Principles of surgical approaches

AO Trauma Basic Principles Course

PLEASE ON THE FOLLOWING LINK TO WATCH THE LECTURE ONLINE:-

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Learning objectives

- Plan your surgical approach
  - Fracture anatomy
  - Stability required
  - Imaging available
  - Surgical experience
- Realize the need to preserve soft tissues
- Know the safe zones

Surgical approaches in trauma surgery

- What types of surgical approaches exist?
- What are the characteristics of a surgical approach?
- What are the critical features of each type of approach?
- How should fracture type and desired stability affect the approach used to treat an individual fracture?

What types of surgical approaches exist?

- Percutaneous
- Minimally invasive
- Open

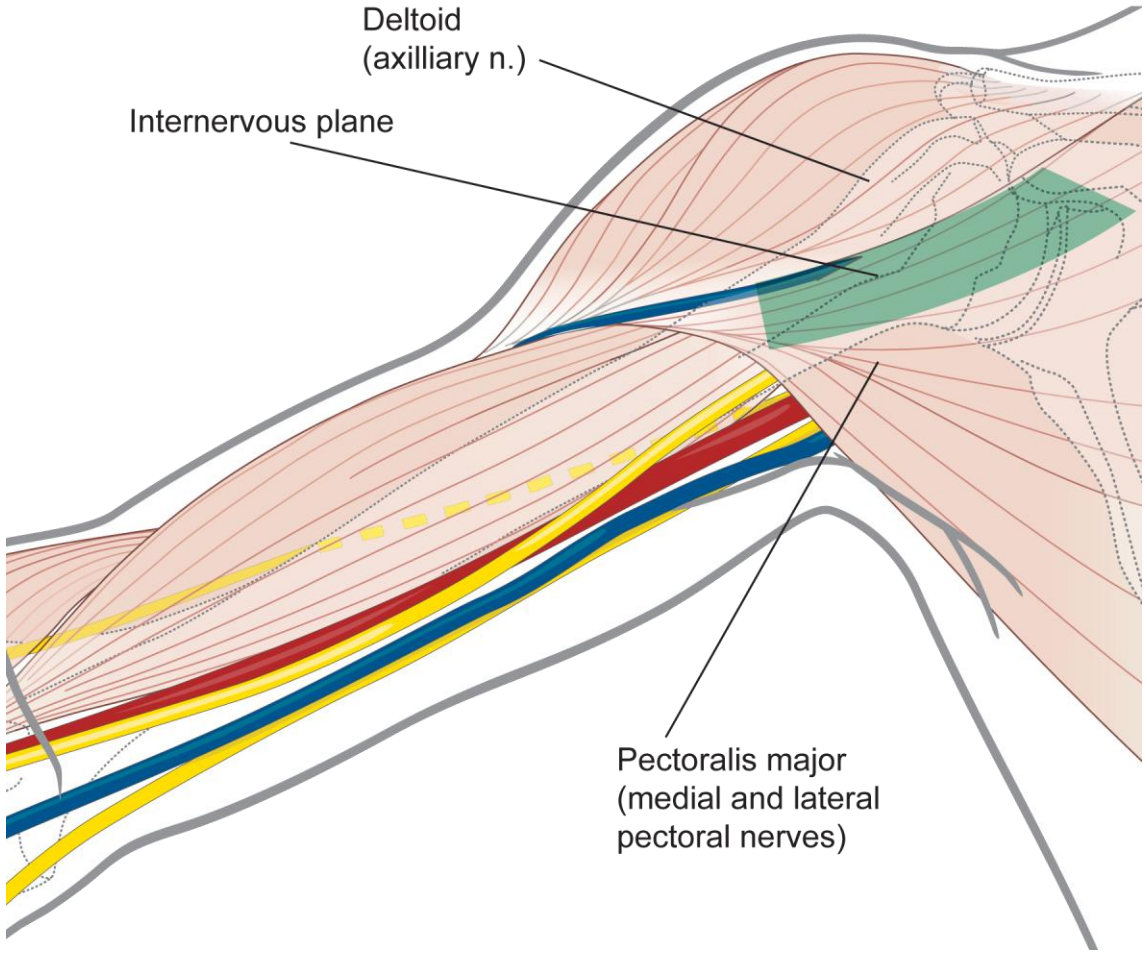
How to plan your surgical approach

- Patient positioning
- Landmarks and incision
- Internervous planes
- Layered dissection—usually superficial and deep
- Dangers
- Extending incision

Internervous plane

- Plane between two muscles that are supplied by different nerves
- You cannot damage the nerve supply of either muscle if you stay within this plane
- You can make your incision as long as you like as long as you stay between the two muscles

Internervous plane—approach to proximal humerus and shoulder

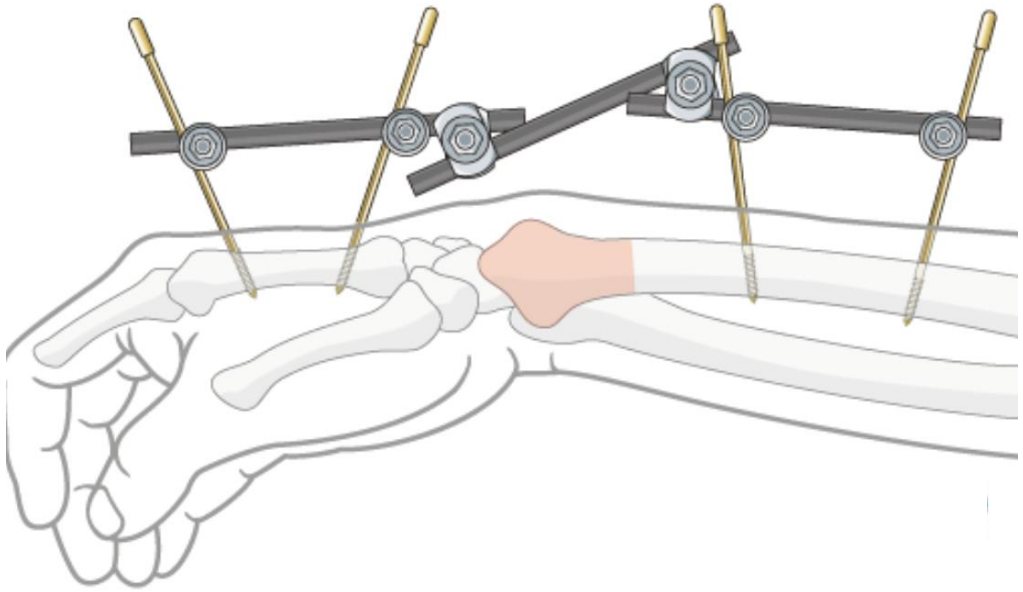


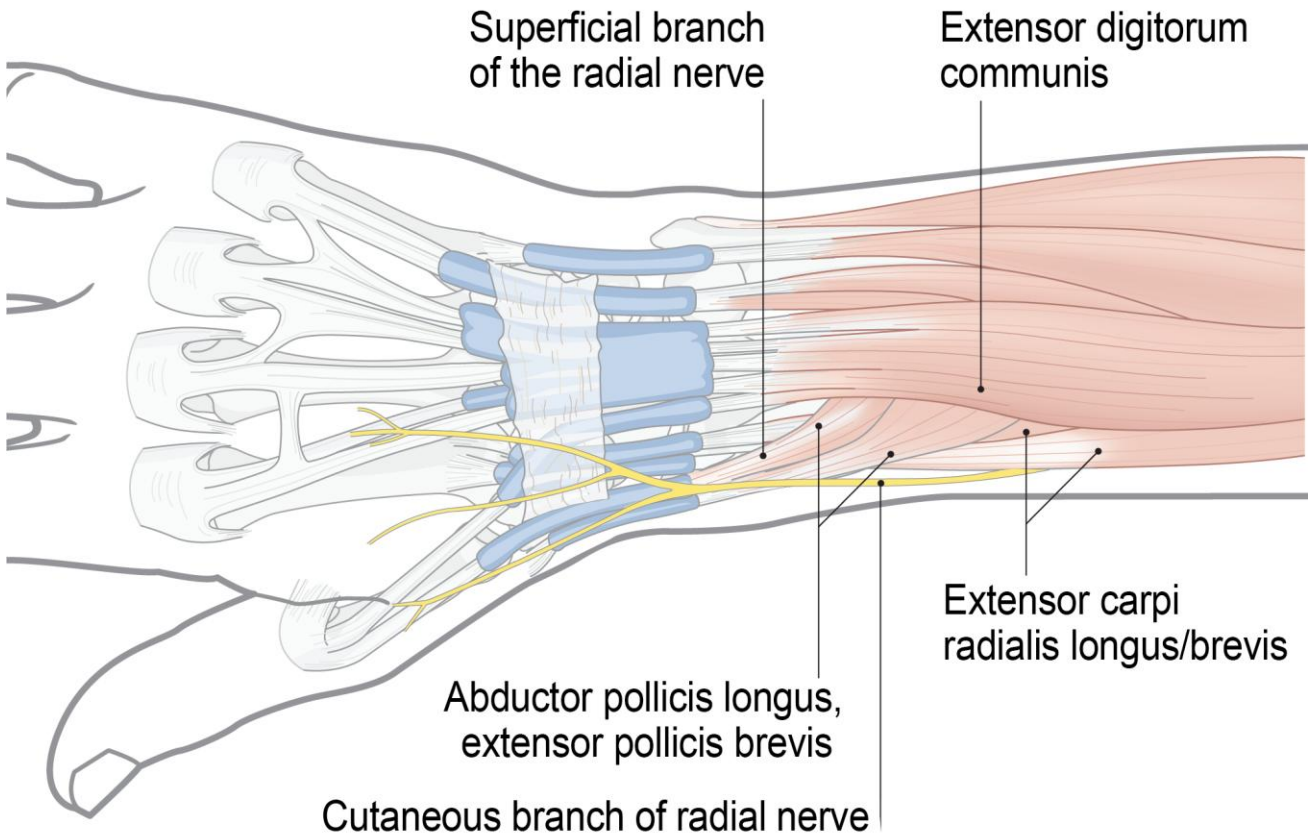
Percutaneous approaches—critical features

Fracture	Must be reduced or be reducible without open surgery
Landmarks	• Palpation of bony landmarks is not sufficiently accurate • Imaging before incision is therefore mandatory, usually with image intensifier
Internervous plane	Not critical but beware of vital anatomical structures
Superficial and deep dissection	Not carried out
Dangers	Damage to vital structures
Surgical extension	Never possible

Percutaneous approaches—dangers

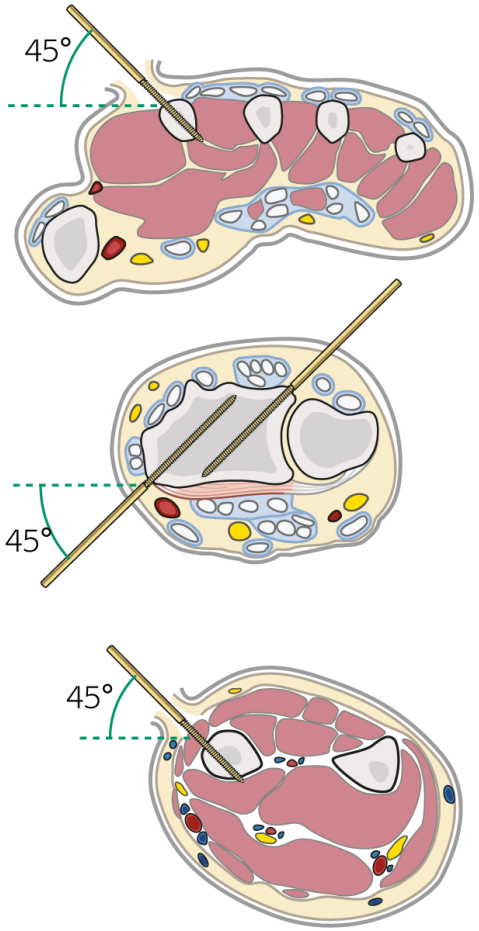
External fixator pins inserted in the distal radius may hit superficial radial nerve

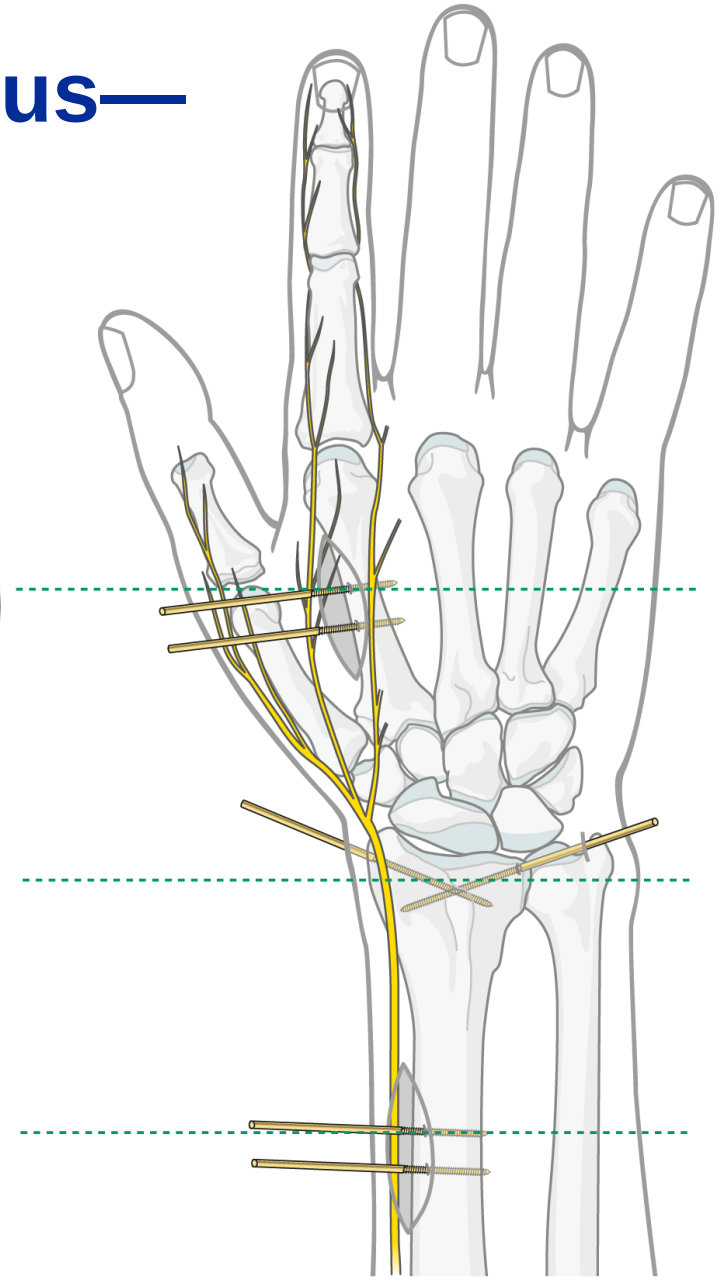




Percutaneous approach to distal radius—no safe stab incisions

Always make a mini surgical approach and look for the nerve





Percutaneous approaches—dangers

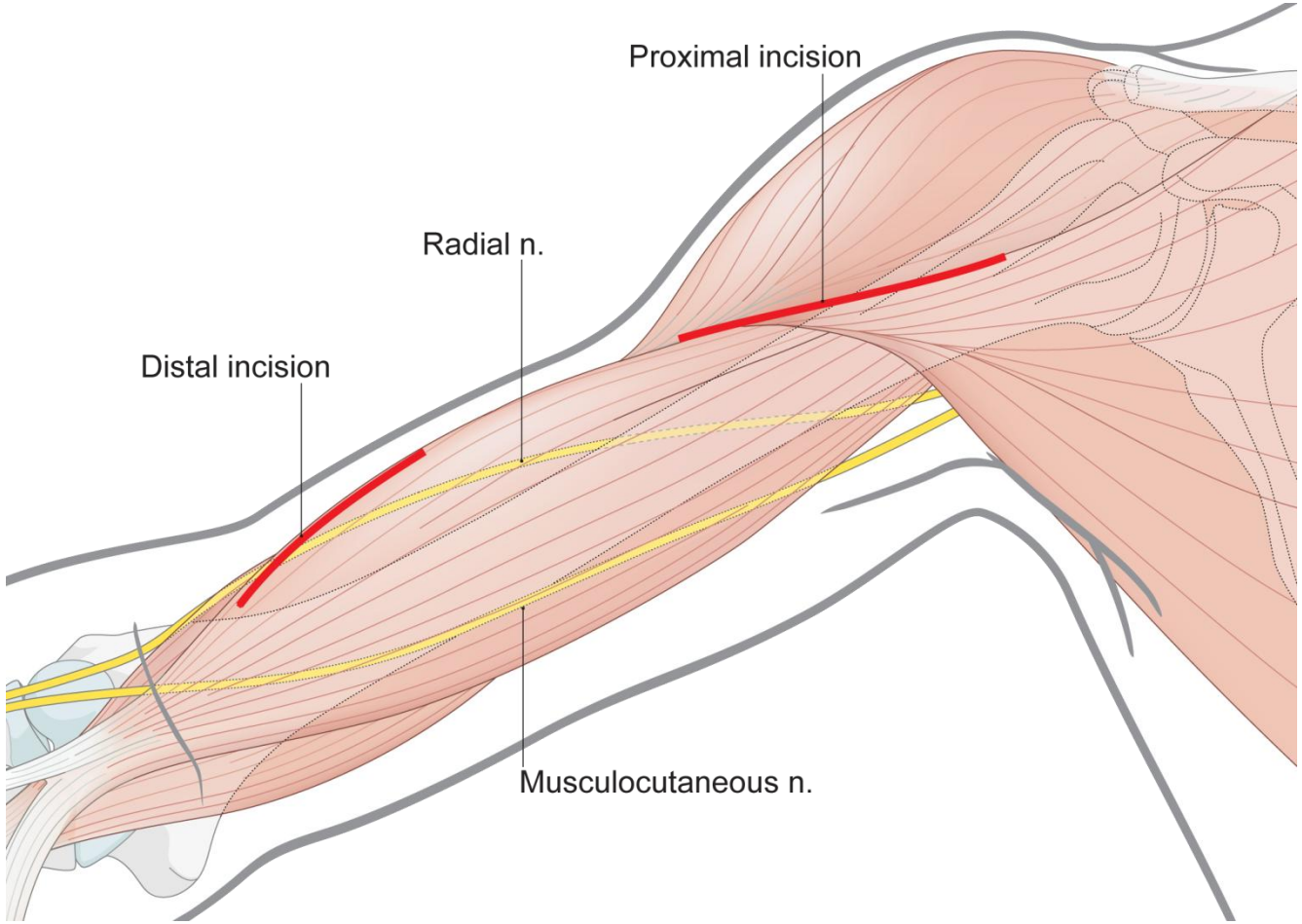
What is this?

This is a targeting device for hitting the radial nerve

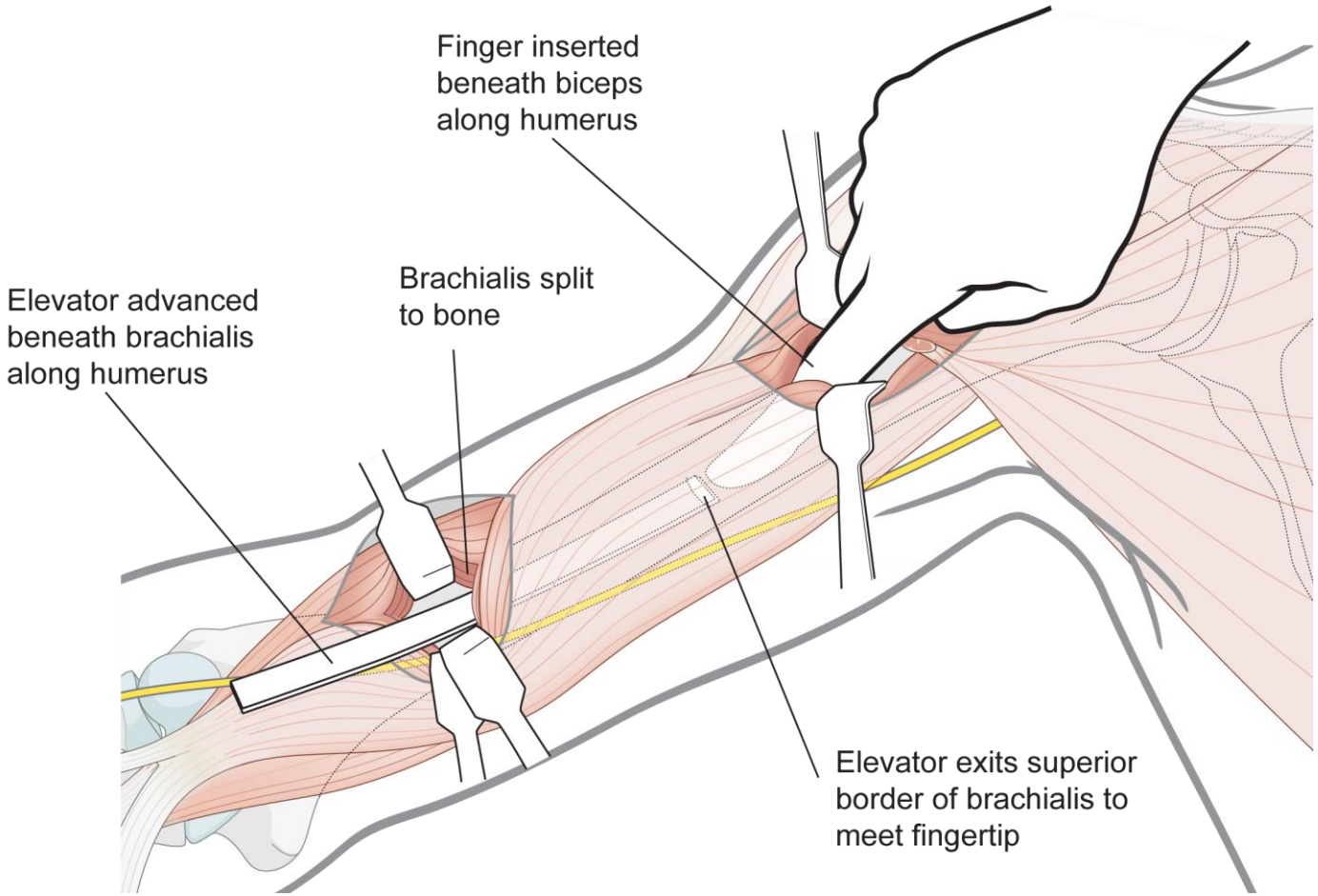
Minimally invasive surgical approaches—critical features

Fracture	Must be reduced or reducible without direct access to the fracture
Landmarks and incision	• Palpation is not accurate enough • Image guidance is mandatory
Internervous plane	Used in windows technique
Superficial and deep dissection	Can either be onto a subcutaneous surface or via a window of an open approach
Dangers	Damage to vital structures in the unexposed zone
Surgical extension	Usually not possible

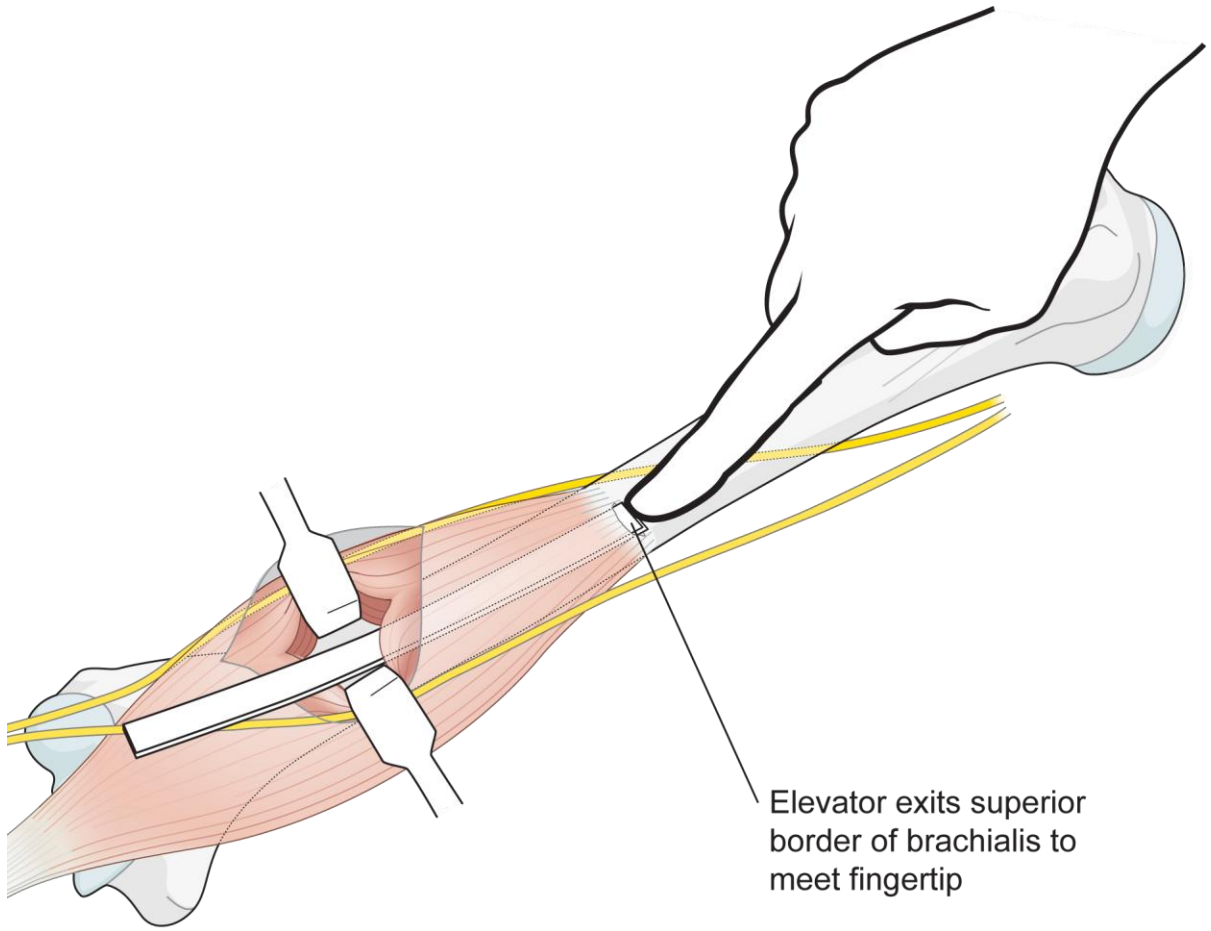
Minimally invasive anterior approach to humerus—skin incisions



Minimally invasive anterior approach to humerus—connecting the two windows



Minimally invasive anterior approach to humerus—developing the deep plane



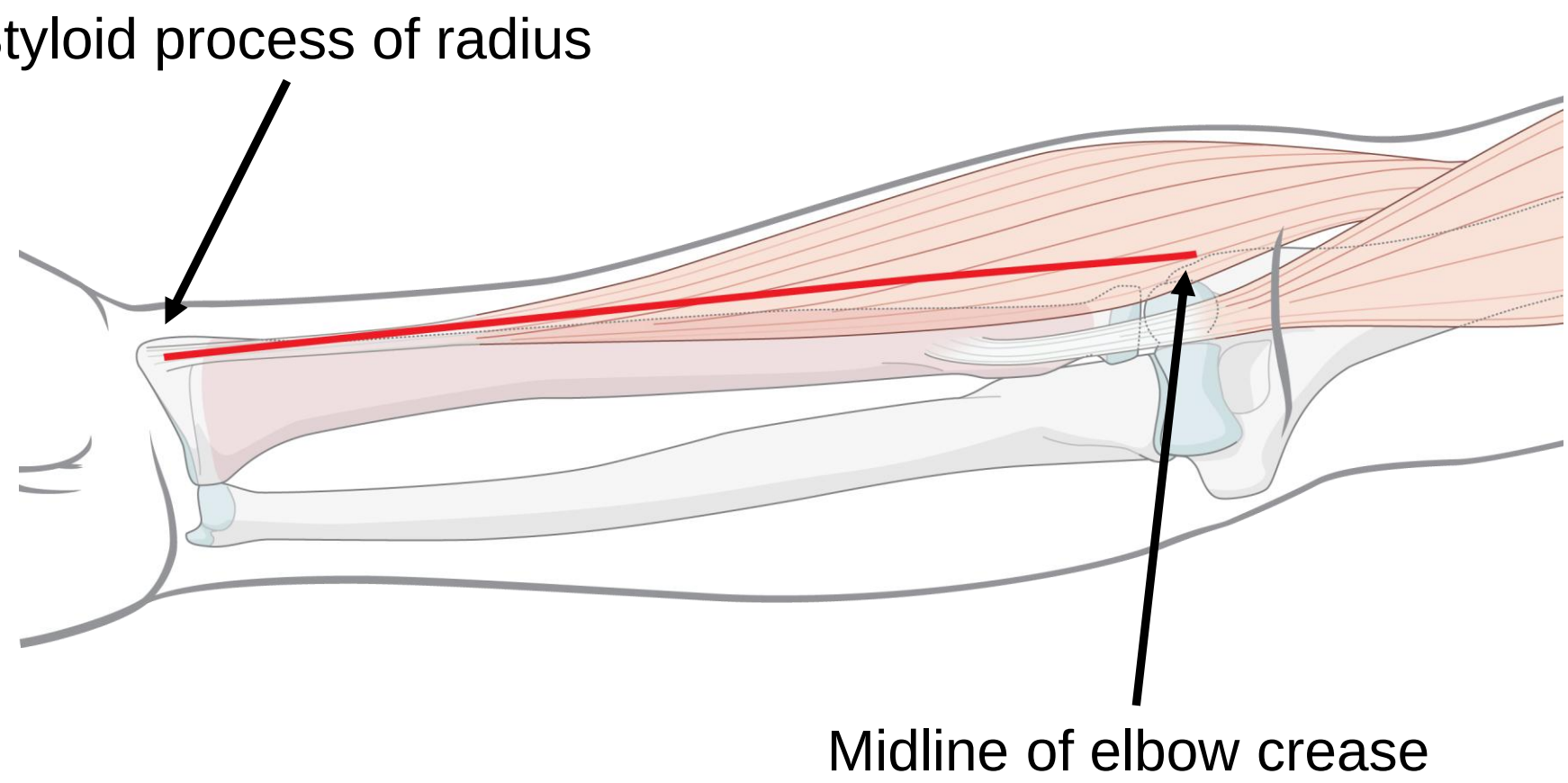
Open surgical approach—critical features

Fracture	Need not be reduced or be reducible by closed methods
Landmarks and incision	• Bony landmarks are sufficiently accurate for incisions to be made • Image intensifier is not necessary but is useful to localize the approach accurately
Internervous plane	Essential if the approach is to be safe
Superficial and deep dissection	Gentle, atraumatic, and avoid fierce retraction
Dangers	Fracture trauma may distort normal anatomy
Surgical extension	Usually possible and safe

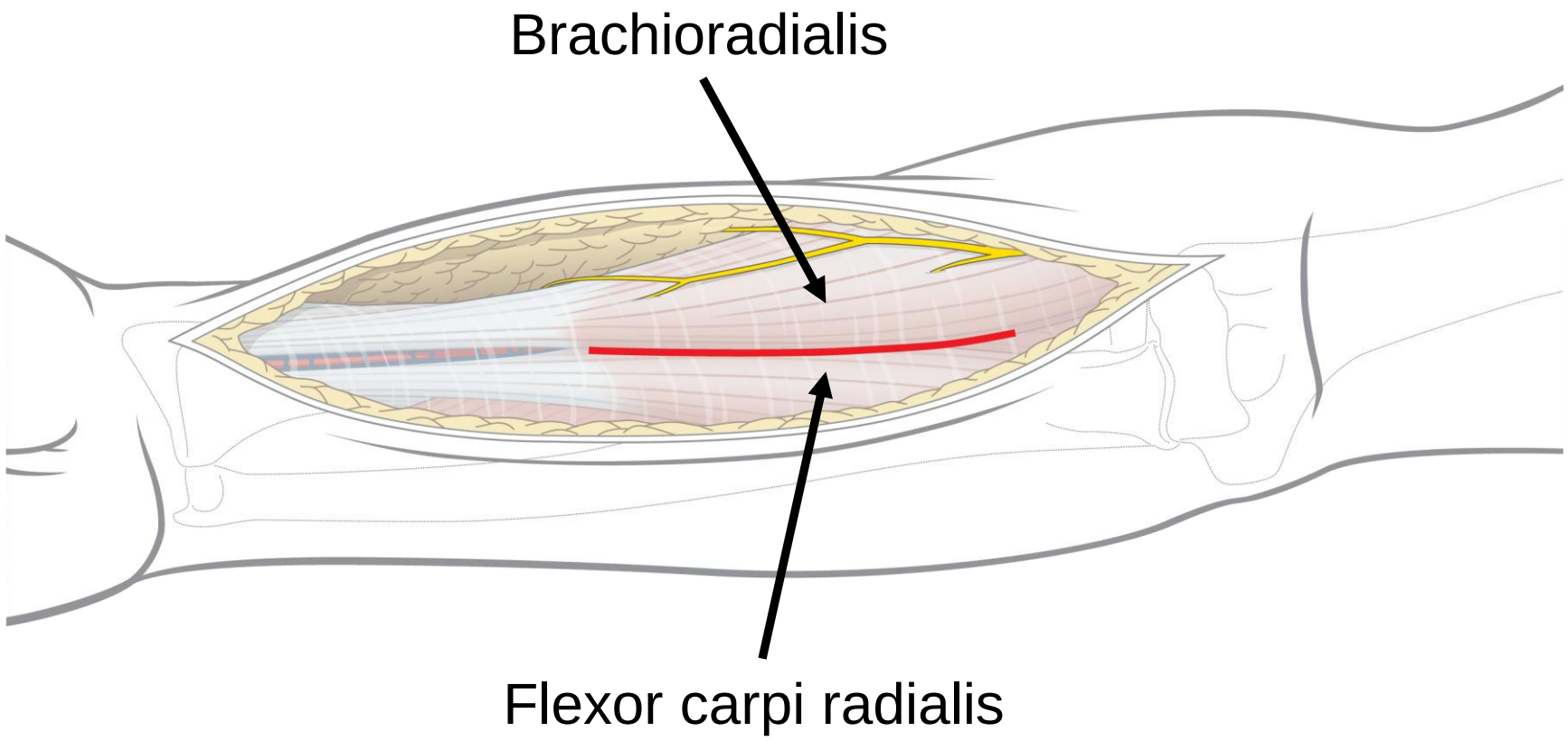
Plating of forearm

- Absolute stability
- Open reduction
- Anatomical reduction

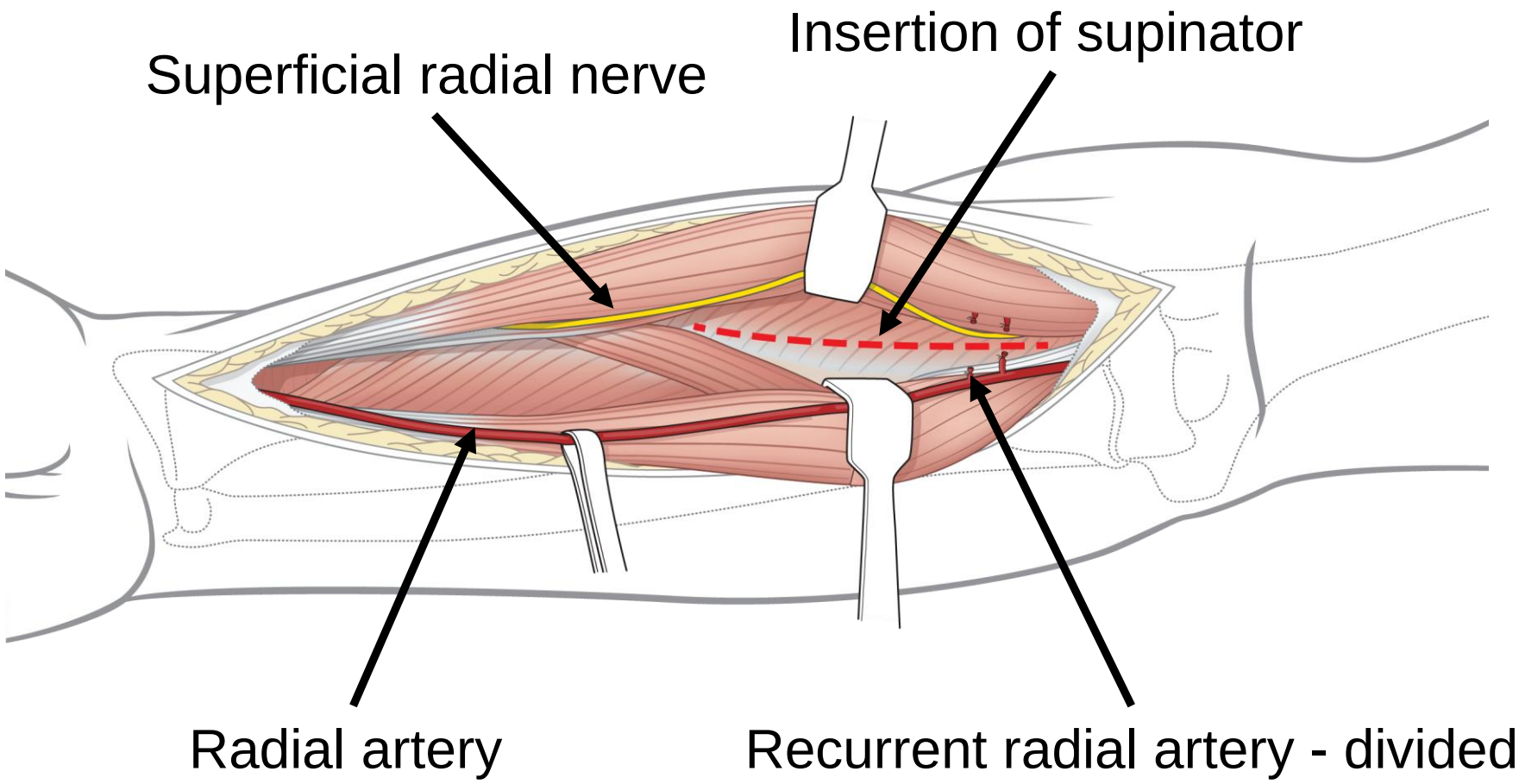
Open surgical approaches—landmarks



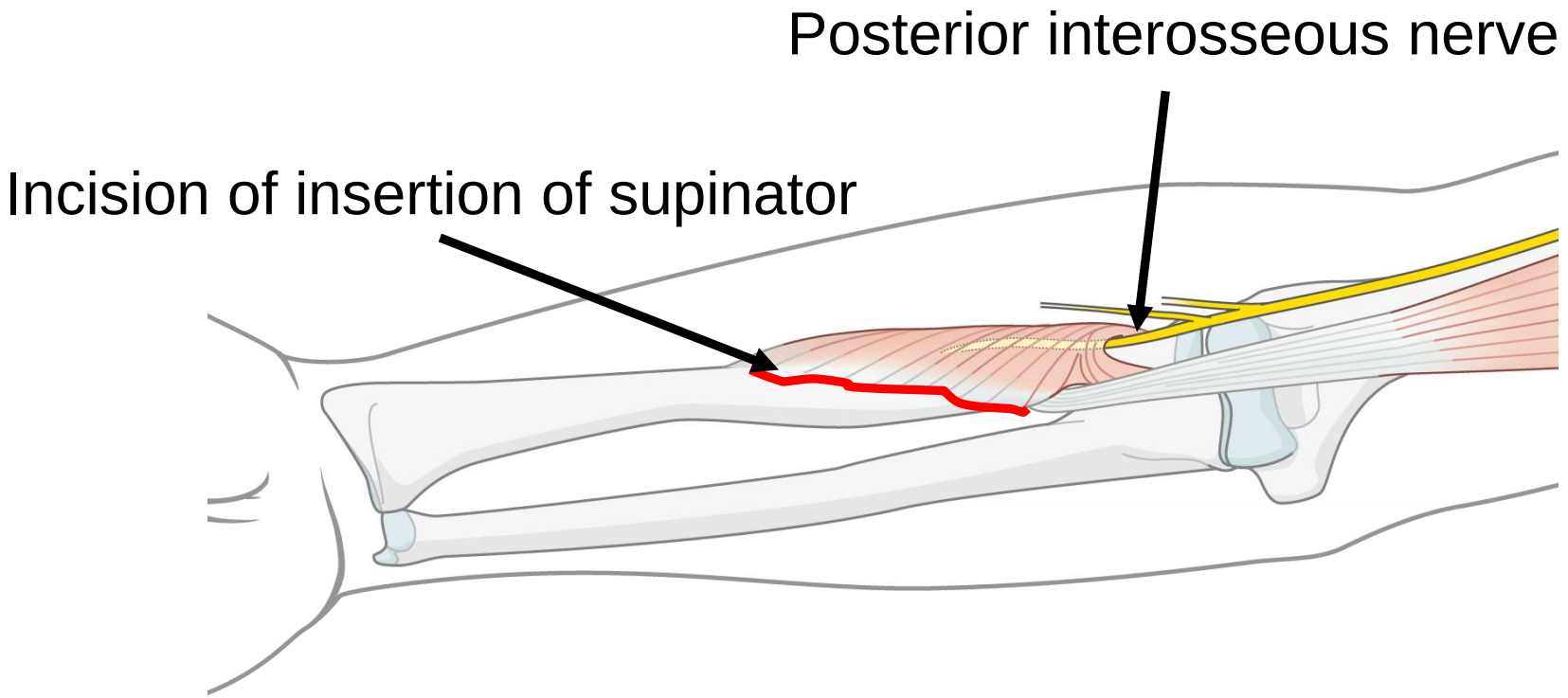
Open surgical approaches—internervous plane



Open surgical approaches—deep surgical dissection

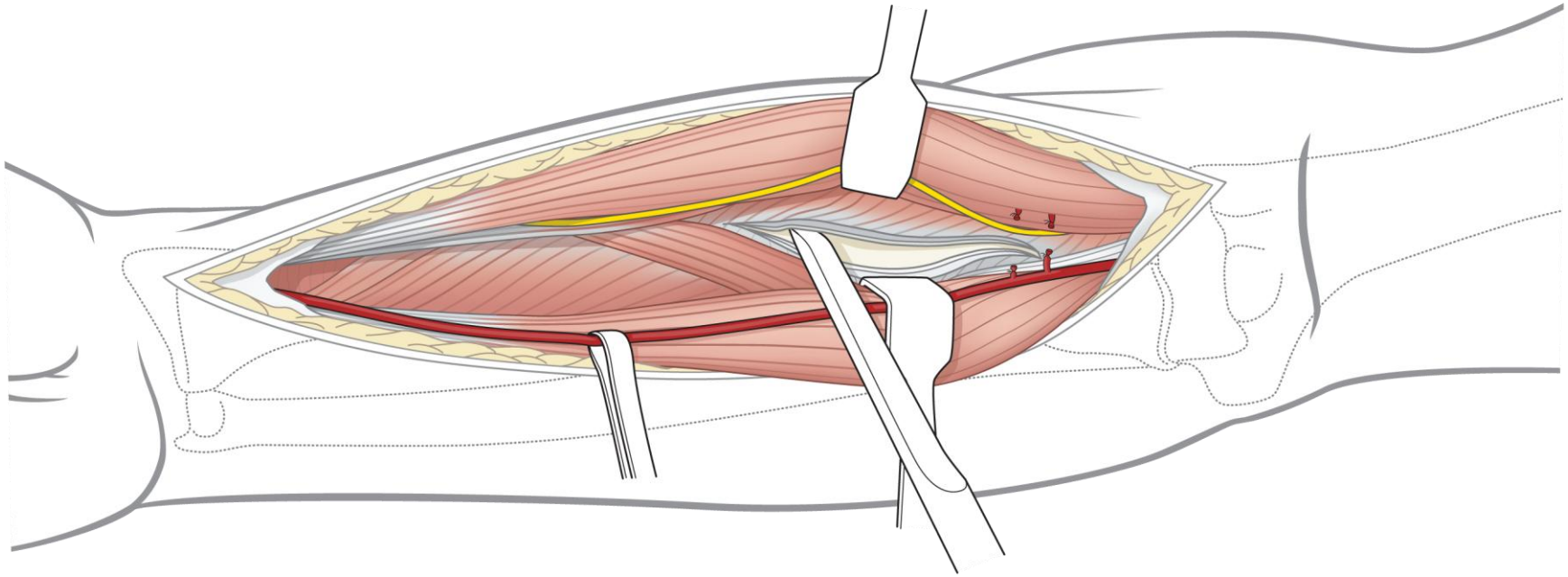


Dangers—how to avoid the posterior interosseous nerve



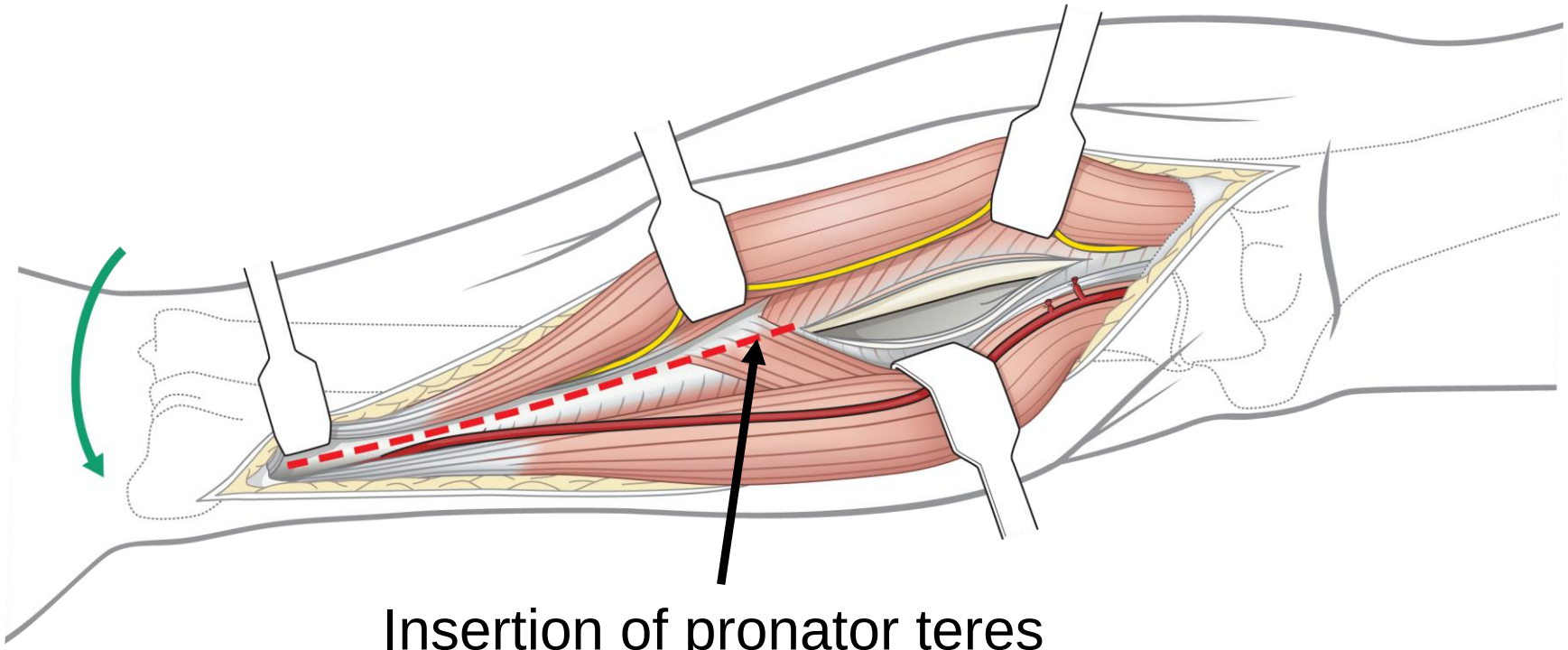
Fully supinate the forearm to take the posterior interosseous nerve away from the surgical field

Dangers—how to avoid the posterior interosseous nerve



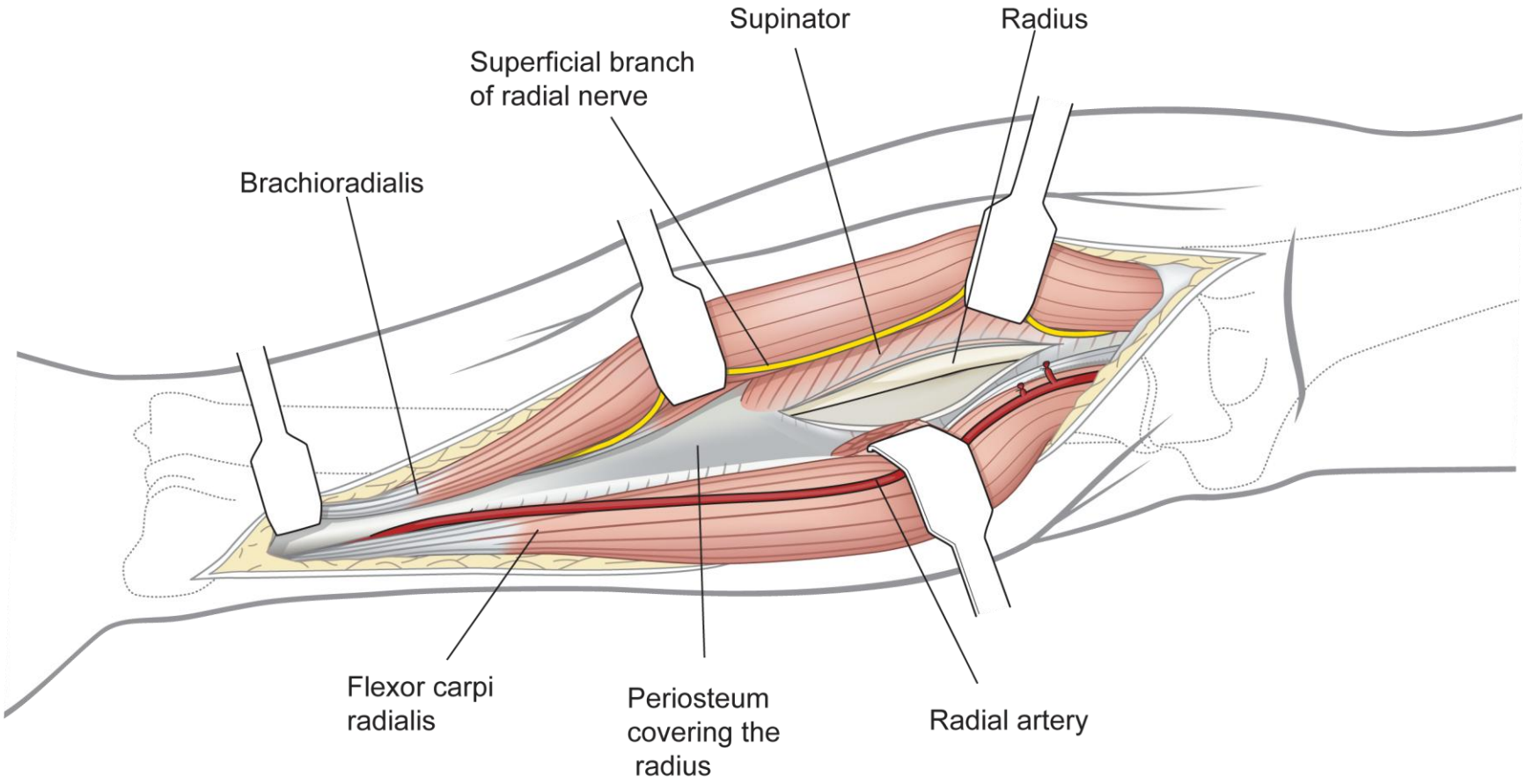
- Detach the insertion of supinator
- Don’t cut through the muscle

Open surgical approaches—deep surgical dissection



Fully pronate the forearm to expose the insertion of pronator teres

Open surgical approaches—the bone



How do you plan your surgical approach?

- Do I require anatomical reduction?
- No—minimally invasive

  approaches are indicated

How do you plan your surgical approach?

- Do I require anatomical reduction?
- Yes—but can I achieve it by closed means?
- Yes—minimally invasive surgery is possible in expert hands

How do you plan your surgical approach?

- Do I require anatomical reduction?
- Yes—but can I achieve it by closed means?
- No—formal open approach is necessary

How do you plan your surgical approach?

- Do I require absolute stability?
- Yes—go for formal open approach techniques unless you are an expert with great imaging and special equipment or the fracture is very simple
- No—minimally invasive approaches are indicated

How do you plan your surgical approach?

- Type A:
  - More likely to require anatomical reduction to achieve absolute stability
  - Therefore, more likely to use an open approach
- Type C:
  - Very unlikely to require anatomical reduction
  - Relative stability usually desirable
  - Therefore, more likely to use minimally invasive approach

Surgical approaches in trauma surgery

- What types of surgical approaches exist?
- What are the characteristics of a surgical approach?
- What are the critical features of each type of approach?
- How should fracture type affect the approach used to treat an individual fracture?

Take-home messages

- There are three types of surgical approaches:
  - Percutaneous
  - Minimally invasive
  - Open
- All types of surgical approach require detailed knowledge of anatomy
- Choice of approach depends on fracture anatomy, soft-tissue conditions, and surgeon experience
- Surgical approach must always be part of the preoperative plan