr>
<td></td>
<td>Device limiting (no thrombectomy, no simultaneous balloon inflation (kissing) technique possible, no Rotablator)</td>
<td>Device limiting</td>
<td>Increased contrast usage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Increased risk of ostial dissection</td>
</tr>
</tbody>
</table>
Selection of guiding catheter

- Size
- Shape/curve
- Length
# Size of the catheter

<table>
<thead>
<tr>
<th>Catheter Size</th>
<th>Devices</th>
<th>Techniques</th>
</tr>
</thead>
</table>
| 5Fr           | Balloons<5 mm  
                Stents<4.5 mm  
                IVUS  
                Rotablator1.25 mm burr | No Kissing Balloon |
| 6 Fr          | All Coronary balloons  
                All Coronary stents  
                Cutting Balloon  
                Rotablator <1.5 mm  
                CSI orbital atherectomy 1.25 mm  
                Protection device  
                Guideliner | Kissing Balloon |
| 7Fr           | Rotablator1.75 mm  
                Guideliner  
                Trapping balloons | Simultaneous Kissing Stent |
| 8Fr           | Rotablator 2 mm  
                Guideliner  
                Trapping balloons | Trifurcation stenting |
Curve selection factors

- Aortic Width
- Coronary Anatomy
- French Size
- Active vs. Passive Support
- Native Coronary vs. CABG
- Amount of Calcium in Target Vessel
Aortic width

- Narrow: < 3.5 cm
- Normal: 3.5 - 4.0 cm
- Dilated: > 4.0 cm
Back-Up Support

- Ability of the guiding catheter to remain in position and provide a stable platform for the advancement of interventional equipment
- There are 3 main types of back up support
  - Passive
  - Active
  - Balanced
Passive support

- Strong support given by
  - inherent design of a guide with good back-up against opposite aortic wall
  - stiffness from manufactured material

- Additional manipulation is generally not required
- Mainly passive
  - Amplatz
Active support

• Active support is typically achieved by

  1. Manipulation of the guide - into a configuration conforming the aortic root
  2. Deep-Seating - Intubation with deep engagement of the guide into the coronary vessels

Balanced Support

• Rely on the inherent property of shaft and shape for coaxiallity, but can be manipulated in cases requiring extra support
  • Judkins
  • EBU
<table>
<thead>
<tr>
<th></th>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Active Support</td>
<td>No</td>
<td>Yes, unless sideholes used</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Passive Support</td>
<td>Yes</td>
<td>Indeterminate</td>
<td>Indeterminate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Determinants of back up support

• 3 factors
  • Catheter size
  • Angle theta of the catheter on the reverse side of aorta
  • Contact area
Determinants of back up support

• Role of $\theta$ – If $\theta$ is larger and close to $90^\circ$
  the backup force is greater

  - If $F \cos \theta \leq \lambda$ (static friction),
    the guiding catheter works.
  - If $F \cos \theta > \lambda$, system collapses.

$$F_{\text{max}} = \frac{\lambda}{\cos \theta}$$
Guide Catheter Selection

•  *MOST IMPORTANT REQUIREMENT: CO-AXIAL ALIGNMENT*

![Non-Coaxial](image1)

![Coaxial](image2)

Non-Coaxial  
Coaxial
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
Most commonly used guides

- Judkins, Amplatz, and Extra-back-up guides

- Others include Multipurpose for RCA bypass or a high left main (LM) takeoff

- LIMA catheter for right and left coronary bypass graft
Guiding Catheter Selection - LCA

Aortic root

• Normal
  • JL4

• Dilated
  • JL \geq 5, AL \geq 2, VL \geq 4, XB \geq 4, EBU \geq 4

• Narrow
  • JL3.5, VL3.5, XB3.0, EBU3.5

Orientation*

• Normal, Anterior
  • JL, AL, VL, XB, EBU

• Posterior
  • AL, VL, XB, EBU

• Superior
  • JL, VL, XB, EBU
Selection of Guiding Catheter: Left

Judkins Left (JL)  
Amplatz Left (AL)

Extra Back Up (EBU)
The Judkins Guide

- Primary (90°), secondary (180°), and tertiary (35°) curves fit aortic root anatomy
- As 1° curve fixed Intubates small segment of ostium - ↓ risk of trauma
- Engage the LM ostium without much manipulation
- knows where to go unless thwarted by the operator
Universal vs. Judkins catheters?

Advantages
- Single pass through radial artery = potentially less time and less spasm

Disadvantages
- Cost
- Learning curve
- Potentially more catheter manipulation

Advantages
- Cost
- Familiarity / availability

Disadvantages
- More time
- More passes through radial artery potentially = more spasm

Ultimate 1  Ultimate 2  Ultimate 3  Performa JL4  JR4  pigtail  MIV pigtail
JUDKINS GUIDE

- Selected according to
  - width of the ascending aorta
  - location of the ostia to be cannulated
  - orientation of the coronary artery
  - segment proximal to the target lesion

- Segment between the primary and secondary curve of the Judkins left guide should fit width of ascending aorta
  - ex: 3.5 cm, 4 cm, 4.5 cm
Aortic width

Co-axial alignment with 45° at the primary curve and the secondary curve buttressing at the C/L wall

Curve length = distance between P (primary curve) & S (secondary curve)
• Aortic diameter determines the curve length
Primary curve

Secondary curve

Tertiary curve

Secondary curve

Primary curve

No tertiary curve

Judkins right guiding catheter

Judkins left guiding catheter
Limitations of Judkins Guide

• As 1° curve is fixed - may not be co-axial with the artery
• may be difficult to pass balloons - as catheter makes an angle of 90° with ostium
• JL- point of contact on ascending aorta - very high & narrow-↑ chance of prolapse & dislodgement
• JR- no point of contact on asc Aorta - extremely poor support
The Amplatz Guide

• Secondary curve rest against the noncoronary posterior aortic cusp

• Offers firm platform for advancement of device

• Best in the case of a short LM, with down going left circumflex artery (LCX)

• Tip points slightly downward - higher danger of ostial injury causing dissection
Amplatz Guide

- Selection of the proper size for an Amplatz guide is essential
  - Size 1 is for the smallest aortic root
  - size 2 for normal
  - size 3 for large roots
- Attempts to force engagement of a preformed Amplatz guide that does not conform to a particular aortic root increase risk of complication
Withdrawal of an Amplatz Guide

- Must be carefully disengaged from the coronary artery
- A simple withdrawal from the vessel can cause the tip to advance farther into the vessel and cause dissection
- To disengage - first advance guide slightly to prolapse the tip out of the ostium
- Then rotate the guide so that tip is totally out of the ostium before withdrawing it
Withdrawal of an Amplatz Guide After Balloon Inflation

• After deflation if balloon is pulled out, the tip of the Amplatz (or any) guide would have the tendency to be sucked in deeper

• To avoid this - pull the balloon out while simultaneously pushing the guide in - to prolapse the guide out
Extra-Back-Up Guide

- Long tip forms a fairly straight line with the LM axis or the proximal ostial RCA
- Long secondary curve - abut the opposite aortic wall
- So tip in the coronary artery is not easily displaced
- Provide a very stable platform
EBU 3.75
Normal Root, left Coronary, lateral takeoff

EBU 4.0
Normal Root, left Coronary, inferior

EBU 3.5
Normal Root, left Coronary, superior takeoff

Will engage 2-3 mm into ostium
Withdraw catheter for inferior orientation
Advance catheter for superior orientation
How to select the curve?

LCA Length Variations

- Smaller Guides will Selectively Engage LAD
- Larger Guides will Selectively Engage and give better support LCx
- Amplatz tip selectively engages LCx
## Guiding catheter’s size in practice

### Left System

<table>
<thead>
<tr>
<th></th>
<th>AL Curve Amplatz curve</th>
<th>XB Curve</th>
<th>JL Curve Judkins left</th>
<th>Q Curve</th>
<th>VL Curve Voda Left</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal</strong></td>
<td>AL1</td>
<td>XB 4.0 or 3.5</td>
<td>JL4</td>
<td>Q 4</td>
<td>VL 4</td>
</tr>
<tr>
<td><strong>Dilated</strong></td>
<td>AL2</td>
<td>XB 4.0 or 4.5</td>
<td>JL 4.5</td>
<td>Q 4.5</td>
<td>VL 5</td>
</tr>
<tr>
<td><strong>Narrow</strong></td>
<td>AL 0.75</td>
<td>XB 3.0 or 3.5</td>
<td>JL 3.5</td>
<td>Q 3.5</td>
<td>VL 3</td>
</tr>
</tbody>
</table>
### JL and EBU sizing

<table>
<thead>
<tr>
<th>Judkins Left Catheter Used</th>
<th>EBU Curve Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>JL 3.5</td>
<td>EBU 3.5</td>
</tr>
<tr>
<td>JL 4.0</td>
<td>EBU 3.75 will engage 2–3 mm into the ostium</td>
</tr>
<tr>
<td></td>
<td>EBU 4.0 will engage 3–5 mm into the ostium</td>
</tr>
<tr>
<td>JL 4.5</td>
<td>EBU 4.5</td>
</tr>
<tr>
<td>JL 5.0</td>
<td>EBU 4.5</td>
</tr>
</tbody>
</table>
Long tip catheters

- Voda, XB, EBU
- Advantages
  - coaxial intubation
  - better support and stability
  - precise control and manipulation
  - lack of bends - improve advancement of devices, decrease the loss of supportive forces
  - safety
RCA interventions

• Usual - JR or Hockey stick guide
• If extra support - CTO, tortuosity – AL1
• Abnormal take off of RCA from aorta esp info orientations - MP guide
• Tortuous or bent anatomy, posterior and superior take off of RCA - 3DRC

Aortic root

• Normal

• Dilated

• Narrow

• JR4, AL1, AR1
• JR ≥ 5, AL ≥ 2, AR ≥ 2
• JR 3, AL ≤ 0.75
Selection of guiding catheter
Right system

Judkins Right (RL)    Amplatz Right (AR)

JR 3.0   JR 3.5   JR 4.0   JR 4.5   JR 5.0   JR 6.0

AR 1.0   AR 2.0   ALR1-2
Take-Off Right Coronary Artery

Transverse Superior Inferior

Judkins Right JR, Hockey-Stick, EBU R, Amplatz Right or Left JR, Multipurpose, SLS
Shepherd’s crook deformity of RCA

Dramatic upturn with
a near 180 degree
switch back turn

- Arani 75° - Support from aorta
- Amplatz - Support from sinus
- El Gamal, Hockey Stick-Support from sinus
- JR4 - Avoid; no support
Other catheters

- **3 DRC** - Three dimensional right curve - for tortuous, bent anatomy and posterior or superior take off of RCA
- **Arani**
  - Double angle 90° curve sits on ascending aorta in S configuration and is therefore useful for RCA with horizontal take-off & shepherded crook RCA
  - Primary and secondary curve provides two contact points on the opposite side of aorta thus providing tremendous back-up support
• XBR and XBRCA - new catheters developed specifically for the inferior and superior take off of RCA respectively
• El Gamal (EGB) - pre-shaped catheter with improved distal end-portion for accessing bypass grafts and more precise access of RCA
• LCB - for left coronary venous bypass grafts. Its tip has 90° bend with 70° secondary bend
• RCB - for right coronary venous bypass grafts, its tip and secondary bends approximate 120° - like a JR catheter with a shallower tip bend
Champ Curves

For superior oriented arteries and saphenous grafts

Right Coronary Artery Champ1.0

Saphenous Grafts Champ2.0

LAD/LCX Champ3.0
Selection of guiding catheter

- Length:
  - Standard length:
    - 100 cm.
  - Shorter length for distal lesions (LIMA, sequential SVGs, retrograde approach to CTO):
    - 85 cm, 90 cm
  - Longer length (Tall patients, tortuous aortoiliac vessels):
    - 110-115 cm
• If tip does not reach the ostium and keep lying below it - guide is too small
• If tip lies above the ostium - guide is too large
• When RCA ostium is very high - left Amplatz guide may be used to engage the right ostium
Multipurpose Guide

- Straight with a single minor bend at the tip
- For RCA bypass graft or a high left main (LM) takeoff
GUIDE MANIPULATION
Standard safety techniques

• Basic safety measures should be applied rigorously when manipulating guides
• 1. Aspirate the guide vigorously after it is inserted into the ascending aorta for any thrombus or atheromatous debris floating
• 2. Insist on generous bleed back to avoid air embolism
• 3. Flush frequently to avoid stagnation of blood inside the guide
• 4. Constantly watch the tip when withdraw interventional device especially with ostial or proximal plaques
• 5. Watch the blood pressure curve for dampening to avoid inadvertent deep engagement of the tip
• 6. During injection, keep the tip of the syringe pointed down so any air bubbles will float up and are not injected
Advancement Through Tortuous Iliac Artery

- Excessive tortuosity - rotations at the proximal end do not transmit similar motion to the distal tip
- Guide can twist on itself
- Methods to advance -
  - 23 cm sheath may help to overcome the iliac tortuosity
  - Abdominal aortic aneurysm - 40 cm sheath is needed
  - Torquing a guide still cannulated inside by a stiff 0.38 wire
Dampening of Arterial Pressure

• Guide can cause
  • fall of diastolic pressure - ventricularization
  • fall of both systolic and diastolic pressure - dampened pressure

• Can be due to
  • significant lesion in the ostium
  • coronary spasm
  • non-coaxial alignment
  • mismatch between diameter of the guide and of the arterial lumen
Checking Stability and Potential of Backup Capability

• Forward advancement of guide should further intubate the coronary artery rather than prolapse into the aortic root
• If tip slips out - guide does not provide sufficient backup
• Need to be changed for another with better support
• Active intubation of the guide may be tried
  • if its tip is soft
  • if the artery is large enough to accommodate the guide
  • no ostial or proximal lesions
• Active support position is needed temporarily in order to advance the device across the lesion
• Once device is positioned guide is withdrawn to ostium.
Techniques to Stabilize a Guide

1. **Second angioplasty wire/ Buddy Wire** - advanced parallel to the first one
   - Straightens tortuous vessel and provides better support for device tracking

2. **Second wire in a side branch** - useful in anchoring the guide (second wire in LCX when dilating LAD lesion)
   - Provides for better backup and allows retraction of the guide when necessary, without loss of position
   - Also prevents the guide from being sucked in beyond the LM when pulling back balloon catheters
   - Cause unnecessary denudation of endothelium in that vessel
Techniques to Stabilize a Guide

3. Change to stronger guide

4. Anchoring Balloon
   - Second small balloon (1.5–2 mm diameter) inserted in a small proximal branch
   - Inflated at 2 ATM - anchor the guide

5. Change the current sheath to a very long sheath

6. Double guide technique
   - Insert a smaller guide in current guide
How to Untwist a Twisted Guide

• Move the twisted segment to a large area by advancing it into the aorta
• Cannulate the guide with a 0.035 wire
• Move its tip to the twisted area
• Next try to untwist the guide by torquing in the opposite direction
• Slowly advance the wire to secure the segment just untwisted
Avoiding Selective Entry of the Conus Branch

- If the guide keeps entering the conus artery
  - change the guide for a larger one
  - approach the RCA from a posterior direction - position the guide above the sinus, rotate the guide counterclockwise to enter the main RCA first
Deep-Seating

- If the guide needs to be deep-seated then it is advanced over an interventional device
- Apply clockwise/counter clockwise torque
- Once deep-seated device is advanced and positioned
- After achieving the position guide is withdrawn with gentle rotation
Deep-seating

- Attempted only if
  - Artery is large enough to accommodate the guide
  - No ostial or proximal lesion
  - Guide tip is soft
- Direction of torquing

Toward the LAD - Counter-clockwise rotation

Toward the LCX and RCA - Clockwise rotation
Deep engagement of the RCA with a Judkins right guiding catheter to achieve active support. (a) Passive engagement of the RCA with a Judkins right guiding catheter, followed by passage of guide-wire and angioplasty balloon into the proximal RCA. (b) Active engagement of the RCA achieved by advancement and rotation of the guiding catheter over the guide-wire, while the angioplasty balloon remains in the proximal RCA.
“Amplatzing” a Judkins left guiding catheter to achieve active support. (a) Passive engagement of the left mainstem with a Judkins left guiding catheter, followed by passage of guide-wire and angioplasty balloon into the LAD. (b) Active engagement of the LAD achieved by simultaneous retraction of the angioplasty balloon, and advancement of the Judkins catheter with counterclockwise torque, thus acquiring Amplatz-like shape and active support.
Shows how an AL guiding catheter shape (Panel a) conforms to the aortic root curvature, which provides greater backup support/counter-force (F3 > F2 > F1) to push against resistance encountered in the target vessel compared to a Judkins left catheter (Panel b).

**Figure legend**

- **F1**: Force/resistance encountered by advancing balloon into target vessel
- **F2**: Counter-force/backup support determined by the frictional force generated by the length and angle of contact (a) between a JL catheter and the aortic wall, & by the contact between the catheter tip & coronary ostium (b)
- **F3**: Counter-force/backup support created by the greater length of contact (c) & the more perpendicular angle between an AL catheter and the aortic wall, & by the greater contact (d) between a coaxial catheter tip & the coronary ostium
Demonstrates in this patient that a JL 3.5 guiding catheter via transradial access (Panel a) provides less support to undertake PCI compared to converting to transfemoral access (Panel b) and using a larger secondary curve guiding catheter of the same shape (e.g. JL4–4.5), which provides more coaxial engagement and better bracing support against the aortic wall. A more aggressively curved guiding catheter shape or larger Fr gauge catheter would provide greater passive support, if required.

**Figure legend**

**F1:** Force/resistance encountered by advancing balloon into target vessel

**F2:** Counter-force/backup support determined by the frictional force generated from the length & angle of contact between the transradial guiding catheter and the aortic wall (a), & by less engagement/contact between the catheter tip & coronary ostium (b), resulting in F1 > F2 which may cause catheter to prolapse during the case

**F1:** Force/resistance encountered by advancing balloon into target vessel

**F2:** Counter-force/backup support created by the more perpendicular angle of contact between the transfemoral guiding catheter and the aortic wall (c), & by greater contact/ deeper engagement between catheter tip & the coronary ostium (d), resulting in F2 > F1 which provides for good guiding catheter support during the case
Appropriate sizing of Judkins left catheters depending upon ascending aortic anatomy. (a) Normal ascending aortic size. JL4 guiding catheter will usually be coaxial. (b) Narrow ascending aorta. JL4 will be oversized and the tip may lodge in the left aortic sinus. JL3.5 or JL3 will usually provide a coaxial fit. (c) Dilated ascending aorta. JL4 will be undersized and may not engage or the tip may poorly engage, pointing upwards in the left mainstem. A larger JL catheter (JL4.5–6) would engage more coaxially.
Shows a superiorly orientated “shepherd’s crook” RCA and appropriate catheter engagement. (a) Where using a Judkins right catheter results in non-coaxial engagement of the RCA ostium. (b) Where using a guiding catheter with a superiorly directed tip (e.g. Amplatzer left) results in coaxial engagement of the RCA ostium.
Showing how RCA may originate from an increasingly anterior position, requiring a different catheter shape to cannulate the ostium successfully. (a) Normal RCA origin – JR catheter engages coaxially. (b) Slightly anterior RCA origin – hockey stick catheter engages better than JR catheter. (c) Significantly anterior RCA origin – JR catheter will not engage, Amplatz left catheter here shown in a rotated plane with appropriate secondary curve length and shape to cannulate the RCA ostium coaxially.
• 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
Common Takeoffs - Left Coronary Artery

- Horizontal

Inferior

Superior
Common Takeoffs Right Coronary Artery

Horizontal

Inferior

Superior
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
Guiding Catheter Selection and Support

- **Standard guide** for most patients; Minimal support
  - Catheters reside above or barely in Sinus of Valsalva
    - JL, JR, LCB, RCB
  - Catheters reside deep in ipsilateral Sinus of Valsalva
    - AL, AR, Hockey stick, El Gamal, Champ, MP

- **Support derived from Sinus of Valsalva**

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

- If the LM is short and there is no acute angle at the bifurcation with the LCX - left Judkins
- If the LM is long and the angle between the LM and LCX is acute - extra-backup guide
- Tip of the guide is very close to the ostium of the LCX so the acuity of the LM and LCX angle is nullified making smoother the transition between the LM and LCX
GUIDES FOR CORONARY ANOMALIES

• Important to be aware of variations of coronary anomalies
• Systematically search in other aortic sinuses when the vessel in question does not arise

• Anomalous artery from the right sinus -
  • Left, right Amplatz , Multipurpose
• Anomalous artery from the left sinus
  • Larger left Judkins , Left Amplatz , Multipurpose
Guides for Anomalous Coronary Arteries Arising from the Left Sinus

• When RCA arises from the left cusp usually it is anterior and cephalad to LM
• Judkins left with secondary curve one size larger than one used for the patient’s LM
• Pushed deep in the left sinus of Valsava, causing it to make an anterior and cephalad U-turn
• Larger curve will prevent guide to engage LM
Missing arteries Guide selection

- Missing LCX due to very short LM - Use large guide with short tip and turn clockwise to point the tip more posteriorly
- No RCA In right sinus - Amplatz left pointing antero-superior to the RCA ostium
- No RCA In left sinus - Judkins left one size larger, pointing antero-superior to the LM ostium
SVG and LIMA

- Usual – JR
- Abnormal positions and take offs MP or AL1
- LCB/RCB
- Internal mammary artery - IMA catheter, LCB
  - IMA Catheter is designed for both Rt. And left Internal Mammary arteries
  - shaped like a JR catheter but with a steeply angled tip (80 to 85°).
Choice of Catheters for Interventions via Radial Artery

• Left coronary artery: down size JL by 0.5
  ➢ Judkins left, Amplatz left, Multipurpose, EBU
  ➢ IKARI left, El Gamal

• Right coronary artery
  ➢ Judkins right, Amplatz right, Amplatz left Multipurpose
  ➢ IKARI right, El Gamal
Catheter course: Radial vs. femoral

Femoral

Right Radial

Left Radial

1 point of resistance

2 points of resistance

1 point of resistance
Selection of Radial guiding catheter

Radial Approach

Kimny Curve
- RCA & LCA Intervention
- Contralateral Support
1 size fits all

Radial curve
- RCA & LCA Intervention
- Contralateral Support
1 size fits all
<table>
<thead>
<tr>
<th>Catheter Size</th>
<th>Devices</th>
<th>Technique</th>
</tr>
</thead>
</table>
| 5 F           | - Balloon ≤ 5 mm  
                - Stent ≤ 4.5 mm  
                - Intravenous ultrasound (Eagle Eye catheter, Volcano Corporation, San Diego, CA; OptiCross coronary imaging catheter, Boston Scientific Corporation, Natick, MA)  
                - Cutting balloon 2.5 mm  
                - Rotablator 1.25 mm (Boston Scientific Corporation) | Two wires allowed for bifurcation but no kissing balloons (only for slender techniques in Japan<sup>a</sup>) |
| 6 F           | - All balloon sizes  
                - All stent sizes  
                - Intravenous ultrasound (Eagle Eye and Revolution catheters, Volcano Corporation)  
                - Optical coherence tomography  
                - Cutting balloon > 2.5 mm  
                - Rotablator ≤ 1.5 mm  
                - Thrombectomy devices  
                - Saphenous vein graft protection devices  
                - Mother-child  
                - Guideliner | Kissing balloon |
| 7 F<sup>b</sup> | Rotablator > 1.75 mm | Kissing stents |

<sup>a</sup> Note, the “slender technique” is an approach used in Japan to minimize the diameter of guide catheters, guidewires, and puncture sites.

<sup>b</sup> An alternative to 7–8 F outside the United States is to use Asahi sheathless 6.5- or 7.5-F devices (Asahi Intecc USA, Inc., Santa Ana, CA).
• Ikari catheter – for trans radial intervention

Ikari R (IR) 1.5
Ikari L (IL) 4
Universal radial guide catheters
Catheter manipulation from right radial approach

Curve A to fit angle of brachiocephalic artery.

Straight portion (20 mm) B to generate strong back-up force supported by opposite side of aortic wall.
Sheath less Guide Catheters During Transradial PCI

The Sheath Less guiding catheter is designed to:

• Minimize the radial puncture site whilst providing a larger inner lumen
• Negates the need for a sheath during PCI
• Hydrophilic coating enhances catheter trackability
• Long dilator provided with each catheter
Sheathless Eaucath system (Asahi Intecc Co Ltd.)

Features:
- Substantial outer layer and large inner lumen: Enhanced kink resistance and backup support with a large inner lumen for easy device delivery.
- Hydrophilic coating: Enhanced catheter trackability even in tortuous vessels, and reduced incidence of spasm.
- ASAHI braiding: Two different braiding patterns provide optimal torque and flexibility.

Specifications:

<table>
<thead>
<tr>
<th>Size (F)</th>
<th>Sheath - Puncture Site Outside Diameter (mm)</th>
<th>Catheter Internal Lumen (mm/inch)</th>
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<tbody>
<tr>
<td>4F</td>
<td>2.00</td>
<td>1.06 0.041</td>
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<tr>
<td>5F</td>
<td>2.16</td>
<td>1.78 0.070</td>
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<tr>
<td>6F</td>
<td>2.30</td>
<td>1.78 0.070</td>
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<td>7.5F</td>
<td>2.49</td>
<td>2.86 0.086</td>
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<tr>
<td>6F</td>
<td>2.70</td>
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<td>8.5F</td>
<td>2.80</td>
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<tr>
<td>7F</td>
<td>3.00</td>
<td>2.04 0.088</td>
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</table>
• The Sheath less Eaucath system with integrated central introducer tailored for minimal clearance over a 0.035-inch wire and interface with the inner lumen of the guiding catheter.

• The shape of the guiding catheter becomes apparent after the central dilator and wire are removed in the central aorta.
Guide extension (Mother and child)

• Improve the delivery of coronary stents to complex lesions
• Child catheters 4/5 F 120 cm
• Mother catheter - 6 F guiding catheter 100cm
• Superior trackability of the 4F child catheter
• Increased backup support of the mother-child system
Guide liner catheter

- Guide Liner catheter is a coaxial guiding catheter extension delivered through a standard guiding catheter on a monorail.
- Comprises a flexible yellow 20 cm straight extension connected to a stainless-steel push tube.
- Permits very deep intubation of the target vessel, thus providing backup support to facilitate stent delivery across heavily calcified lesions in tortuous vessels.
Figure 1. The GuideLiner catheter. This consists of a flexible 20 cm straight guide extension connected to a stainless-steel push tube.

Figure 2. Insertion of the GuideLiner. (a) The monorail GuideLiner catheter is inserted into a guiding catheter over a guidewire (b). Once advanced into the guiding catheter, the GuideLiner push tube can be advanced while holding the guidewire in place (c). The GuideLiner can be advanced up to 10 cm beyond the guiding catheter tip (d). Balloons or stents can be advanced along the guidewire (e), through the GuideLiner to the target lesion (f).
<table>
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<tr>
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<th>GUIDEZILLA</th>
<th>Guideliner® V3*</th>
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<tbody>
<tr>
<td><strong>Size</strong></td>
<td>6 F (1.7 mm)</td>
<td>6 F (1.78 mm)</td>
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<tr>
<td><strong>Proximal Shaft</strong></td>
<td>Stainless steel hypotube</td>
<td>Stainless steel ribbon</td>
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<td><strong>Coating</strong></td>
<td>Hydrophilic (Bioslide)</td>
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<td><strong>I.D.</strong></td>
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<td><strong>O.D.</strong></td>
<td>0.066&quot; (1.68 mm)</td>
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<td><strong>Distal Guide Length</strong></td>
<td>25 cm</td>
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<tr>
<td><strong>Collar Type</strong></td>
<td>Stainless steel collar embedded in polymer</td>
<td>All-polymer half-pipe collar</td>
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<tr>
<td><strong>Marker Band</strong></td>
<td>1 Distal MB at tip 1 MB distal to collar</td>
<td>1 Distal MB at tip 1 MB distal to collar</td>
</tr>
</tbody>
</table>
Heartrail® II - PTCA guiding catheter

• Hear trail II is developed to maximize your back-up force when using right and left Ikari curves during transradial interventions and through its innovative 5-in-6 system.

• By inserting a 5 Fr (120 cm with flexible distal portion) into a 6 Fr guiding catheter:

• Provides the back-up support of a 7 Fr guiding catheter with a 6 Fr system
A 120 cm Proximal hypotube shaft
B 0.057” (1.45 mm) Inner-diameter
C Stainless steel collar embedded in polymer
D Proximal marker band
E 1×1 Braid
F Hydrophilic coating
G Distal marker band
H Atraumatic tip
NAMES OF GUIDE CATHETERS FROM DIFFERENT COMPANIES

BOSTON SCIENTIFIC
CONVEY
GUIDEZELLA GUIDE
EXTENTION CATHETER
MACH 1
RUBICON SUPPORT
RUNWAY
WISEGUIDE

MEDTRONIC

• LAUNCHER

CORDIS

• GUIDE CATHETER PORTFOLIO – COMPOSED OF ADROIT GUIDE CATHETER AND VIST BRTIE TIP

MERIT MEDICAL

• CONCIERGE
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<th>Curve type</th>
<th>Shape type</th>
<th>Shape code</th>
<th>Stronger backup curves</th>
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<th>Back Up for right coronary</th>
<th>Other curves</th>
<th>Curves for bypass</th>
<th>Curves for radial access</th>
<th>5 in 6 system</th>
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