MEDICAL EDUCATION RESOURCE

Metacarpophalangeal and Interphalangeal Joints

Metacarpophalangeal and Interphalangeal Joints

? Metacarpophalangeal (MCP) Joints

Type

- **Condyloid (ellipsoid) synovial joints** between the **heads of metacarpals** and the **bases of proximal phalanges**.
- Permit movements in **two planes** — flexion/extension and abduction/adduction.

Articular Surfaces

- **Head of metacarpal:** Convex, broader anteriorly.
- **Base of proximal phalanx:** Concave, fitting the metacarpal head.
- **Each joint has a separate synovial cavity.**

Ligaments

LIGAMENT	ATTACHMENTS / FUNCTION

Palmar (volar) ligament / plate	Thick fibrocartilaginous plate attached firmly to base of proximal phalanx, loosely to metacarpal head ? prevents hyperextension.
Collateral ligaments (proper + accessory)	From sides of metacarpal heads ? base of proximal phalanx and volar plate ? check abduction during flexion.
Deep transverse metacarpal ligaments	Connect volar plates of 2nd–5th MCP joints ? maintain transverse arch of palm.

Capsule

- Surrounds each joint; attached to margins of articular surfaces.
- Lined by **synovial membrane**.

Movements at MCP Joints

MOVEMENT	RANGE / PLANE	MUSCLES RESPONSIBLE
Flexion	0–90°	FDS, FDP, lumbricals, interossei
Extension	Up to 45°	EDC, EIP, EDM
Abduction	Fingers move away from midline (middle finger)	Dorsal interossei
Adduction	Toward midline	Palmar interossei
Circumduction	Composite	Sequential activation of above muscles

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Axis

- Passes through **head of metacarpal**; middle finger acts as **axis of reference** (no adduction possible for it).

Stability Factors

- Collateral and palmar ligaments.
- Interosseous muscles tonus.
- Integrity of deep transverse metacarpal ligaments.

Nerve Supply

- **Digital branches of median and ulnar nerves** (Hilton's law).

Clinical Notes

- **MCP dislocation:** Often dorsal; volar plate may trap metacarpal head ? irreducible without surgery.
- **Rheumatoid arthritis:** MCP joints show swelling, ulnar deviation, and boutonnière deformity.
- **Knuckle pads:** Fibrotic thickening over MCP joints from repetitive trauma.

? Interphalangeal (IP) Joints

Type

- **Hinge-type synovial joints.**
- Allow movement in **one plane** (flexion–extension only).

Articular Surfaces

- **Head of proximal phalanx:** Pulley-shaped, with two condyles.
- **Base of distal phalanx:** Concave with two shallow facets.
- Covered by hyaline cartilage and enclosed by a capsule.

Ligaments

LIGAMENT	FUNCTION
Palmar (volar) ligament / plate	Prevents hyperextension.
Collateral ligaments	Maintain lateral stability during flexion.

(No deep transverse ligaments here.)

Types of IP Joints

1. **Proximal Interphalangeal (PIP)** – between proximal & middle phalanges.
2. **Distal Interphalangeal (DIP)** – between middle & distal phalanges.
   (Thumb has only one IP joint.)

Movements at IP Joints

MOVEMENT	RANGE (°)	MUSCLES RESPONSIBLE
Flexion	Up to 100–120° (PIP), 80–90° (DIP)	FDS (PIP), FDP (DIP)
Extension	Limited (~30°)	EDC, EPL, lumbricals, interossei

Axis

- Transverse axis through heads of phalanges.

Stability Factors

- Strong collateral ligaments.
- Volar plates.
- Tendon expansion of extensor mechanism (dorsal digital expansion).

Nerve Supply

- **Digital branches of median and ulnar nerves.**

Clinical Anatomy

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1. Mallet Finger

- Rupture or avulsion of **extensor tendon** at DIP joint ? finger tip droops.
- Common in ball sports injuries.

2. Swan-Neck Deformity

- Hyperextension of PIP with flexion of DIP joint ? seen in rheumatoid arthritis due to imbalance of flexor/extensor forces.

3. Boutonnière Deformity

- Flexion of PIP and hyperextension of DIP joint ? rupture of central slip of extensor tendon.

4. Dupuytren's Contracture

- Progressive fibrosis of palmar fascia ? flexion deformity at MCP and PIP joints (especially ring and little fingers).

5. Trigger Finger

- Thickening of flexor tendon sheath ? tendon "snaps" during flexion or extension.

6. Post-Traumatic Stiffness

- Follows fractures or tendon adhesions; early physiotherapy essential.

? Functional Correlation

- **MCP joints** allow fine finger spread and precision positioning.
- **IP joints** ensure powerful grasp and release.
- Coordination of both ensures the **prehensile function of hand** — grip, pinch, and manipulation.