



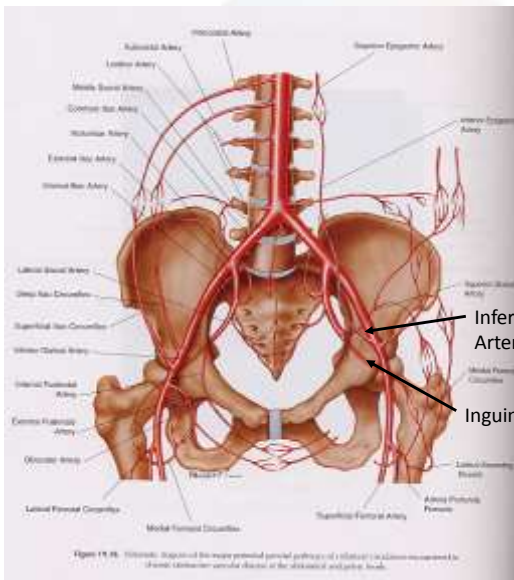
Vascular Access

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Access Site Locations



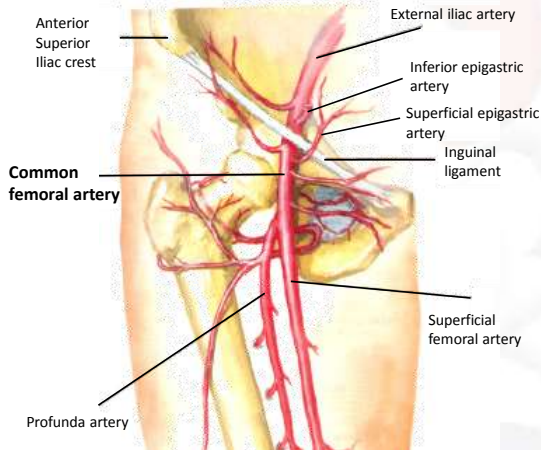
Femoral Access:
the most common used access
for invasive vascular
(coronary/non-coronary) imaging
& intervention

Inferior Epigastric
Artery

Inguinal Ligament



Access Site Landmarks

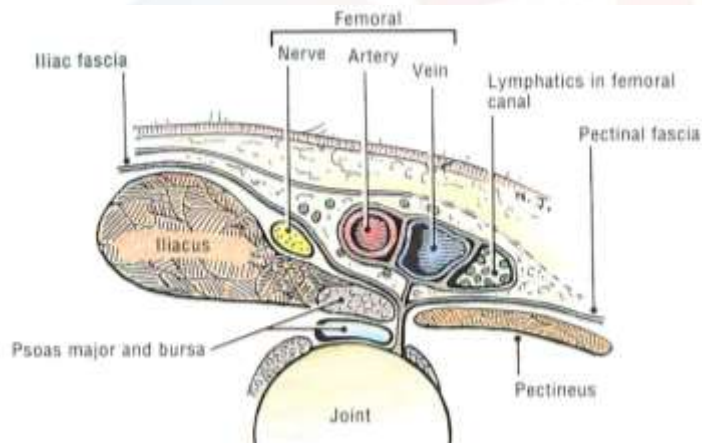


Potential landmarks

- Skin crease
- Arterial pulse
- Bones (inguinal ligament by drawing an imaginary line between anterior superior iliac crest and symphysis pubis)
- Vessel calcifications



Access Site Anatomy



Femoral sheath:

- is a tube that encloses femoral vessels and femoral canal
- does not enclose femoral nerve

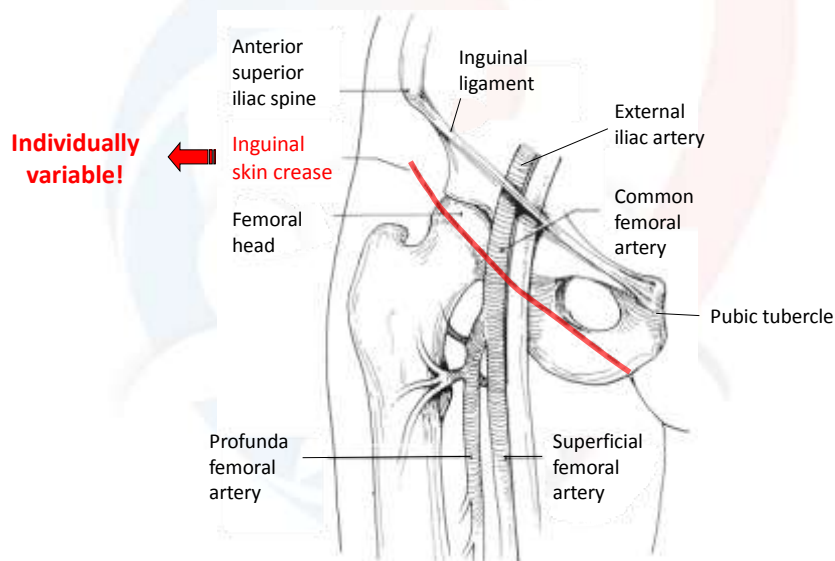


Groin Anatomy

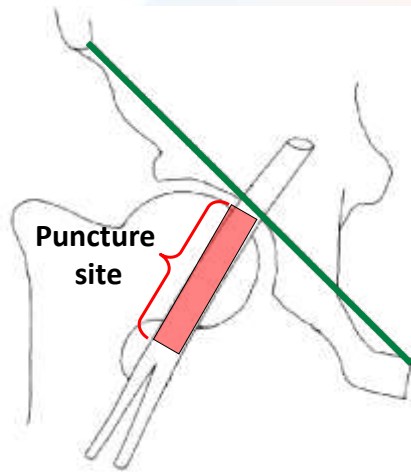
- **Inguinal ligament** divides External Iliac A. from Common Femoral A.
- **Above inguinal ligament is retroperitoneal space**
- **Common Femoral A.** lies over femoral head
- **Bifurcation** of CFA usually occurs below inferior margin of femoral head or lower 1/3 of femoral head
- **Profunda** arises from lateral side of CFA and then runs posterior
- SFA is continuation of CFA



Access Site Landmarks Inspection and Palpation



The perfect femoral puncture



Puncture site

Between inguinal ligament and bifurcation of the femoral artery



Potential complications at the puncture site

- Hematomas (inguinal or retroperitoneal)
- Pseudoaneurysms
- Arteriovenous (AV) fistulae
- Acute arterial occlusion (thrombus or dissection)
- Cholesterol emboli
- Thickening of perivascular tissue
- Infection
- Venous thrombosis



Predictors of Access Site Complications

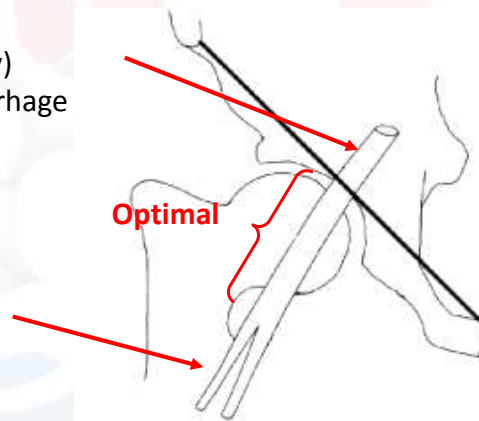
- High sticks: puncture outside CFA (or when CFA puncture missed the area over the femoral head)
- Low sticks: puncture lower than bifurcation
- Advance age
- Body surface area (extremely thin or obese)
- Diabetes
- Female gender
- Repeated percutaneous transluminal procedures
- Low patient compliance to immobilization



Potential complications and puncture site technique

High puncture
(external iliac artery)
retroperitoneal haemorrhage

Low puncture
A-V fistula
pseudoaneurysm
thrombosis
vessel laceration



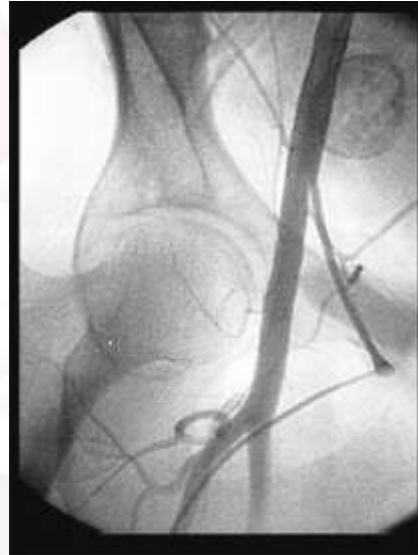
Potential complications at the puncture site

High puncture

(external iliac artery)
retroperitoneal haemorrhage

Retroperitoneal haemorrhage

- *Definition:* Escape of blood into the retroperitoneum
- *Symptoms:* Flank pain
Lowered blood pressure
Hematocrit drop
Hidden killer

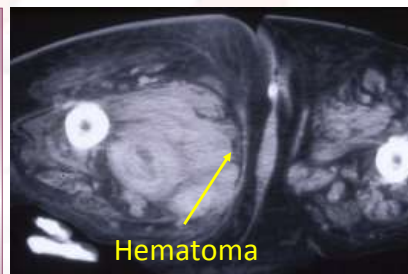


Potential complications at the puncture site

Haematoma

CT-scan

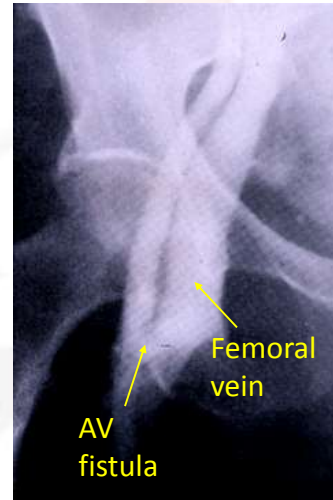
- *Definition:* Blood filled mass around puncture site
- *Symptom:* Expanding hematoma may result in significant blood loss
- *Treatments:* Compression
use local anesthesia to avoid vaso-vagal reaction
Surgical repair



Potential complications at the puncture site

Arterio-venous (AV) fistula

- **Definition:** Abnormal connection between artery and vein
- **Cause:** Inadvertent puncture of vein or artery
- **Detection:** Continuous murmurs or bruit, Doppler and US
- **Treatment:** US compression
Surgical repair



Pseudoaneurysm

- **Definition:** Encapsulated hematoma in communication with artery
- **Symptoms:** Tender, pulsatile mass with systolic bruit
- **Detection:** Ultrasound
- **Treatment:** Ultrasound guided compression
Surgery



Profunda femoris pseudoaneurysm



Kumar S et al *Heart* 2002;88:215

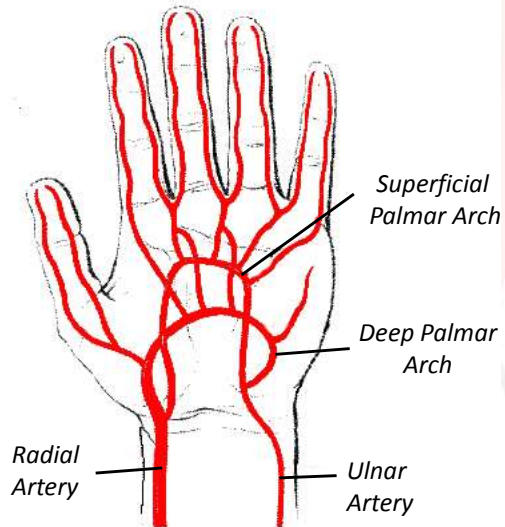


Access Site Locations

Radial Puncture:
the most common used alternative access
for invasive coronary imaging & intervention



Anatomy



Allen's Test

May be improved by using digital oxymetry at the index level



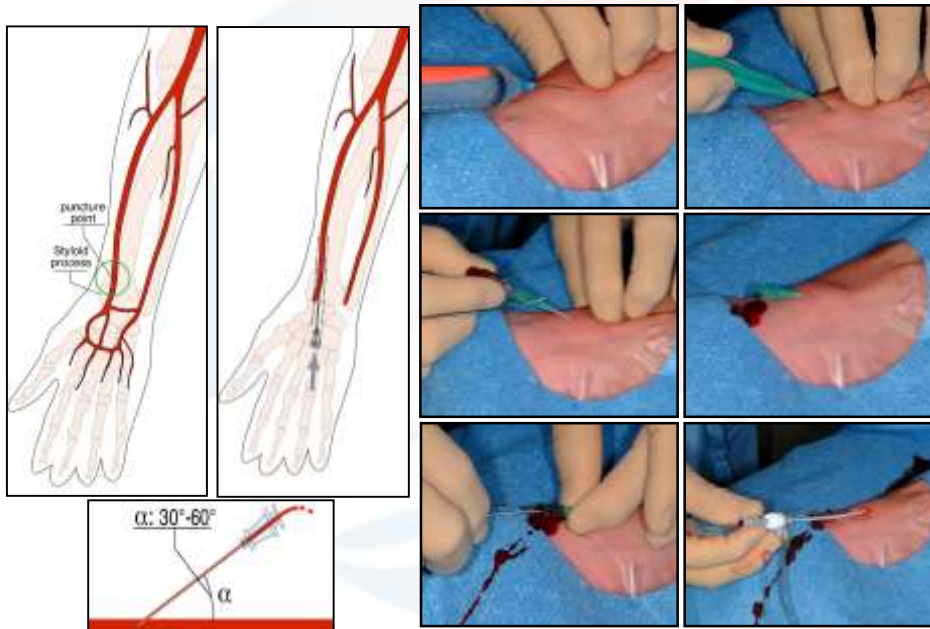
- Both the radial and ulnar arteries should be occluded so as to notice obvious pallor of the hand.
- Test positive (normal) if palm coloration normalize within 10 seconds of release of compression of the ulnar artery.



Archobold et al. *BMJ* 2004; 329: 443-6



Puncture



How to prevent radial spasm

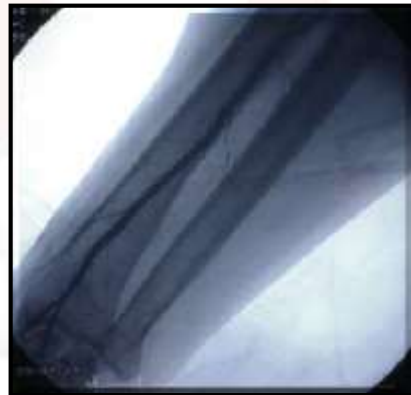
- Proper patient sedation
- After the introducer is inserted, give “cocktail” of Verapamil 1-2 mg diluted in saline, or 100-200 mcg of nitroglycerine, and 50 units/kg heparin bolus



Sedation and Verapamil / Nitro Virtually Eliminates the Spasm Problem



Before



After



Radial Loop and Radial Recurrent Artery



How do you deal with tortuosity?

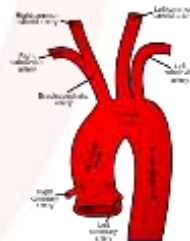
- Use a hydrophilic/Terumo wires.
- Pull the wire into the shaft of the catheter in order to facilitate catheter torquing for coronary cannulation.
- Use JR or MP as your initial catheter to access the ascending aorta and then exchange for the PCI catheter

Quesada et al, "Transradial Coronary Interventions", Interventional Cardiology Secrets, 2003, pp. 203-210



The Learning Curve: Transradial Pitfalls

- Getting access
- Radial Artery Spasm
 - ✓ Prevention and management
- Anatomical Variations
 - ✓ Tortuosity, vascular anomalies
- Transversing the subclavian – Rt vs. Lt
 - ✓ Respiration maneuvers
 - ✓ Need for TF conversion
- Catheter shape selection for cannulation
- Catheter control and backup support
- "Patent Haemostasis" after pulling out the sheath

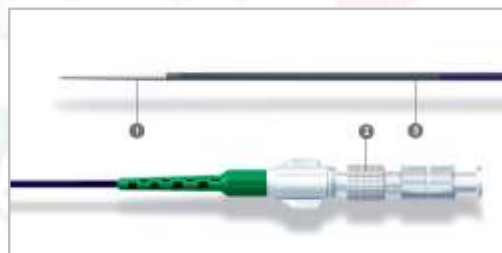


Commonly Used Guiding Catheter Shapes

Left Arm Approach	Right Arm Approach
<p><u>For Lesions in LCA</u></p> <ul style="list-style-type: none"> - XB 3.5 - JL 4 - Kimny <p><u>For Lesions in RCA</u></p> <ul style="list-style-type: none"> - JR 4 - AL I or AL II - Kimny 	<p><u>For Lesions in LCA</u></p> <ul style="list-style-type: none"> - JL 3.5 - XB/EBU 3.0 - Kimny <p><u>For Lesions in RCA</u></p> <ul style="list-style-type: none"> - JR 4 , 3DRC - AL I - Kimny



Sheathless Catheters



Patent Haemostasis



Developments with trans-radial equipment

- Dedicated and better TR access tools
 - ✓ hydrophilic sheaths
 - ✓ Sheathless guiding catheters
 - ✓ Single catheter diagnostics (e.g. Tiger)
- 5 French compatible PCI equipment
- Ability to perform complex interventions
 - ✓ STEMI, bifurcations, CTO, LM, long lesions etc.



Transradial Access Site Complications

- Radial artery occlusion ($\approx 5\%$, mostly asympt.)
- Forearm hematoma and/or pain
- Radial artery pseudoaneurysm
- Radial or brachial or artery perforation
- Uncontrolled bleeding with resultant compartment syndrome
- Pain during catheter insertion
- Need for femoral conversion (5-10%)



Radial Artery Complications

- 1372 Procedures

Asymptomatic radial occlusion	4.7%
Symptomatic radial occlusion	0.2%
Significant hematoma	0.2%
Significant pseudoaneurysm	0.2%
- Worst Complication

Perforation \rightarrow Compartment Syndrome	1 Case
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GR. Barbeau, et.al. ACC 2006)



Radial Access - The Advantages

- Decreases the incidence of major vascular complications
- Decreases the incidence of bleeding complications
- Appears to decrease MACE in patients with ACS
- Better control over vascular access and hemostasis for obese and overall patients
- Decreases time to ambulation
- Improves patient movement and comfort
- Allows early discharge policy and decreases cost



Radial Access - Disadvantages

- needs significant operator learning curve
- Has limited compatibility with very large equipment
- Elderly patients may have increased tortuosity of the radial and subclavian arteries which makes the procedure more challenging
- May have limited guiding catheter support in most challenging PCI scenarios (tortuosity, heavy calcifications, complex bifurcations)



