🦴 ANTERIOR FASCIAL COMPARTMENT OF FOREARM

🔹 Formation of Compartments

The forearm is divided into compartments by:

📌 Structures forming compartments:

Structure	Role
Deep fascia (fascial sheath)	Encloses forearm muscles
Interosseous membrane	Separates anterior & posterior compartments
Intermuscular septa	Divide muscle groups

- Deep Fascia of Forearm
  - Forms a strong fibrous sleeve around forearm
  - Attached to:
    - Posterior subcutaneous border of ulna
  - Sends septa to bones → creates compartments

- Compartments of Forearm

Forearm

↓

Divided into:

→ Anterior compartment (flexor-pronator)

→ Posterior compartment (extensor-supinator)

👉 Each compartment has:

- Its own muscles
- Nerve supply
- Blood supply

🟢 INTEROSSEOUS MEMBRANE

🔹 Features

Feature	Description
Attachments	Interosseous borders of radius & ulna
Fiber direction	Downwards & medially
Superior limit	~2–3 cm below radial tuberosity

Inferior feature	Aperture for anterior interosseous vessels

Functions 💡

- Binds radius ↔ ulna
- Provides muscle attachment
- Transmits weight from radius → ulna
- Maintains forearm stability

🟢 CONTENTS OF ANTERIOR COMPARTMENT

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1. MUSCLES (Divided into 3 Groups) ⭐

🔸 A. SUPERFICIAL GROUP

👉 Common origin: Medial epicondyle (Common flexor origin)

Muscle	Origin	Insertion	Nerve	Action
Pronator teres	Medial epicondyle + coronoid process	Lateral radius	Median	Pronation + weak flexion
Flexor carpi radialis	Medial epicondyle	Base of 2nd/3rd metacarpal	Median	Flexion + abduction of wrist
Palmaris longus	Medial epicondyle	Flexor retinaculum + palmar aponeurosis	Median	Wrist flexion
Flexor carpi ulnaris	Medial epicondyle + ulna	Pisiform → 5th metacarpal	Ulnar	Flexion + adduction

💡 Key Concept:

👉 All superficial muscles → median nerve EXCEPT FCU

🔸 B. INTERMEDIATE GROUP

Muscle	Origin	Insertion	Nerve	Action
Flexor digitorum superficialis (FDS)	Medial epicondyle + radius	Middle phalanges (digits 2–5)	Median	Flexes PIP joints

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💡 Function:

- Flexes proximal interphalangeal joints (PIP) ✋

🔸 C. DEEP GROUP

Muscle	Origin	Insertion	Nerve	Action
Flexor pollicis longus	Radius + interosseous membrane	Distal phalanx of thumb	Anterior interosseous (Median)	Flexes thumb
Flexor digitorum profundus	Ulna (proximal ¾)	Distal phalanges (2–5)	Lateral: Median Medial: Ulnar ⚠️	Flexes DIP joints
Pronator quadratus	Distal ulna	Distal radius	Anterior interosseous	Powerful pronation

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💡 FDP has dual nerve supply = very important MCQ

🔄 FUNCTIONAL FLOWCHART

Finger Flexion:

FDS → Flexes PIP

⬇️

FDP → Flexes DIP

⬇️

FPL → Flexes thumb

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2. BLOOD SUPPLY 🩸

Artery	Supply
Ulnar artery	Major supply
Radial artery	Lateral forearm
Anterior interosseous artery	Deep muscles

3. NERVE SUPPLY ⚡

🔹 Main Nerve: Median nerve

📌 Exceptions:

Muscle	Nerve
Flexor carpi ulnaris	Ulnar nerve
Medial half of FDP	Ulnar nerve

💡 Golden Rule:

👉 "All flexors = Median nerve EXCEPT 1½ muscles"

- 1 = FCU
- ½ = medial FDP

🟢 IMPORTANT MUSCLE EXPLANATIONS

🔹 Pronator Teres

- Key pronator muscle 🔄
- Forms medial boundary of cubital fossa

🩺 Clinical:

- Median nerve may get compressed → pronator syndrome

🔹 Palmaris Longus

- Absent in ~10–15% people ❗
- Used in tendon grafts

🔹 Flexor Digitorum Profundus

- Only muscle that flexes DIP joints
- Essential for grip strength ✊

🔹 Pronator Quadratus

- Most powerful pronator
- Stabilizes distal radioulnar joint

🟢 APPLIED ANATOMY 🩺

🔸 1. Compartment Syndrome ⚠️

Cause:

- Increased pressure within fascia

Effect:

- Reduced blood supply → muscle ischemia

🔸 2. Median Nerve Injury

Signs:

- Loss of pronation
- Weak wrist flexion
- "Hand of Benediction" ✋

🔸 3. Ulnar Nerve Injury

Affects:

- FCU + medial FDP

Signs:

- Weak grip
- Clawing of medial digits

🔸 4. Volkmann's Ischemic Contracture

- Due to ischemia of flexor muscles
- Leads to:
  - Permanent flexion deformity

🟢 ARTERIES OF ANTERIOR COMPARTMENT OF FOREARM

🔹 Main Arteries

- Ulnar artery (larger, dominant)
- Radial artery (smaller, clinically important)

🔸 ULNAR ARTERY

🔹 Overview

- Larger terminal branch of brachial artery
- Begins at neck of radius (cubital fossa)

🔹 Course

Brachial artery

↓

Ulnar artery

↓ (deep to flexor muscles)

Middle forearm

↓ (becomes superficial distally)

Between FCU & FDS

↓

Crosses wrist anterior to flexor retinaculum

↓

Forms SUPERFICIAL PALMAR ARCH

- Relations

Region	Relation
Upper forearm	Deep to flexor muscles
Distal forearm	Between FCU & FDS

Wrist	Lateral to ulnar nerve

🔹 Branches

Branch	Function
Anterior ulnar recurrent	Elbow anastomosis
Posterior ulnar recurrent	Elbow anastomosis
Common interosseous artery	Divides into anterior & posterior interosseous
Muscular branches	Supply flexor muscles
Carpal branches	Wrist anastomosis

- Terminal Branch
  - Forms Superficial Palmar Arch ✋

RADIAL ARTERY

- Overview
  - Smaller terminal branch of brachial artery
  - Begins in cubital fossa

- Course

Brachial artery

↓

Radial artery

↓ (lateral side)

Under brachioradialis

↓

Distal forearm (superficial)

↓ (Pulse point)

Between brachioradialis & FCR

↓

Winds dorsally around wrist

↓

Forms DEEP PALMAR ARCH

- Relations

Structure	Relation
Superficial radial nerve	Lateral to artery
Distal forearm	Between brachioradialis & FCR
Wrist	Site of radial pulse ❤️

🔹 Branches

Branch	Function
Radial recurrent artery	Elbow anastomosis
Muscular branches	Supply muscles
Superficial palmar branch	Contributes to superficial arch

🔄 COMPARISON TABLE ⭐

Feature	Ulnar Artery	Radial Artery
Size	Larger	Smaller
Position	Medial	Lateral
Main contribution	Superficial palmar arch	Deep palmar arch
Pulse	Not commonly felt	Radial pulse site
Relation to nerve	Medial to ulnar nerve	Lateral to superficial radial nerve

🟢 NERVES OF ANTERIOR FOREARM

🔹 1. MEDIAN NERVE

- Origin
  - From lateral + medial cords of brachial plexus

- Course (VERY IMPORTANT ⭐)

Arm → lateral to brachial artery

↓ crosses anteriorly

↓ becomes medial to artery

Cubital fossa → medial to brachial artery

↓

Between 2 heads of pronator teres

↓

Between FDS & FDP

↓

Wrist → behind flexor retinaculum

- Branches

Type	Supply
Muscular	FCR, Palmaris longus, FDS
Articular	Elbow joint
Anterior interosseous nerve	Deep muscles
Palmar cutaneous	Skin of lateral palm

2. ANTERIOR INTEROSSEOUS NERVE

- Origin
  - Branch of median nerve

- Course
  - Runs on interosseous membrane
  - Between:
    - Flexor pollicis longus
    - Flexor digitorum profundus

- Supply

Muscle	Function
Flexor pollicis longus	Thumb flexion
Pronator quadratus	Pronation
Lateral FDP	Finger flexion

🩺 Clinical Insight:

- Injury → "Pinch sign" defect ❗
  (cannot make OK sign)

🔹 3. ULNAR NERVE

🔸 Origin

- From medial cord of brachial plexus

🔸 Course (VERY IMPORTANT ⭐)

Arm → medial to brachial artery

↓

Behind medial epicondyle ("funny bone")

↓

Between 2 heads of FCU

↓

Runs with ulnar artery (medial side)

↓

Wrist → anterior to flexor retinaculum

🔸 Branches

Type	Supply
Muscular	FCU + medial FDP
Articular	Elbow
Palmar cutaneous	Hypothenar skin
Dorsal cutaneous	Dorsum of hand

🩺 Clinical Insight:

- Injury → Claw hand deformity 🖐️

🟢 RELATION AT WRIST ⭐

👉 From LATERAL → MEDIAL:

Order	Structure
1	Brachioradialis
2	Superficial radial nerve
3	Radial artery
4	Flexor carpi radialis
5	Median nerve
6	Flexor digitorum superficialis
7	Ulnar artery

8	Ulnar nerve
9	Flexor carpi ulnaris

💡 Mnemonic:

👉 "Brainy Students Read Fresh Medical Facts Using Notes Frequently"

🟢 APPLIED ANATOMY 🩺

🔸 1. Compartment Syndrome ⚠️

- Increased pressure → ↓ blood flow
- Leads to muscle ischemia

🔸 2. Volkmann's Ischemic Contracture

📌 Cause:

- Untreated compartment syndrome

📌 Features:

- Permanent flexion deformity
- Most affected:
  - FDP
  - FPL

🔸 3. Radial Pulse

- Palpated at:
  - Distal radius (lateral wrist)

- Between:
    - Brachioradialis
    - Flexor carpi radialis

🔸 4. Ulnar Nerve Injury

- At medial epicondyle
- Causes:
    - Clawing of digits
    - Weak grip

🔸 5. Median Nerve Compression

- At pronator teres or carpal tunnel
- Leads to:
    - Loss of pronation

- Thenar wasting

🟢 FLEXOR RETINACULUM (Transverse Carpal Ligament)

- 🔹 Definition
  - A strong fibrous band on the anterior aspect of wrist
  - Converts carpal bones into a carpal tunnel

- 🔹 Attachments 🦴

Side	Bones

Medial	Pisiform + Hook of hamate
Lateral	Tubercle of scaphoid + Trapezium

🟢 STRUCTURES RELATED TO FLEXOR RETINACULUM

🔹 Structures Passing SUPERFICIAL to Flexor Retinaculum

Structure	Notes
Tendon of flexor carpi ulnaris	Inserts into pisiform
Ulnar nerve	Enters hand outside carpal tunnel

Ulnar artery	Forms superficial palmar arch
Palmar cutaneous branch of ulnar nerve	Sensory
Tendon of palmaris longus	Variable presence
Palmar cutaneous branch of median nerve	Supplies lateral palm

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💡 Key Concept:

👉 These structures are NOT affected in carpal tunnel syndrome

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🔹 Structures Passing DEEP (Within Carpal Tunnel)

🔥

Structure	Function
Tendons of FDS (4)	Flex PIP joints
Tendons of FDP (4)	Flex DIP joints
Tendon of FPL	Flex thumb
Median nerve ⚠️	Major nerve of hand

⚠️ Important Clarification:

👉 Flexor carpi radialis tendon

- Lies in a separate compartment within the retinaculum
- NOT strictly inside the main carpal tunnel

🧠 Mnemonic:

👉 "8 tendons + 1 nerve = Carpal Tunnel"

(4 FDS + 4 FDP + 1 FPL + Median nerve)

🟢 CARPAL TUNNEL SYNDROME (CTS) ⚠️

🔹 Definition

Compression of median nerve at wrist due to reduced tunnel space

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🔹 Causes

- Repetitive wrist movements
- Inflammation of tendon sheaths

- Pregnancy (fluid retention)
- Diabetes / hypothyroidism

🔹 Symptoms 🩺

Symptom	Explanation
Paresthesia	Tingling in lateral 3½ digits
Hypoesthesia	Reduced sensation
Pain	Radiates to forearm
Thenar wasting	Late sign
Weak grip	Due to muscle weakness

- Sensory Area Affected

  - Thumb
  - Index finger
  - Middle finger
  - Lateral half of ring finger

👉 Palm sensation spared (palmar cutaneous branch runs superficial)

- Clinical Tests

Test	Finding
Phalen's test	Flex wrist → symptoms appear
Tinel's sign	Tap nerve → tingling

- Treatment
  - Wrist splinting
  - NSAIDs
  - Steroid injection
  - Surgical decompression (cut flexor retinaculum)

🦴 LATERAL FASCIAL COMPARTMENT OF FOREARM

- Overview
  - Also called "mobile wad of Henry"
  - Lies between anterior & posterior compartments

🔹 Contents

📌 Muscles

Muscle	Origin	Insertion	Action	Nerve
Brachioradialis	Lateral supracondylar ridge	Distal radius	Flexes elbow (mid-prone)	Radial nerve
Extensor carpi radialis longus (ECRL)	Lateral supracondylar ridge	Base of 2nd metacarpal	Wrist extension + abduction	Radial nerve

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🔹 Blood Supply 🩸

- Branches of:
  - Radial artery
  - Brachial artery

- 🔹 Nerve Supply ⚡
  - Radial nerve

🟢 RADIAL NERVE IN FOREARM

- 🔹 Course ⭐

Radial nerve

↓

Pierces lateral intermuscular septum

↓

Between:

→ Brachialis (medial)

→ Brachioradialis + ECRL (lateral)

↓

At lateral epicondyle

↓

Divides into:

→ Superficial branch (sensory)

→ Deep branch (motor)

🔹 Branches

🔸 1. Superficial Branch

Feature	Description

Type	Sensory
Course	Under brachioradialis
Relation	Lateral to radial artery
Supply	Skin of lateral 2/3 of dorsum of hand

🔸 2. Deep Branch (Posterior Interosseous Nerve)

Feature	Description
Type	Motor
Passes through	Supinator muscle
Supplies	Extensor muscles

🟢 CLINICAL CORRELATION 🩺

🔸 1. Radial Nerve Injury

📌 Causes:

- Fracture of humeral shaft
- Compression (Saturday night palsy)

🔸 Features:

Sign	Explanation
Wrist drop	Loss of wrist extensors

Inability to extend MCP joints	Extensors paralyzed
IP extension intact	Due to lumbricals/interossei
Sensory loss	Posterior forearm & dorsum of hand

🔸 Key Concept:

👉 Radial nerve = EXTENSOR nerve

🔸 2. Wrist Drop 🔥

- Classic sign of radial nerve palsy
- Hand hangs flaccidly

💡 High Yield Mnemonics:

👉 Carpal Tunnel:

"FDS FDP FPL + Median nerve"

👉 Median nerve spared area:

"Palm is calm" (palmar cutaneous branch spared)

👉 Radial nerve injury:

"DROP = Cannot extend wrist"

-> The End <-