Spital Thurgau

ULNAR NERVE ENTRAPMENT

Moritz Fischer

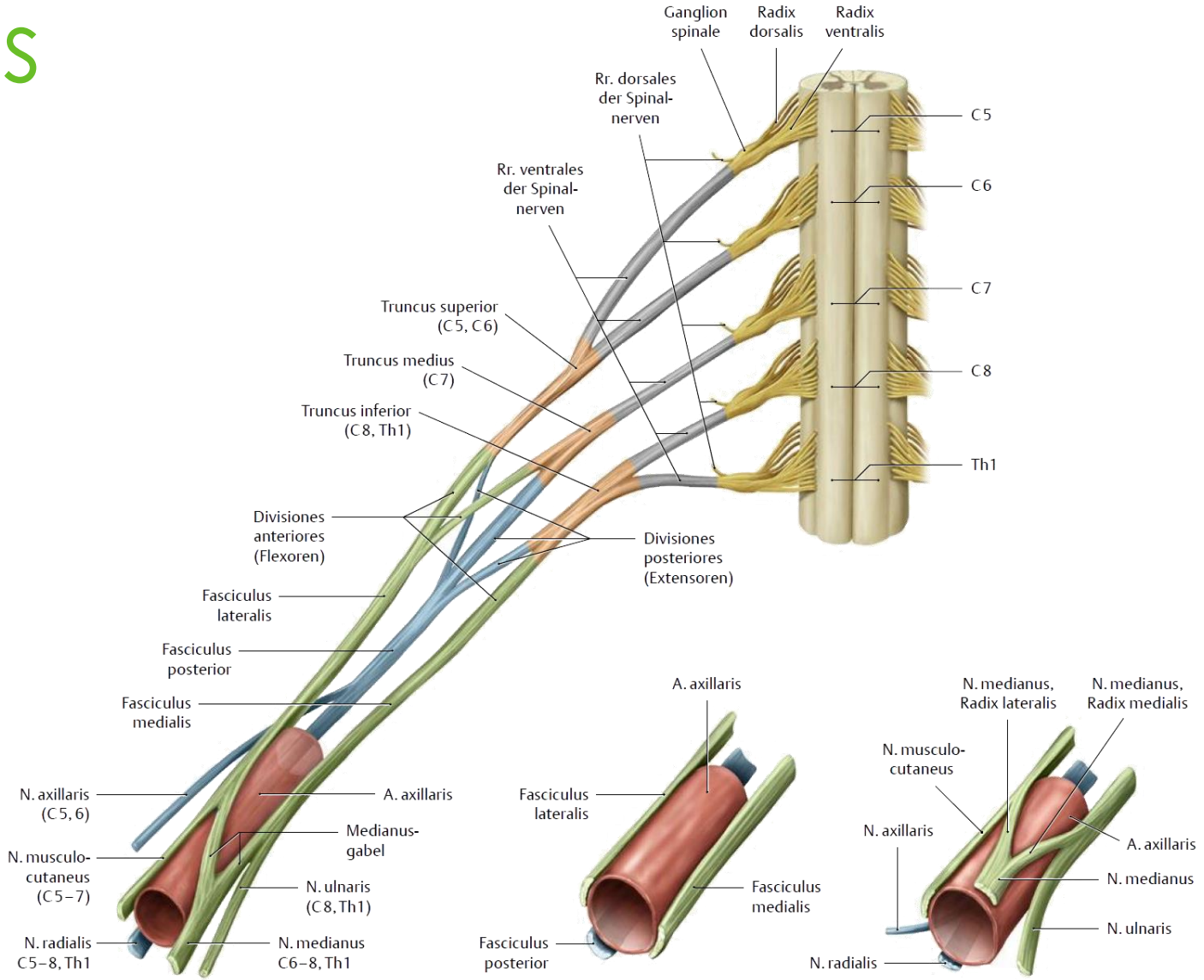
Introduction

- Compression neuropathy is common found to affect the ulnar nerve
- Cubital tunnel ist the second most common compression neuropathy in the upper limb
- Guyon canal is another site of frequent compression

Spital Thurgau

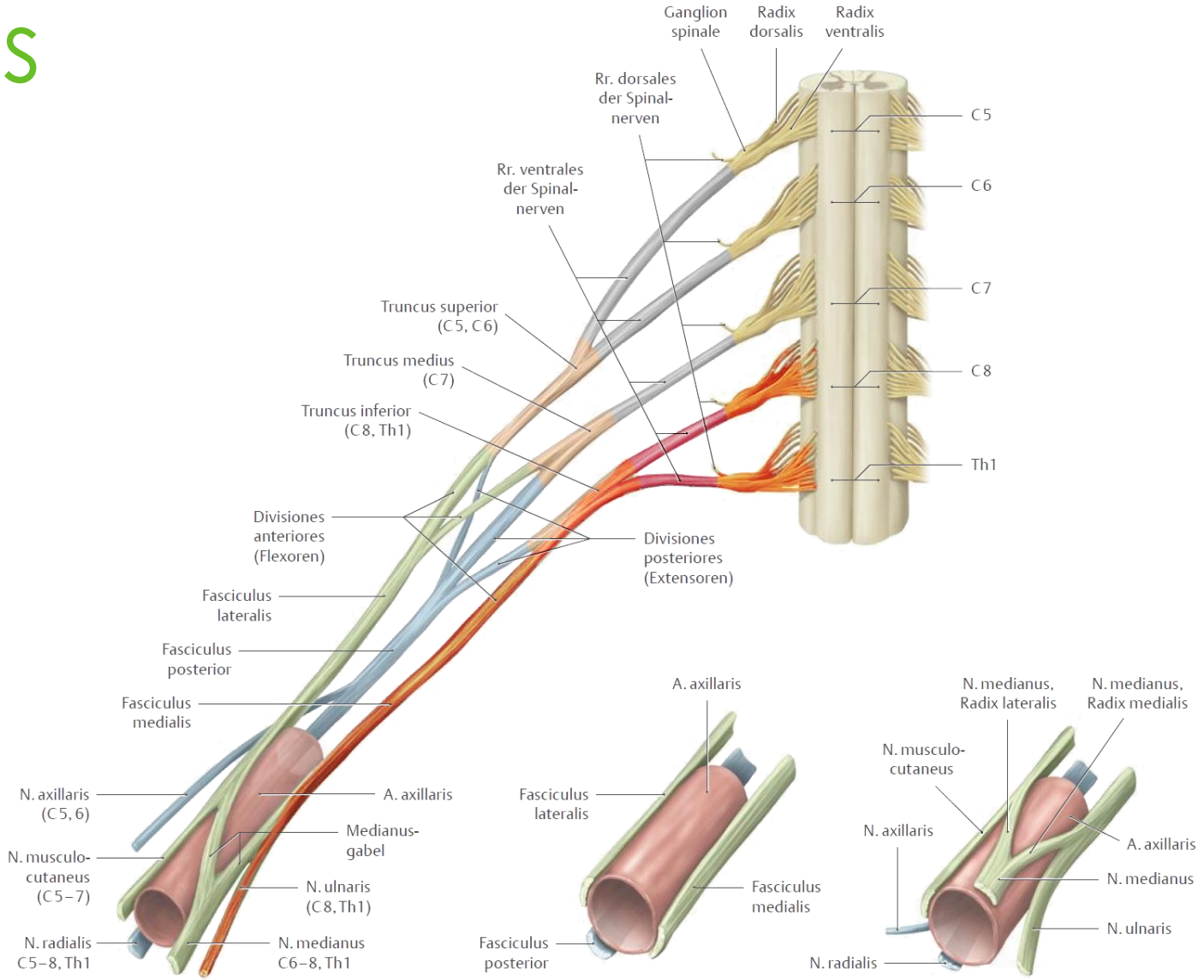
ANATOMY

Anatomy plexus



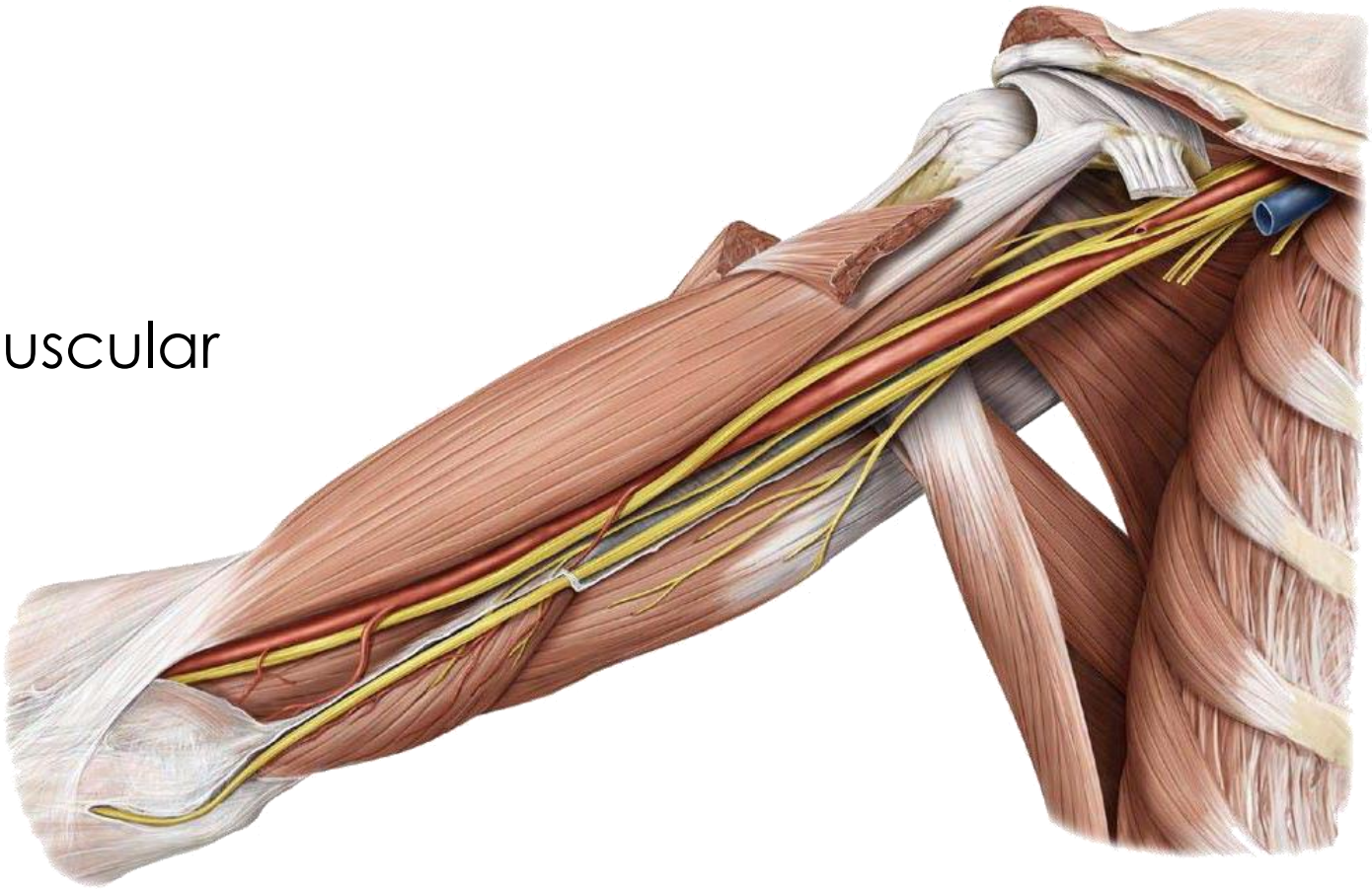
Anatomy plexus

- Formed from the root C8 + Th1
- Truncus inferior
- Divisiones anteriores
- Fasciculus medialis
- Nervus ulnaris



Anatomy upper arm

- Anterior to the M. triceps
- Piercing of the medial intermuscular septum in the middle third
- Fibro-osseus tunnel between medial epicondyle and olecranon



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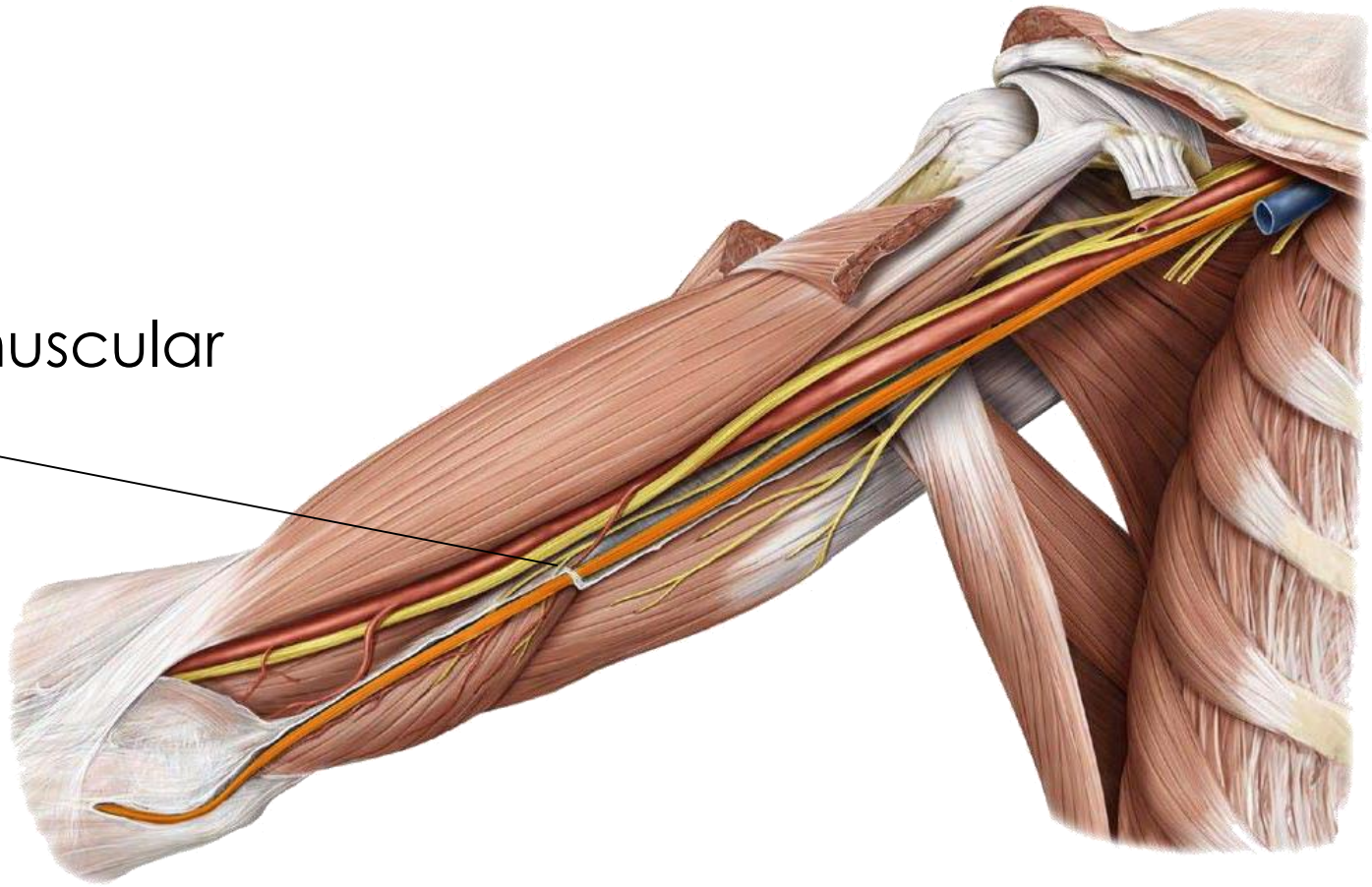
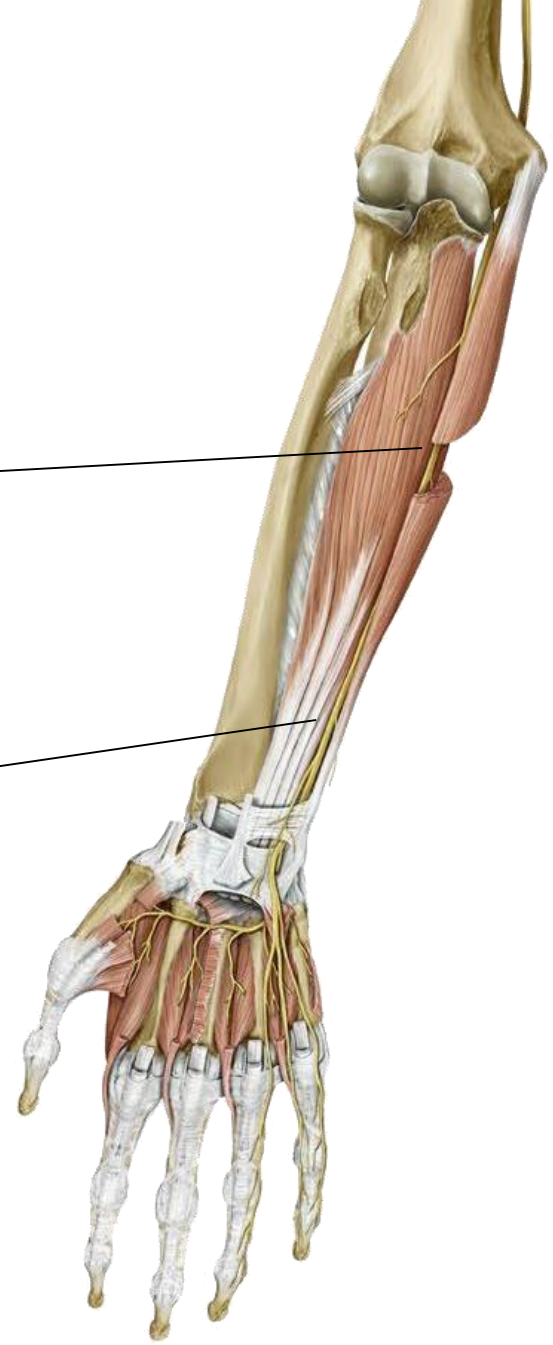


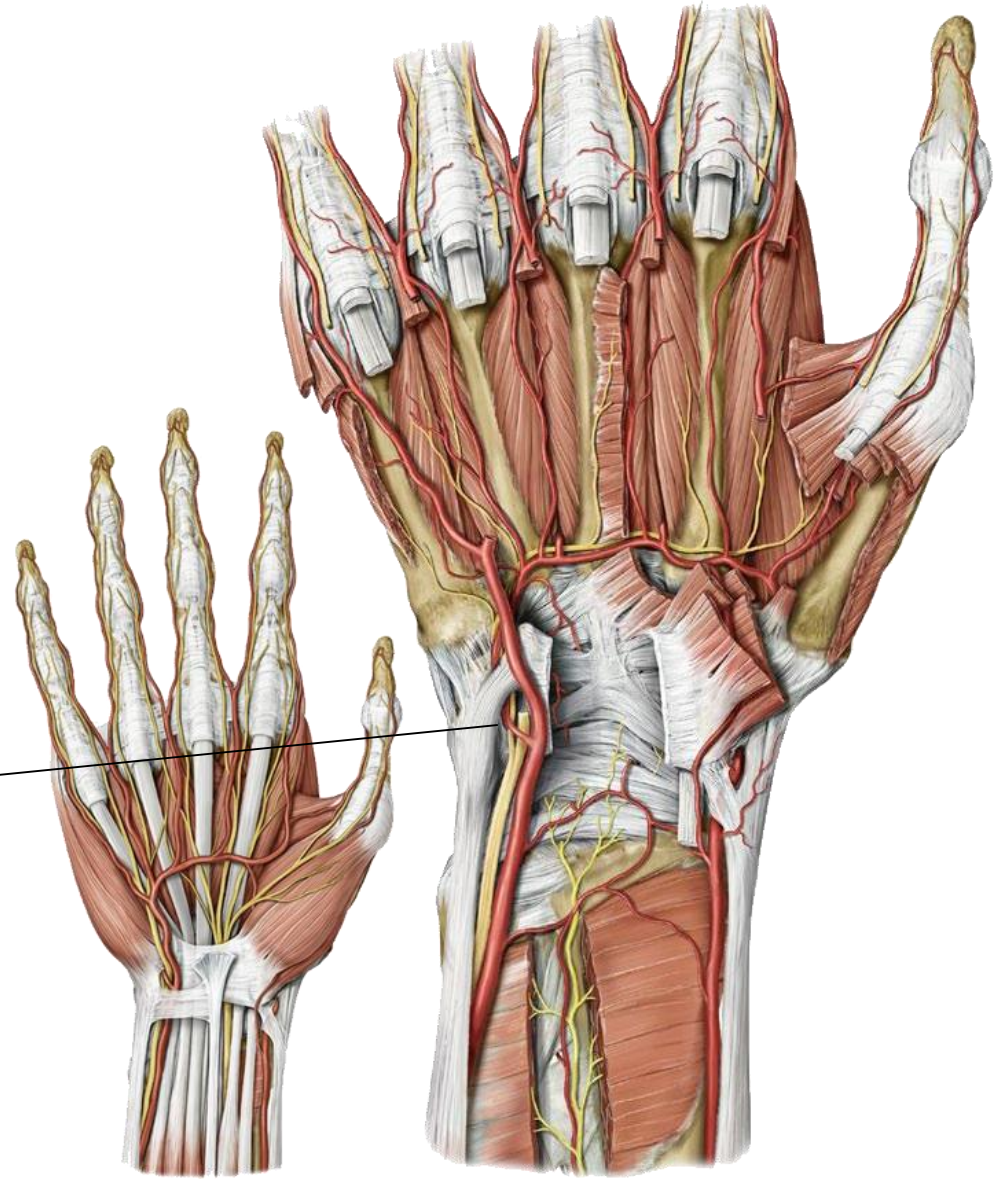
Anatomy forearm

- Entering the forearm between the two FCU-heads
- Dorsal cutaneous branch exits the main nerve ~9cm proximal to the wrist crease



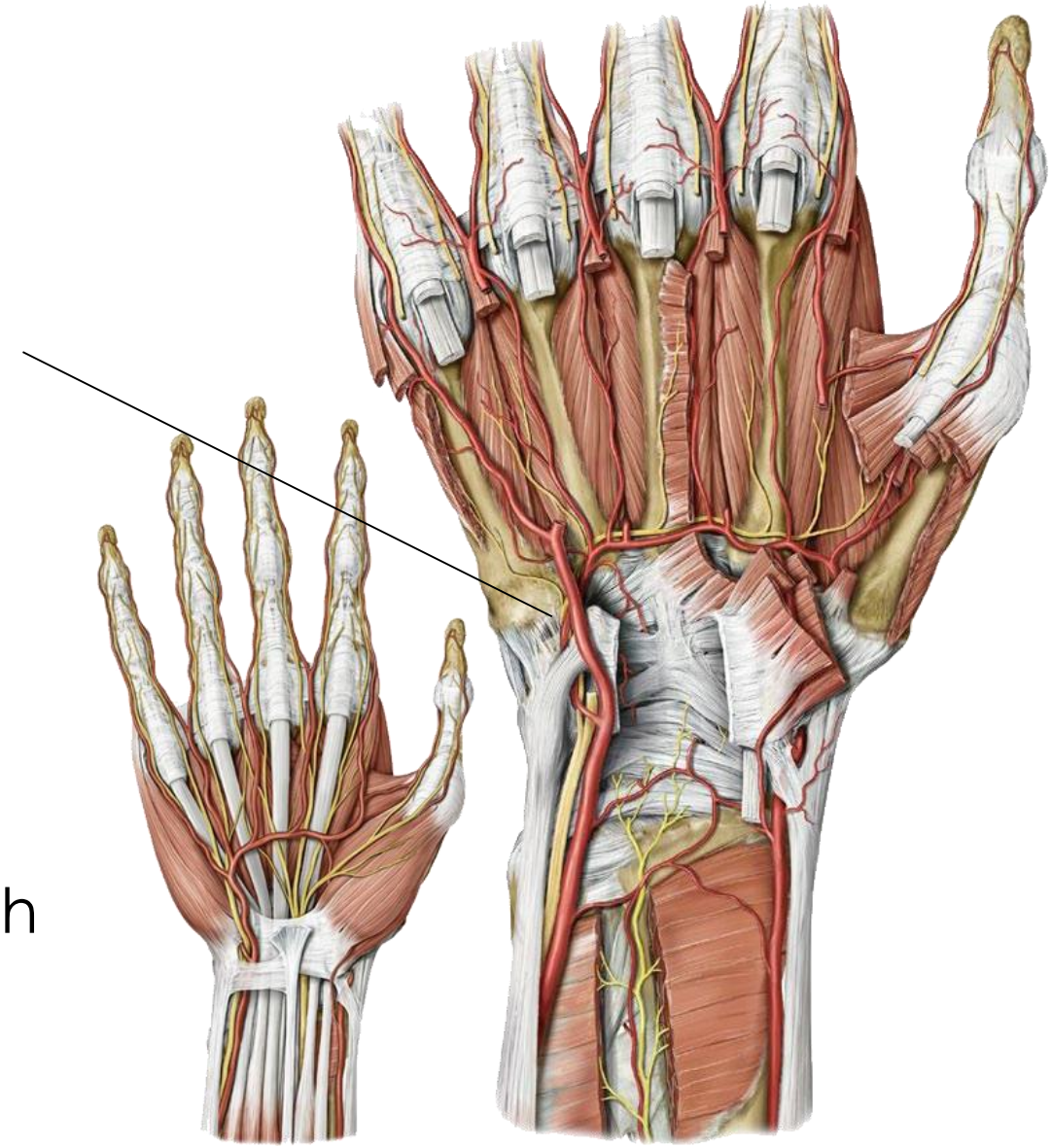
Anatomy wrist

- Entering the hand superficial to the tranversal carpal ligament
- Loge de Guyon
- Deep motor fascicles diverge from the superficial sensory fascicles just distal the pisiform along with the deep branch of the ulnar artery



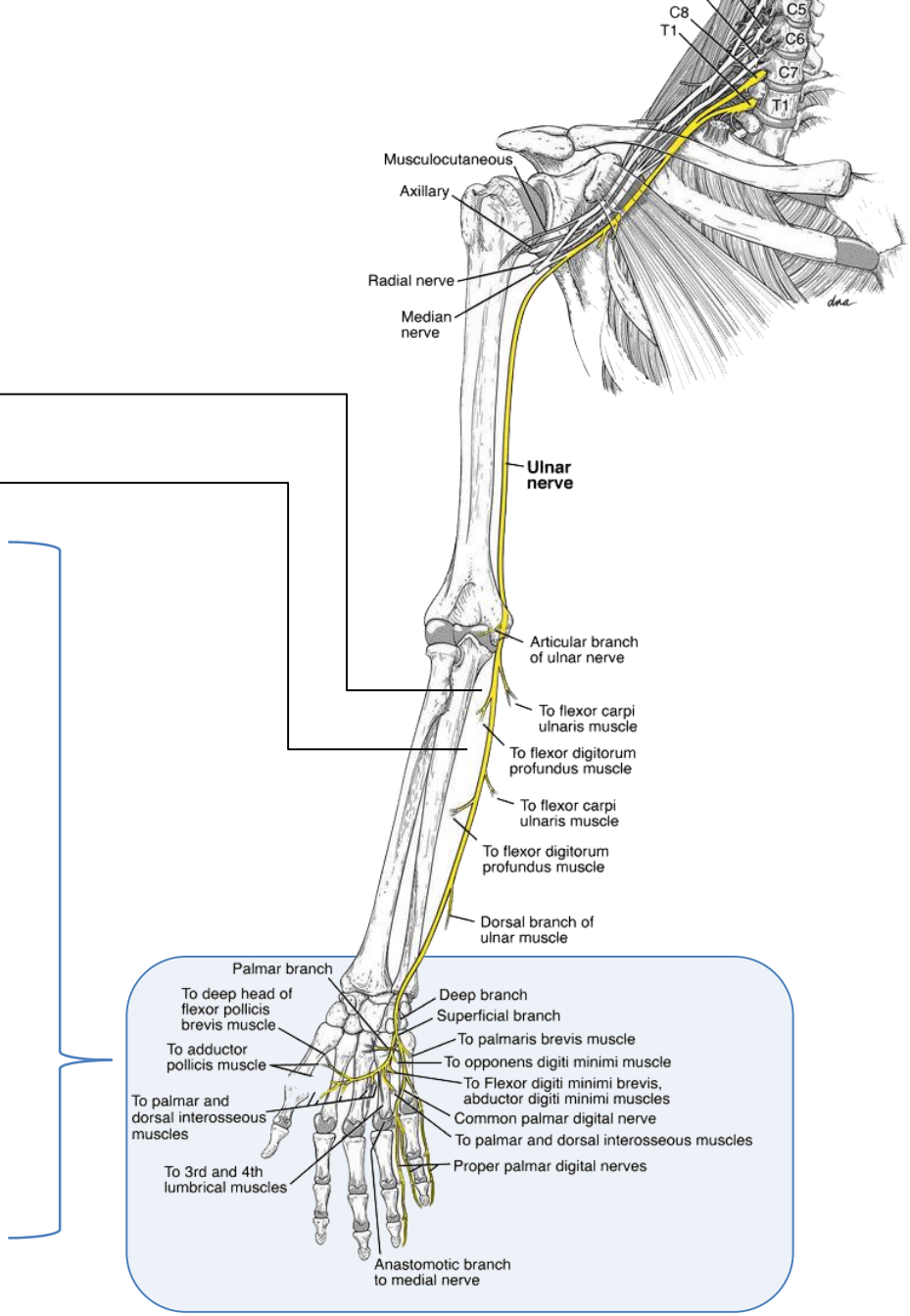
Anatomy hand

- The motor branch courses deep to the leading edge of the flexor digiti minimi around the hook of hamate
- Innervation of the intrinsics
- The superficial branch contains the sensible fascicles of the ½ 4th and the 5th finger



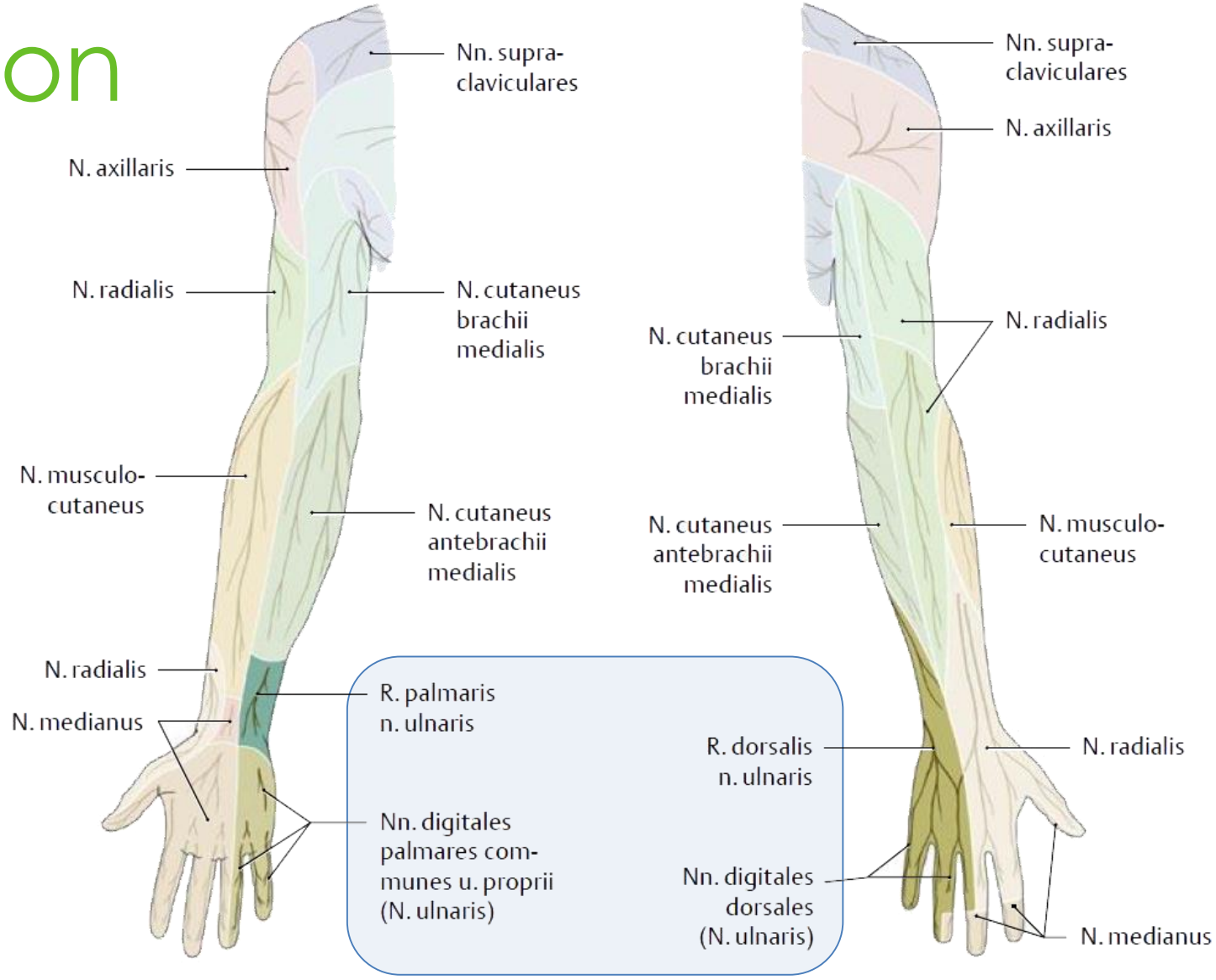
Motor innervation

- M. flexor carpi ulnaris
- M. flexor digitorum profundus (½)
- M. palmaris brevis
- M. flexor digiti minimi brevis
- M. abductor digiti mimimi
- M. opponens digiti minimi
- M. adductor pollicis
- M. flexor pollicis brevis (Caput profundum)
- Mm. interossei palmars et dorsales
- Mm. lumbricales III und IV



Sensory innervation

- Articular branch (cubital)
- Dorsal branch
- Ramus palmaris n. ulnaris
- Nn. digitales palmares (N8 – N10)



Spital Thurgau

CUBITAL TUNNEL SYNDROME

Definition

- Compression neuropathy of the ulnar nerve in the region of the elbow.

- Paresthesia in the ulnar nerve distribution and weakness or atrophy of the FCU, FDP 4/5, intrinsics.

Incidence

- Second most common compression neuropathy
- 1/13 the frequency of CTS
- 24.7 / 100‘000 (Province Siena)
- 2 : 1 (m : f)
- left > right (CTS right > left)

Etiology

- Trauma
- Arthritis
- Heterotropic ossifications
- Soft tissue masses
- Metabolic conditions (diabetes, alcoholism)
- External compression

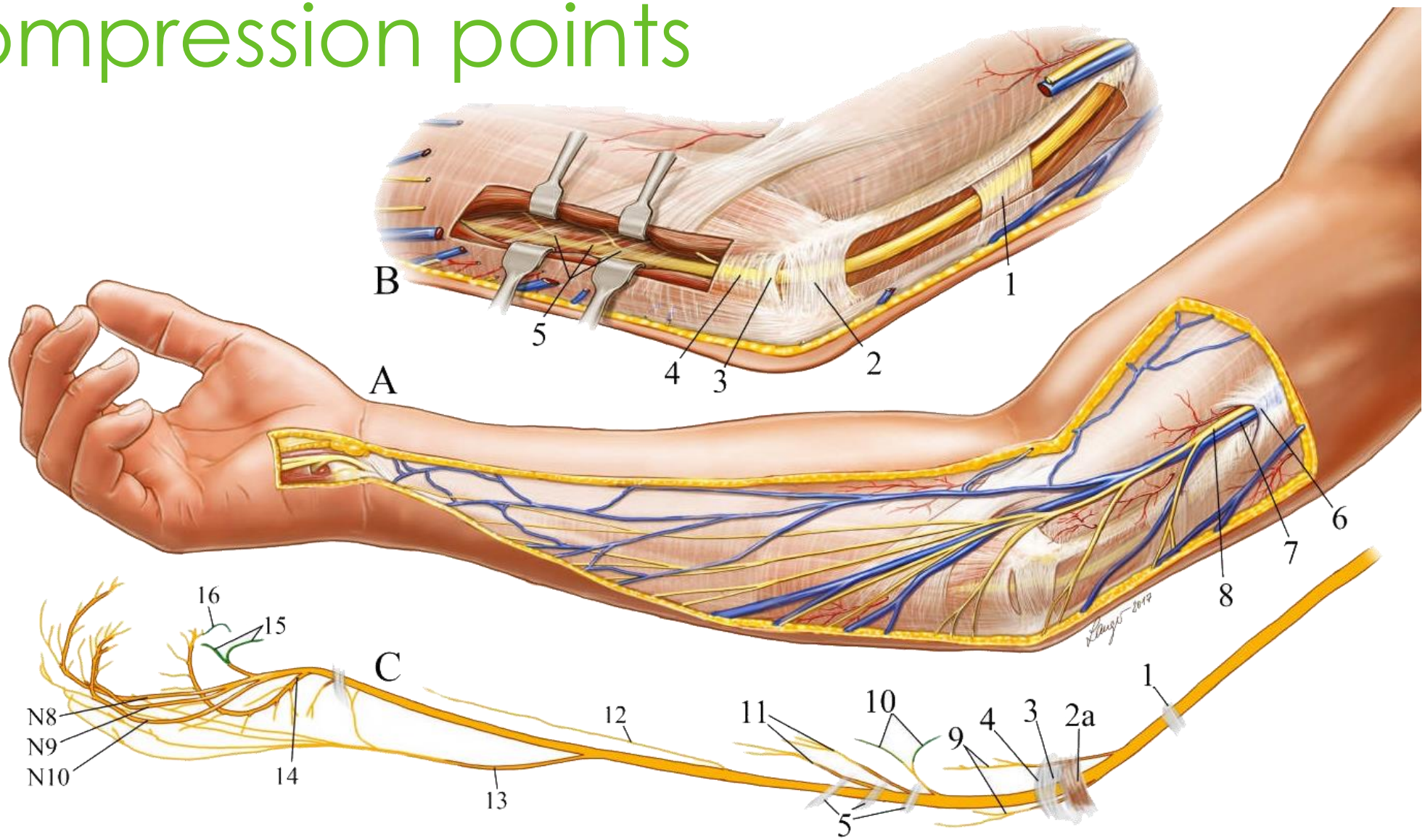
Congenital variations

- Cubitus valgus
- Anconeus epitrochlearis muscle (11%)
- Prominent medial triceps muscle
- Thick Osborne band
- (Sub-)luxation of the nerve (16%)

Symptoms

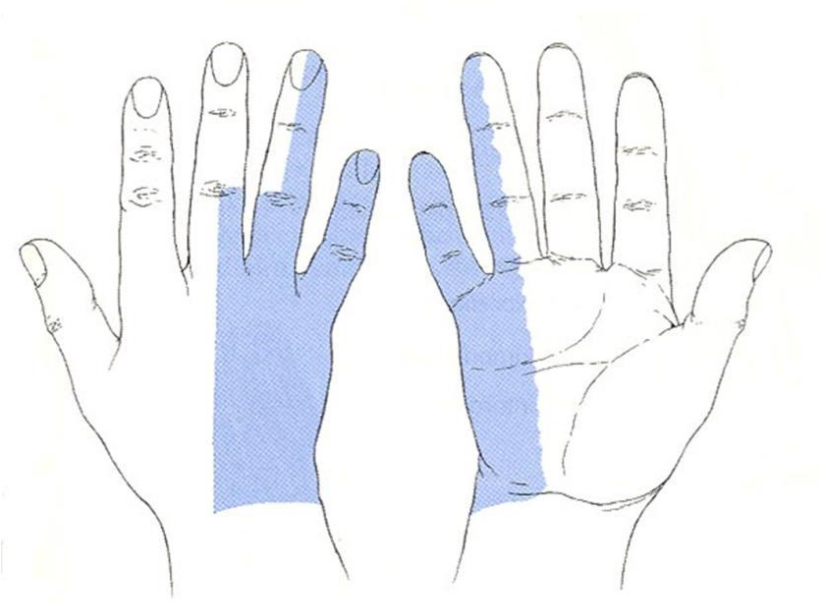
- Numbness and paresthesias
- Pain at the elbow (less common)
- Diminished sensation N8-10 (2PD > 5mm)
- Weakness of the FCU, FDP 4/5 and intrinsics
- Impaired dexterity

Compression points

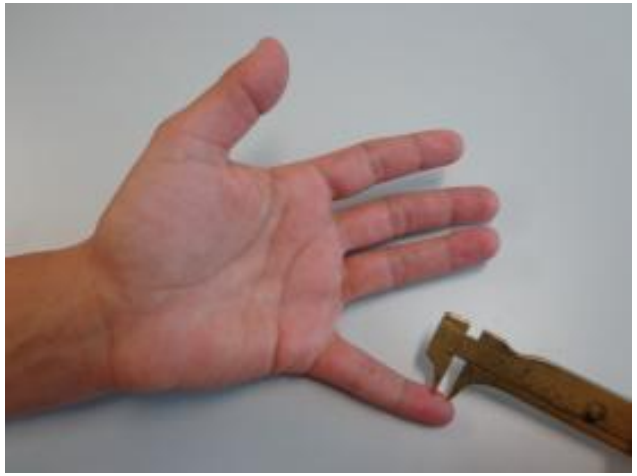


Clinical findings

- Decrease of the sensibility in Digitus IV and V and the ulnare edge of the hand



- Enhanced 2-point discrimination >5mm



Clinical findings

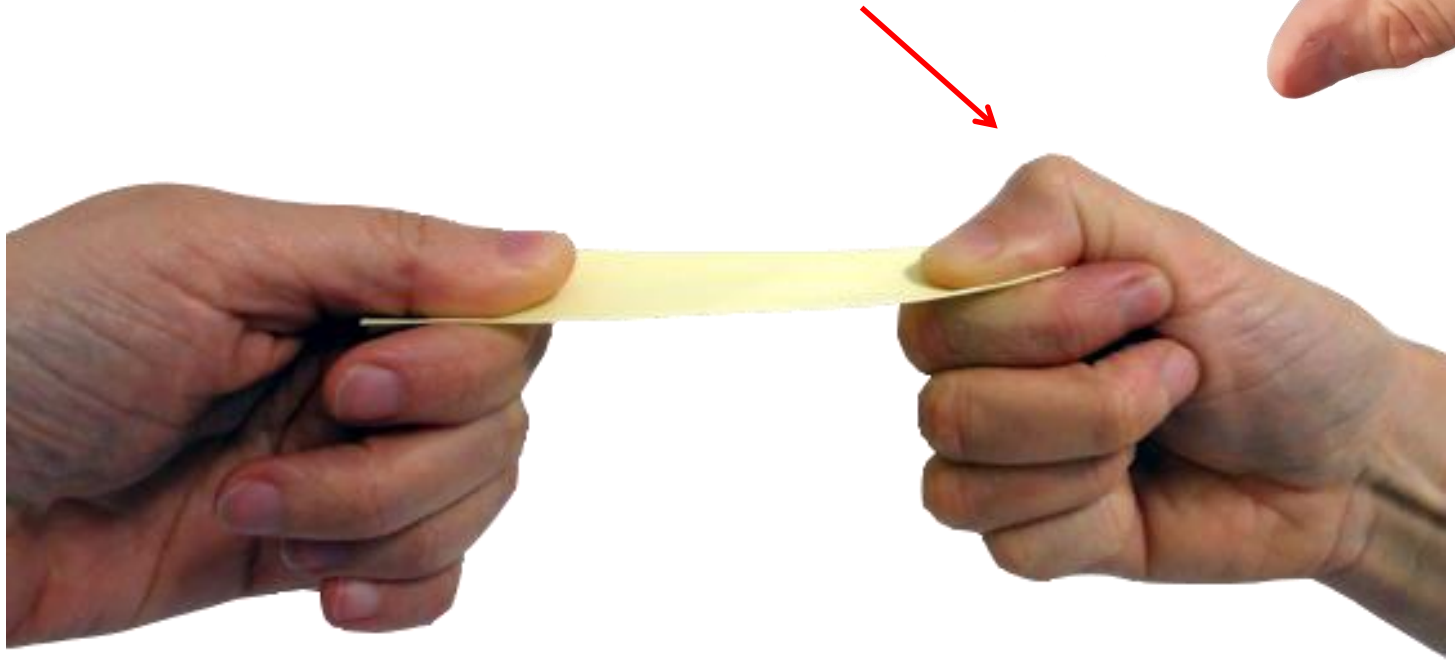
- Clawing of the ring- and small finger

- Intrinsic weakness

Clinical findings

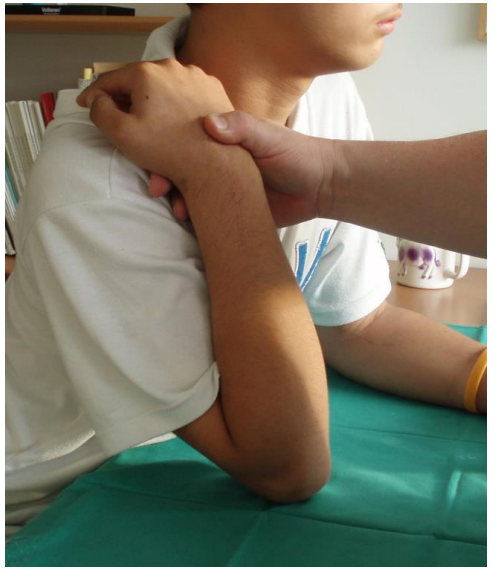
- Wartenberg‘s sign

- Froment sign



Provocation tests

- Tinel‘s sign over the sulcus ulnaris (sensitivity 70%)
- Elbow flexion test (sensitivity 75%)
- Pressure test (sensitivity 89%)
- Combined flexion-pressure test (sensitivity 98%)



Muscle function tests

- Flexor carpi ulnaris

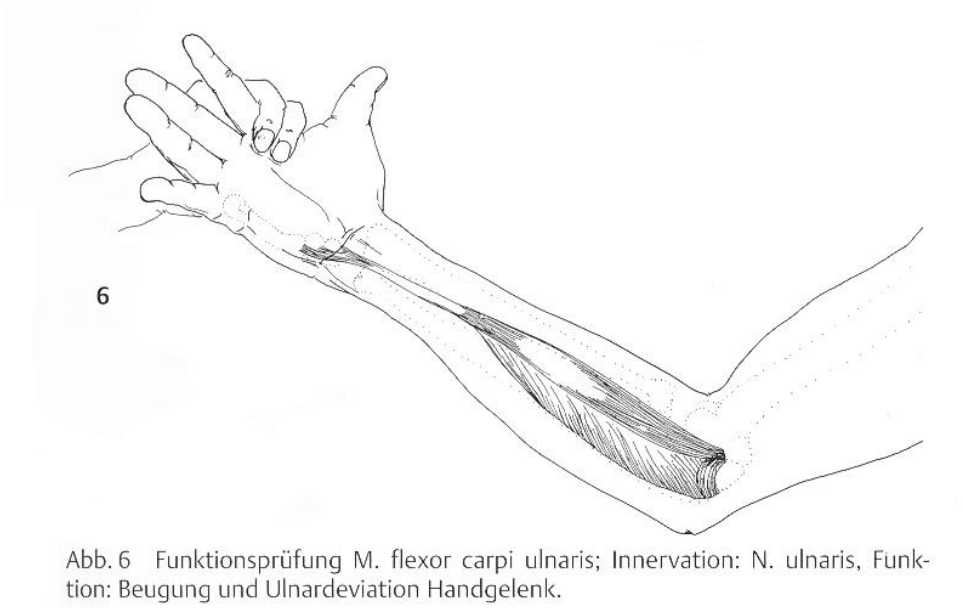
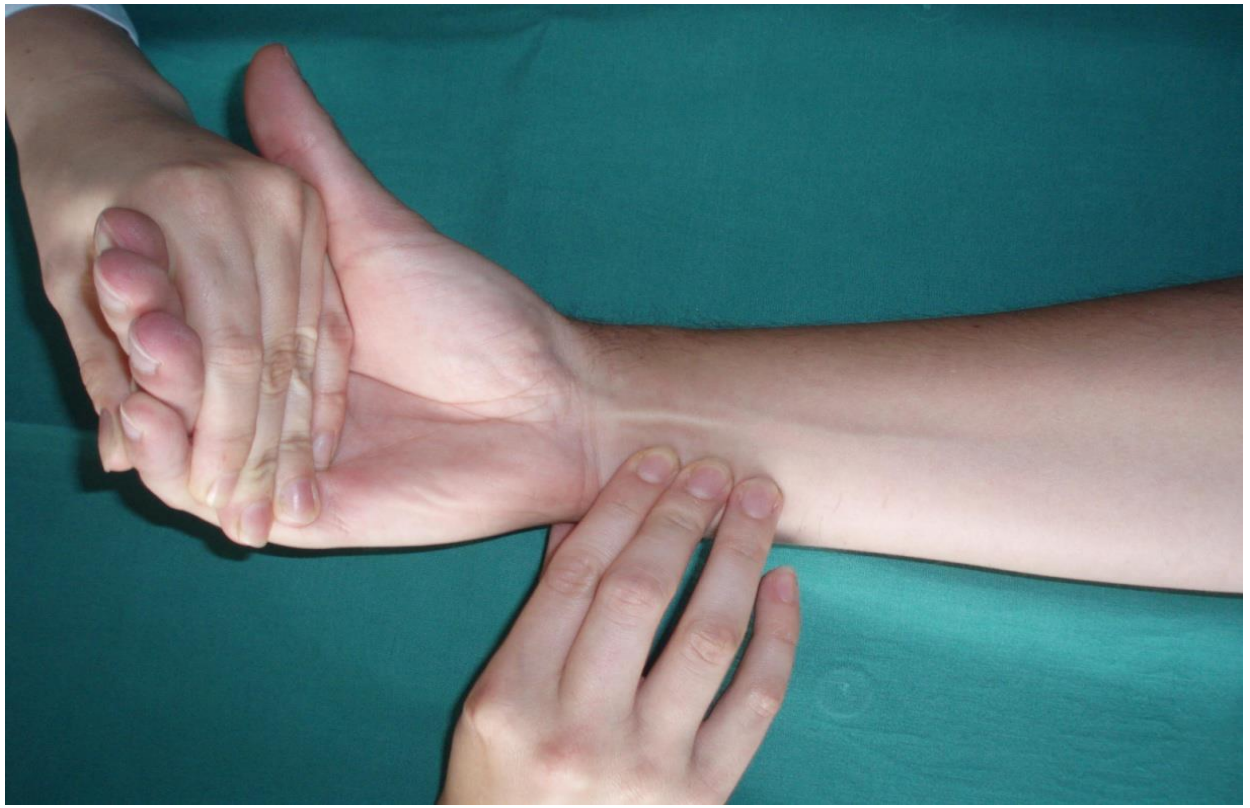


Abb. 6 Funktionsprüfung M. flexor carpi ulnaris; Innervation: N. ulnaris, Funktion: Beugung und Ulnardeviation Handgelenk.



Muscle function tests

- Flexor digitorum profundus IV & V

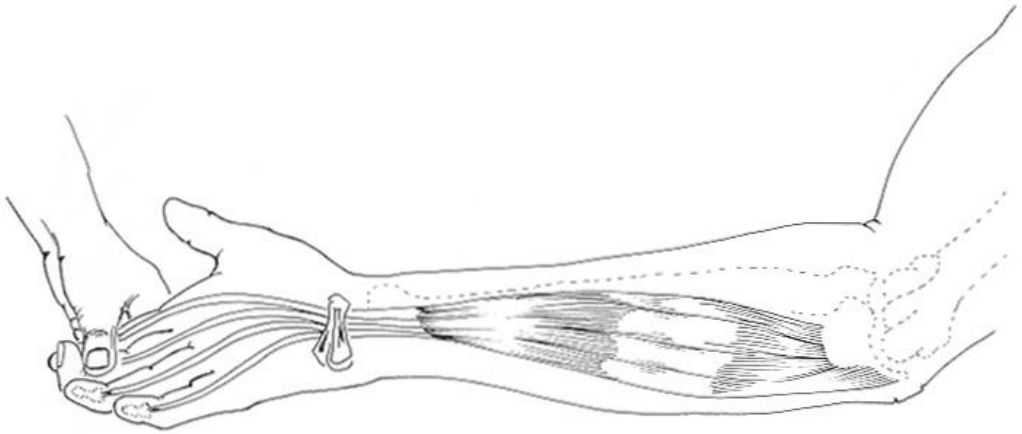


Abb. 10 Funktionsprüfung M. flexor digitorum profundus; Innervation: N. medianus (II, evtl. auch III), N. ulnaris (III – V), Funktion: Beugung Endgelenke III – V.

Muscle function tests

- Musculus adductor pollicis

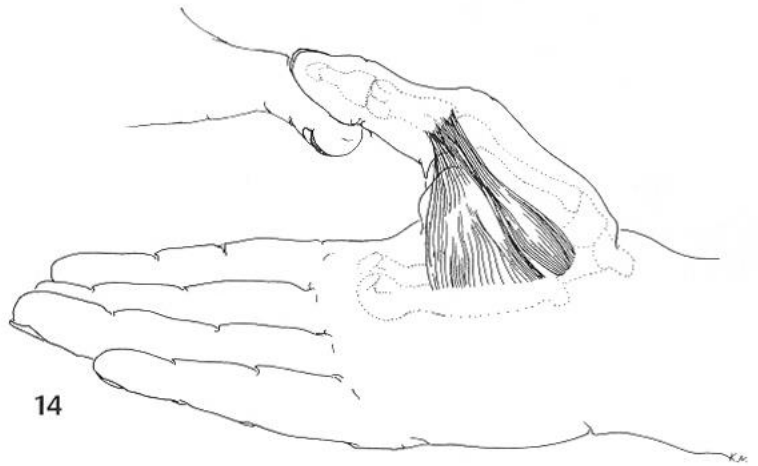
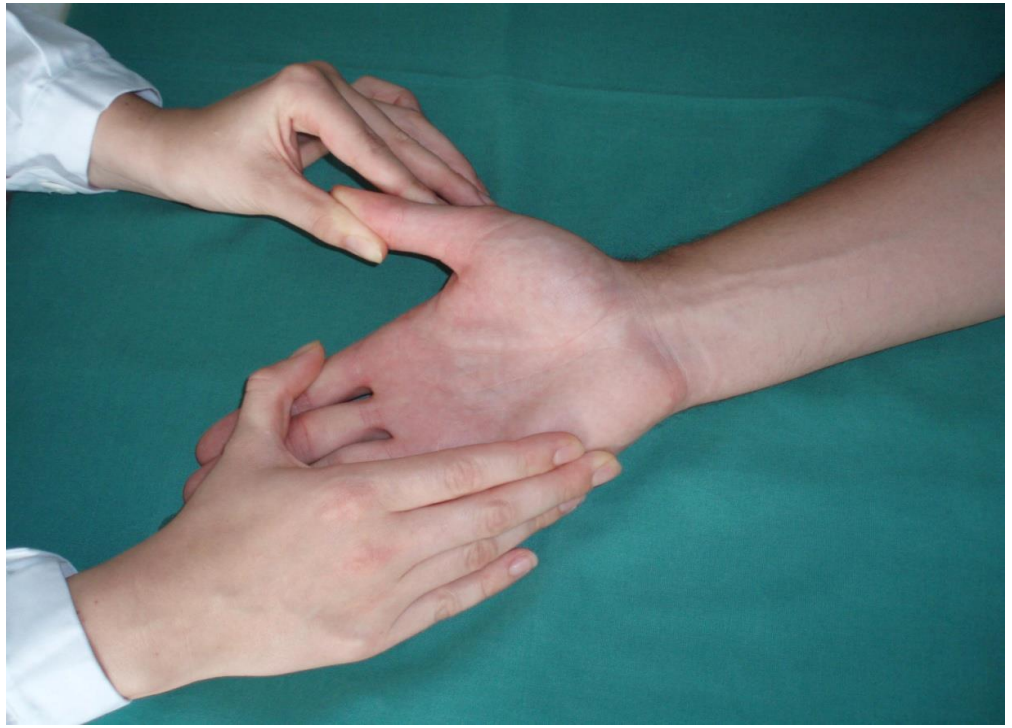


Abb. 14 Funktionsprüfung M. adductor pollicis; Innervation: N. ulnaris, Funktion: Adduktion Daumen (unterstützt Endgelenkstreckung).



Muscle function tests

- Musculus abductor digiti minimi

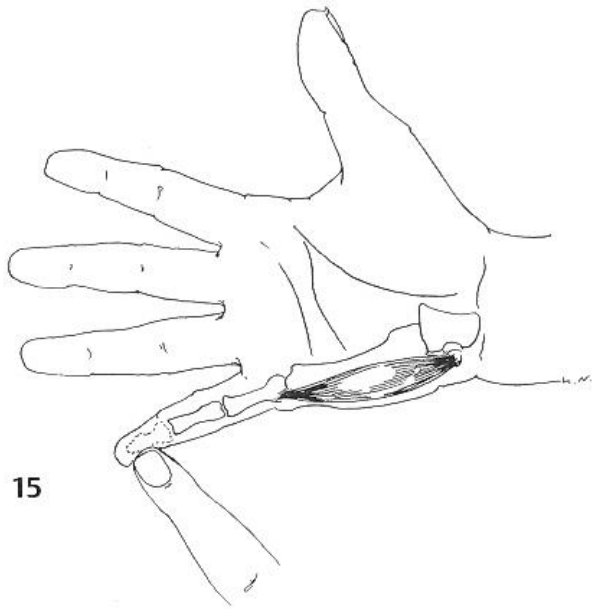
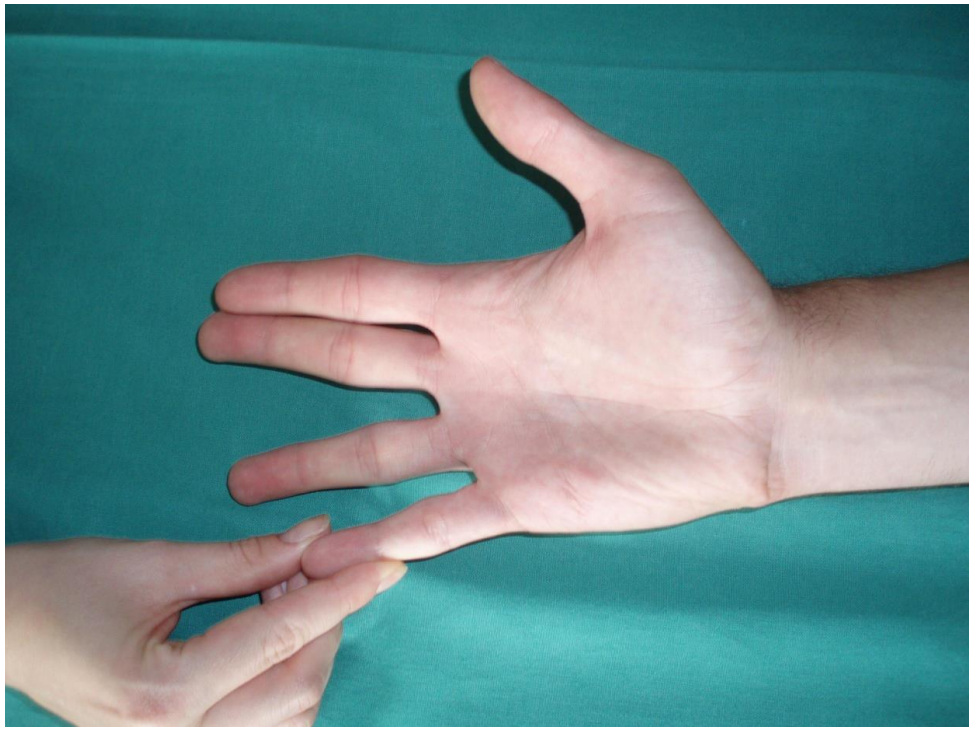
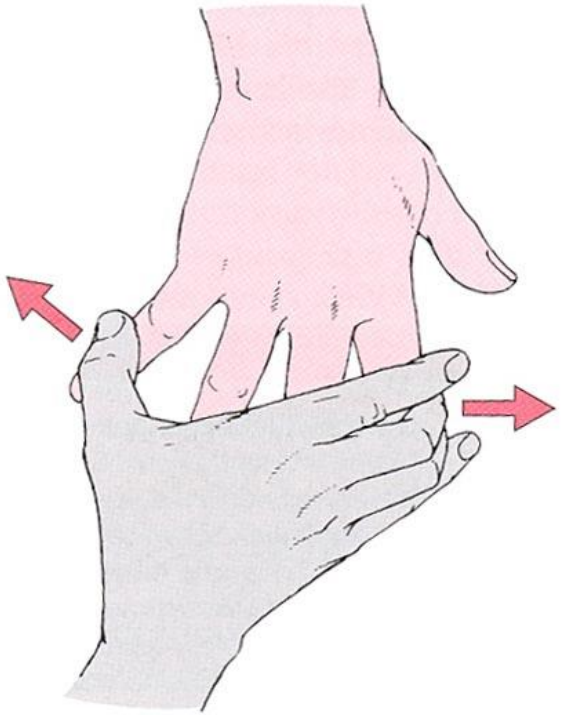


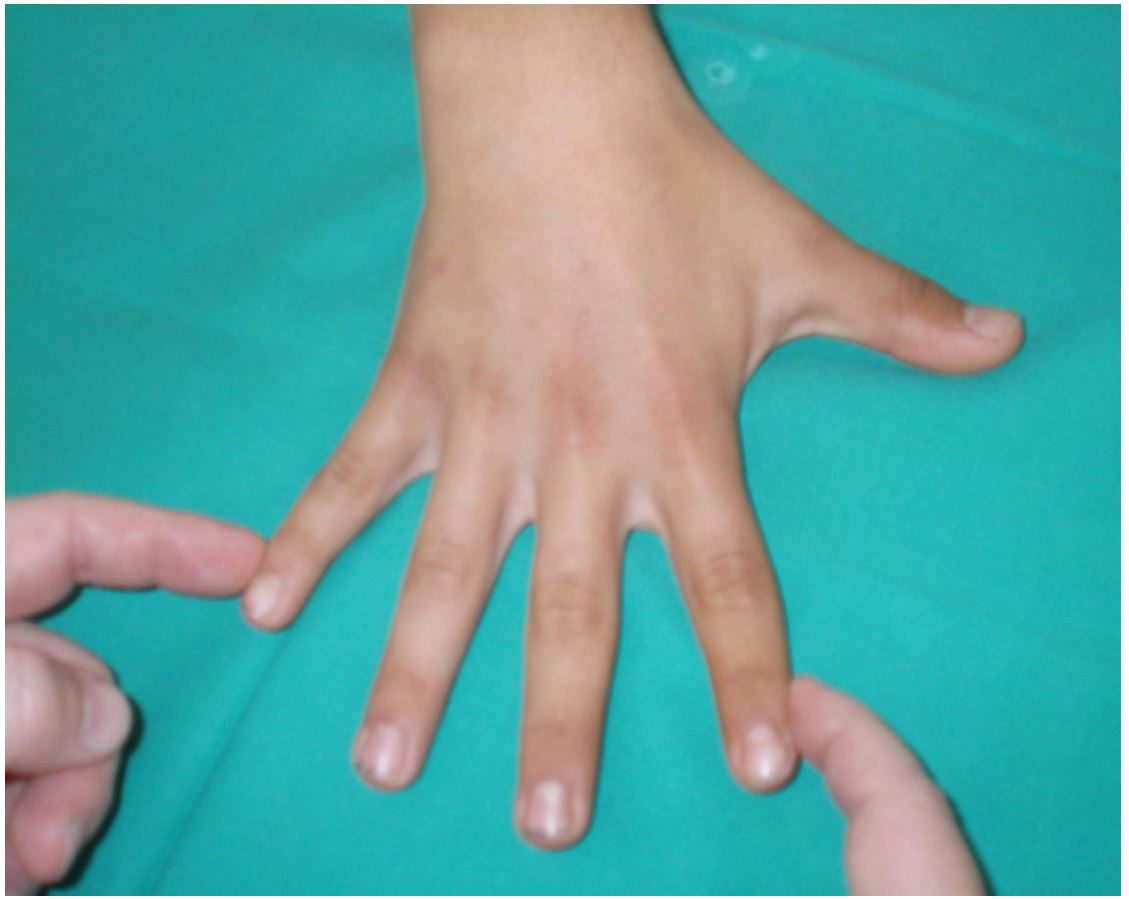
Abb. 15 Funktionsprüfung M. abductor digiti minimi; Innervation: N. ulnaris, Funktion: Abduktion Kleinfinger.



Muscle function tests

- Intrinsics





Dellon‘s classification

	Mild	Moderate	Severe
Sensory	Intermittent paresthesia	Intermittent paresthesia	Permanent paresthesia
Motor	Subjective weakness	Weakness	Palsy

Nerve studies

- Always recommended
- Confirmation of the diagnosis
- Extent of damage
- Other neuropathies (polyneuropathy, AML, etc.)
- Progress observation

Imaging

- **X-ray:** Elbow pa / lateral, (sulcus view)
- **CT:** exceptional cases
- **MRI:** rare (ganglia, aberrant muscles, masses)
- **Sono:** nerve diameter, ganglia, aberrant muscles, (sub-)luxation

Differential diagnosis

- High lesion of the ulnar nerve
  (Plexus damage, disc herniation, plexusneuritis)
- Neuropathy, Polyneuropathy
- Double crush

Conservative Treatment

- Activity modification
- Splint at night (30-45° Elbow flexion)
- Nerve gliding exercises
- Padding

Indications for surgical treatment

- Progressive complaints
- Motor deficits and muscular atrophy
- Lack of improvement in the course of conservative treatment

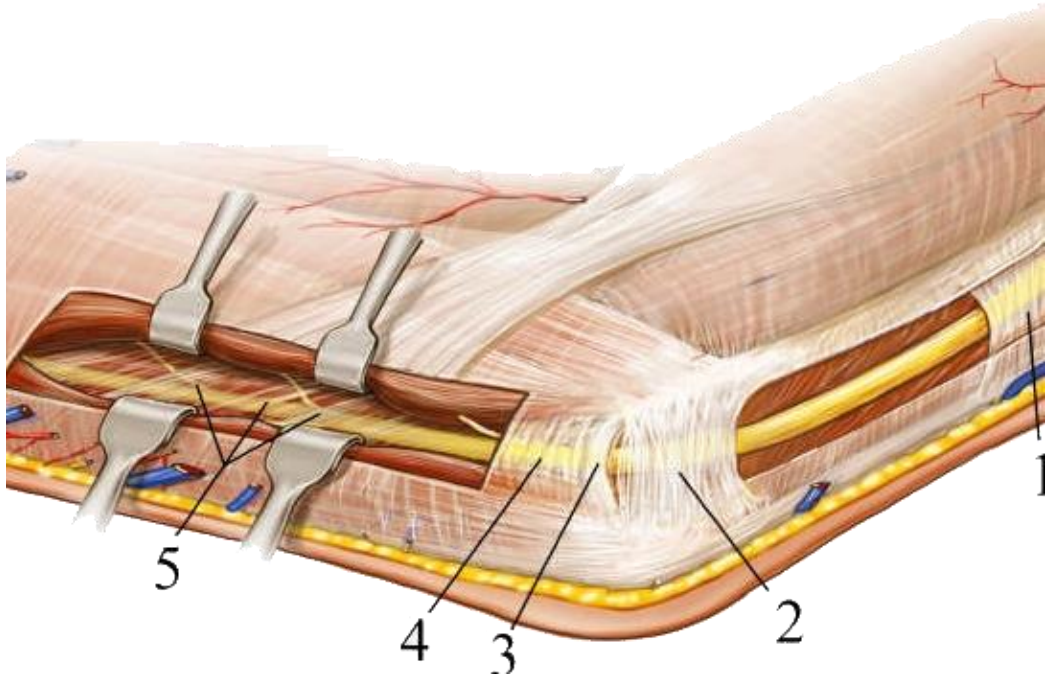
Operative options

- **In situ decompression**
  open (OCTuR) / endoscopic (ECTuR)

- **Transposition**
  subcutaneous, subfascial, intra- / submuscular

- **Medial epicondylectomy and transposition**

Endoscopic in situ decompression



Endoscopic in situ decompression

Endoscopic in situ decompression

Endoscopic in situ decompression

Advantages:

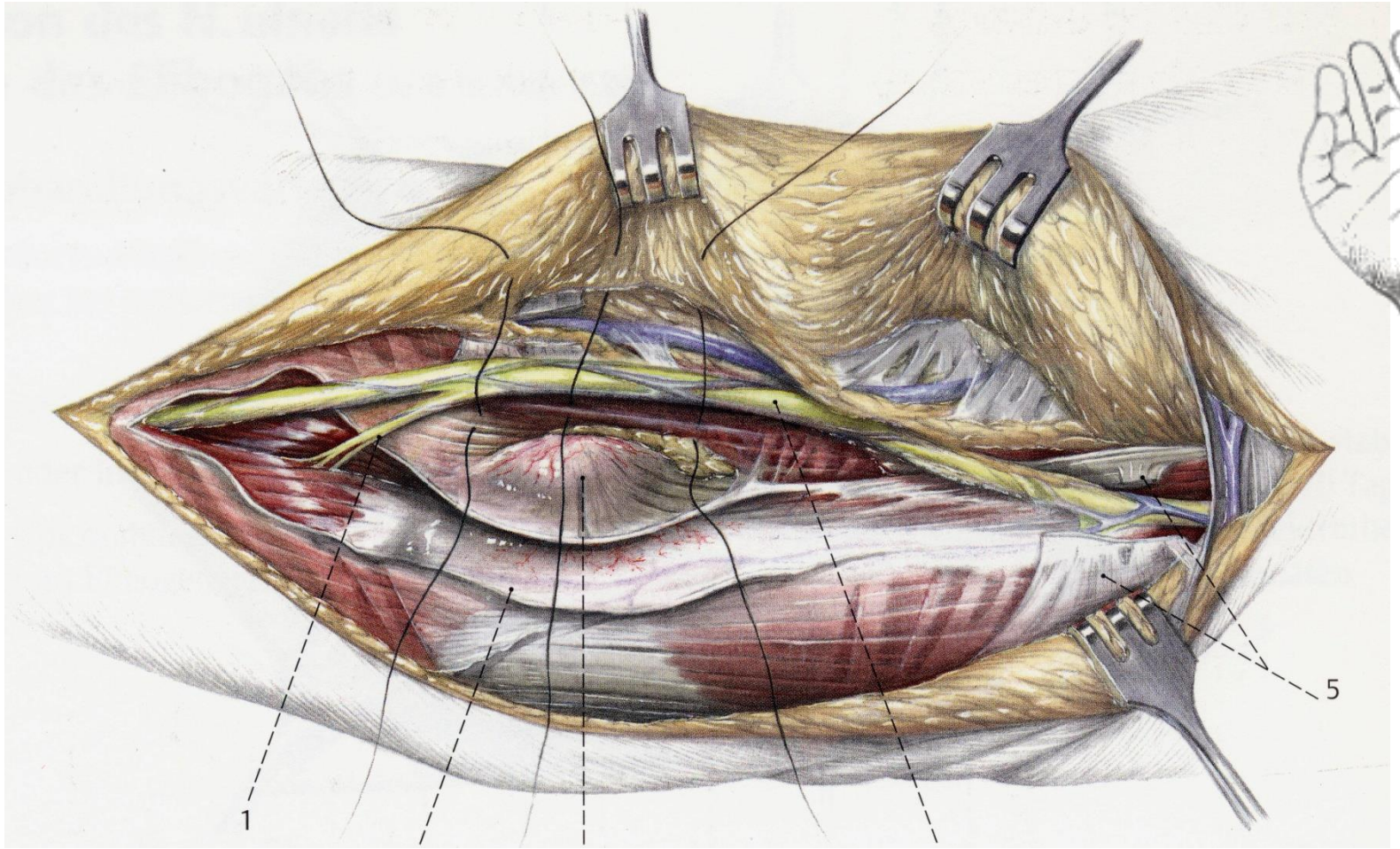
- Small incision to access
- Good overview
- Long distance decompression
- No compromise of the vascular supply of the nerve
- Less postoperative pain
- No need for postoperative immobilisation

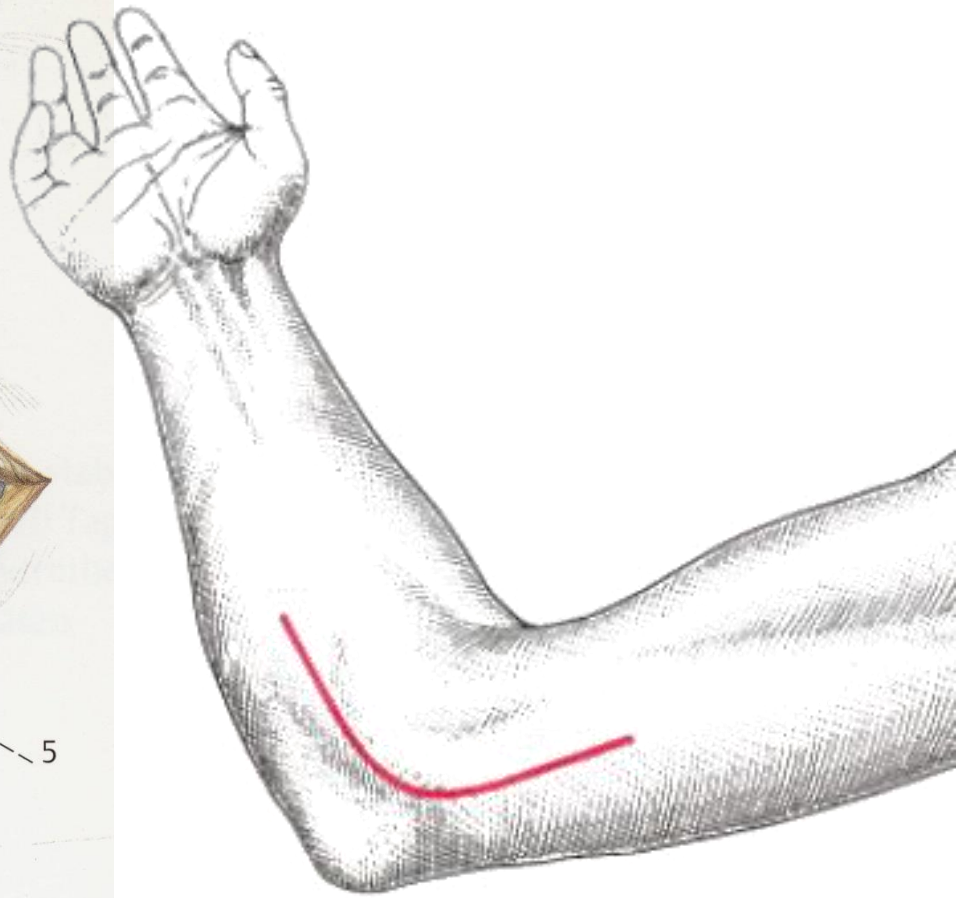
Endoscopic in situ decompression

Complications:

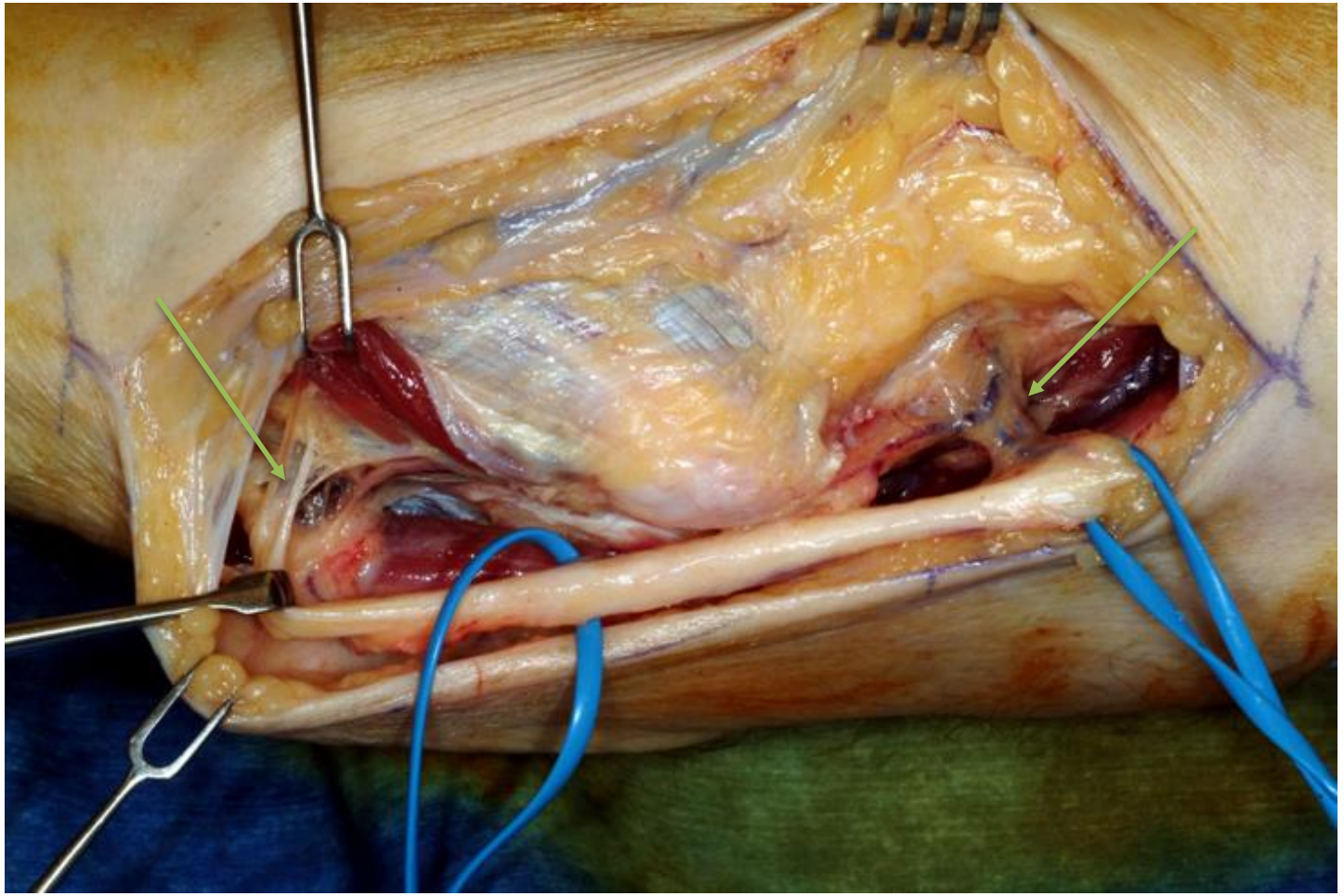
- Hematoma
- Sensory disturbances
  (MABC: medial antebrachial cutaneous nerve)
- Painful scar
- (Sub-)luxation

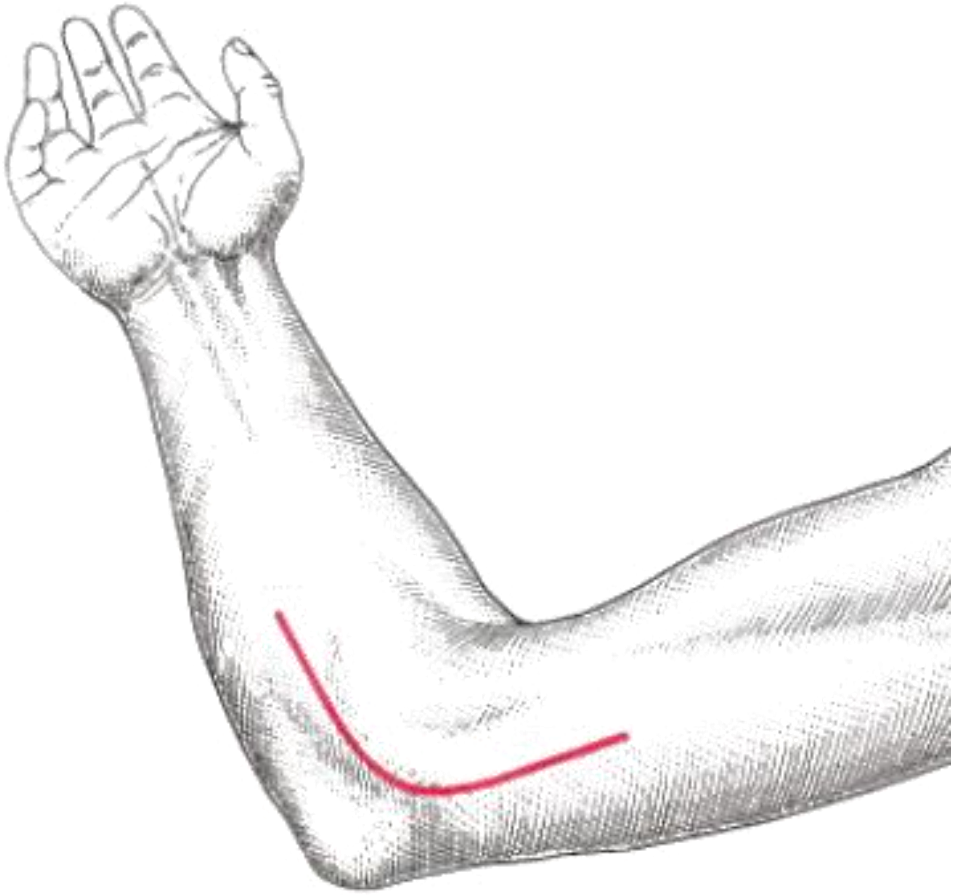
Subcutaneus anterior transposition



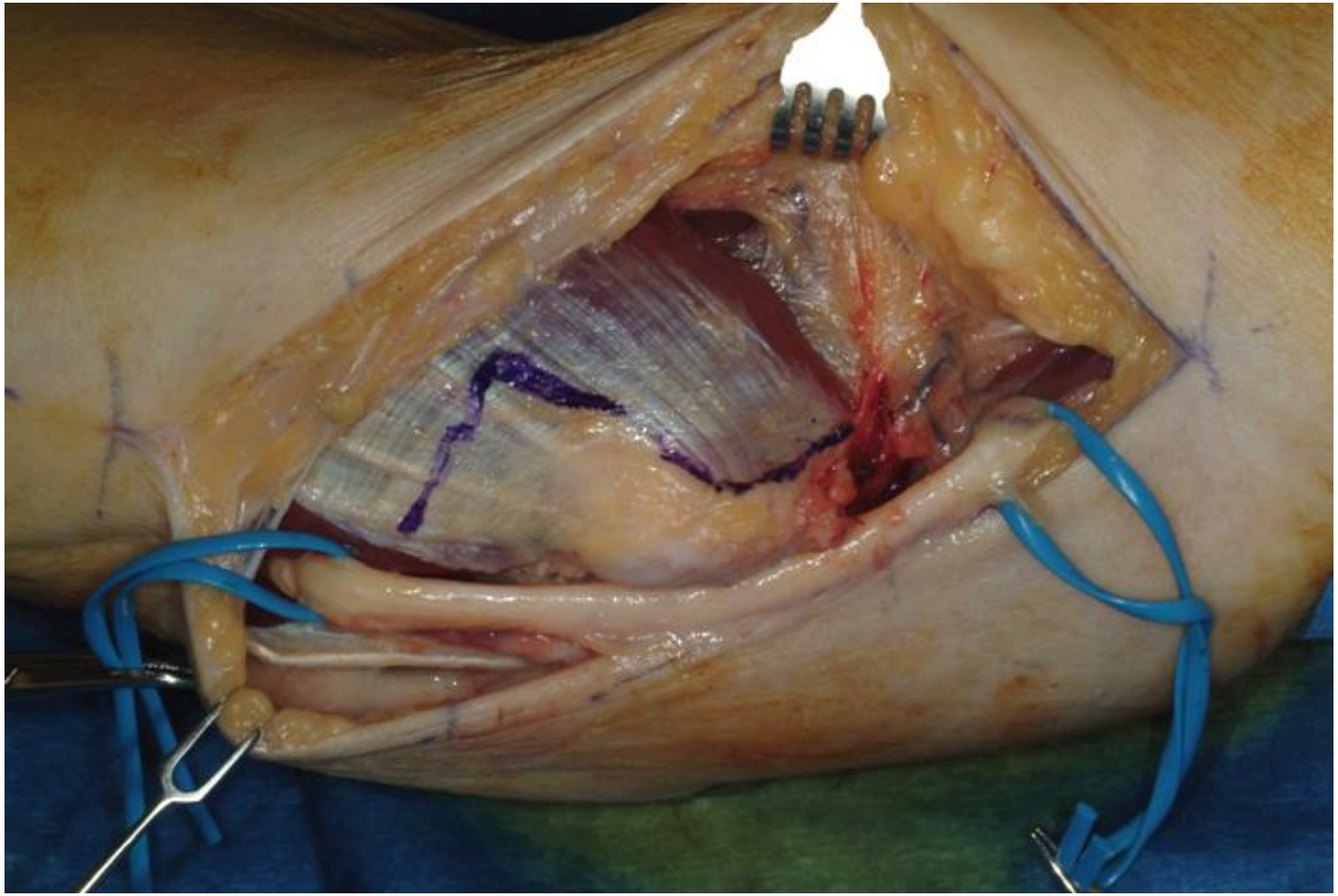


Submuscular transposition





Submuscular transposition



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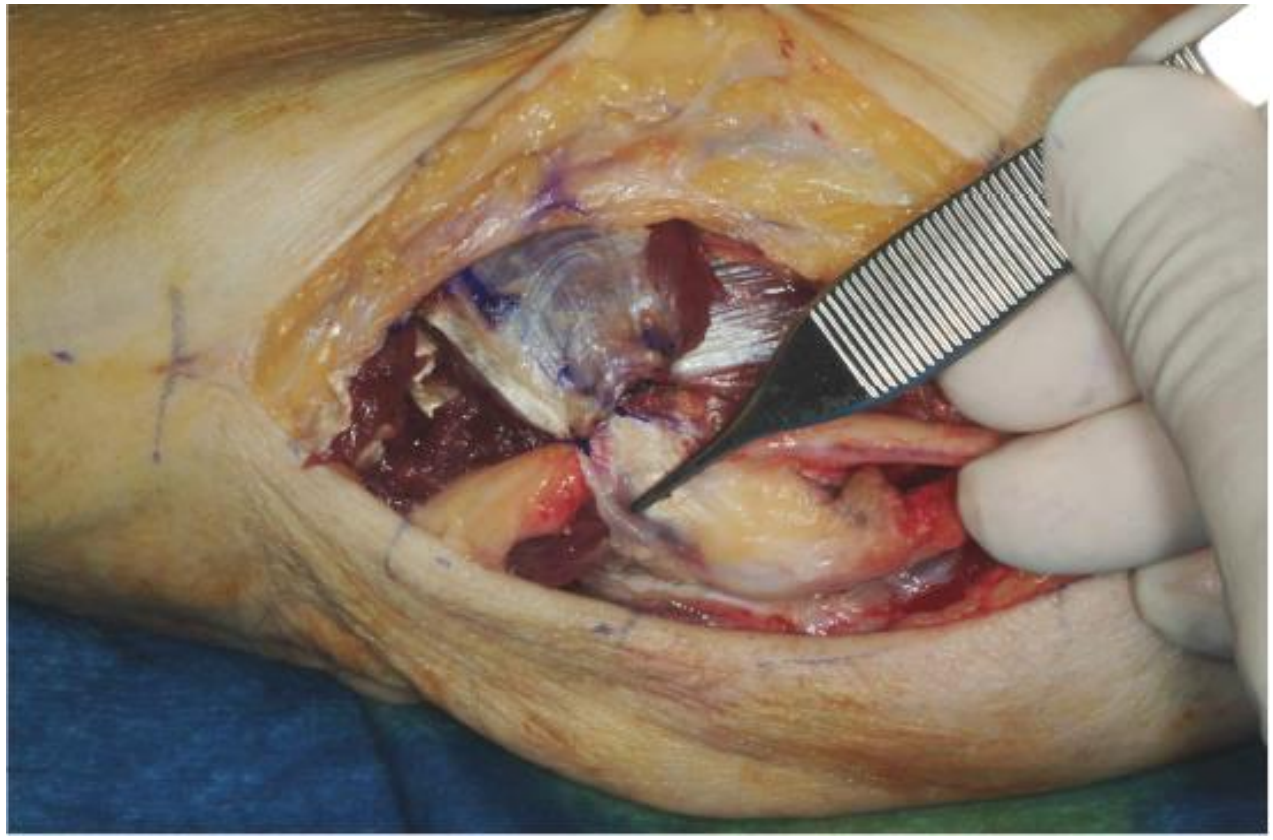


OCTuR versus ECTuR

- Similar outcomes with a high satisfaction rate for both (~80-90% good – excellent results)
- Similar reoperation rates
  1.6% endoscopic / 2.8% open technique
- Significantly higher complication rates in the open procedure (scar tenderness, elbow pain, MABC lesion)

Simple decompression vs. transposition

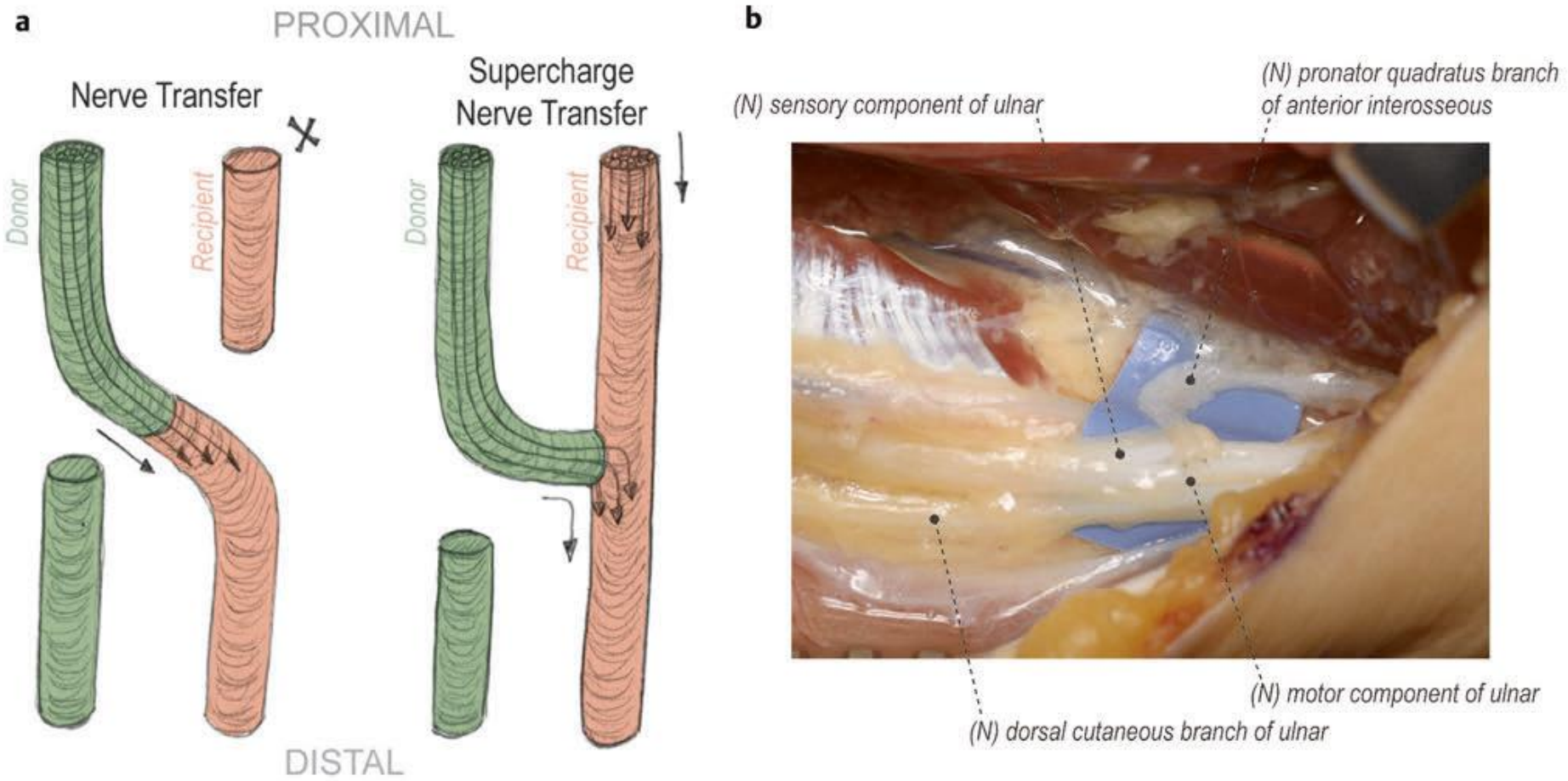
- No statistically significant difference in clinical outcomes or rate of revision surgery
- Significantly higher complication rates with the ulnar nerve transposition

Recommendations:

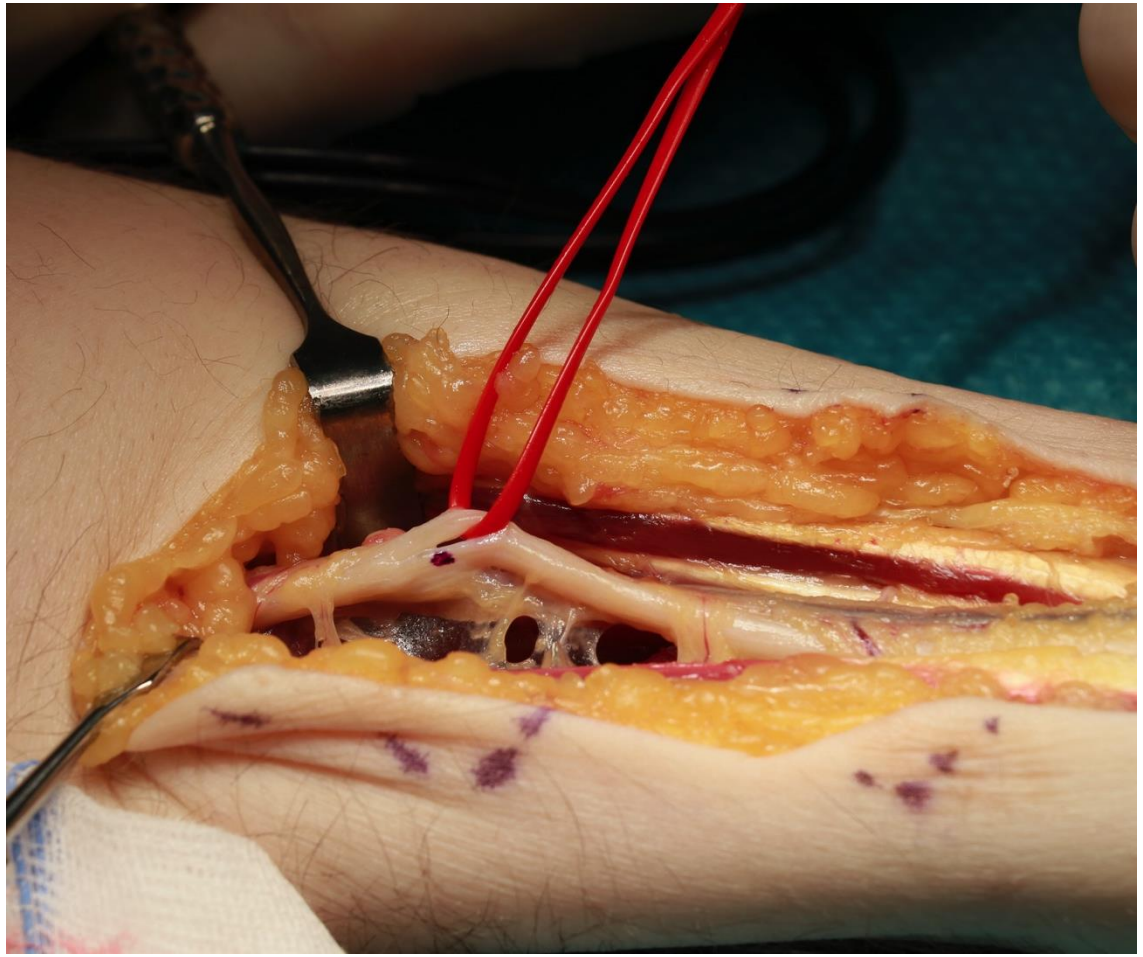
- **In situ decompression** as first line surgical treatment (subluxation is not a contraindication)

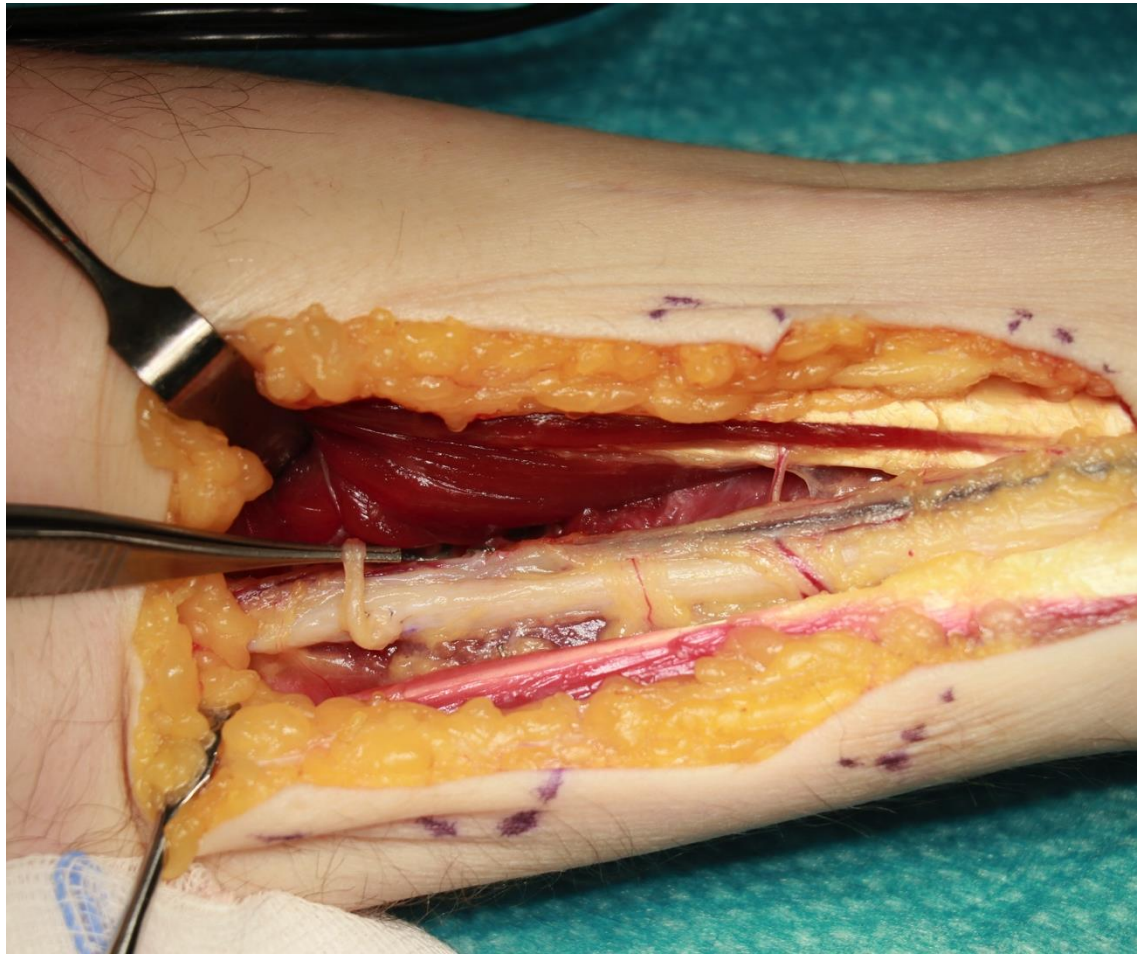
- **Transposition** of the ulnar nerve in:
  - Severe posttraumatic or degenerative findings
  - Painful luxation of the ulnar nerve
  - Pronounced cicatritial changes (posttraumatic / postoperative)

Supercharge nerve transfer



Supercharge nerve transfer





Spital Thurgau

ULNAR TUNNEL SYNDROME
(GUYON CANAL SYNDROME)

Definition

- Compression neuropathy of the ulnar nerve in the Guyon canal

- Motor and/or sensory deficits according to the compression site (zone I – III)

- 1861: Guyon first described the anatomical space

Incidence

- Second most common compression neuropathy of the ulnar nerve
- 1/20 the frequency of cubital tunnel syndrome
- 1-2 / 100‘000 / year

Etiology

Atraumatic

- Ganglion cyst
- Soft tissue masses (giant cell tumor, lipoma, schwannoma)
- Vascular malformations
- Atypical muscles

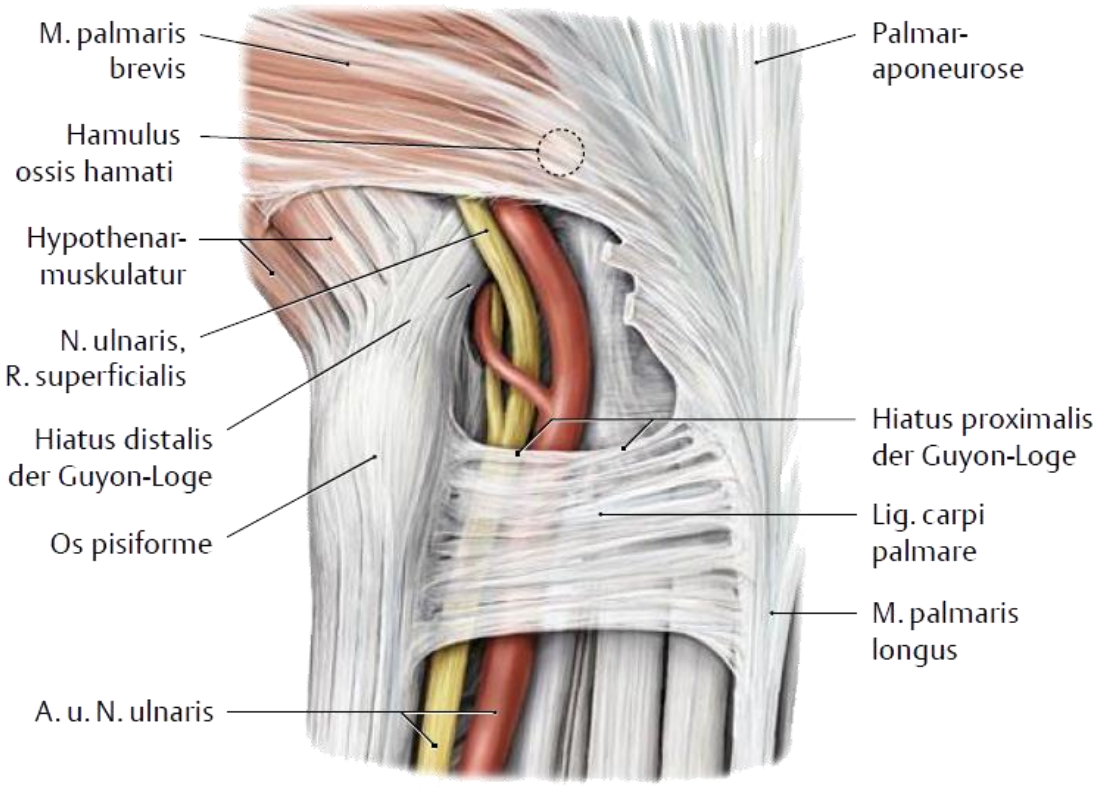
Traumatic

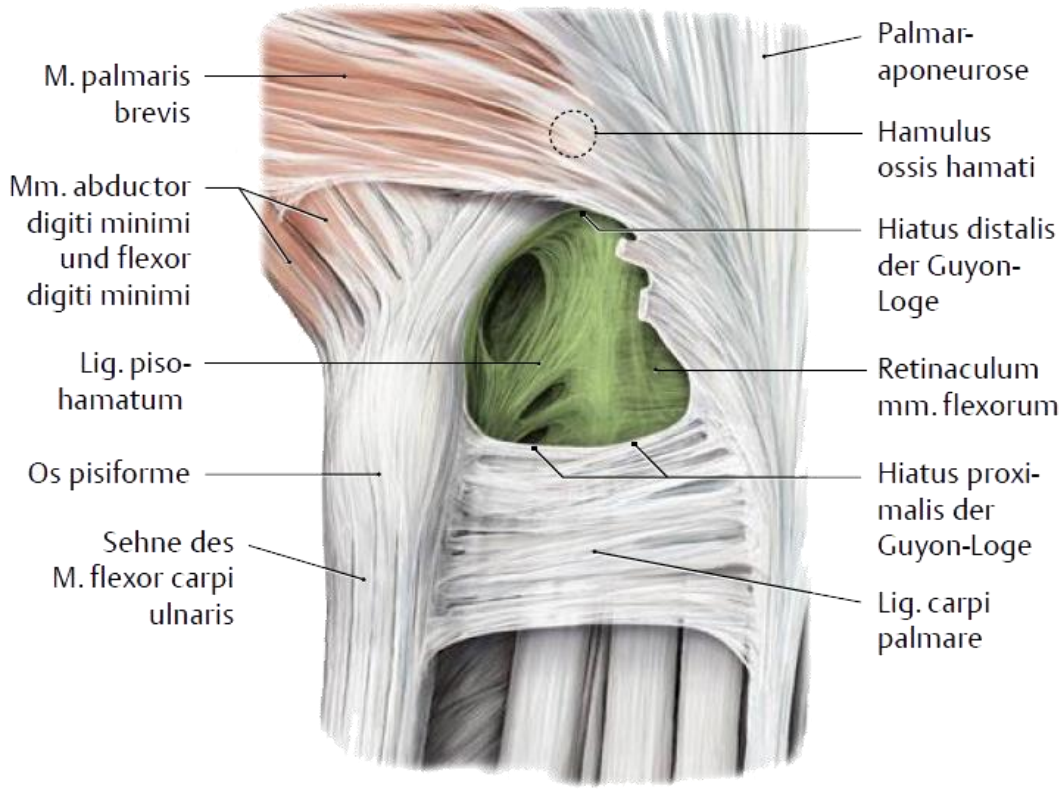
- Hook of hamate fracture / nonunion
- Acute or repetitive trauma (hypothenar hammer syndrome)
- Carpal fracture dislocations
- Radius fracture

Symptoms

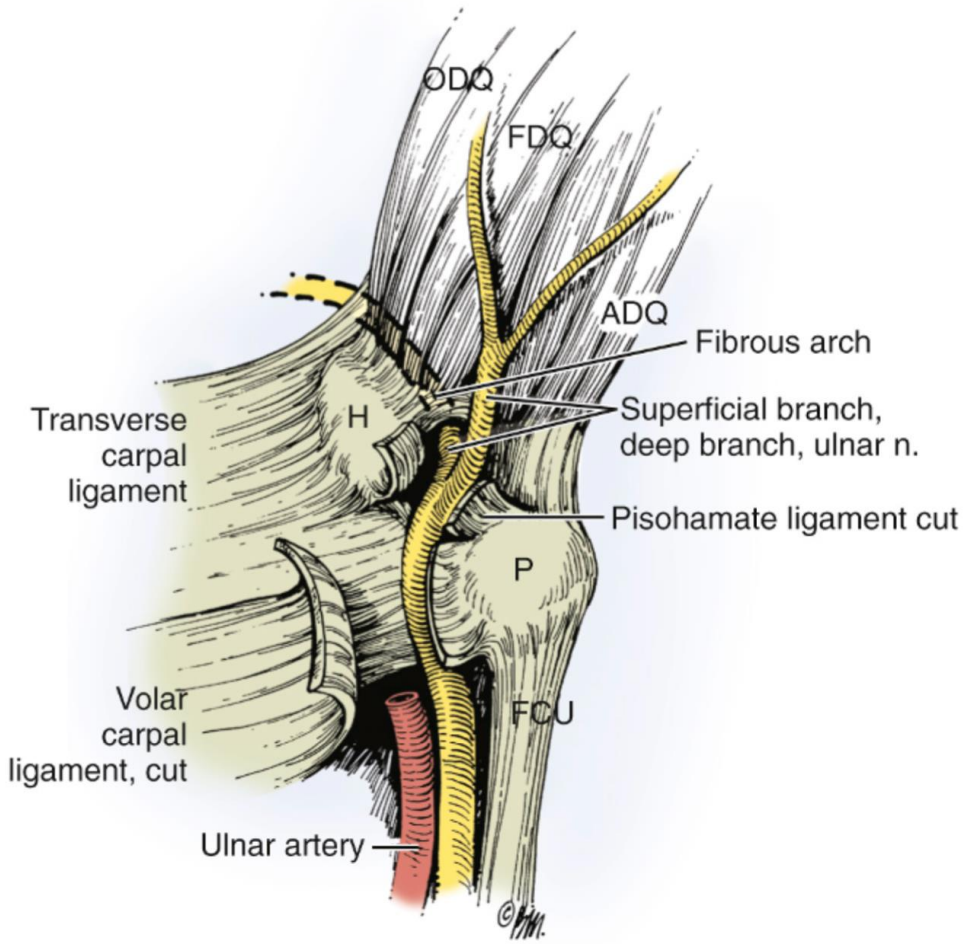
- Pain, numbness and paresthesias
- Diminished sensation N8-10 (2PD > 5mm)
- Weakness of the intrinsic muscles of the hand
- Ulnar claw deformity „Duchenne sign“
- Impaired dexterity
- Awaking at night because of pain and paresthesias

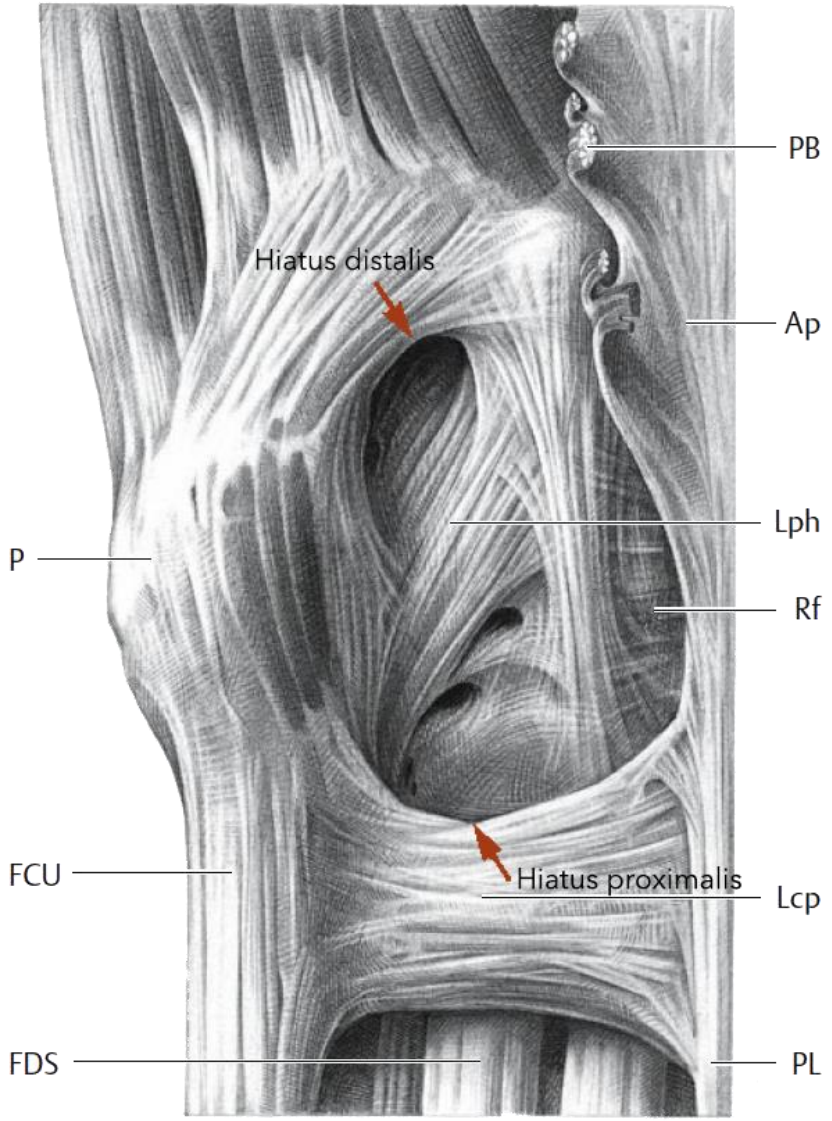
Anatomy


M. palmaris brevis
Hamulus ossis hamati
Hypothenar-muskulatur
N. ulnaris, R. superficialis
Hiatus distalis der Guyon-Loge
Os pisiforme
A. u. N. ulnaris
Palmar-aponeurose
Hiatus proximalis der Guyon-Loge
Lig. carpi palmare
M. palmaris longus


M. palmaris brevis
Mm. abductor digiti minimi und flexor digiti minimi
Lig. piso-hamatum
Os pisiforme
Sehne des M. flexor carpi ulnaris
Palmar-aponeurose
Hamulus ossis hamati
Hiatus distalis der Guyon-Loge
Retinaculum mm. flexorum
Hiatus proxi-malis der Guyon-Loge
Lig. carpi palmare

Anatomy


ODQ
FDQ
ADQ
Fibrous arch
Transverse carpal ligament
H
Superficial branch, deep branch, ulnar n.
Pisohamate ligament cut
P
Volar carpal ligament, cut
FCU
Ulnar artery


PB
Hiatus distalis
Ap
Lph
P
Rf
FCU
Hiatus proximalis
Lcp
FDS
PL

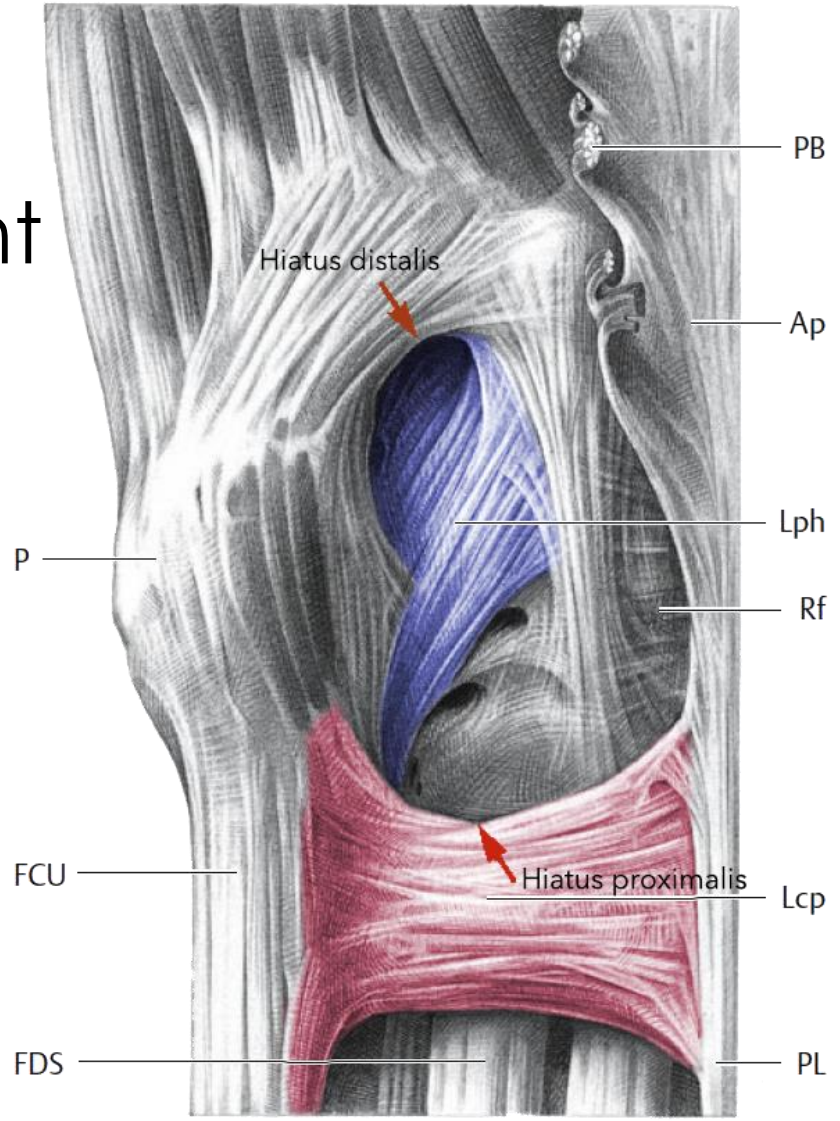
Anatomy

Roof: palmar carpal ligament

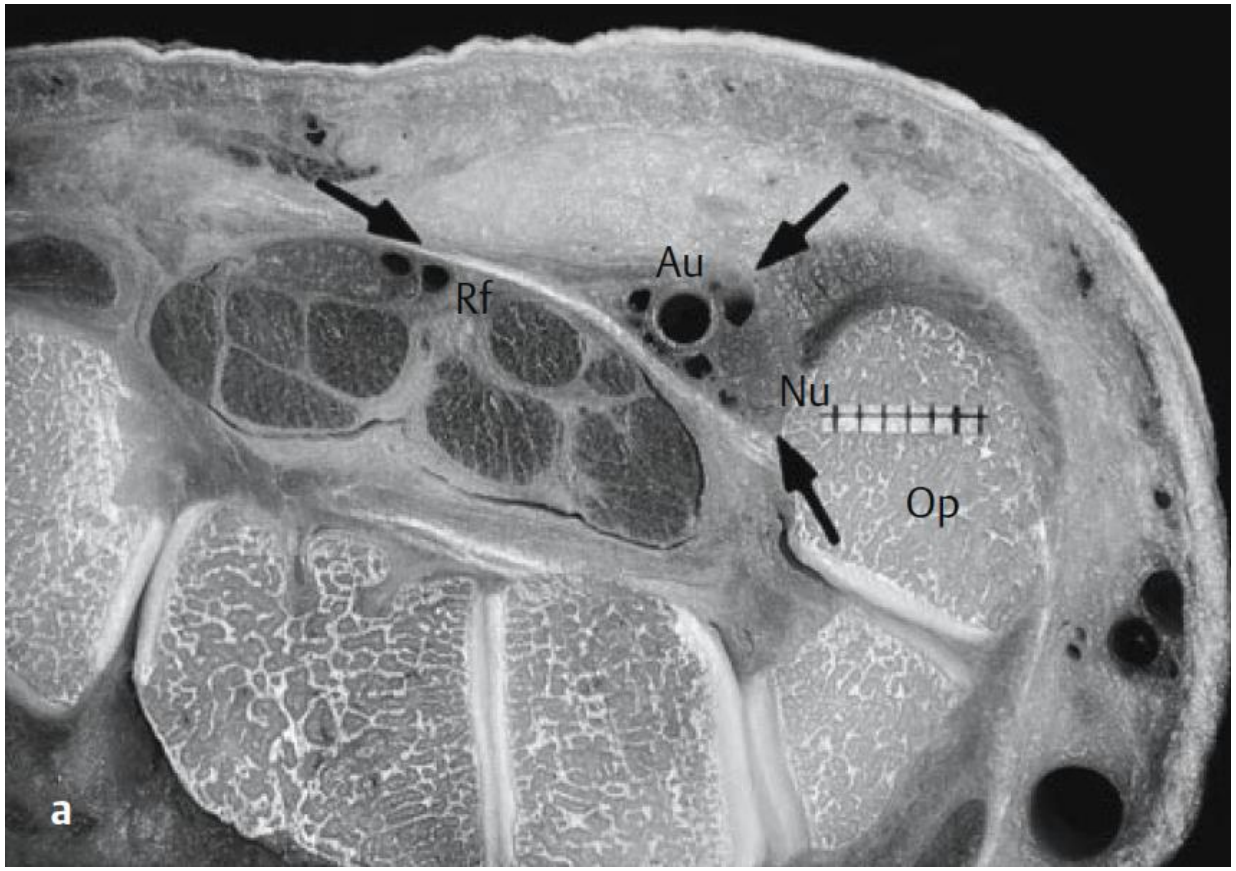
Floor: pisohamate ligament

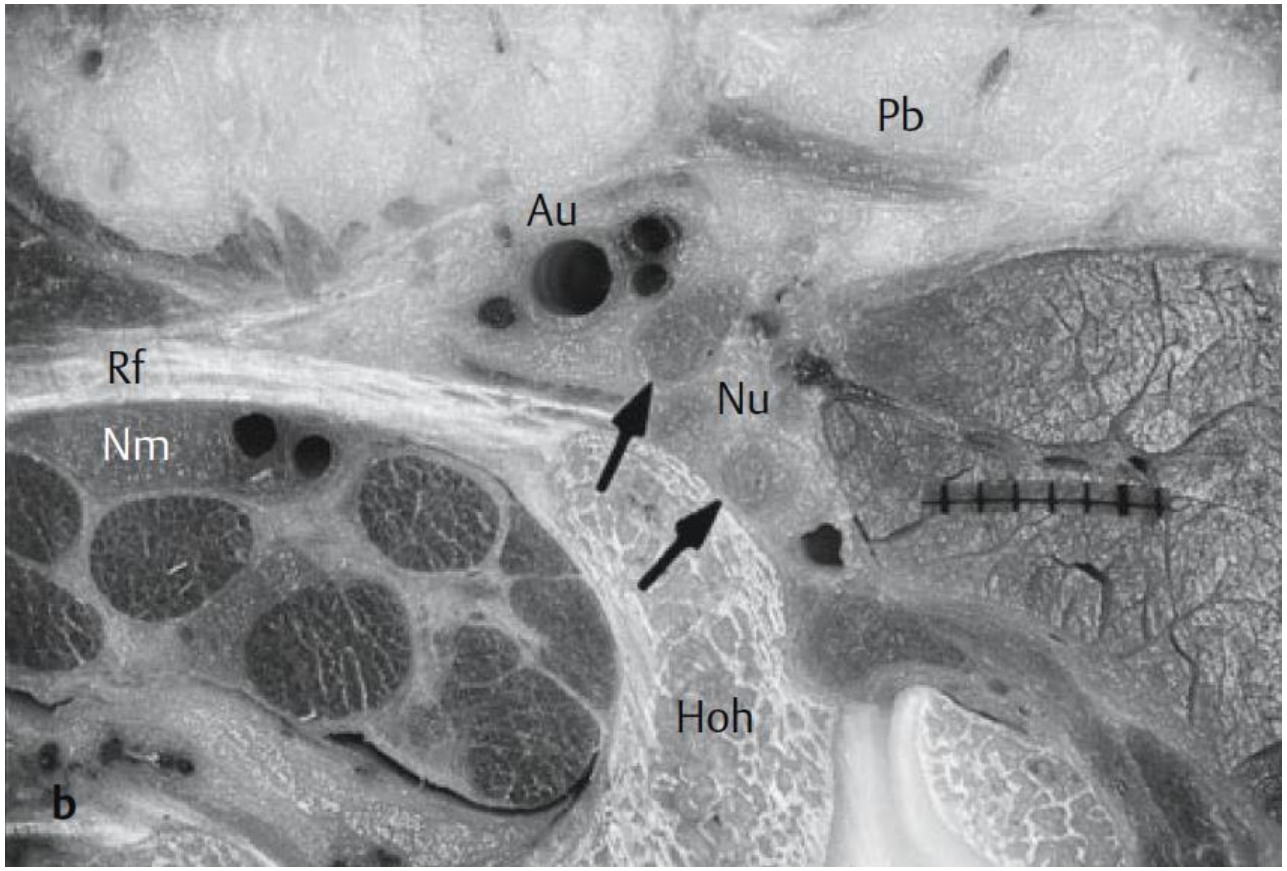
Medially: pisiform

Laterally: hook of the hamate

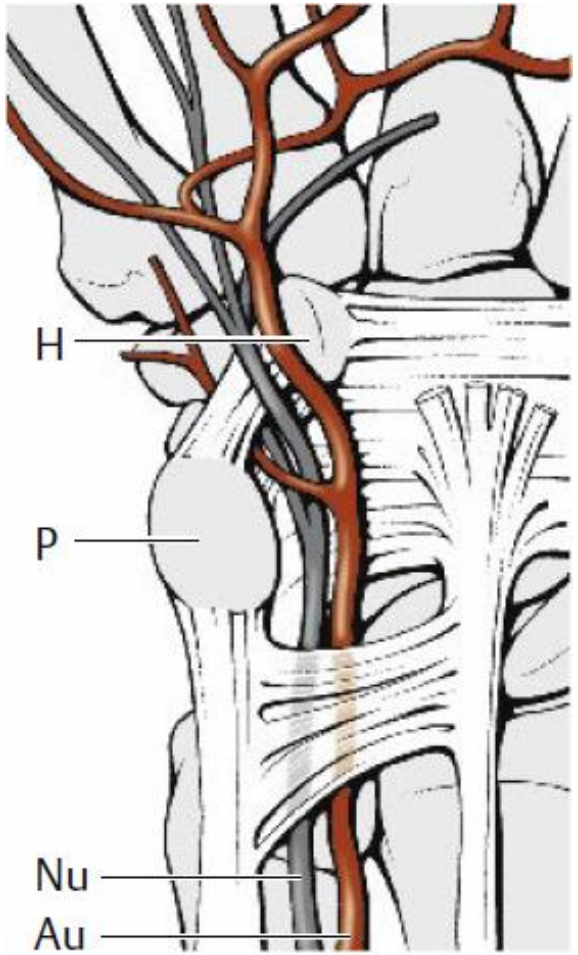


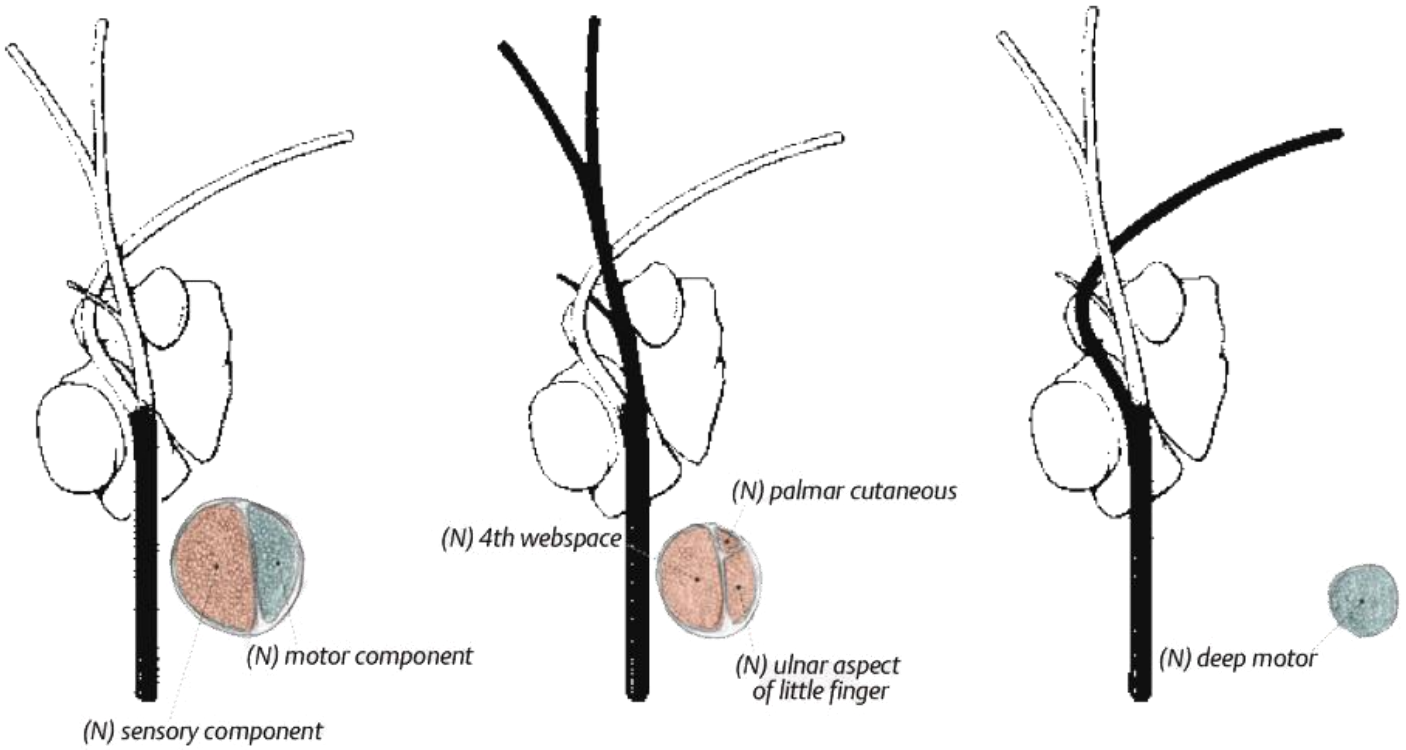
Anatomy





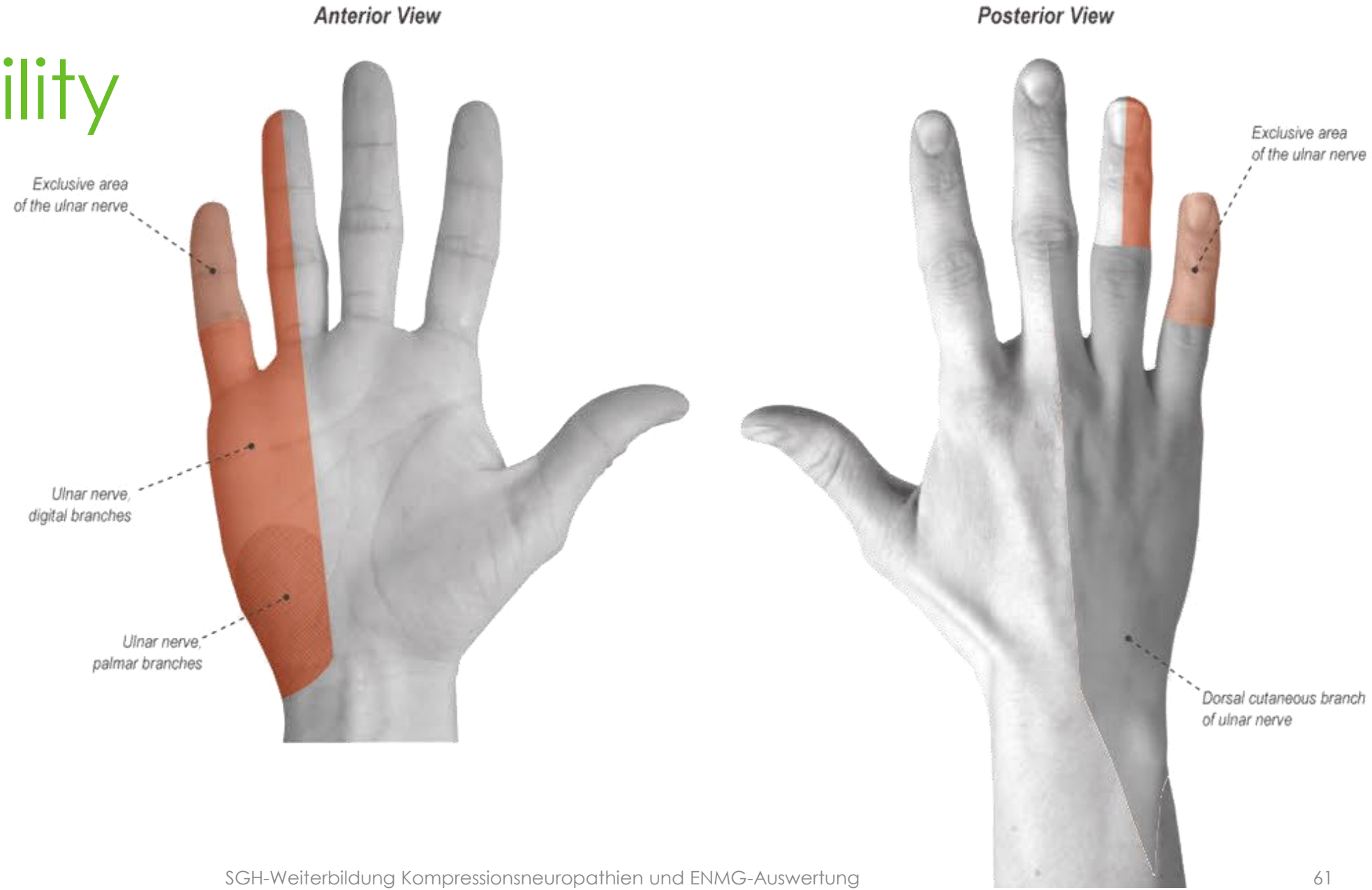
Anatomy





- Type I Compression of the common ulnar nerve bundle
- Type II Compression of the superficial sensory branch
- Type III Compression of the deep motor branch

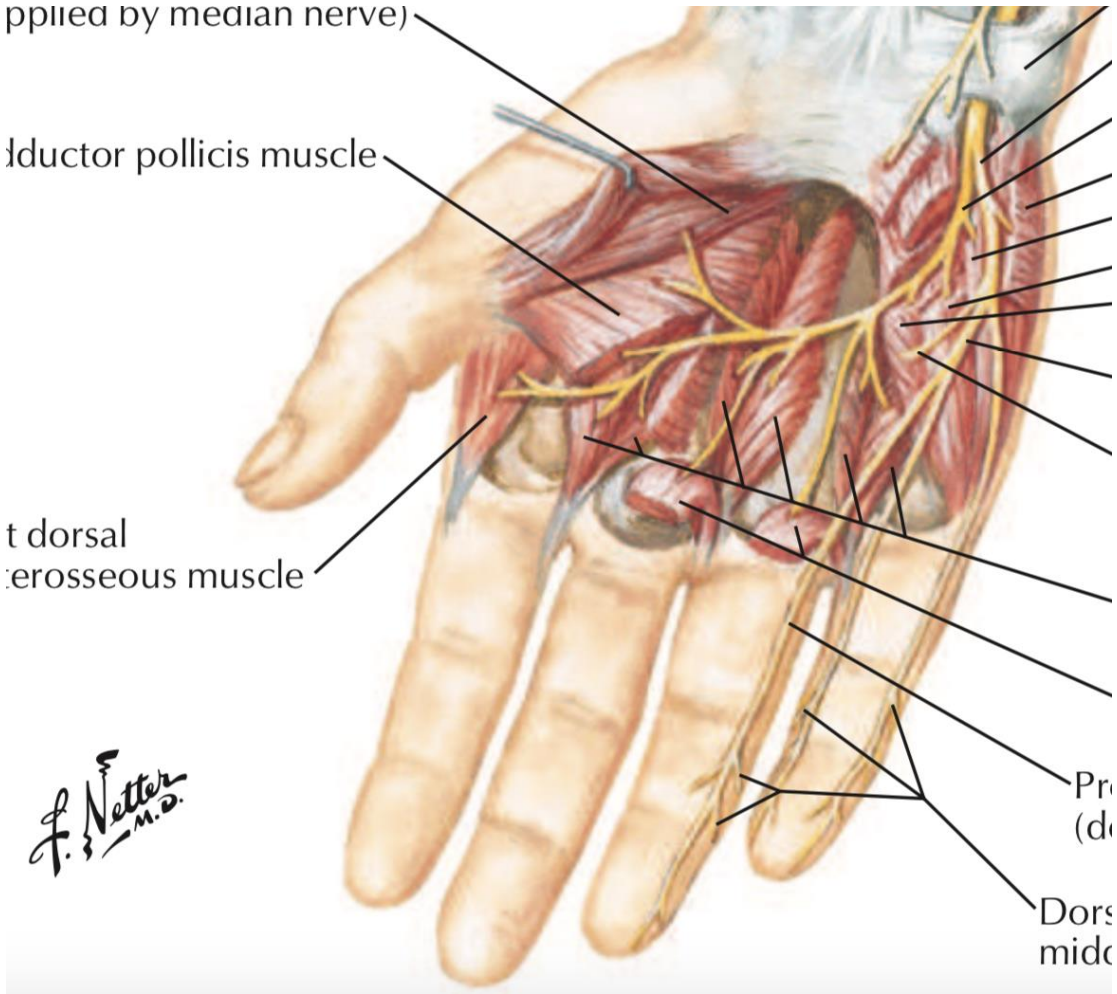
Sensibility



Motor innervation

- M. palmaris brevis
- M. flexor digiti minimi brevis
- M. abductor digiti mimimi
- M. opponens digiti minimi
- M. adductor pollicis
- M. flexor pollicis brevis (Caput profundum)
- Mm. interossei palmars et dorsales
- Mm. lumbricales III und IV

- Nicht: FCU und FDP 4/5



Clinical findings

Same symptoms as cubital tunnel syndrome

but

Dorsum of the hand is not involved

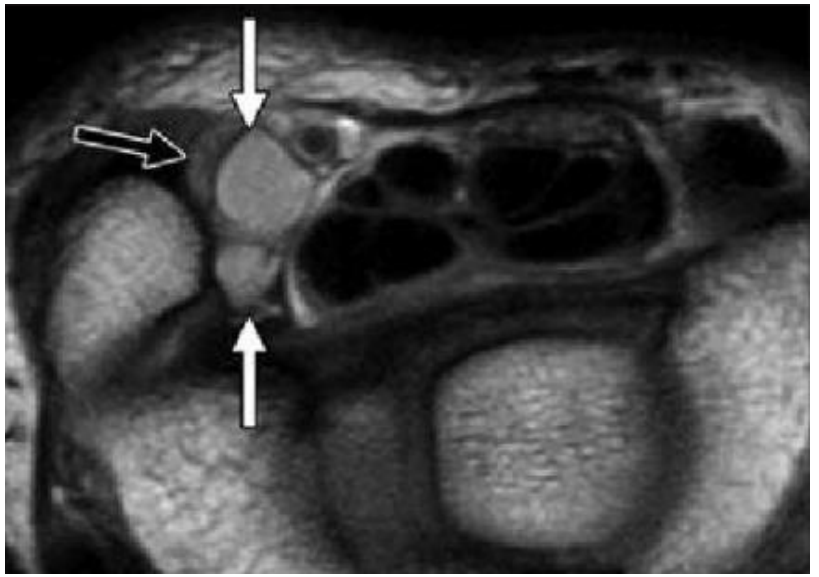
Clawing of ring- and small finger more pronounced

Nerve studies

- Level of the lesion
- Confirmation of the diagnosis
- Extent of damage
- Other neuropathies
- Progress observation

Imaging

- **X-ray:** Wrist pa / lateral
- **Sono:** ganglia, vessles, aberrant muscles
- **CT/MRI:** exceptional cases



Treatment

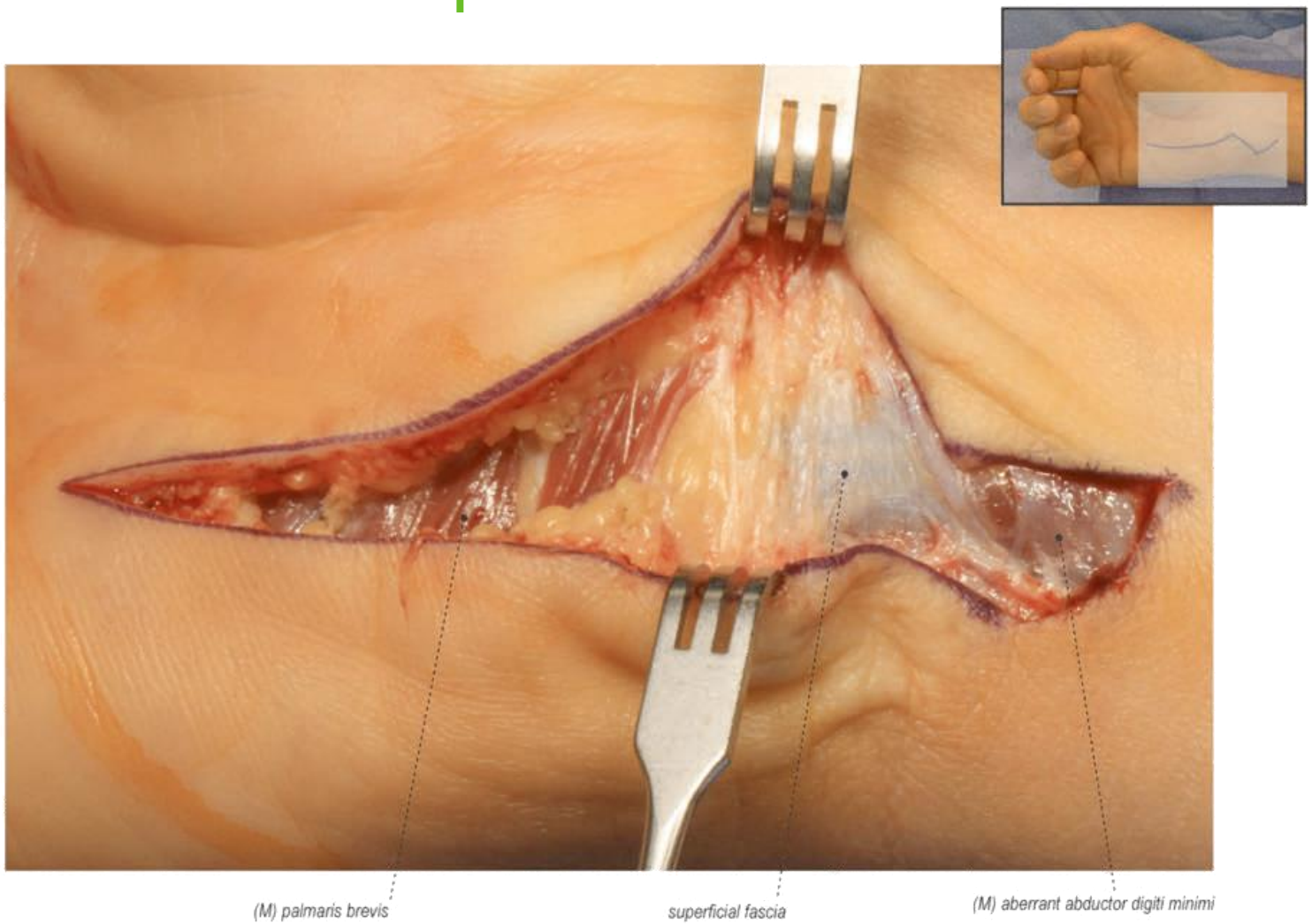
Conservative

- Acute closed traumatic lesion
- Idiopathic disease

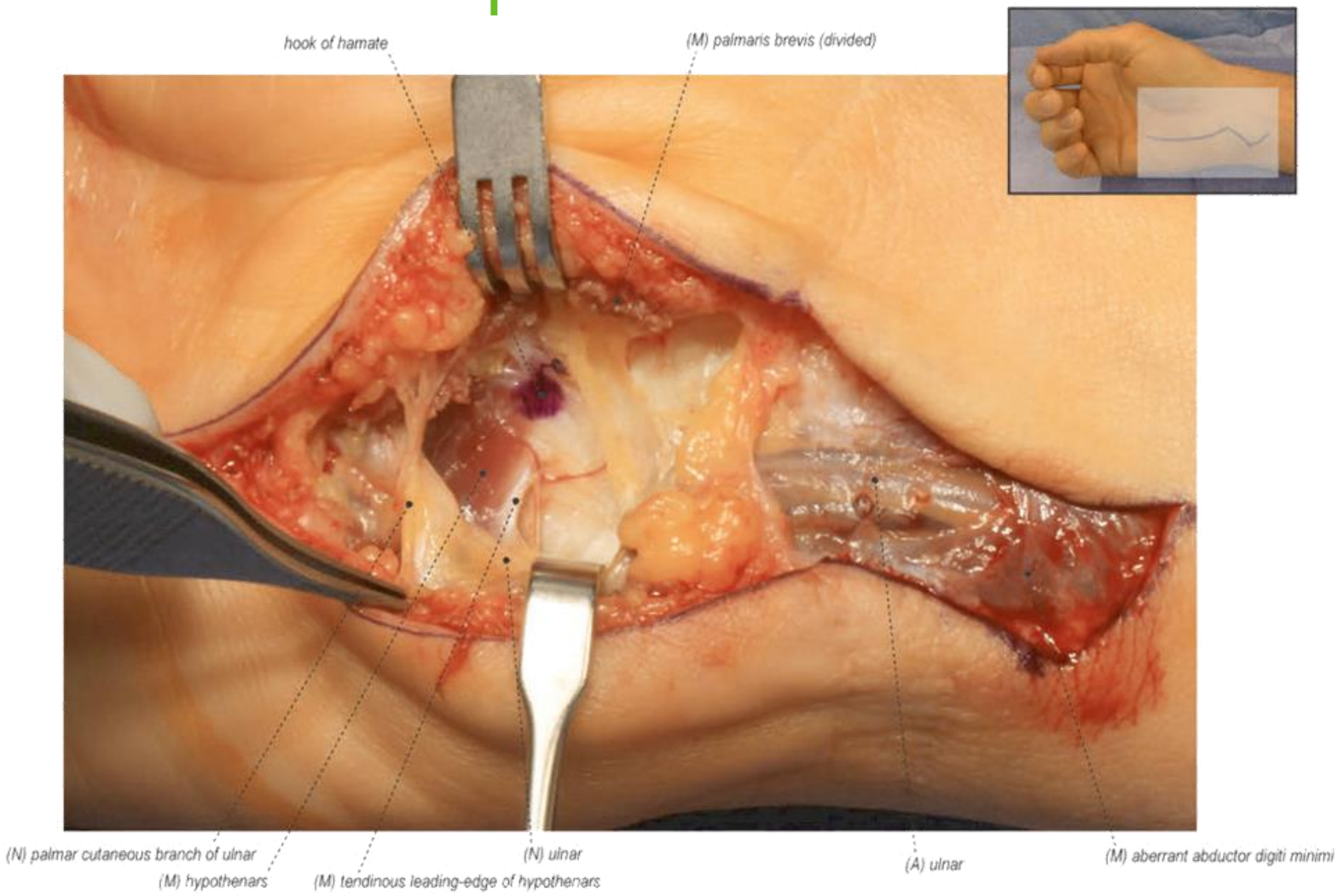
Operative

- Confirmed cause
- Progressive complaints
- Lack of improvement
- Motor impairment

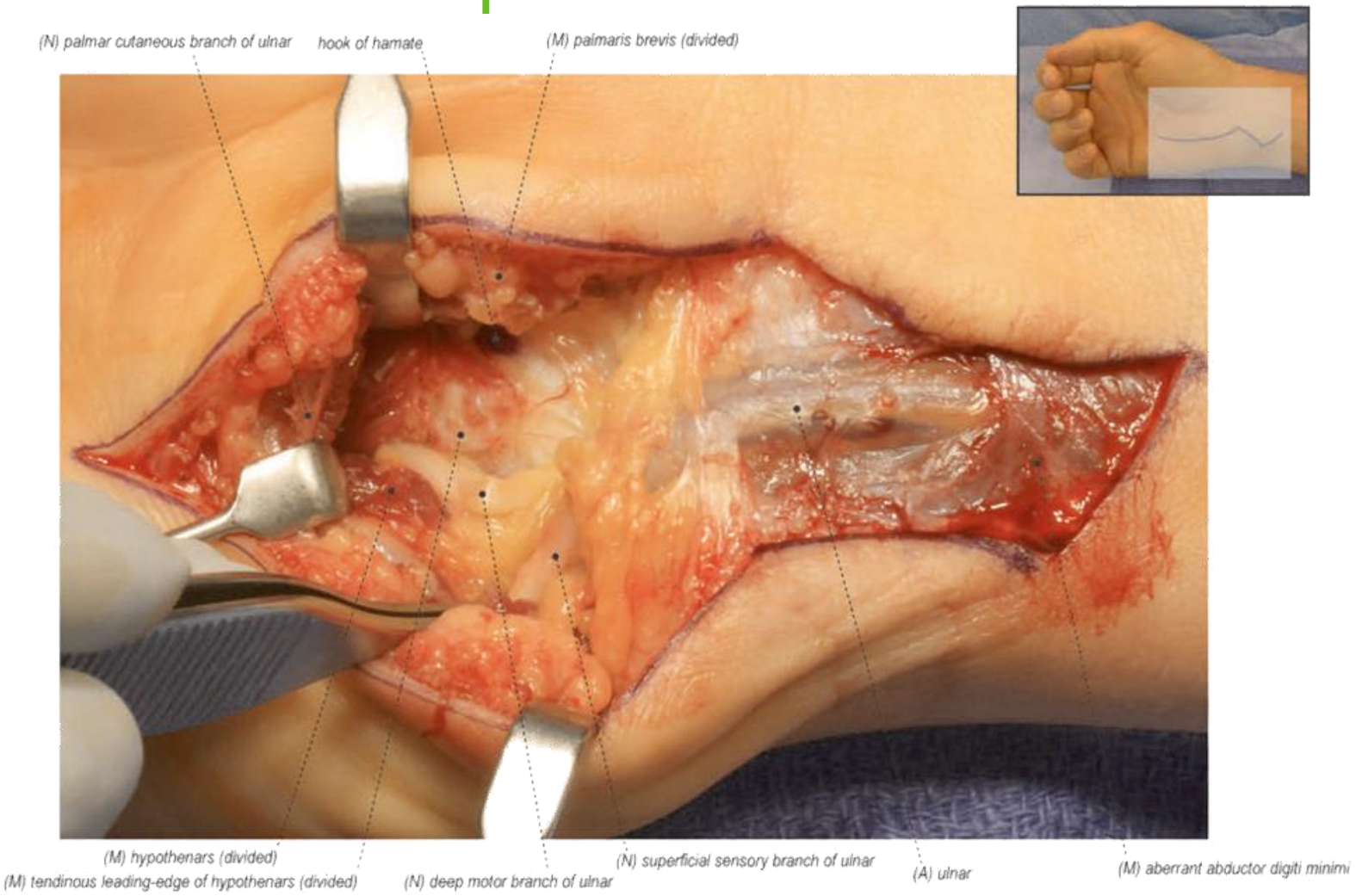
Surgical technique



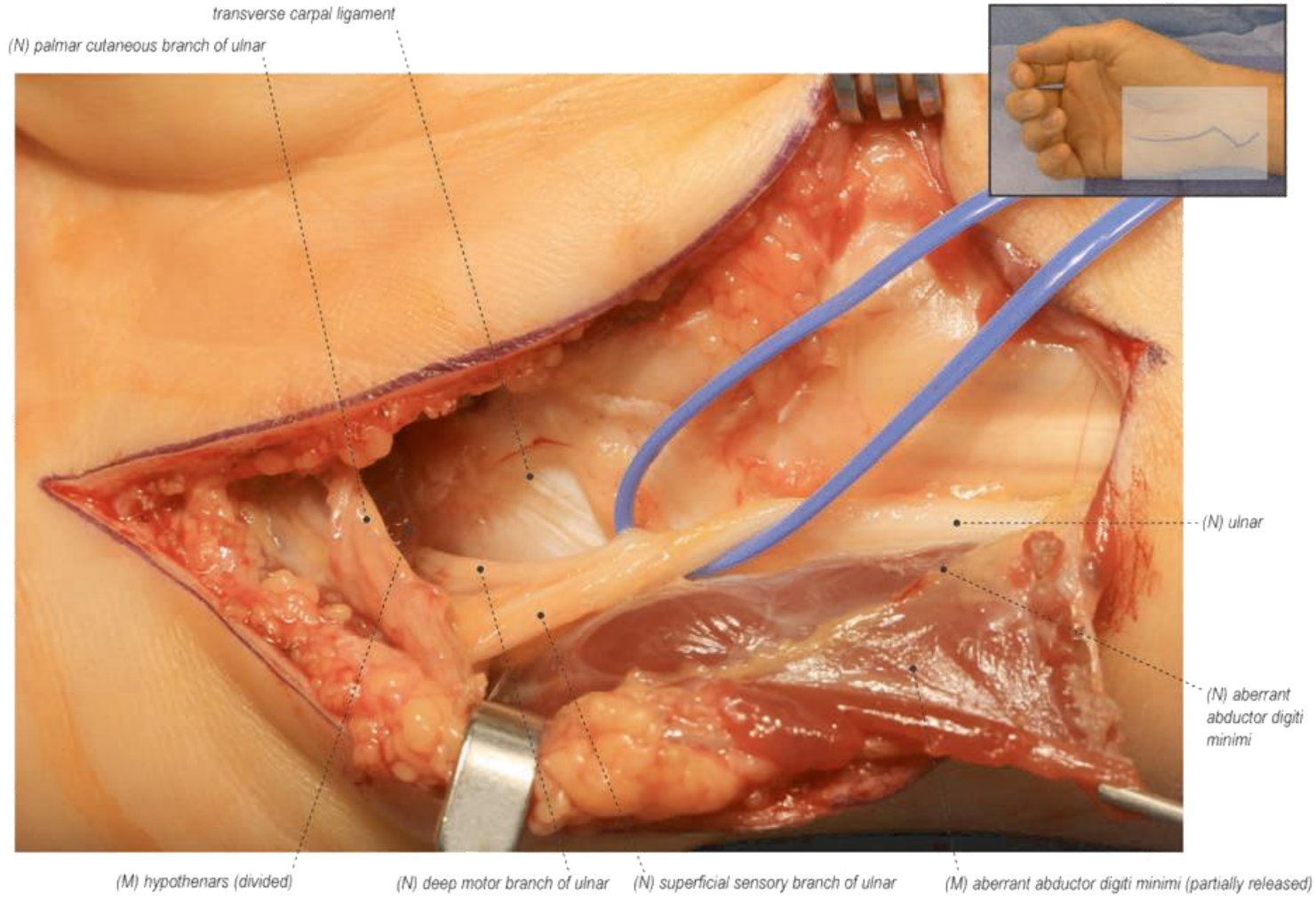
Surgical technique



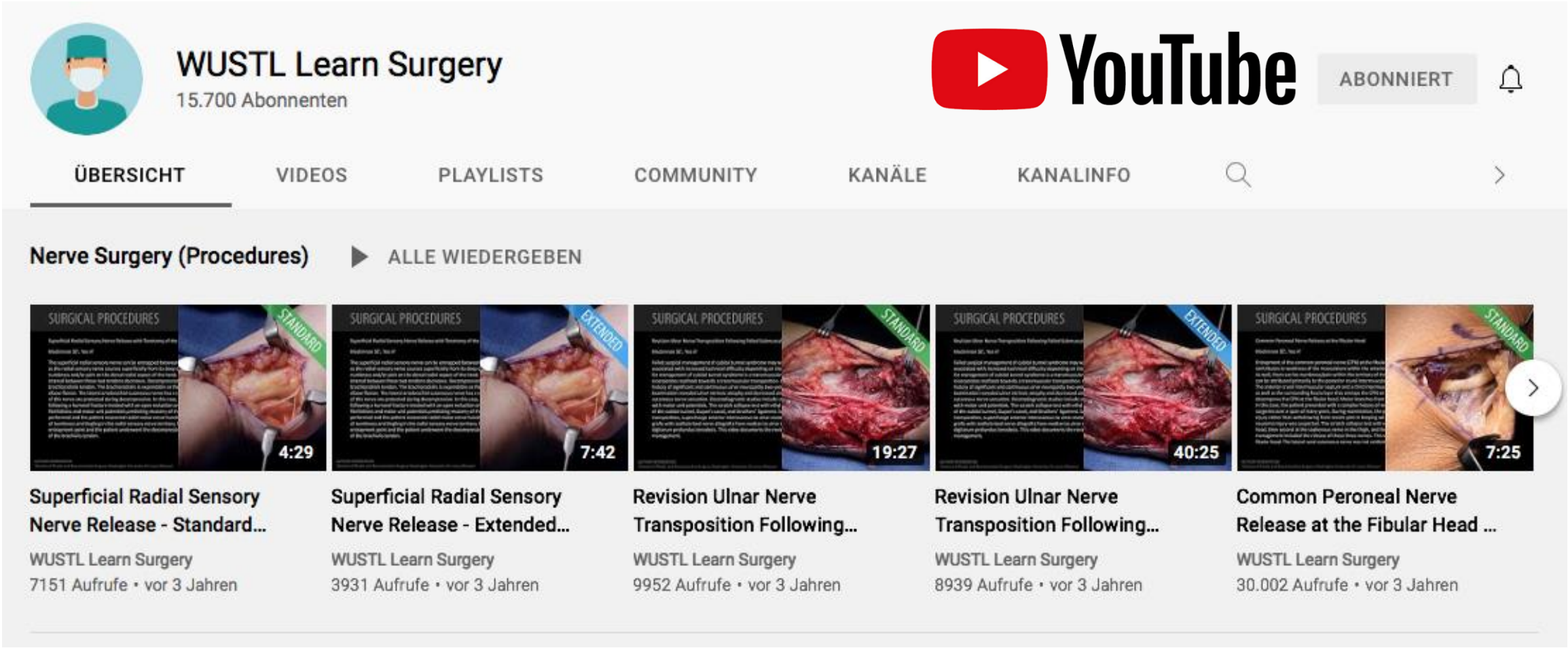
Surgical technique



Surgical technique



Suggested surgical video



Spital Thurgau

THANK YOU FOR YOUR ATTENTION

Spital Thurgau

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