Femoral Vascular Access and Closure in Evolution: Fluoro, Ultrasound, Micropuncture, and More

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### Disclosure Statement of Financial Interest

<table>
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<tr>
<th>Affiliation/Financial Relationship</th>
<th>Company</th>
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<tbody>
<tr>
<td>Grant/Research Support</td>
<td>Abbott Vascular</td>
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Vascular Access in the New Percutaneous Technologies Era is:
- Taken for Granted
- Under-investigated
- but

Way Over-represented in Complications
“We All Know How to Do This”

Sven-Ivar Seldinger
Interventional Radiologist
Karolinska Institute

Little Change in Past 61 Years
Usual Approach

• Keep poking until you get a gusher
1. Inguinal crease
2. Maximal pulsation
3. Bone landmarks
4. Prior puncture site
Landmarks Used for Femoral Puncture

Skin Crease
Maximum Pulse
Bony Landmarks

Skin Crease Most Common

Inguinal Crease

UC San Diego

Camden, NJ
This is NOT Normal Anatomy

3 Misconceptions despite 60 years experience
Femoral Artery Anatomy: A Prospective Study

- 200 consecutive patients
- All undergoing coronary angiography
- Femoral angiography at end of procedure
- Quantitative angiography
Femoral Head and the CFA Bifurcation

Number of patients

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<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
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<tr>
<td>111</td>
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<td>34</td>
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<tr>
<th>Location</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Below inferior border</td>
<td>55.5%</td>
</tr>
<tr>
<td>At inferior border</td>
<td>22%</td>
</tr>
<tr>
<td>Below center of head</td>
<td>17%</td>
</tr>
<tr>
<td>At center of head</td>
<td>1.5%</td>
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<tr>
<td>Above center of head</td>
<td>4.0%</td>
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n=200
Common Femoral Artery – Classic Measurements

- From top of femoral head to femoral bifurcation
- Does not take IEA into consideration
- Does not consider implications of CFA stick above bifurcation, but below femoral head
Target Zone
TYPE 2

Centerline

Target Zone

8.0 mm
Cumulative Probability of Being Outside Target Zone

Below

Above

mm from Femoral Head Centerline

FH Centerline

Probability of Being Outside Target Zone (%)

0

20

40

60

80

100

Below          Above
Distance from Centerline (mm)

-30 -20 -10 0 10

# of Patients
0 2 4 6 8 10 12 14

Below CTZ
In CTZ
Above CTZ
Above Centerline

N=296
Site-Rite 5, Bard Access, Inc.
18g needle guide #9001C0212

A. Seto TCT 2009
FAUST

Puncture over top 1/3rd femoral head = 28%
Micropuncture
Some simple math ~ 7th grade

- Flow = \( \Delta \text{Pressure}/\text{Resistance} \)
- Resistance = \( \text{viscosity} \times \text{length} / \text{radius}^4 \)

If \( \Delta \text{Pressure}, \text{viscosity and length fixed} \)

Then \( \Delta \text{Flow} \sim \Delta \text{radius}^4 \)
Std needle (18g) = 1.27 mm
Micropuncture (21g) = 0.813 mm

↑ In size = 56%

5.9 fold ↑ in blood loss
How to Decrease Risk of Complications

1. **Access using fluoroscopy and/or ultrasound**

2. Needle entry below centerline of femoral head

3. Femoral angiogram regardless of closure device use

4. Proceed to PCI (and anticoagulate) only if puncture in safe zone
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4. Proceed to PCI (and anticoagulate) only if puncture in target zone
5. Use micropuncture
Better Technique ⇒ Better Result