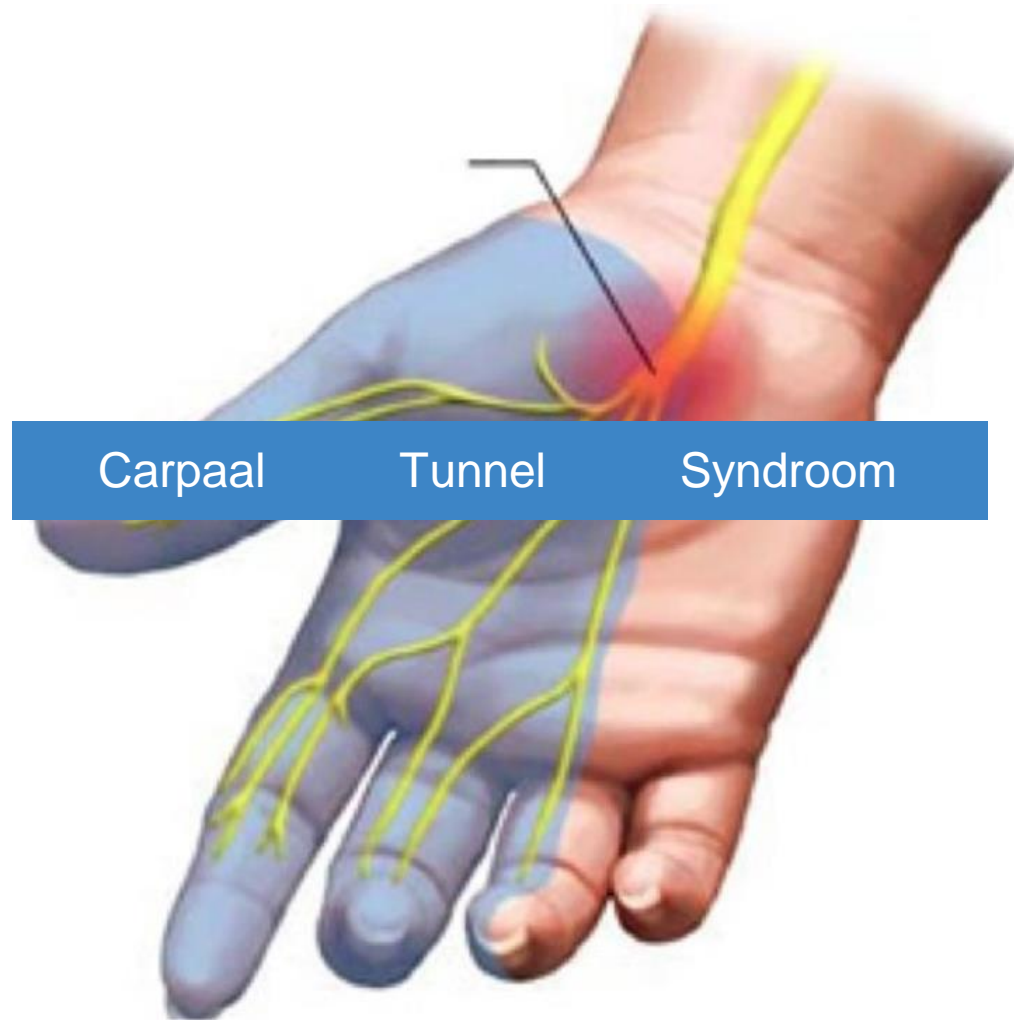


# Carpaal tunnel syndroom: behandeling zonder tunnelvisie.



Francis Bonte  
ORTHOCLINIC Symposium 2024

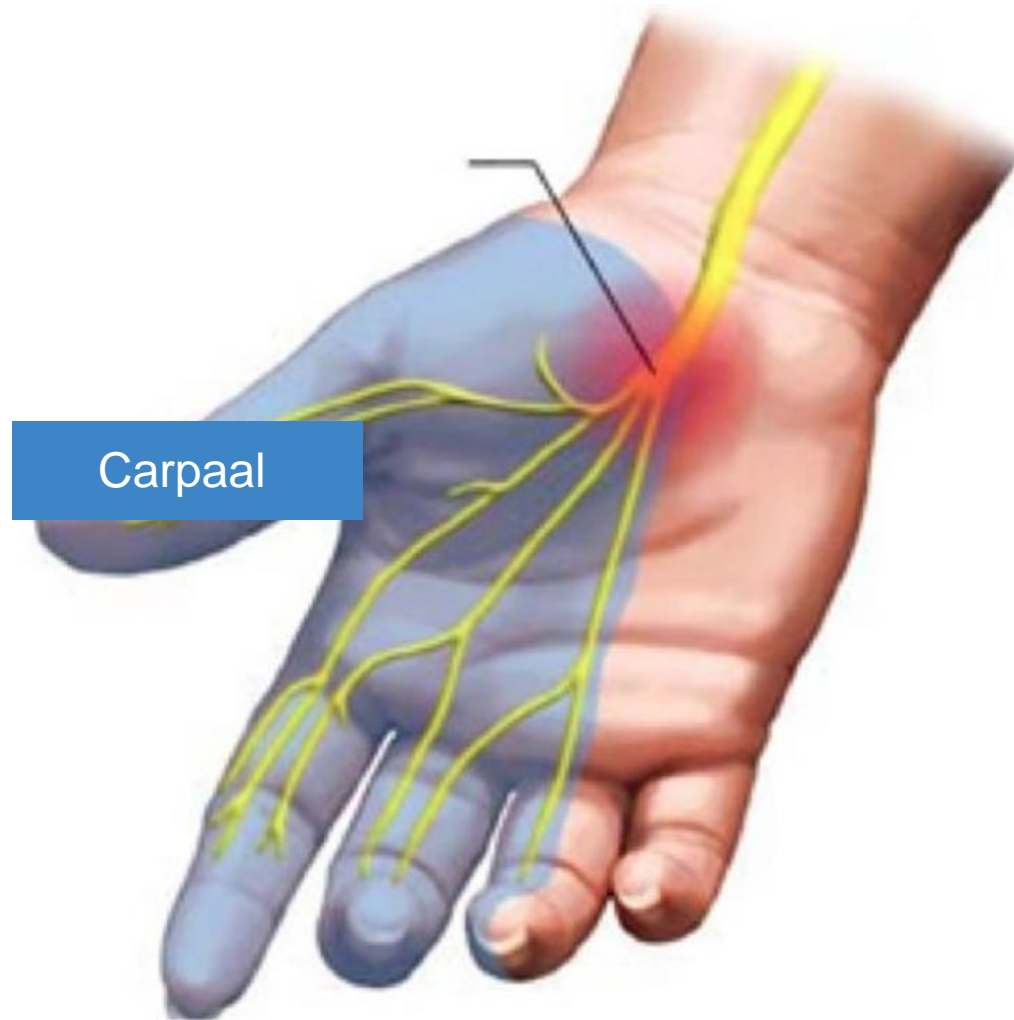


Carpal

Tunnel

Syndroom

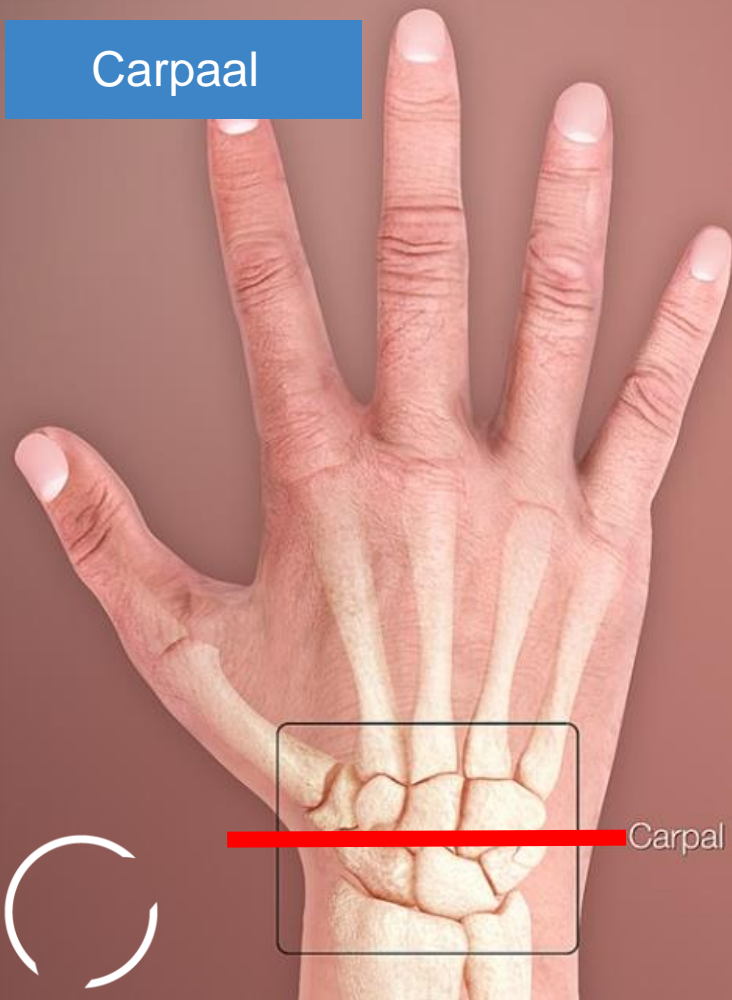




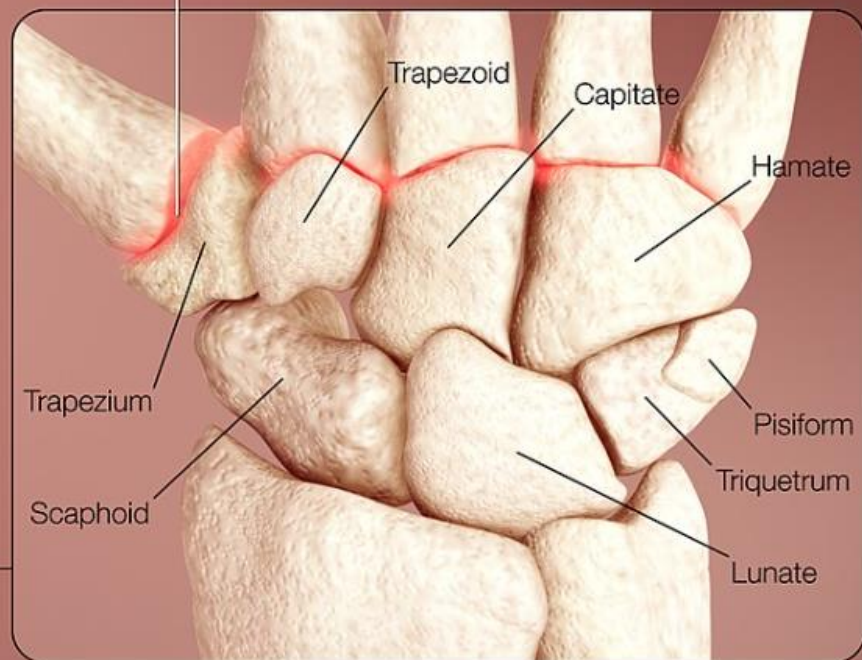
Carpal



# Carpaal

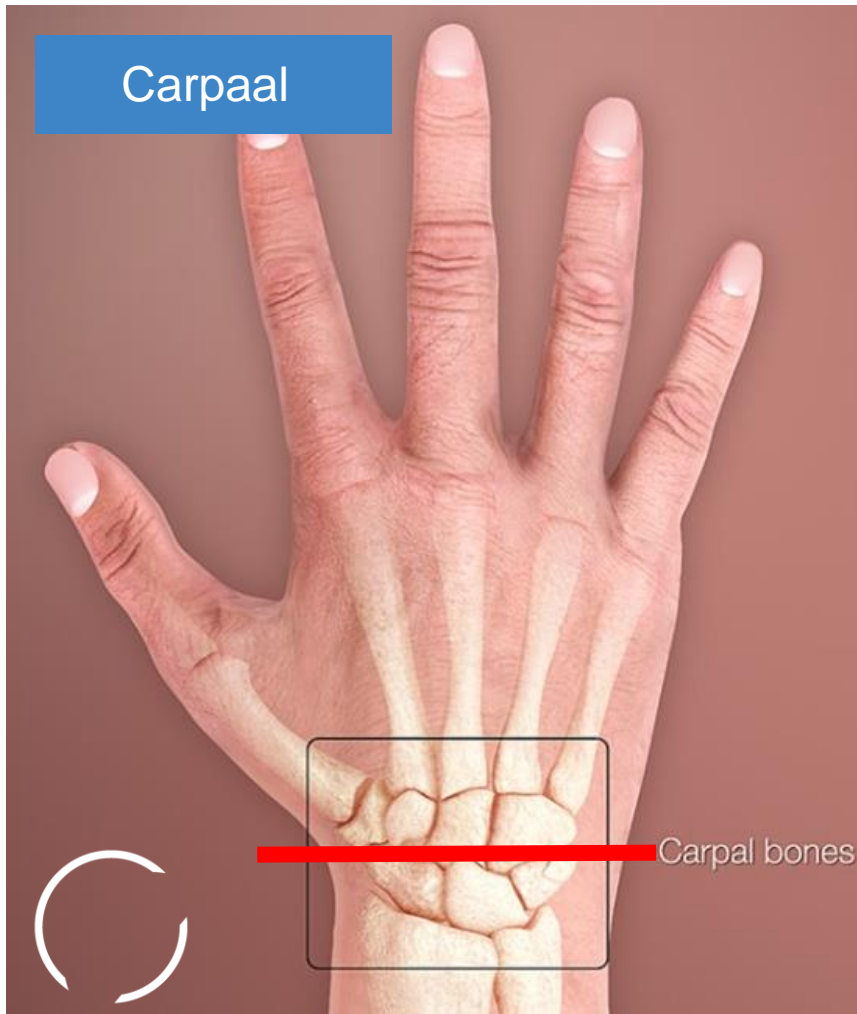


Carpometacarpal joint

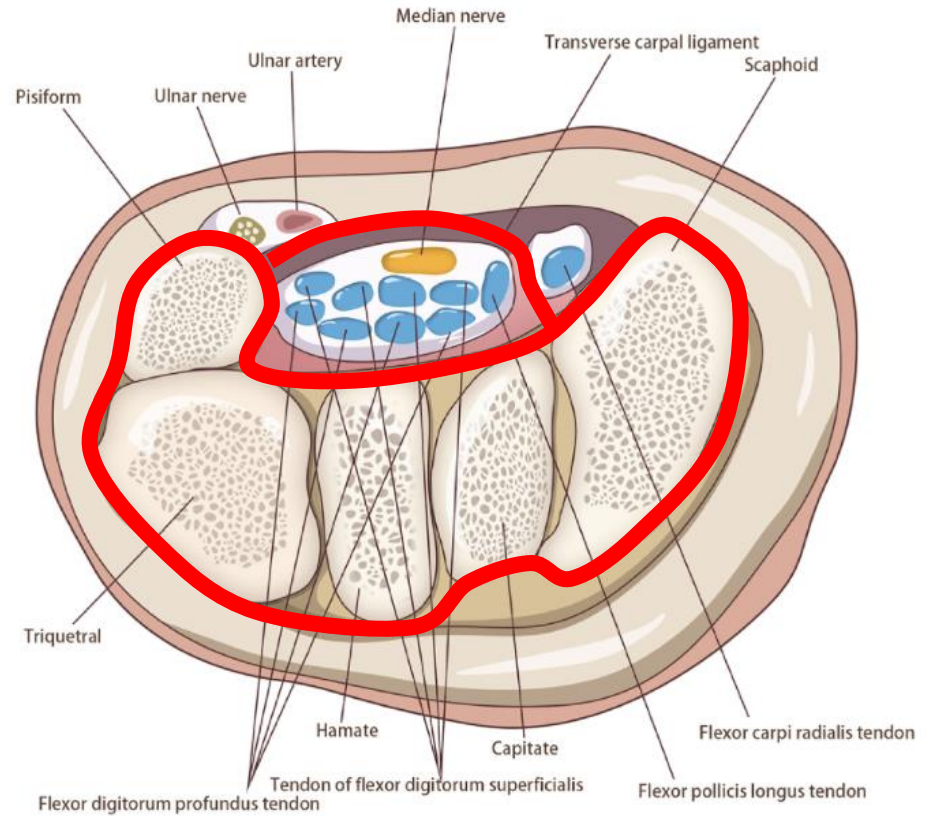


Carpal bones

## Carpaal

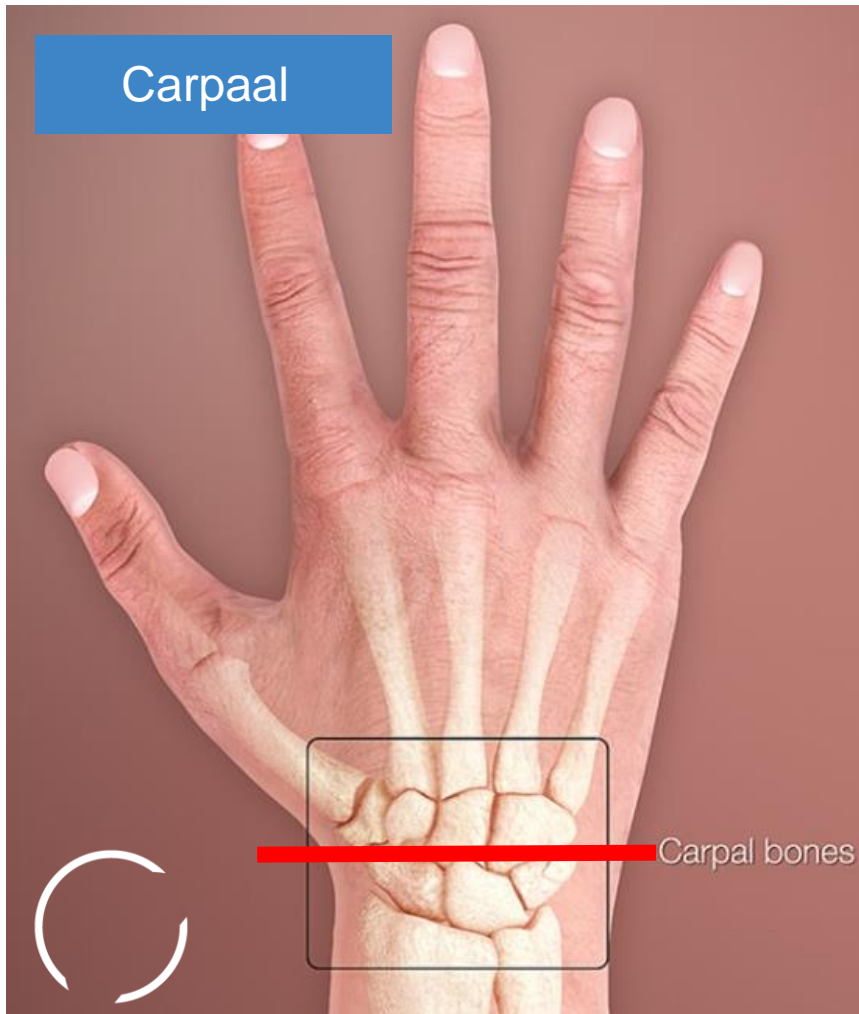


## Tunnel

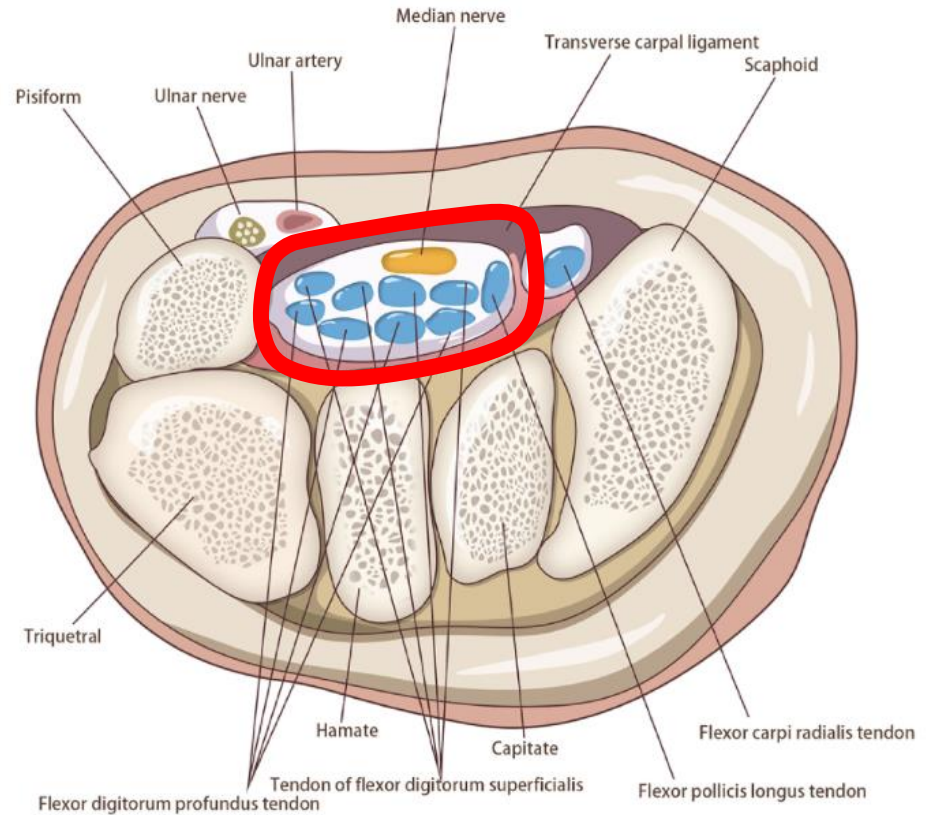




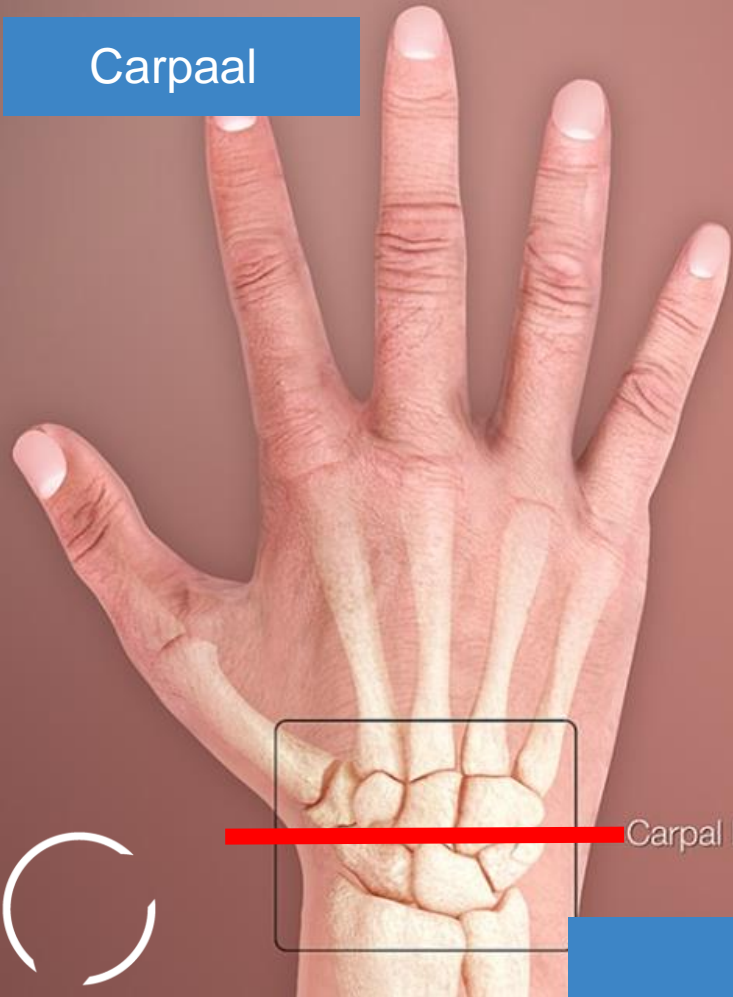
## Carpaal



## Tunnel



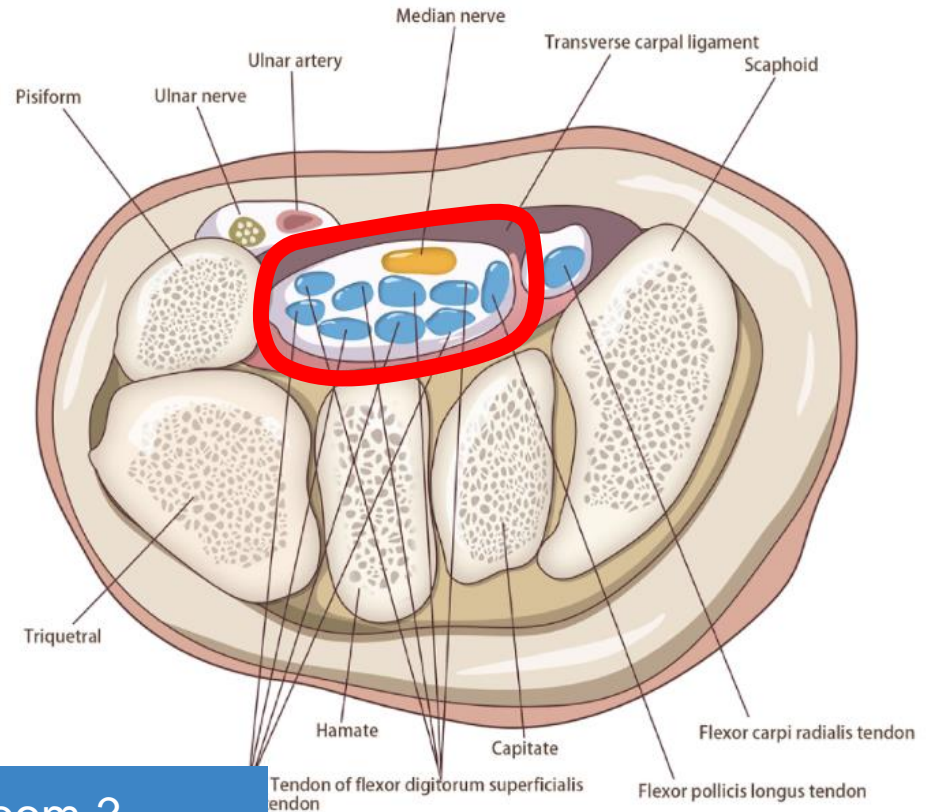
Carpaal



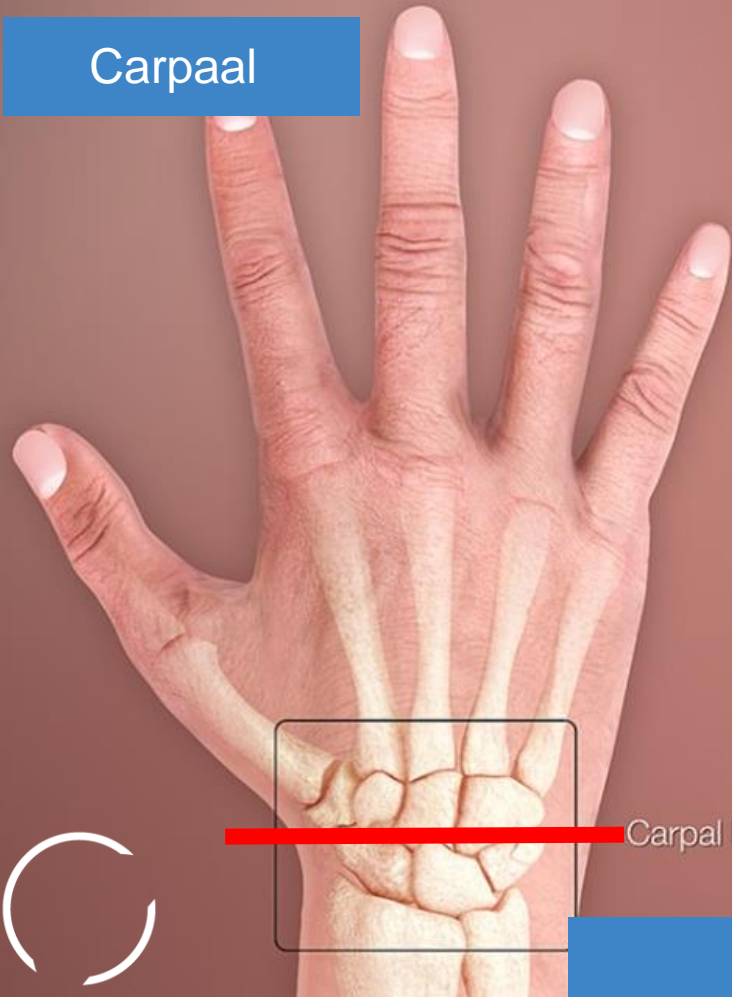
Carpal bones

Syndroom ?

Tunnel



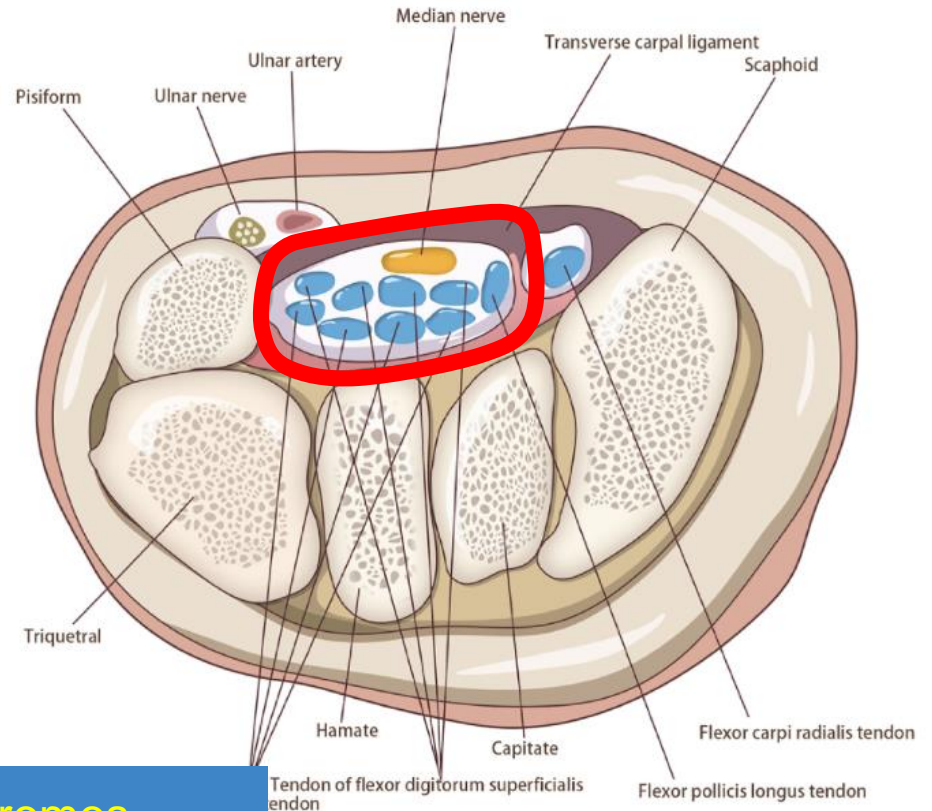
Carpaal



Carpal bones

Sun Dromos

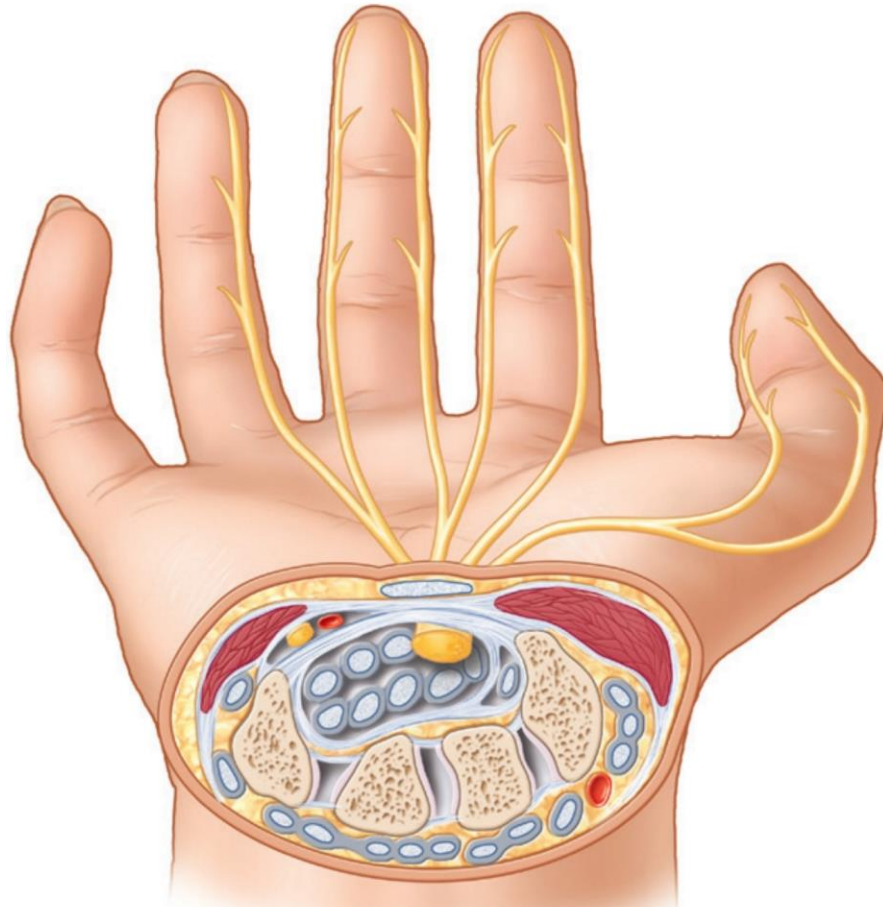
Tunnel





Carpaal

Tunnel

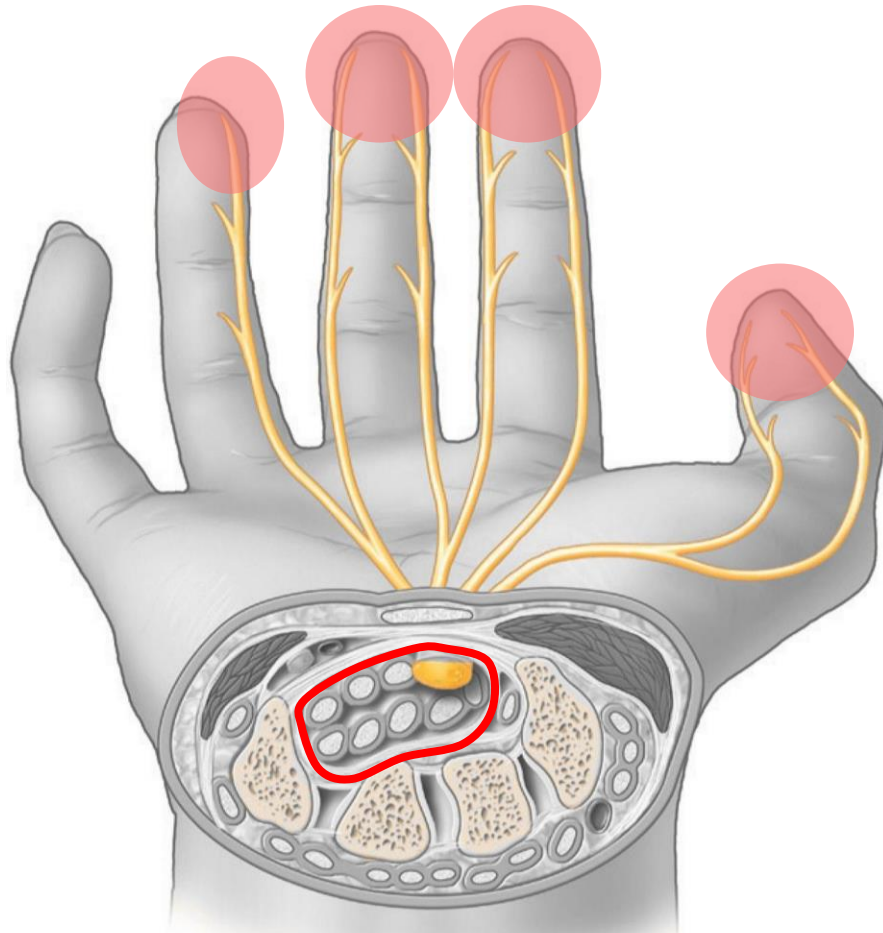


Syndroom



Carpaal

Tunnel



Syndroom

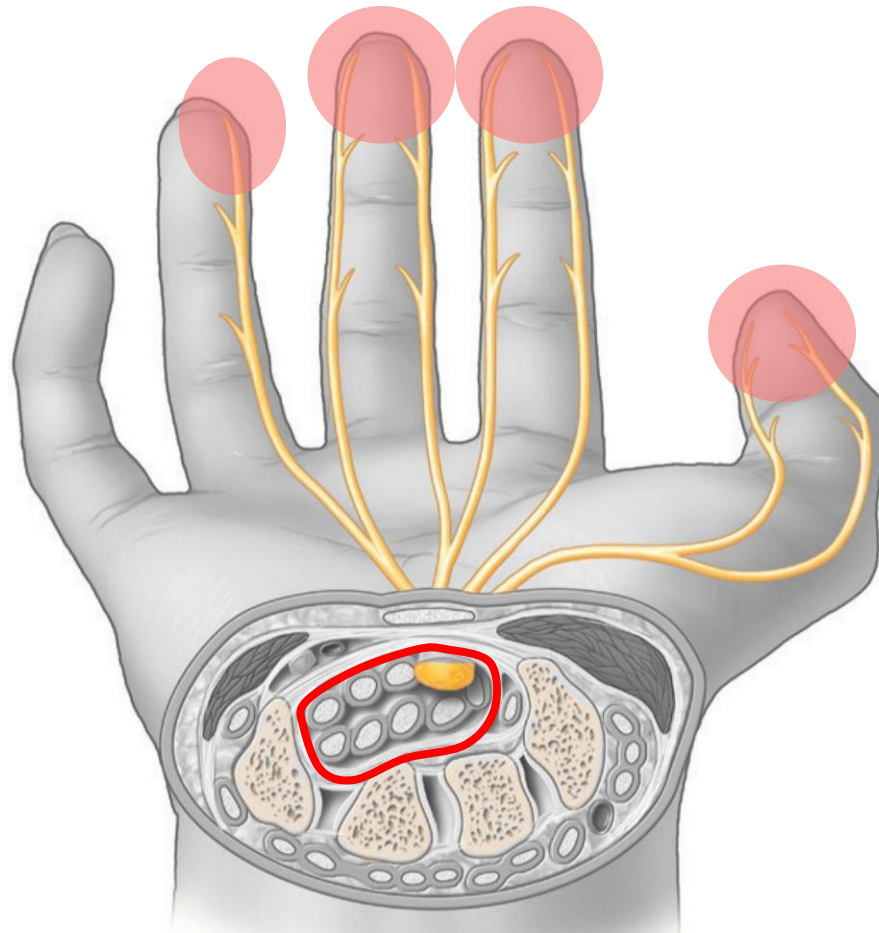


Carpaal

Tunnel

7 - 16% populatie

Idiopatisch



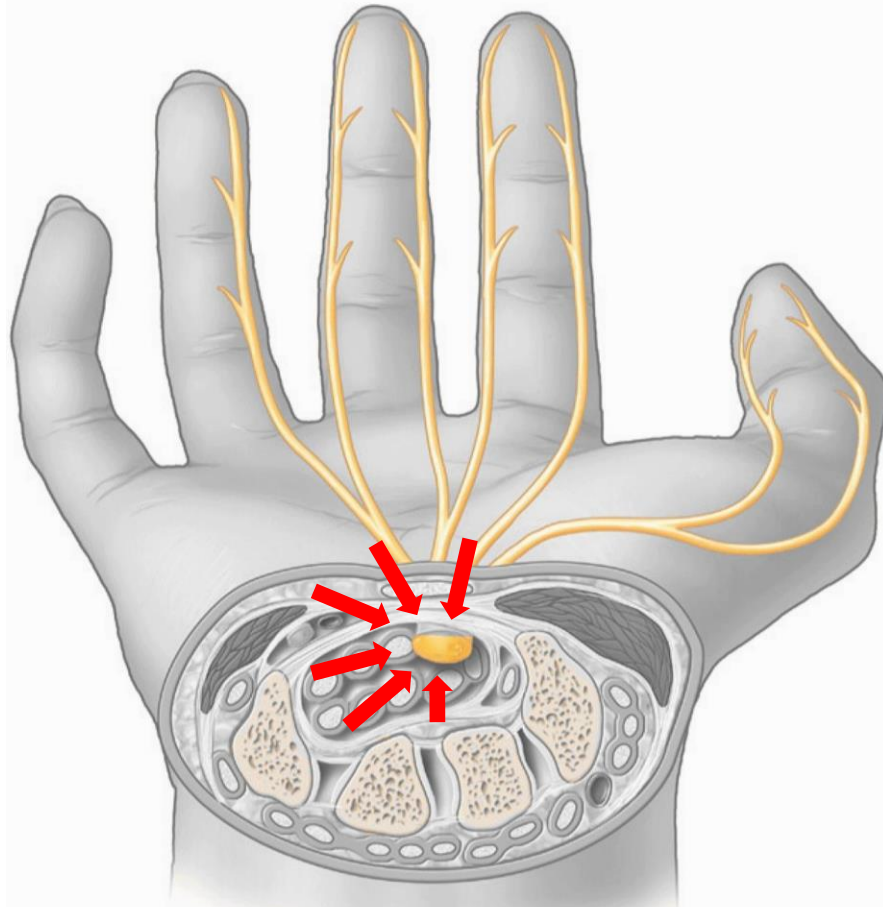
Syndroom

Ferry S, Pritchard T, Keenan J, et al.  
Estimating the prevalence of delayed  
median nerve conduction in the  
general population. Br J Rheumatol.  
1998



Carpaal

Tunnel



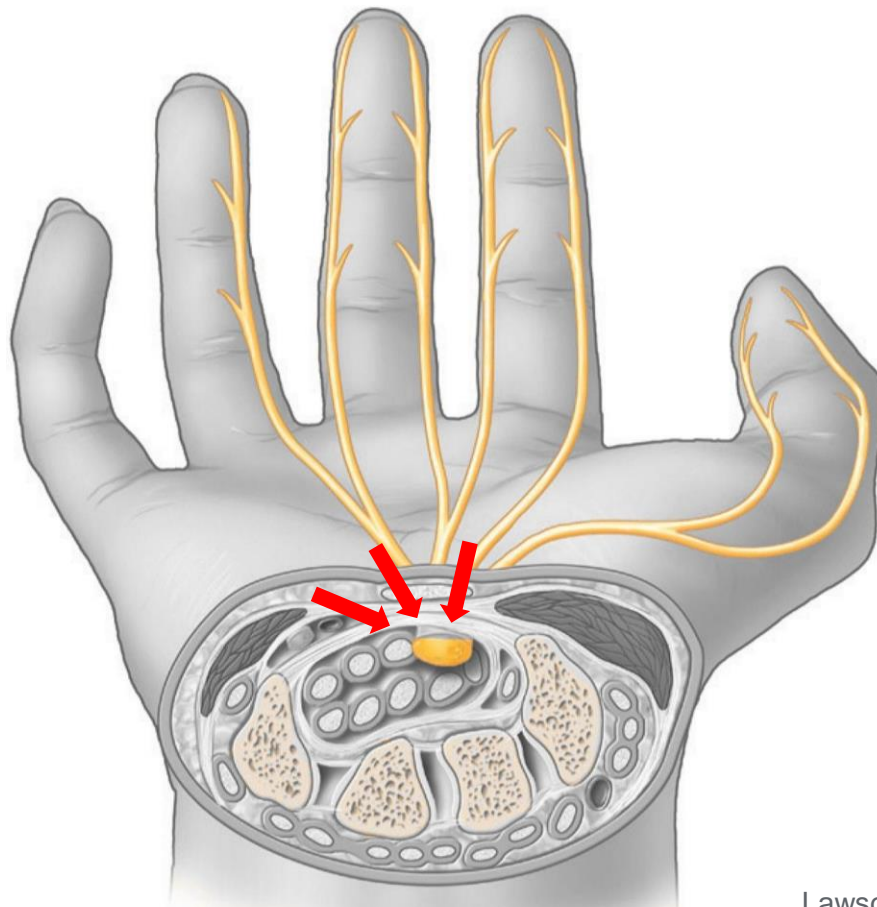
Syndroom





Carpaal

Tunnel



Repetitief manueel werk

Krachtige  
grijpbewegingen

repetitieve  
polsflexie -  
extensie

trillingen



Syndroom

Lawson IJ. Is carpal tunnel syndrome caused by work with vibrating tools? Occup Med (Lond). 2020

Carpaal

Tunnel

Nauwe tunnel

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

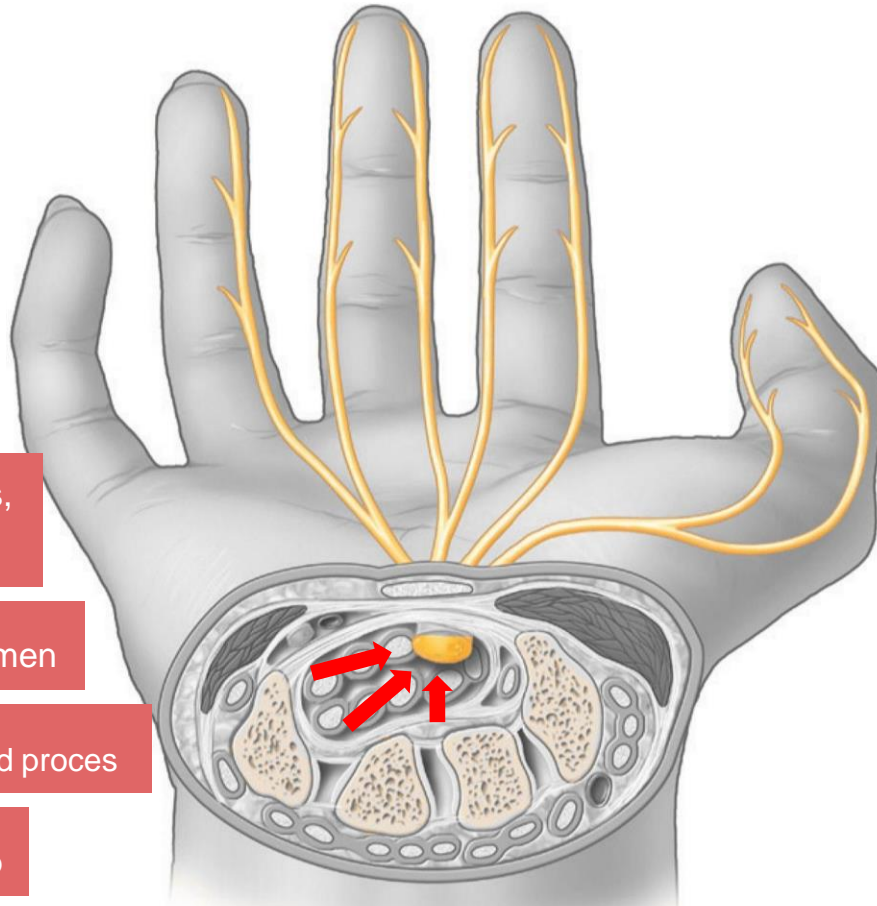
Trauma

Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze



Syndroom



Carpaal

Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

Trauma

Ruimte innemend proces

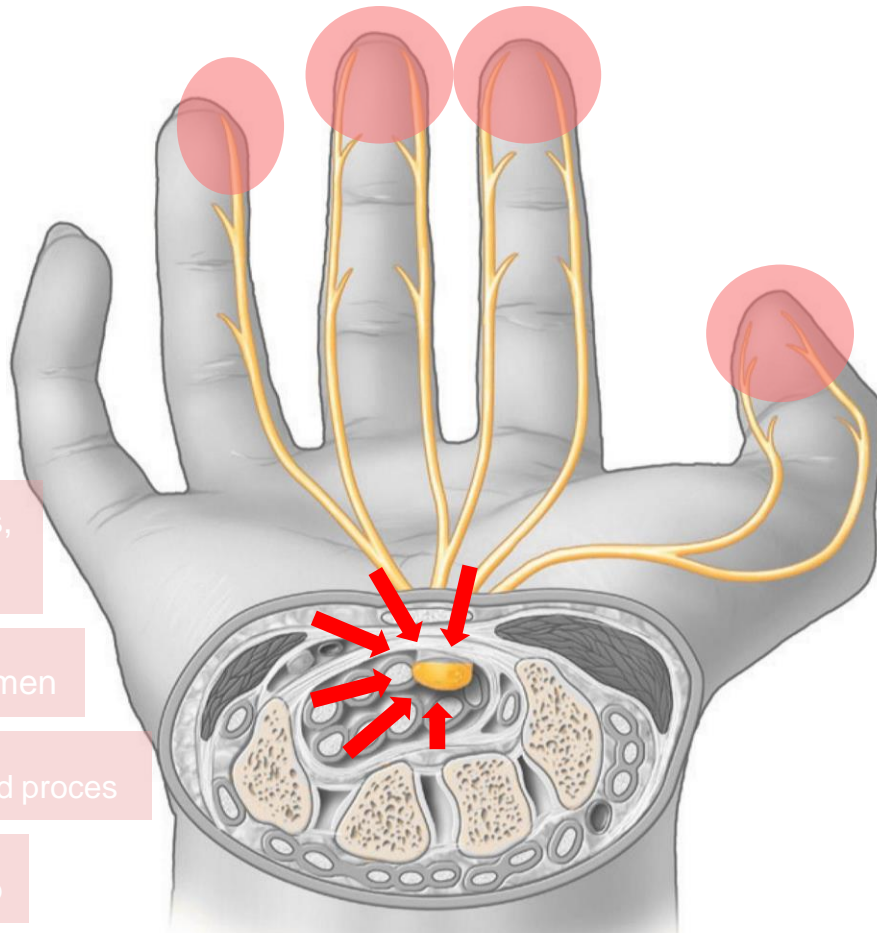
Obesitas

Zwangerschap

Menopauze

Verhoogde druk  
op de zenuw

Syndroom



Carpaal

Tunnel



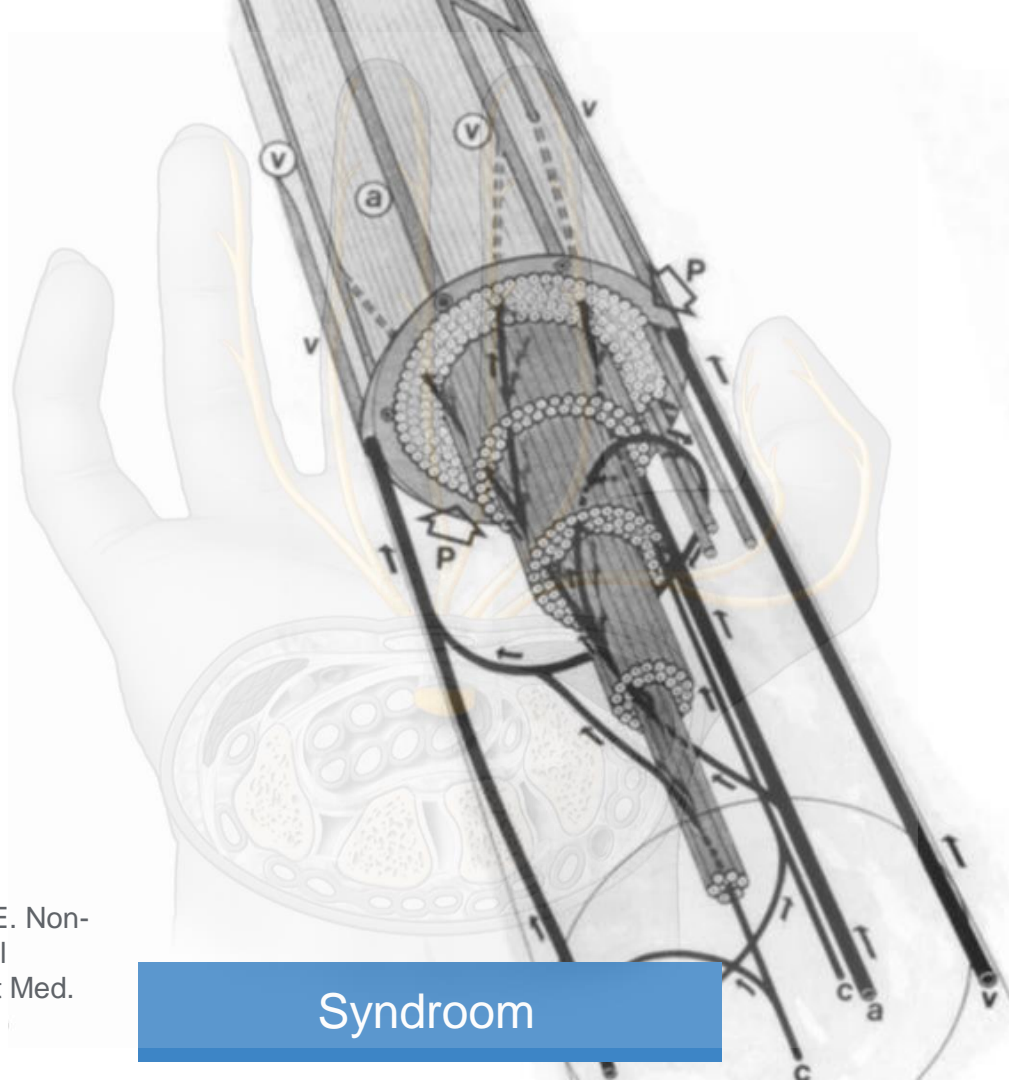
Syndroom





Carpaal

Tunnel



Ostergaard PJ, Meyer MA, Earp BE. Non-operative treatment of carpal tunnel syndrome. Curr Rev Musculoskelet Med. 2020

Syndroom



Carpaal

Tunnel

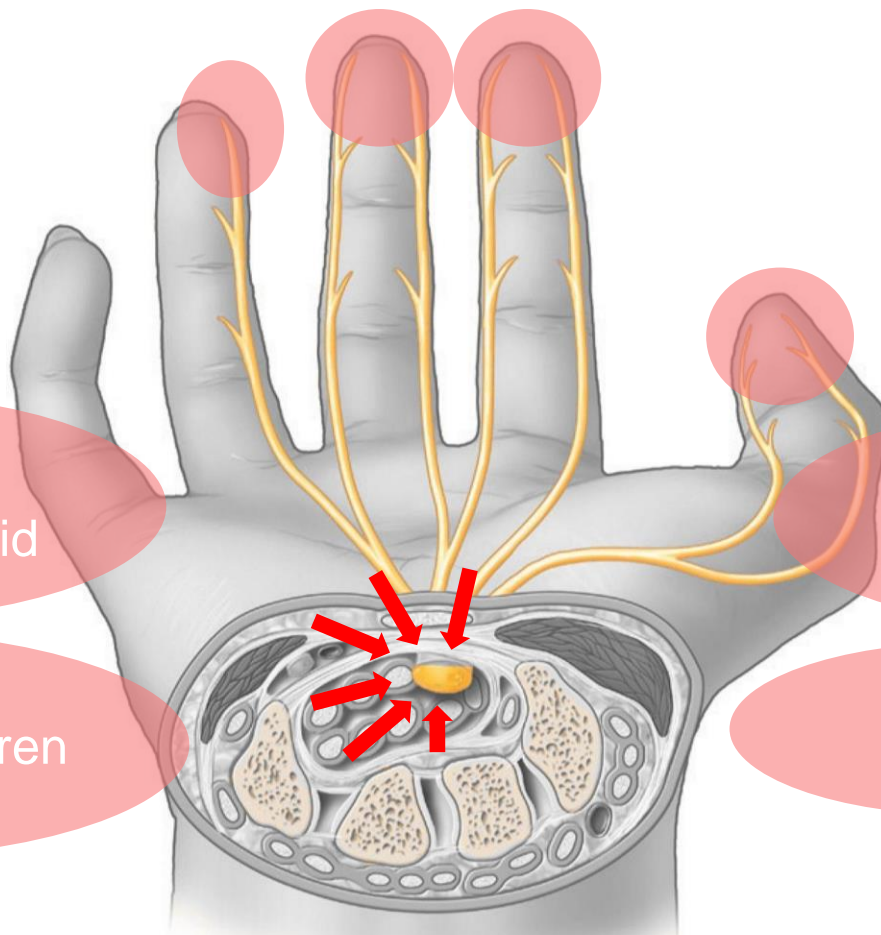
Genetische  
voorbeschiktheid

Gezondheids-  
toestand

Omgevingsfactoren

Leeftijd

Syndroom

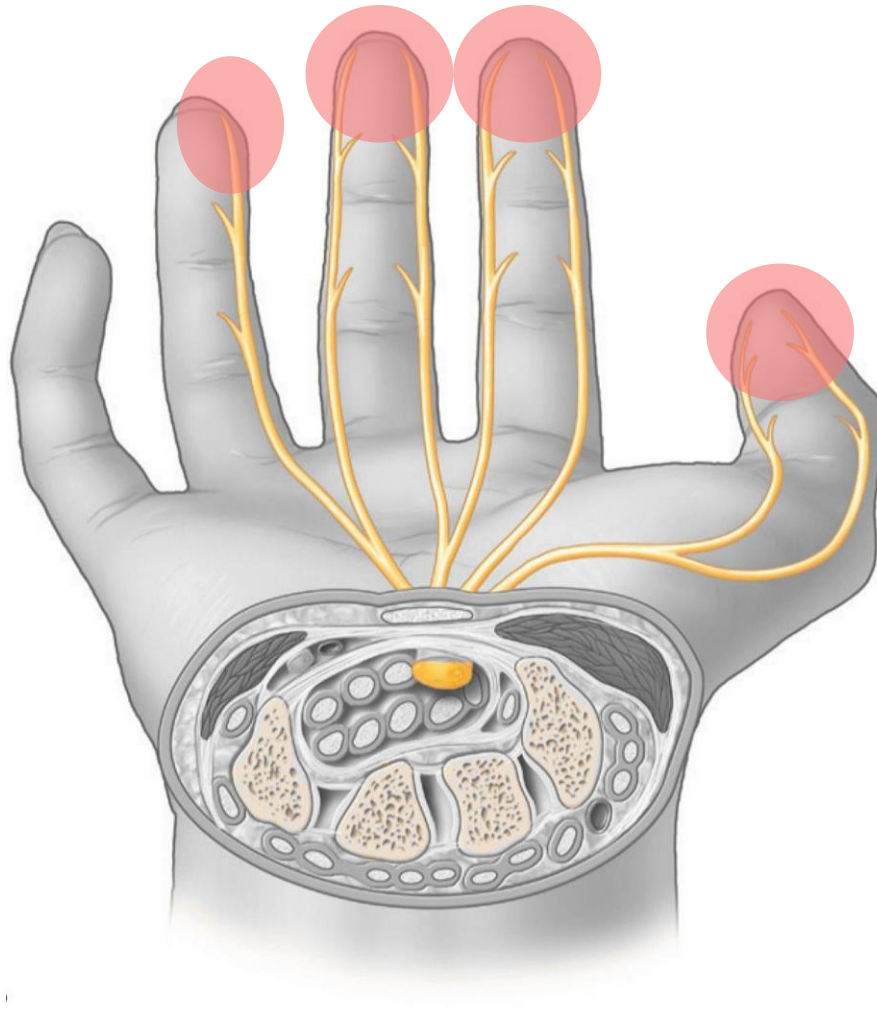


Carpal

Tunnel

Syndroom

Diff diagnose



- Brachial plexopathy
- Cervical myofascial pain
- Cervical spondylosis
- Compartment syndrome
- Ischemic stroke
- Mononeuritis multiplex
- Multiple sclerosis
- Median neuropathy in the forearm
- Motor neuron disease
- Diabetic neuropathy
- Cervical radiculopathy
- Overuse injury
- Traumatic brachial plexopathy
- Radiation-induced brachial plexopathy
- Neuropathies
- Tendonitis
- Tenosynovitis
- Thoracic outlet syndrome



Carpaal

Tunnel

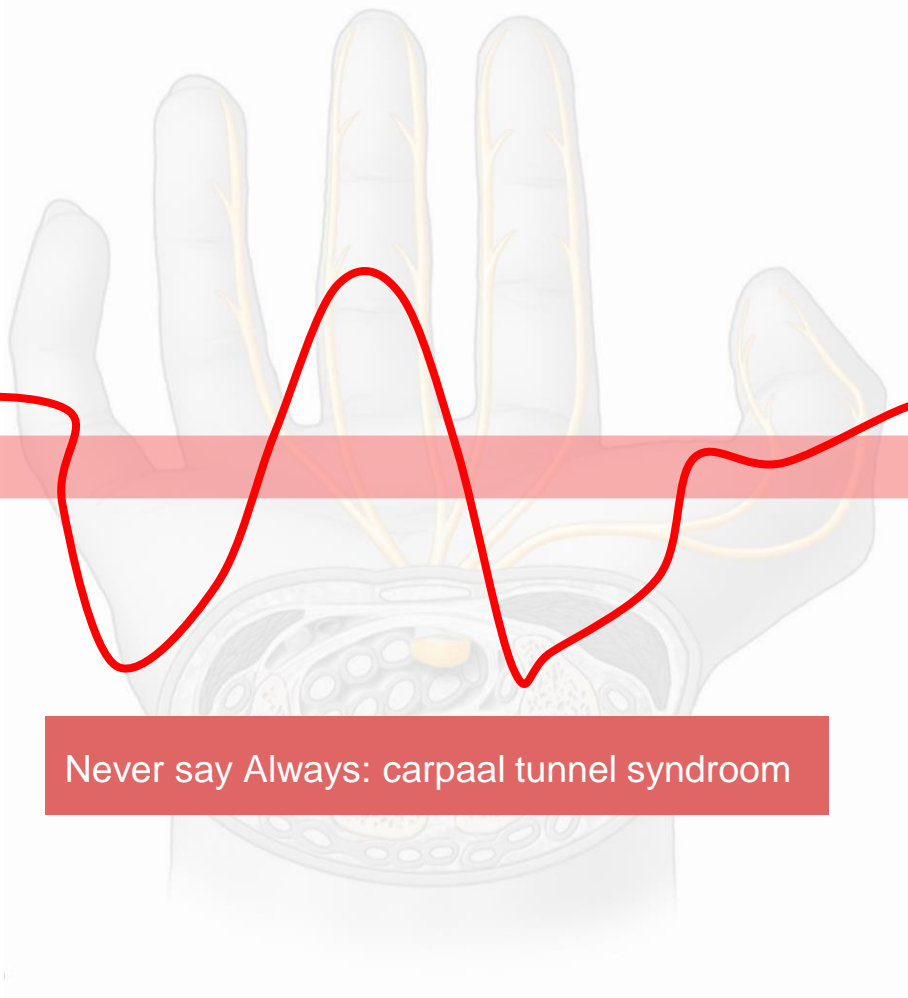
Syndroom

Klachten

Klachtenvrij

Voorkomen  
permanente  
zenuwschade

Never say Always: carpaal tunnel syndroom





Carpaal

Tunnel

Syndroom

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling



Carpaal

Tunnel

Syndroom

Anamnese

Nachtelijke  
tintelingen  
vingers

Nachtelijke  
pijn hand

Hand moeten  
wakker  
schudden

Moeite om de  
vingers te  
bewegen in de  
ochtend

Slapende  
hand tijdens  
het fietsen

Voorwerpe  
n laten  
vallen

Moeite met  
oprapen  
fijne vwerpen

Koude  
intolerantie

Moeite met  
knoopjes  
dichten

Pijn  
onderarm  
elleboog



Carpaal

Tunnel

Syndroom

Anamnese

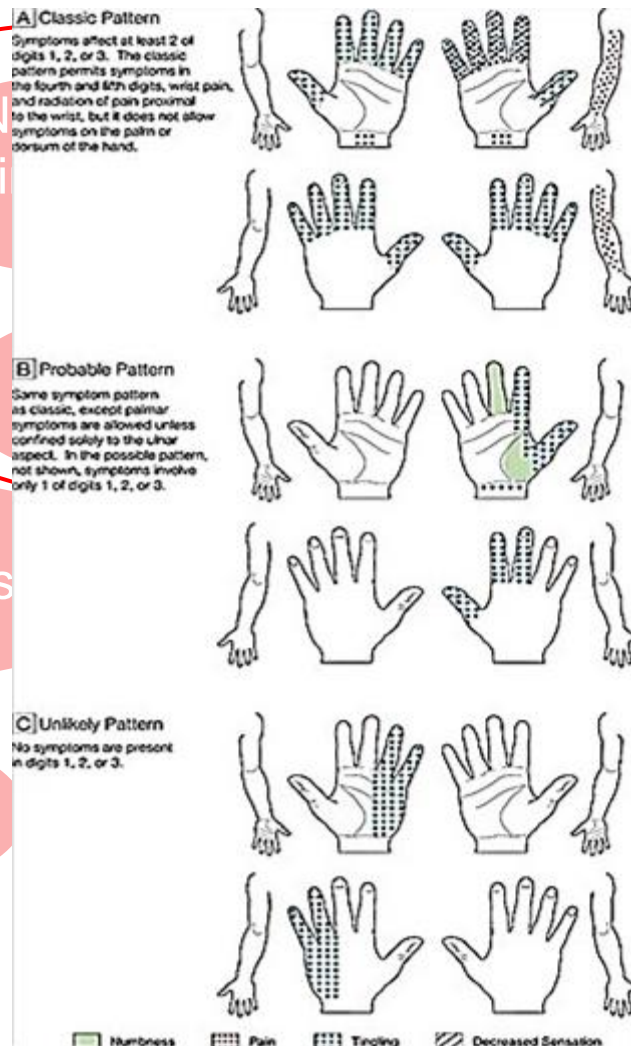
Slapende  
hand tijdens  
het fietsen

Koude  
intolerantie

Moeite om de  
vingers te  
bewegen in de  
ochtend

Moeite met  
oprapen  
fijne vppen

Pijn  
erarm  
eboog



Katz J and Stirrat C. (1990). A self-administered hand diagram for the diagnosis of carpal tunnel syndrome. The Journal of Hand Surgery, 15(2), 360-363.

Carpaal

Tunnel

Syndroom

Anamnese

Diabetes ?

rugproblemen ?

schildklier ?

Leeftijd ?

Nierproblemen ?

Manueel werk ?

unilateraal ?

hartproblemen ?

zwangerschap ?

dominantie ?

springvingers ?

nekpijn ?

Reuma ?

medicatie ?

Menopauze ?

Carpaal tunnel syndroom bij  
familieleden?





Carpaal

Tunnel

Syndroom

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling



Carpaal

Tunnel

Syndroom

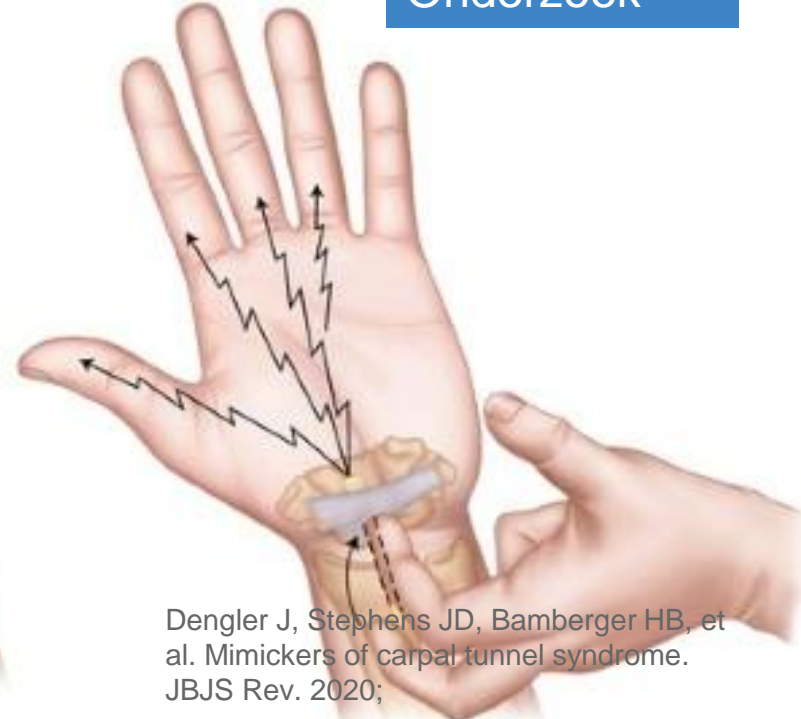
Tinel

sens: 0.28 - 0.73

spec: 0.44 - 0.95

Anamnese

Klinisch  
Onderzoek



Dengler J, Stephens JD, Bamberger HB, et al. Mimickers of carpal tunnel syndrome. JBJS Rev. 2020;



Carpaal

Tunnel

Syndroom

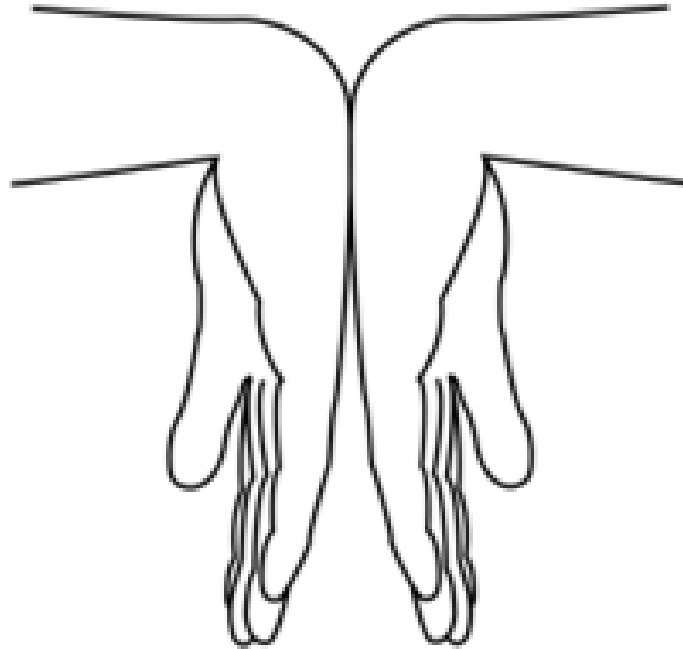
Phalen

sens: 0.46 - 0.80

spec: 0.51 - 0.91

Anamnese

Klinisch  
Onderzoek



Dengler J, Stephens JD, Bamberger HB, et al. Mimickers of carpal tunnel syndrome. JBJS Rev. 2020;



Carpaal

Durkan

Anamnese

Tunnel

Klinisch  
Onderzoek

Syndroom



Dengler J, Stephens JD, Bamberger HB, et al. Mimickers of carpal tunnel syndrome. JBJS Rev. 2020;

Carpaal

Tunnel

Syndroom

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling

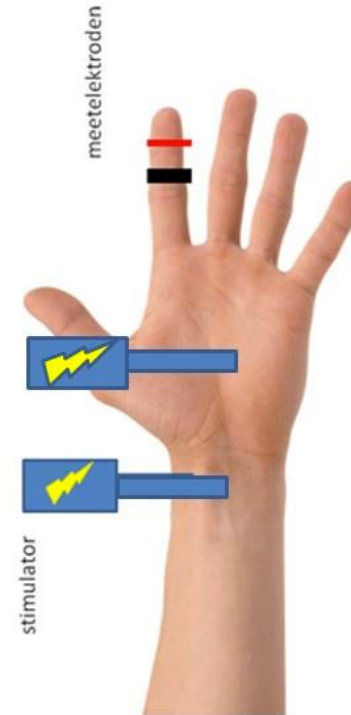
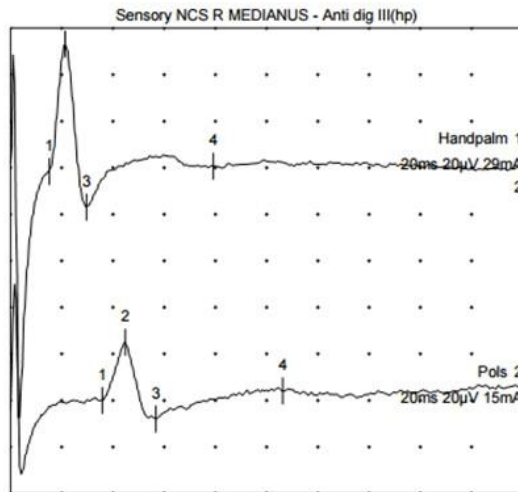


Carpaal

Tunnel

Syndroom

## EMG



Anamnese

Klinisch  
Onderzoek

Technisch  
onderzoek





Carpaal

Tunnel

Syndroom

Anamnese

Klinisch  
Onderzoek

Technisch  
onderzoek

Every patient with suspected CTS should undergo NCS before invasive treatment to **confirm the diagnosis**. The NCS are valid and reliable in confirming the clinical impression of CTS with a **sensitivity of > 85%** and a specificity of 95%.

Alanazy MH. Clinical and electrophysiological evaluation of carpal tunnel syndrome: approach and pitfalls. Neurosciences (Riyadh). 2017



Carpaal

Tunnel

Syndroom

Anamnese

Klinisch  
Onderzoek

Technisch  
onderzoek

## The Canterbury NCS Severity Scale for CTS

Normal (**grade 0**)

Very mild (**grade 1**), CTS demonstrable only with most sensitive tests.

Mild (**grade 2**), sensory nerve conduction velocity slow on finger/wrist measurement, normal terminal motor latency.

Moderate (**grade 3**), sensory potential preserved with motor slowing, distal motor latency to abductor pollicis brevis (APB)  $> 4,5 - < 5,5$  ms.

Severe (**grade 4**), sensory potentials absent but motor response preserved, distal motor latency to APB  $> 5,5 < 6,5$  ms.

Very severe (**grade 5**), terminal latency to APB  $> 6,5$  ms.

Extremely severe (**grade 6**), sensory and motor potentials effectively unrecordable (surface motor potential from APB  $< 0,2$  mV amplitude).



Carpaal

Tunnel

Syndroom

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling

nachtelijke tintelingen

Tinel +

EMG

nachtelijke pijn

Phalen +

ECHO

hand 'wakker' schudden

Durkan +



Carpaal

Tunnel

Syndroom

Never say always: operatie?

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling

nachtelijke tintelingen

Tinel +

EMG

OPERATIE ?

nachtelijke pijn

Phalen +

ECHO

hand 'wakker' schudden

Durkan +



Carpaal

Tunnel

Syndroom

Never say always: operate?

Klachten

Ana

nachtelijke tir

nachtelijke pi

hand 'wakker' schudden

Durkan +

Klachtenvrij

## The Canterbury NCS Severity Scale for CTS

**Normal (grade 0)**

**Very mild (grade 1)**, CTS demonstrable only with most sensitive tests.

**Mild (grade 2)**, sensory nerve conduction velocity slow on finger/wrist measurement, normal terminal motor latency.

**Moderate (grade 3)**, sensory potential preserved with motor slowing, distal motor latency to abductor pollicis brevis (APB)  $> 4,5 - < 5,5$  ms.

**Severe (grade 4)**, sensory potentials absent but motor response preserved, distal motor latency to APB  $> 5,5 < 6,5$  ms.

**Very severe (grade 5)**, terminal latency to APB  $> 6,5$  ms.

**Extremely severe (grade 6)**, sensory and motor potentials effectively unrecordable (surface motor potential from APB  $< 0,2$  mV amplitude).

Carpaal

Tunnel

Syndroom

Klachten

zo efficiënt mogelijk verloop

Klachtenvrij

Anamnese

KO

TO

Behandeling

nachtelijke tintelingen

Tinel +

EMG

spalk

nachtelijke pijn

Phalen +

ECHO

inspuiting

hand 'wakker' schudden

Durkan +

Operatie



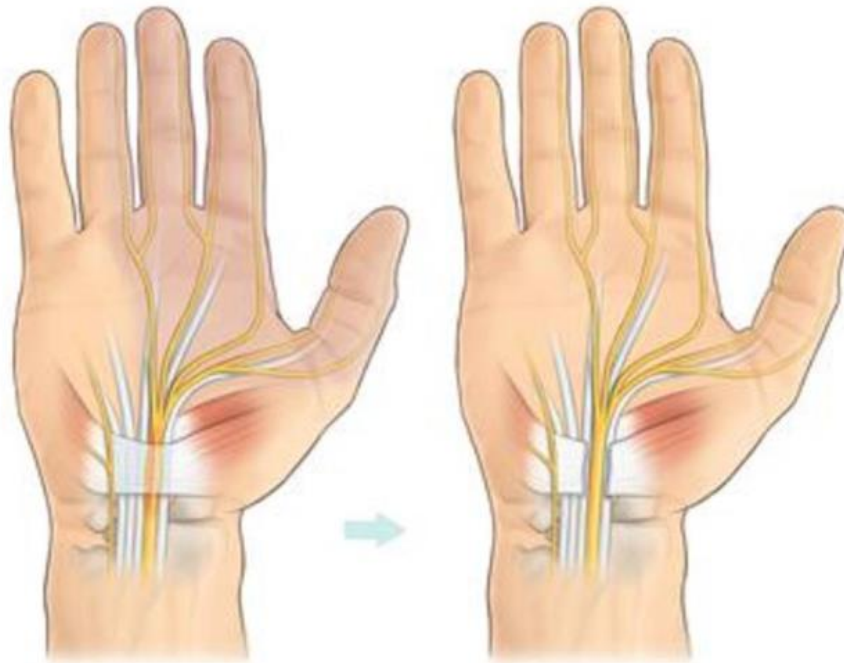


Open

Mini open

Endoscopisch

Echogeleid



Open

Endoscopisch

Mini open

Echogeleid

> [Cureus](#). 2024 Mar 21;16(3):e56677. doi: 10.7759/cureus.56677. eCollection 2024 Mar.

## A Comparison of Mini Open Transverse Incision and Longitudinal Incision for the Release of Moderate and Severe Carpal Tunnel Syndrome

Georges F Bassil <sup>1</sup>, Joeffroy Otayek <sup>2</sup>, Ramzi C Moucharafieh <sup>3</sup>, Mohammad Badra <sup>4</sup>

**Results:** A total of 415 patients were included in our study. All patients included had moderate to severe median nerve compression documented by nerve-conducted studies with positive Tinel's and Phalen's signs. Baseline demographics between group A (CTR through a longitudinal palmar mini-incision) and group B (CTR with a mini-transverse incision at the palmar crease) didn't show a statistically significant difference. Both groups showed improved grip strength and BCTQ scores at the post-operative follow-up.

**Conclusions:** Median nerve decompression using both types of incisions has resulted in the same functional outcomes and patient satisfaction.

Review

> [Cureus](#). 2024 Jul 20;16(7):e64991. doi: 10.7759/cureus.64991. eCollection 2024 Jul.

## Endoscopic Versus Open Carpal Tunnel Release: A Systematic Review of Outcomes and Complications

Ramkumar Rajapandian <sup>1</sup>, Sajida Moti Wala <sup>2</sup>, Esraa M Aledani <sup>2</sup>, Essa A Samuel <sup>3</sup>, Khoula Ahmad <sup>2</sup>, Naelijwa J Manongi <sup>4</sup>, Samia Rauf Butt <sup>5</sup>

from three to 24 months. The findings reveal that ECTR has comparable or better outcomes than OCTR, particularly in postoperative discomfort, functional recovery, grip strength, resumption of work, and patient satisfaction. Additionally, ECTR has lower levels of scar sensitivity, pillar pain, and wound-related complications than OCTR. However, ECTR carries a higher risk of reversible nerve injury. There were no substantial differences between the two techniques regarding other potential complications. Both ECTR and OCTR are safe and effective interventions for CTS. ECTR has benefits like faster recovery and improved cosmetic outcomes but requires higher technical proficiency and carries the risk of nerve injury. The choice of technique should consider patient preference, cost-effectiveness, and surgeon expertise.

Open

Endoscopisch

Mini open

Echogeleid

> J Am Acad Orthop Surg. 2022 Apr 1;30(7):292-301. doi: 10.5435/JAAOS-D-21-00949.

## Endoscopic Carpal Tunnel Release: Techniques, Controversies, and Comparison to Open Techniques

Jacques H Hacquebord <sup>1</sup>, Jeffrey S Chen, Michael E Rettig

### Abstract

Endoscopic carpal tunnel release (ECTR) continues to rise in popularity as a treatment option for carpal tunnel syndrome. Numerous variations in technique and instrumentation currently exist, broadly classified into two-portal and single-portal techniques with antegrade and retrograde designs. ECTR is equally effective as open carpal tunnel release for alleviating symptoms of carpal tunnel syndrome with no differences in long-term outcomes. ECTR has an increased risk of transient nerve injury, whereas open carpal tunnel release has an increased risk of wound and scar complications. ECTR has higher direct costs but is associated with earlier return to work. ECTR is a safe and effective approach to carpal tunnel release in the hands of experienced surgeons.

Comparative Study > J Am Acad Orthop Surg. 2024 Sep 1;32(17):777-785.

doi: 10.5435/JAAOS-D-23-00872. Epub 2024 Apr 25.

## Direct Variable Cost Comparison of Endoscopic Versus Open Carpal Tunnel Release: A Time-Driven Activity-Based Costing Analysis

Terence L Thomas <sup>1</sup>, Graham S Goh, Pedro K Beredjiklian

**Results:** Total facility costs were \$352 higher in ECTR compared with OCTR (\$882 versus \$530). ECTR cases had higher personnel costs (\$499 versus \$420), likely because of longer surgical time (15 versus 11 minutes) and total operating room time (35 versus 27 minutes). ECTR cases also had higher supply costs (\$383 versus \$110). Controlling for demographics and comorbidities, ECTR was associated with an increase in personnel costs of \$35.74 (95% CI, \$26.32 to \$45.15), supply costs of \$230.28 (95% CI, \$205.17 to \$255.39), and total facility costs of \$265.99 (95% CI, \$237.01 to \$294.97) per case.


**Discussion:** Using TDABC, ECTR was 66% more costly to the facility compared with OCTR. To reduce the costs related to endoscopic surgery, efforts to decrease surgical time and negotiate lower ECTR-specific supply costs are warranted.

Open

Endoscopisch

Mini open

Echogeleid

► *Hand (N Y)*. 2022 Jun 29;18(1 Suppl):100S–105S. doi: [10.1177/15589447221085700](https://doi.org/10.1177/15589447221085700) 

## Surgeons' Recommendations for Return to Work After Carpal Tunnel Release

[Tobias N von Bergen](#)<sup>1</sup>, [Risa Reid](#)<sup>2</sup>, [Matthew Delarosa](#)<sup>1</sup>, [John Gaul](#)<sup>1</sup>, [Christopher Chadderdon](#)<sup>1,2,3,✉</sup>

In conclusion, a large degree of consistency exists among members of the ASSH in the perioperative management of patients undergoing CTR. The 3 most influential factors in determining RTW identified by our respondents were type of work, employer support, and financial considerations. We have outlined RTW parameters based on physical job demands to provide a clinical framework during the perioperative care of patients undergoing CTR. These data may be referenced by practitioners when considering appropriate recommendations for their patients. Our study adds to the literature on RTW guidelines and can be used as a tool to optimize perioperative protocols and facilitate the safe RTW after CTR.

► *Hand Surg Rehabil*. 2024 Oct 30:101974. doi: [10.1016/j.hansur.2024.101974](https://doi.org/10.1016/j.hansur.2024.101974).

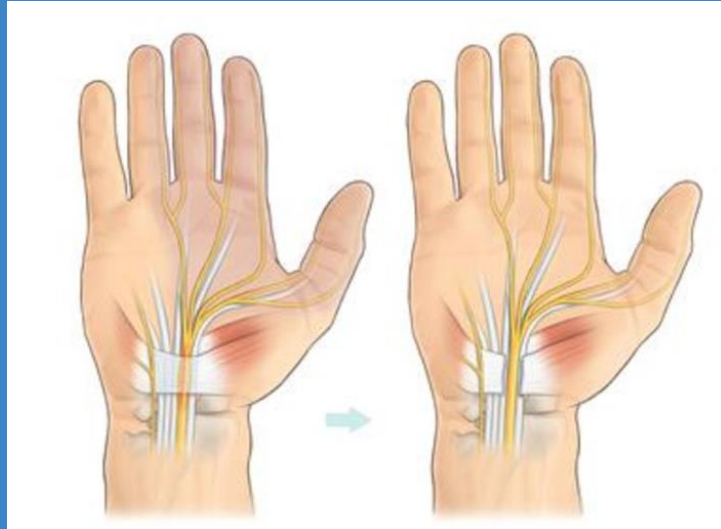
Online ahead of print.

## Comparison of WALANT versus locoregional nerve block in staged bilateral endoscopic carpal tunnel release

[Dries Verrewaere](#)<sup>1</sup>, [Pieter Reyniers](#)<sup>2</sup>, [Hanne Vandevivere](#)<sup>2</sup>, [Filip Stockmans](#)<sup>2</sup>, [Bart Berghs](#)<sup>2</sup>, [Francis Bonte](#)<sup>2</sup>

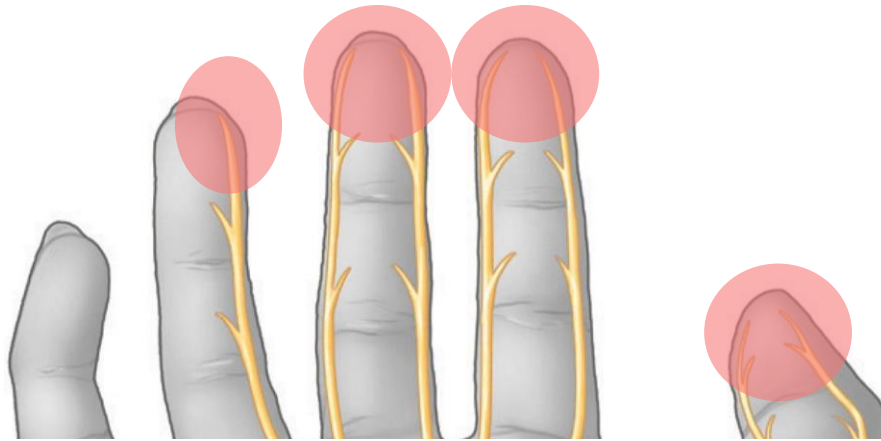
**Conclusion:** In general, endoscopic carpal tunnel release was better tolerated under WALANT than locoregional distal nerve block. Although statistical analysis showed no significant difference in visibility and fluency for the surgeon between the two anesthesia techniques, we do not recommend endoscopic release under WALANT due to the consistent report of reduced visibility in the surgical field. This limitation, likely related to the presence of anesthetic fluid, may have failed to reach statistical significance due to small sample size, but is nevertheless a considerable challenge in practice.

## Carpaal tunnel syndroom: behandeling zonder tunnelvisie.



Carpaal

Tunnel



As CTS is the most prevalent nerve entrapment neuropathy, individuals affected will seek care from various healthcare specialties. Symptoms can become debilitating if not promptly addressed. Clinicians from various specialties, including obstetrics, orthopedics, neurology, primary care, endocrinology, and physical or occupational therapy, are critical in diagnosing and managing CTS. Combined therapy may offer more substantial benefits than any single treatment. Therefore, healthcare professionals must educate patients about the risks, benefits, and efficacy of various treatment modalities of CTS and help them establish realistic expectations regarding their treatment outcomes. Effective communication among healthcare team members is essential in facilitating combined therapies, patient education, and timely treatment to support patients in regaining normal function. The collaborative interprofessional team approach is instrumental in improving outcomes for CTS patients.[22][23]

Syndroom

**Carpal Tunnel Syndrome**

Justin O. Sevy; Reddog E. Sina; Matthew Varacallo.



Carpaal

Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

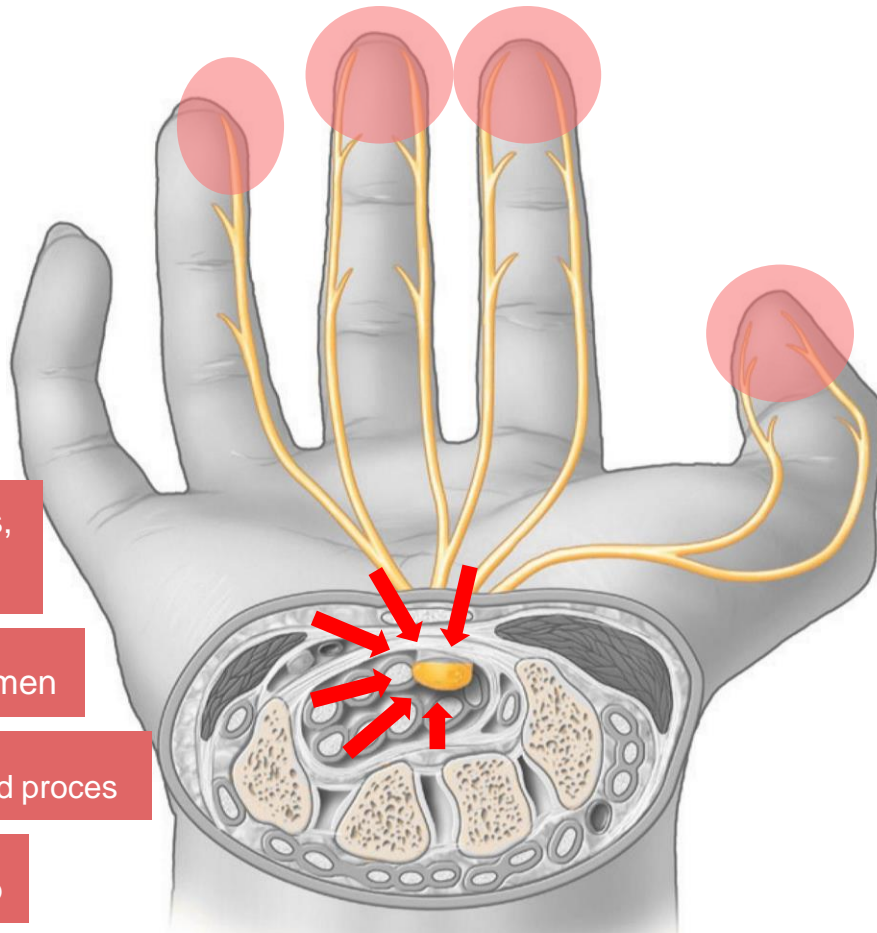
Trauma

Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze



Syndroom



Carpaal

Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

Trauma

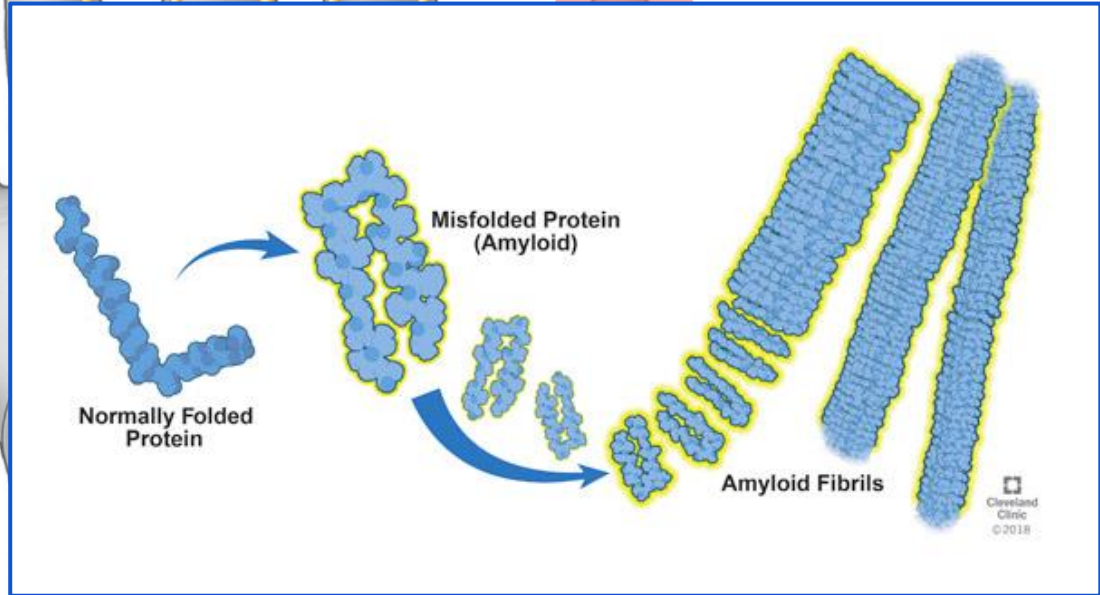
Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze

Syndroom



Carpaal

Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

Trauma

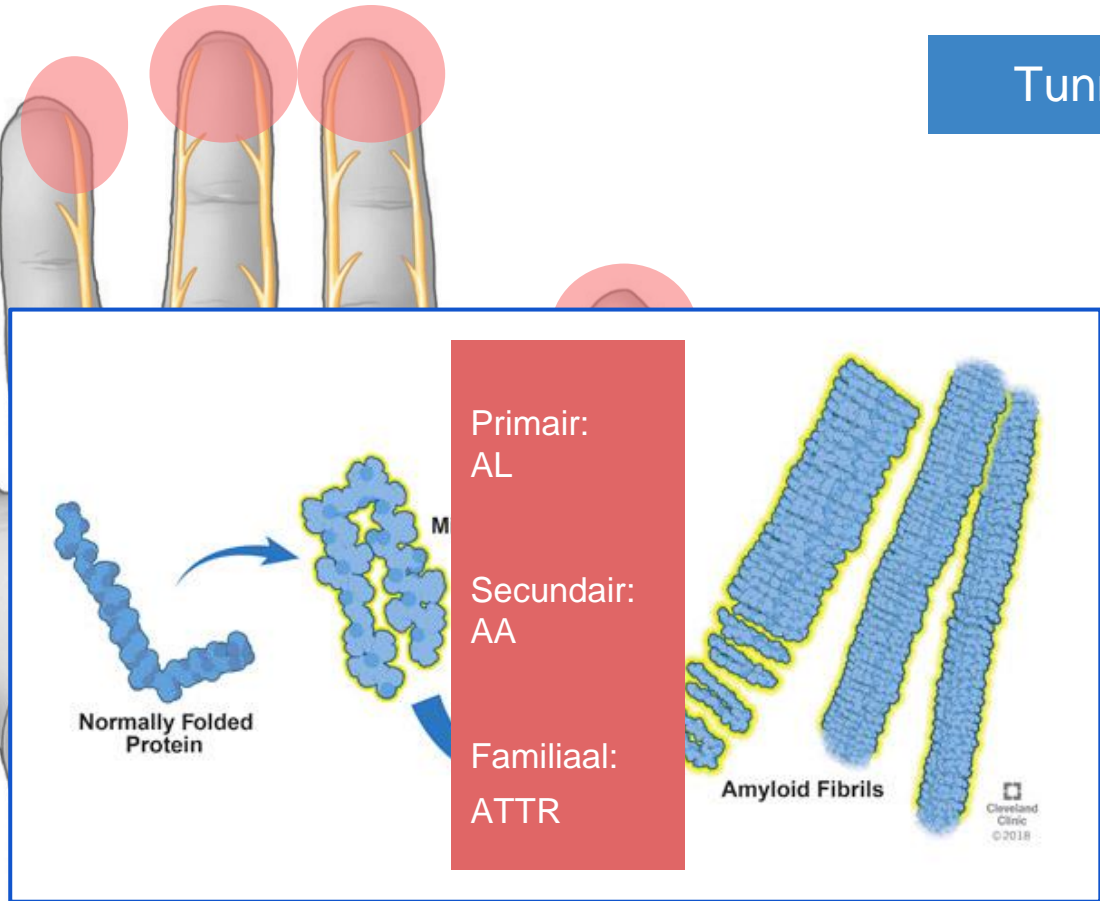
Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze

Syndroom



Carpaal

Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

Trauma

Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze

**TABLE 1. Tier 1 and Tier 2 Criteria for Biopsy According to Donnelly et al,<sup>7</sup> 2019\***

Tier 1	Tier 2
Men aged >50 y	Spinal stenosis
Women aged >60 y	Biceps tendon rupture
Bilateral carpal tunnel syndrome	Congestive heart failure
	Family history of ATTR amyloidosis

\*Biopsy is indicated if 2 criteria are met from tier 1 or 1 criterion from tier 1 plus 1 criterion from tier 2.

Syndroom

CTS presented at a median of 5.1 years prior to a diagnosis of cardiac amyloidosis.

Sood and Lipira





# Carpaal

# Tunnel

Nauwe tunnel

Repetitief manueel werk

Hypothyroïdie, RA, diabetes,  
sclerodermie, Jicht, Lupus

Amyloïdose

Nier problemen

Trauma

Ruimte innemend proces

Obesitas

Zwangerschap

Menopauze

# Syndroom

> J Hand Surg Am. 2024 Jul;49(7):675-680. doi: 10.1016/j.jhssa.2022.09.005. Epub 2023 Jan 14.

## Results of Implementation of Amyloidosis Screening for Patients Undergoing Carpal Tunnel Release

Nicholas P Gannon <sup>1</sup>, Christina M Ward <sup>2</sup>

**Results:** Seventy-five (48%) of 156 patients who underwent CTR met the eligibility criteria for amyloidosis testing. Of the 62 patients who agreed to undergo tenosynovial biopsy, 14 had amyloid-positive biopsy specimens (10 men and 4 women). All patients with positive tenosynovial biopsies had bilateral carpal tunnel syndrome and wild-type transthyretin amyloid subtype. One patient was diagnosed and started treatment for otherwise asymptomatic cardiac amyloidosis.

**Conclusions:** The incidence of amyloid-positive tenosynovial biopsy results from CTR was 22.5% in patients using the criteria from an appropriateness screening algorithm, which was higher than previously reported. Implementation of a screening program for patients undergoing CTR requires a multidisciplinary approach and may result in early diagnosis and lifesaving interventions for patients with amyloidosis.



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Conclusie:

Carpaal tunnel syndroom is een relatief **eenvoudige diagnose**.

Wees alert voor de **differentiaal diagnose** / double crush fenomeen

Never say always: carpaal tunnel syndroom.

Never say always: operatie.

Doe zo nodig een proefperiode met een nachtsplak of proefinfiltratie in de carpaal tunnel.

Denk steeds aan een **onderliggend probleem** als oorzaak van een carpaal tunnel syndroom en probeer dit, zo nodig, ook te behandelen.

Syndroom

