Radial Access: Should It Be the Routine Access Route?

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Geisinger Medical Center, Danville PA

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Temple University Medical School
Philadelphia, PA
No Conflicts of Interest Relevant to this Topic

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Dr. Owayed Al Shammeri
Dr. Mohammed Al Shehri
Dr. Mirvat Al Asnag
Dr. Ali Al Masood
Dr. Ali Al Ghamdi
Dr. Saad Bugami
OUR MISSION

To promote excellence in interventional cardiovascular medicine through education, research, counseling and caring of cardiac services.

OUR VISION

_Saudi Arabia Cardiac Interventional Society (SACIS)_ will represent the Cardiovascular Intervention in Saudi Arabia and will be an active transparent and dynamic organization of high impact on its members.
Mission

Lead the global interventional cardiovascular community through education, advocacy, research, and quality patient care.

Values

Patients First • Excellence • Inclusiveness • Integrity • Leadership
Elephant Rock

Tombs at Al Ula
Excavations at Al Khuraybah
(2500 years old)
Excavations at Al Khuraybah (2500 years old)

Almost falling off a camel
Radial Access Technical Challenges

- Radial loop
- Brachial artery
- Recurrent radial artery
Radial Access Technical Challenges

- 5F Cath
- 4F Cath
- Loop Straightens
Radial Access Technical Challenges
High Take-Off Radial => Failure
Radial Access Technical Challenges
High Take-Off Radial => Failure

Brachial artery

High Take-Off radial artery
Radial Access Site Complications

• Radial artery occlusion (5%, mostly asympt.)
• Forearm hematoma (0.2%)
• Radial artery pseudoaneurysm (0.2%)
• Compartment syndrome (0.1%)
• Radial/brachial perforation

GR. Barbeau, et.al. ACC 2006)
Radial Access Technical Challenges
Radial Peforation
Should It Be the Routine Access Route?

Does it improve outcomes?

Should it be the Routine Access Route?
Should It Be the Routine Access Route?

Does it improve outcomes?
Should It Be the Routine Access Route?

Does it improve outcomes?

ST elevation myocardial infarction (STEMI)

Acute Coronary Syndromes (ACS)

Stable Coronary disease
Should It Be the Routine Access Route?

Does it improve outcomes?

ST elevation myocardial infarction (STEMI)

Acute Coronary Syndromes (ACS)

Stable Coronary disease
2014 Meta-analysis of 5124 STEMI patients
Randomized to radial vs femoral access in
12 RCTs 2003 - 2012
### Mortality

<table>
<thead>
<tr>
<th>Studies</th>
<th>Year of publication</th>
<th>Event/TRI</th>
<th>Event/TFI</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMPURA</td>
<td>2003</td>
<td>4/77</td>
<td>6/72</td>
<td>0.603 (0.163, 2.230)</td>
</tr>
<tr>
<td>RADIAL-AMI</td>
<td>2005</td>
<td>0/25</td>
<td>1/25</td>
<td>0.320 (0.012, 8.245)</td>
</tr>
<tr>
<td>Vazquez-Rodriguez</td>
<td>2007</td>
<td>8/217</td>
<td>9/222</td>
<td>0.906 (0.243, 3.393)</td>
</tr>
<tr>
<td>FARMI</td>
<td>2007</td>
<td>3/57</td>
<td>3/57</td>
<td>1.000 (0.193, 5.176)</td>
</tr>
<tr>
<td>RADIAMI</td>
<td>2007</td>
<td>0/50</td>
<td>1/50</td>
<td>0.327 (0.013, 8.214)</td>
</tr>
<tr>
<td>Gan</td>
<td>2009</td>
<td>2/90</td>
<td>3/105</td>
<td>0.773 (0.126, 4.730)</td>
</tr>
<tr>
<td>Hou</td>
<td>2010</td>
<td>4/100</td>
<td>5/100</td>
<td>0.792 (0.206, 3.039)</td>
</tr>
<tr>
<td>RIVAL</td>
<td>2011</td>
<td>12/955</td>
<td>32/1003</td>
<td>0.386 (0.198, 0.754)</td>
</tr>
<tr>
<td>RADIAMI II</td>
<td>2011</td>
<td>0/49</td>
<td>0/59</td>
<td>1.202 (0.023, 61.679)</td>
</tr>
<tr>
<td>RIFFLE STEACS</td>
<td>2012</td>
<td>26/500</td>
<td>46/501</td>
<td>0.543 (0.330, 0.893)</td>
</tr>
<tr>
<td>STEMI RADIAL</td>
<td>2012</td>
<td>8/348</td>
<td>11/359</td>
<td>0.744 (0.296, 1.873)</td>
</tr>
</tbody>
</table>

### Heterogeneity

- $\tau^2 = 0.00$; $\chi^2 = 3.56$, df = 9 ($p = 0.94$)
- $I^2 = 0\%$; Test for overall effect: $Z = 3.48$ ($p < 0.0005$)

### Risk of death

**Death:**

OR .58 ($p < 0.005$) favors Radial

---

Major Bleeding:
OR .52 (p < 0.0001) favors Radial

Major Adverse Cardiovascular Events: OR .67 (p < 0.0001) favors Radial

<table>
<thead>
<tr>
<th>Studies</th>
<th>Year of publication</th>
<th>Event/TRI</th>
<th>Event/TFI</th>
<th>Odds ratio (95% CI)</th>
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<td>2005</td>
<td>0/25</td>
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</tr>
<tr>
<td>Vazquez-Rodriguez</td>
<td>2007</td>
<td>11/217</td>
<td>10/222</td>
<td>1.132 (0.471, 2.723)</td>
</tr>
<tr>
<td>FARMI</td>
<td>2007</td>
<td>6/57</td>
<td>6/57</td>
<td>1.000 (0.302, 3.308)</td>
</tr>
<tr>
<td>RADIAMI</td>
<td>2007</td>
<td>1/50</td>
<td>4/50</td>
<td>0.235 (0.025, 2.178)</td>
</tr>
<tr>
<td>Yan</td>
<td>2008</td>
<td>3/57</td>
<td>3/46</td>
<td>0.796 (0.153, 4.145)</td>
</tr>
<tr>
<td>Gan</td>
<td>2009</td>
<td>2/90</td>
<td>5/105</td>
<td>0.455 (0.086, 2.402)</td>
</tr>
<tr>
<td>Hou</td>
<td></td>
<td></td>
<td></td>
<td>0.792 (0.206, 3.039)</td>
</tr>
<tr>
<td>RIVAL</td>
<td>2011</td>
<td>30/955</td>
<td>52/1003</td>
<td>0.593 (0.375, 0.938)</td>
</tr>
<tr>
<td>RADIAMI II</td>
<td>2011</td>
<td>1/49</td>
<td>1/59</td>
<td>1.208 (0.074, 19.831)</td>
</tr>
<tr>
<td>RIFFLE STEACS</td>
<td>2012</td>
<td>36/500</td>
<td>57/501</td>
<td>0.604 (0.390, 0.936)</td>
</tr>
<tr>
<td>STEMI RADIAL</td>
<td>2012</td>
<td>12/348</td>
<td>15/359</td>
<td>0.819 (0.378, 1.776)</td>
</tr>
</tbody>
</table>

110/2525 165/2599

Heterogeneity: $I^2 = 0.00$; $\chi^2 = 4.10$, $df = 11$ ($p = 0.97$)

Risk of major adverse events (MACE)

Influence of Arterial Access Site Selection on Outcomes in Primary Percutaneous Coronary Intervention

Are the Results of Randomized Trials Achievable in Clinical Practice?

Mamas A. Mamas, BM BCH, DPHIL,† Karim Ratib, MB BS,‡ Helen Routledge, MD,§ Ludwig Neyes, MD,*,† Douglas G. Fraser, MB BCHIR, MD,* Mark de Belder, MA, MD,|| Peter F. Ludman, MA, MD,¶ Jim Nolan, MD,‡ on behalf of the British Cardiovascular Intervention Society and the National Institute for Cardiovascular Outcomes Research

Manchester, Stoke-on-Trent, Worcester, Middlesbrough, and Birmingham, United Kingdom

Registry of 46,128 STEMI patients
Radial vs femoral access
British CV Intervention Data Set

Survival: OR .79 (p < 0.0001) favors Radial

MACCE: OR .48 (p < 0.001) favors Radial

MACCE: Radial access independently predicts MACCE: HR .73, P < 0.05

Table 4. MACCE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Radial (n = 18,037)</th>
<th>Femoral (n = 28,091)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACCE</td>
<td>616 (3.4%)</td>
<td>2,158 (7.7%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death at 30 days</td>
<td>145 (0.8%)</td>
<td>1,875 (6.2%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Reinfarction</td>
<td>60 (0.3%)</td>
<td>131 (0.5%)</td>
<td>0.10</td>
</tr>
<tr>
<td>Reintervention</td>
<td>87 (0.5%)</td>
<td>169 (0.6%)</td>
<td>0.09</td>
</tr>
<tr>
<td>TIA or stroke</td>
<td>47 (0.3%)</td>
<td>92 (0.3%)</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Values are n (%). MACCE = major adverse cardiac and cardiovascular events; TIA = transient ischemic attack.

Table 5. Multivariate Predictors of In-Hospital MACCE

<table>
<thead>
<tr>
<th>Variable</th>
<th>HR (95% CI)*</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access site (radial)</td>
<td>0.73 (0.57–0.93)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Age, yrs (per 10 yrs)</td>
<td>1.04 (1.03–1.05)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No GP l/lb/lla</td>
<td>1.40 (1.11–1.76)</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Severe LV dysfunction</td>
<td>4.48 (3.54–5.66)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Shock</td>
<td>4.10 (3.06–5.50)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IABP use</td>
<td>2.96 (2.18–4.04)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

*Adjusted for age, sex, diabetes, hypertension, hypercholesterolemia, smoking status, shock, intra-aortic balloon pump use, previous AMI, previous CABG, thrombectomy catheter, LV function, year of procedure, and GP l/lb/lla use. Abbreviations as in Tables 1, 2, 3, and 4.

Conclusion # 1:

For STEMI PCI:

Radial access decreases:

Mortality
Major Adverse Cardiovascular Events
Bleeding complications
Cohort of 197 patients with STEMI and shock
55% radial access, 45% femoral access

Mortality at 1 year:
44% in radial arm; 64% in femoral arm ($P = .0044$).

Conclusion # 2

For STEMI PCI with shock:

Radial access appears to decrease mortality
Should It Be the Routine Access Route?

Does it improve outcomes?

ST elevation myocardial infarction (STEMI)

Acute Coronary Syndromes (ACS)

Stable Coronary disease

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Radial N = 4197</th>
<th>Femoral N = 4207</th>
<th>Rate Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>1.6%</td>
<td>2.2%</td>
<td>0.72</td>
<td>0.045</td>
</tr>
<tr>
<td>Major Adverse Events</td>
<td>8.8%</td>
<td>10.3%</td>
<td>0.85</td>
<td>0.03</td>
</tr>
<tr>
<td>Net Adverse Events</td>
<td>9.8%</td>
<td>11.7</td>
<td>0.83</td>
<td>.009</td>
</tr>
</tbody>
</table>
Non-STEMI PCI:
Radial access decreases bleeding and long-term mortality

Bavishi et al, American J Cardiology Meta-analysis 2016:
220,126 patients, 43% radial, (non-randomized)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Odds Ratio</th>
<th>Confidence Interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality – 1 month</td>
<td>0.78</td>
<td>0.57-1.07</td>
<td>0.12</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>0.52</td>
<td>0.36 – 0.73</td>
<td>0.002</td>
</tr>
<tr>
<td>Access site bleeding</td>
<td>0.41</td>
<td>0.22 – 0.78</td>
<td>0.007</td>
</tr>
<tr>
<td>Transfusion</td>
<td>0.61</td>
<td>0.41-0.91</td>
<td>0.02</td>
</tr>
<tr>
<td>Mortality – 1 year</td>
<td>0.72</td>
<td>0.55-0.95</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Non-STEMI PCI:
Radial access decreases adverse events and mortality

Ando et al, JACC CV Interventions 2016 meta-analysis: 19,328 patients (randomized)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Relative Risk</th>
<th>Confidence Interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>0.73</td>
<td>0.60 - 0.88</td>
<td>0.001</td>
</tr>
<tr>
<td>Major Adverse Cardiac Events</td>
<td>0.86</td>
<td>0.77 - 0.95</td>
<td>0.005</td>
</tr>
<tr>
<td>Major Bleeding</td>
<td>0.60</td>
<td>0.48 - 0.76</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Conclusion # 3

For PCI for Non-STEMI:

Radial access decreases:
- Mortality
- Bleeding
- Adverse events
Should It Be the Routine Access Route?

Does it improve outcomes?

ST elevation myocardial infarction (STEMI)

Acute Coronary Syndromes (ACS)

Stable Coronary disease
Adoption of Radial Access and Comparison of Outcomes to Femoral Access in Percutaneous Coronary Intervention
An Updated Report from the National Cardiovascular Data Registry (2007–2012)

Dmitriy N. Feldman, MD; Rajesh V. Swaminathan, MD; Lisa A. Kaltenbach, MS; Dmitri V. Baklanov, MD; Luke K. Kim, MD; S. Chiu Wong, MD; Robert M. Minutello, MD; John C. Messenger, MD; Issam Moussa, MD; Kirk N. Garratt, MD; Robert N. Piana, MD; William B. Hillel, MD; Mauricio G. Cohen, MD; Ian C. Gilchrist, MD; Sunil V. Rao, MD

Registry of 2.8 million PCI Patients
ACC National Cardiovascular Data Registry
2007-2012

### Table 3. Unadjusted and Adjusted Association Between r-PCI and Primary Outcomes (f-PCI as Reference)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Unadjusted Odds Ratio</th>
<th>P Value</th>
<th>Adjusted Odds Ratio</th>
<th>P Value</th>
<th>C Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural success</td>
<td>1.24 (1.17–1.33)</td>
<td>&lt;0.001</td>
<td>1.13 (1.06–1.20)</td>
<td>&lt;0.001</td>
<td>0.651</td>
</tr>
<tr>
<td>Any bleeding complication</td>
<td>0.42 (0.40–0.45)</td>
<td>&lt;0.001</td>
<td>0.51 (0.49–0.54)</td>
<td>&lt;0.001</td>
<td>0.774</td>
</tr>
<tr>
<td>Any vascular complication</td>
<td>0.36 (0.28–0.45)</td>
<td>&lt;0.001</td>
<td>0.39 (0.31–0.50)</td>
<td>&lt;0.001</td>
<td>0.672</td>
</tr>
</tbody>
</table>

The procedural success model was adjusted for the American College of Cardiology-National Cardiovascular Data Registry mortality risk score, American College of Cardiology/American Heart Association lesion risk, bifurcation disease, chronic total occlusion, and preprocedure Thrombolysis in Myocardial Infarction flow grade. Any bleeding and vascular models were adjusted for the American College of Cardiology-National Cardiovascular Data Registry bleeding risk score, sex (female as reference), body mass index, glycoprotein IIb/IIIa inhibitor use, unfractionated heparin use, direct thrombin inhibitor use, history of congestive heart failure, and peripheral vascular disease. CI indicates confidence interval; f-PCI, femoral approach to percutaneous coronary intervention; and r-PCI, radial approach to percutaneous coronary intervention.

Access Site Practice and Procedural Outcomes in Relation to Clinical Presentation in 439,947 Patients Undergoing Percutaneous Coronary Intervention in the United Kingdom

Karim Ratib, MB ChB,* Mamas A. Mamas, BM BCh, DPhil, †‡ Simon G. Anderson, MB BCh, PhD, †‡ Gurbir Bhatia, MD, †‡ Helen Routledge, MD, || Mark De Bekker, MA, MD, †‡ Peter F. Ludman, MA, MD, †‡ Douglas Fraser, MB BChir, †‡ James Nolan, MD,* for the British Cardiovascular Intervention Society and the National Institute for Cardiovascular Outcomes Research

British Interventional Cardiovascular Society database

178,662 Stable CAD Patients

Outcomes following multivariate logistic regression. Interaction terms for indication for PCI and access site were included in the multivariate models and these were significant for major adverse cardiac events (MACE) (p < 0.001) and major bleeding (p < 0.005).

OR = odds ratio; other abbreviations as in Figure 1.

FIGURE 3 Forest Plot of OR for Outcomes Following Multivariate Logistic Regression

Bleed

<table>
<thead>
<tr>
<th>Condition</th>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>0.24 (0.16-0.36)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>NSTEACS</td>
<td>0.35 (0.27-0.44)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STEACS</td>
<td>0.47 (0.39-0.58)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Access Site Complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>0.21 (0.16-0.27)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>NSTEACS</td>
<td>0.19 (0.15-0.24)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STEACS</td>
<td>0.16 (0.11-0.23)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

30-day mortality

<table>
<thead>
<tr>
<th>Condition</th>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>0.77 (0.61-0.97)</td>
<td>0.03</td>
</tr>
<tr>
<td>NSTEACS</td>
<td>0.76 (0.67-0.85)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STEACS</td>
<td>0.72 (0.65-0.79)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

MACE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Odds Ratio (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>1.08 (0.95-1.23)</td>
<td>0.25</td>
</tr>
<tr>
<td>NSTEACS</td>
<td>0.72 (0.65-0.80)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>STEACS</td>
<td>0.70 (0.64-0.77)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Conclusion # 4:

PCI for Stable Coronary Disease:

Radial access decreases
Bleeding complications
Access site complications
Mortality
No increase in stroke with radial approach

Less kidney injury with radial access: 48% reduction (p = 0.0002)
Hazard ratio = 0.52 (0.38, 0.73)
Summary of Radial Access (RA)  
(Compared to Femoral Access (FA))

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mortality</th>
<th>MACE</th>
<th>Bleeding</th>
<th>Access Site Complications</th>
<th>Stroke</th>
<th>Acute Kidney Injury</th>
<th>Patient Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEMI</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>=</td>
<td>+</td>
</tr>
<tr>
<td>Non-STEMI</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>=</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Stable Coronary Disease</td>
<td>+</td>
<td>=</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
5. Procedural Considerations

5.1. Vascular Access: Recommendation

**CLASS IIa**

1. The use of radial artery access can be useful to decrease access site complications (255,260,356–362). *(Level of Evidence: A)*
Should It Be the Routine Access Route?

Does it improve outcomes?

Should it be the preferred access route?
Should It Be the Routine Access Route?

Does it improve outcomes?

Should it be the preferred access route?

Easier for the operator
Should It Be the Routine Access Route?

Does it improve outcomes?

Should it be the preferred access route?
Easier for the operator
Preferred by patients
Should It Be the Routine Access Route?

Does it improve outcomes?

Should it be the preferred access route?
  Easier for the operator
  Preferred by patients
  Better Outcomes
Blankenship’s Outcomes: 2011 -2015
(80-90% Radial including STEMIs)

Mortality after PCI due to Access Site Complications

<table>
<thead>
<tr>
<th>Femoral</th>
<th>Radial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/200</td>
<td>0/800</td>
</tr>
</tbody>
</table>
Conclusion # 5: Radial is the preferred access site in 2015
Thanks

For the opportunity to speak to you today
The Anatomy
MOST COMMON ACCESS MISTAKE

FIRST STICK TOO CLOSE TO WRIST
Technical Tips for Successful Transradial Cannulation

• Use a 21 G x 2.5 cm thin wall needle to cannulate the radial artery

• Advance a 0.025 inch guidewire through the needle

• Advance sheath over wire

• Give “cocktail” of Verapamil 2 mg diluted in saline, or 100-200 mcg of nitroglycerine, with 50 units/kg heparin bolus

Sedation and Verapamil / Nitro for Spasm

Before

After
Radial Loop and Radial Recurrent Artery

Recurrent Radial Artery

Loop
Taking on Tortuosity

- Use coronary wire for tortuous radial/brachials
- When meeting resistance, take an angiogram
- Use small (5F) gentle-bend (JR, MP) catheter
- Or Benson, Wholey, or Terumo wires
- Torque (rotate) the catheter as it goes up
- Use a JR4 to steer around sharp bend in the innominate
- Deep inspiration helps entry into the ascending aorta
- To cannulate coronary, keep .035 wire in catheter while torqueing it

Balloon-Assisted Tracking
Balloon-Assisted Tracking

(A) Razor effect

(B) Balloon-assisted tracking
Sheathless Catheters

- **4F**: Sheath (6F OD), Catheter 2.00 x 1.05 x 0.041
- **6.5F**: Sheathless Guide, Catheter 2.16 x 1.78 x 0.070
- **5F**: Sheath (7F OD), Catheter 2.30 x 1.20 x 0.047
- **7.5F**: Sheathless Guide, Catheter 2.49 x 2.06 x 0.081
- **6F**: Sheath (8F OD), Catheter 2.70 x 1.78 x 0.070
Patent Haemostasis
<table>
<thead>
<tr>
<th>Proven to reduce risk</th>
<th>May reduce risk</th>
<th>Not shown to reduce risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate anticoagulation(^a)</td>
<td>Hydrophilic sheaths</td>
<td>Short vs. long arterial sheaths</td>
</tr>
<tr>
<td>Non-occlusive (‘patent’) haemostasis</td>
<td>Reducing radial artery spasm</td>
<td>Sheathless technique</td>
</tr>
<tr>
<td>Smaller diameter arterial sheaths</td>
<td>Minimizing the duration of post-procedure radial artery compression</td>
<td></td>
</tr>
</tbody>
</table>
Radial Access - The Advantages

• Decreases the incidence of major vascular complications
• Decreases the incidence of bleeding complications
• Decreases mortality in STEMI and STEMI + shock
• Improved patient movement and comfort
• Decreased time to ambulation
• Facilitates same day discharge
• May decrease cost
Thanks for listening
Thanks for listening
Net Adverse CV Events (NACE): Favors radial (p = 0.0028)
Bleeding: Favors radial (p = 0.001)
Major Adverse CV Events (MACE): No difference (p = 0.7)
Table 2. Changing Incidence of Major Femoral Bleeding and Blood Transfusion After PCI

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Femoral hematoma</td>
<td>172 (7.0%)*</td>
<td>236 (3.8%)*</td>
<td>257 (2.8%)</td>
</tr>
<tr>
<td>Femoral bleed</td>
<td>60 (2.5%)*</td>
<td>76 (1.2%)*</td>
<td>54 (0.6%)</td>
</tr>
<tr>
<td>Retroperitoneal bleed</td>
<td>20 (0.8%)*</td>
<td>19 (0.3%)</td>
<td>26 (0.3%)</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 U</td>
<td>207 (8.5%)*</td>
<td>482 (7.8%)*</td>
<td>516 (5.6%)</td>
</tr>
<tr>
<td>3+ U</td>
<td>98 (4.0%)</td>
<td>288 (4.6%)*</td>
<td>347 (3.8%)</td>
</tr>
<tr>
<td></td>
<td>109 (4.5%)*</td>
<td>194 (3.1%)*</td>
<td>169 (1.8%)</td>
</tr>
</tbody>
</table>

*p < 0.005 versus Group 3.

PCI = percutaneous coronary intervention.
Radial Access Technical Challenges
Recurrent Radial Dissection