Radial Artery Access for Cardiac Catheterization
Should this be the Standard?

Dustin Feldman, DO FACC

September 12th, 2015
• Lucian Campeau, 1989
  – Initial diagnostic cardiac catheterization via the radial approach

• Ferdinand Kiemeneij, 1992
  – Initial PCI via the radial artery approach
Commonly Utilized Sites for Arterial Access

- Brachial Artery
- Femoral Artery
- Radial Artery
Brachial Artery Access

- Historically required exposure or cut-down to access
- Closure requiring suture of arteriotomy site and skin site
- Several potential complications
Brachial Artery Access: Complications

Compartment Syndrome:

The median and Ulnar nerve run within the medial brachial fascia to the elbow.

Bleeding related to brachial arterial access can result in compression of these nerves.
Hematoma at the site of Brachial Artery Puncture

Hematoma can result in compartment syndrome with nerve compression and ischemic sequelae of the distal vasculature.

Lumsden, A; DeBakey Heart and Vascular Center

NCVH
New Cardiovascular Horizons
Femoral Arterial Access

• Advantages:
  – Larger arterial size
  – Landmarks can assist
  – U/S guidance can be helpful
  – Closure devices can reduce non-ambulatory time and reduce complications
  – Necessary for larger ventricular assist or hemodynamic support devices

• Potential difficulties:
  – Patient body habitus
  – Peripheral vascular disease
  – Inability to lay flat
Complications

- Hematoma
- Pseudo-aneurysm
- Active bleeding from puncture site
- AV fistula
- Retroperitoneal hematoma/hemorrhage
- Abscess/infection
- Closure device related complications:
  - Embolization/Ischemic leg
  - Abscess
Radial Artery Access

• Pitfalls:
  – Radiation exposure
  – Arterial vasospasm
  – Limited sheath size
  – Tortuous/variant anatomy
  – Operator experience/catheter technique

• Advantages:
  – Readily accessible
  – Limits patient down time
  – REDUCED BLEEDING
So...Radial vs. Femoral: Which Should we Choose?

• Theory: Reduced bleeding leads to reduced mortality during catheterization and PCI

• Concept: Radial artery catheterization is associated with lower bleeding risk than femoral arterial access

• Conclusion: Radial arterial access for primary PCI should result in reduced bleeding, morbidity and mortality
M.O.R.T.A.L. Study

MORTAL STUDY
Chase et al. *Heart*; 94:1019-1025, 2008

39,386 PCI procedures Jan 1999 to Dec 2005 in 32,822 patients

311 CARG in 10 days
7972 radial access (20.5%)
36,872 procedures for analysis
30,903 femoral access (79.5%)
43 brachial access 37 not entered
123 repeat procedures same day

Transfusion 108 (1.4%)
No transfusion 7864 (99.6%)
Transfusion 819 (2.4%)
No transfusion 30,041 (97.2%)

1-year mortality 26 (24.1%)
30-day mortality 9 (8.3%)
1-year mortality 198 (2.5%)
30-day mortality 69 (0.9%)
1-year mortality 195 (22.7%)
30-day mortality 113 (13.2%)
1-year mortality 1018 (3.4%)
30-day mortality 407 (1.4%)

Lenox Hill Heart and Vascular Institute of New York
Predictors of 1-Year Mortality in the Mortal Study

<table>
<thead>
<tr>
<th>Predictor</th>
<th>OR (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥ 75</td>
<td>2.75 (2.45 to 3.09)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Low BMI</td>
<td>2.40 (1.79 to 3.24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male sex</td>
<td>1.01 (0.89 to 1.14)</td>
<td>NS</td>
</tr>
<tr>
<td>Previous CVD</td>
<td>1.71 (0.46 to 2.01)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.42 (1.26 to 1.60)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Previous CABG</td>
<td>1.35 (1.16 to 1.57)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Previous MI</td>
<td>1.52 (1.35 to 1.71)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Urgent PCI</td>
<td>3.15 (2.77 to 3.58)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stable angina</td>
<td>0.42 (0.33 to 0.55)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Creatinine</td>
<td>2.04 (1.82 to 2.28)</td>
<td>&lt;0.001</td>
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<tr>
<td>Radial access</td>
<td>0.83 (0.71 to 0.98)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Transfusion</td>
<td>3.58 (2.94 to 4.36)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Previous pulmonary disease</td>
<td>2.01 (1.73 to 2.33)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Previous malignancy</td>
<td>1.64 (1.38 to 1.96)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Chase et al. *Heart* 94:1019-1025, 2008

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New Cardiovascular Horizons

St. John Providence Health System
RIFLE-STEACS

- Multi-center, randomized, parallel group study
- 2 years, 1,001 STEMI patients for treatment with primary/rescue PCI
- Primary outcome 30 day NACE rate (Net adverse clinical outcomes)
  - Cardiac death, stroke, MI, TLR and bleeding

- Primary endpoint in 68 radial patients (13.6%) and 105 femoral patients (21%)

Further Support:

• Radial artery access:
  – Less cardiac mortality (5.2% vs. 9.2%, p 0.02)
  – Less bleeding (7.8% vs. 12.2%, p 0.026)
  – Shorter hospital stay (5 days vs 6 days, p 0.03)
RIVAL Study

Advantage to radial access clear in STEMI (A) patients not substantiated in NSTEACS (B) patients
Caution: REVERE trial

Assessed for Eligibility (n = 1,919)

Excluded
- Previous CABG (n= 142)
- Access limitations (n = 63)
- Ad-Hoc PCI (n = 221)

Randomization (n = 1,493) (1:1:1)

Femoral Access (n = 498)
Left Radial Access (n = 498)
Right Radial Access (n = 497)

Primary endpoint: Air Kerma
Secondary endpoints: Dose-area product and fluoroscopy time, and operator exposure. Number of cineangiograms, catheters

*No significant difference in DAP or fluoroscopy time between the various access sites

*LRA seen to produce significant increase in operator exposure
Points to remember

• Not complication free:
  – Spasm
  – Bleeding
  – Hematoma
  – Compartment syndrome
  – Evulsion of artery
  – Digital ischemia
  – AV fistula/Pseudoaneurysm
Figure 1. Radial artery loop.

Figure 2. The loop was traversed using a Glidewire (Terumo Medical Corp.)
Recommendations

• Competency:
  – Level 1- Simple diagnostic cases with favorable anatomy
  – Level 2- Simple diagnostic and interventional cases with more favorable upper limb anatomy (elective single vessel PCI, CABG)
  – Level 3- Complex interventional procedures with challenging upper limb anatomy (AMI, multi-vessel, CTO)

Caputo, R et al; Catheterization and Cardiovascular Interventions. Transradial Arterial Access For Coronary and Peripheral Procedures: Executive Summary by the Transradial Committee of the SCAI. 2011
Conclusions

• Improved outcomes with mortality benefit in STEMI population

• Less major bleeding contributing significantly to lower MACE/NACE

• Operator experience matters

• Patient comfort/diminished bleeding risk and operator ease demand the propagation of radial access as the preferred arterial access site
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