

Entrapment am Thoracic Outlet?

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Klassifikation von TOS

- Vaskulaer (~5-10%)
 - arteriell
 - venoes
- Neurologisch (~90-95%)
 - klassisch (true)
 - unspezifisch
- Neuro-vaskulaer
- Muskuloskeletal
 - unspezifisch

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Case report (Lee et al 2011)

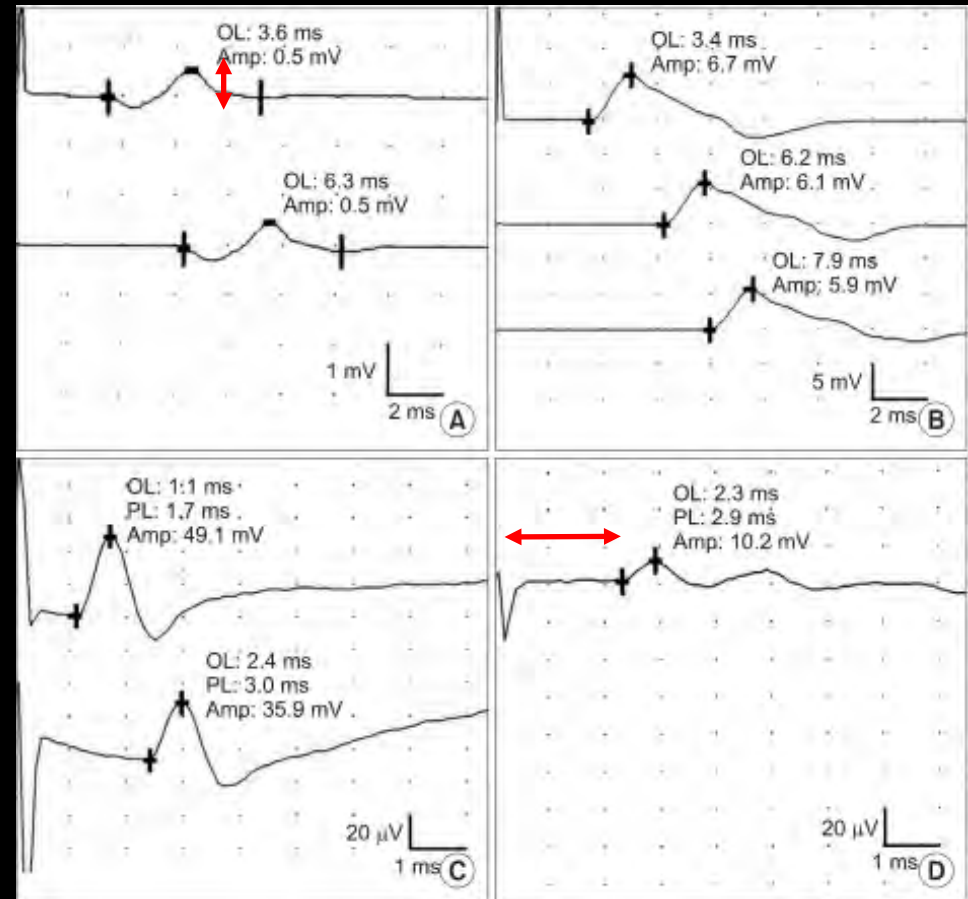


motorisch

sensorisch

median

ulnar



Untersuchung



Unspezifisch neurogen

+ Symptome:

- Paraesthesien
- Schmerz
- Hyperalgesie

+ Zeichen:

- Neurale Mechanosensitivitaet
 - Neurodynamische Teste
 - Palpation
 - Provokationsteste
 - Tinel's sign

Mechanismen



Druckgradient



Arterie>Kapillare> Nerv Faszikel> Vene> Skalenus Dreieck

Ischaemie

Tiermodelle (Rydevik 1981)

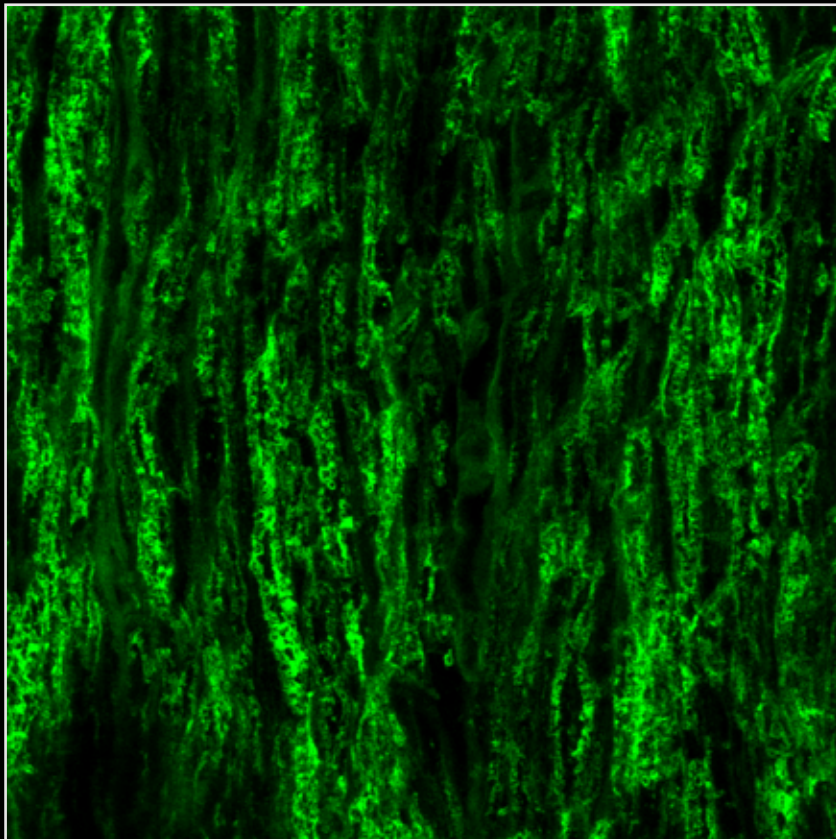
- 20-30 mmHg: ↓ venoese Zirkulation
- 40-50 mmHg: ↓ arterielle und kapillaere Zirkulation

Menschen (Lundborg 1982)

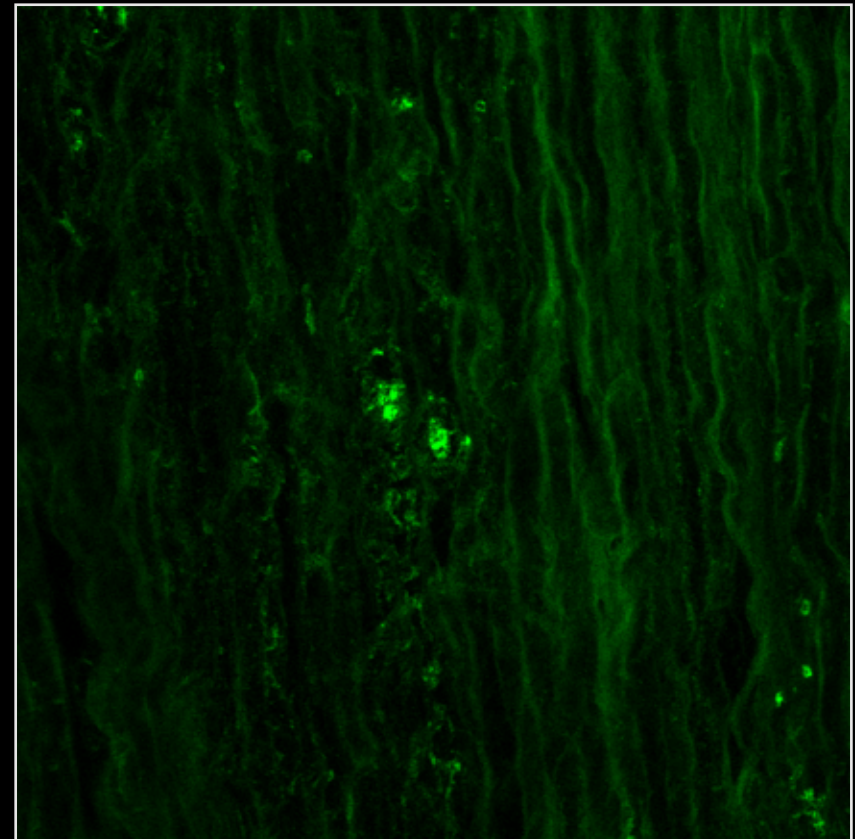
- 30 mmHg: Paraesthesien, ↓ Nervenleitgeschwindigkeit

Lokale Demyelinisierung

kontralateral



Läsion



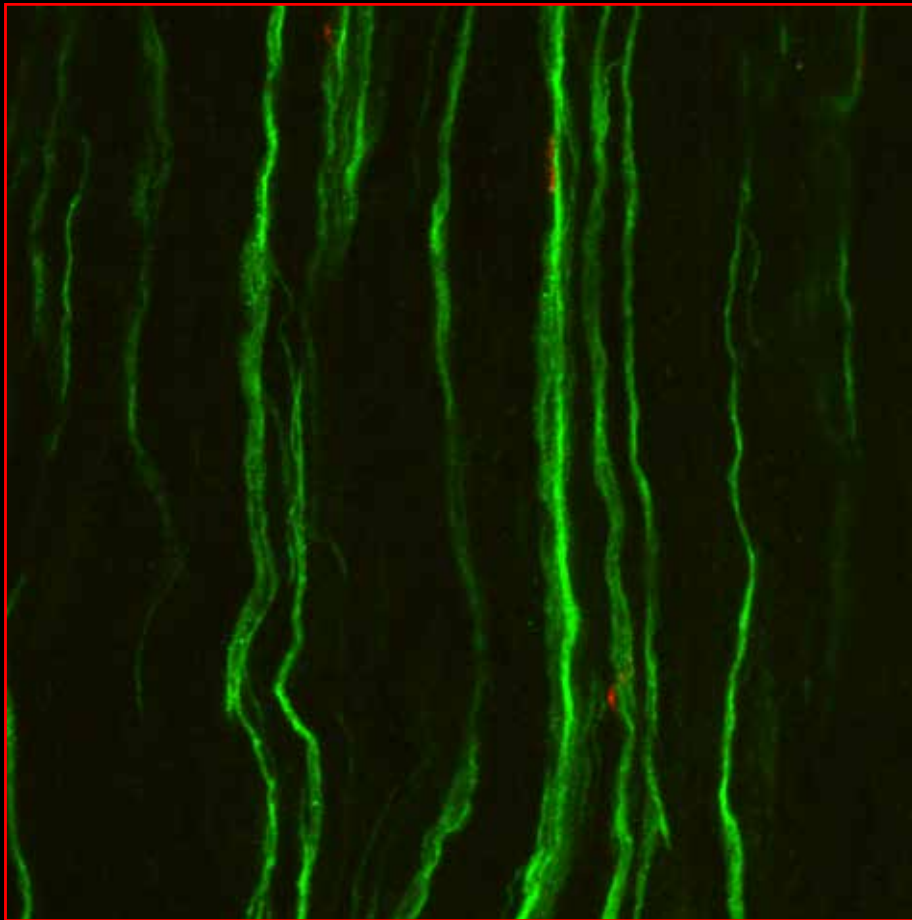
● Myelin basic protein

Schmid et al 2013

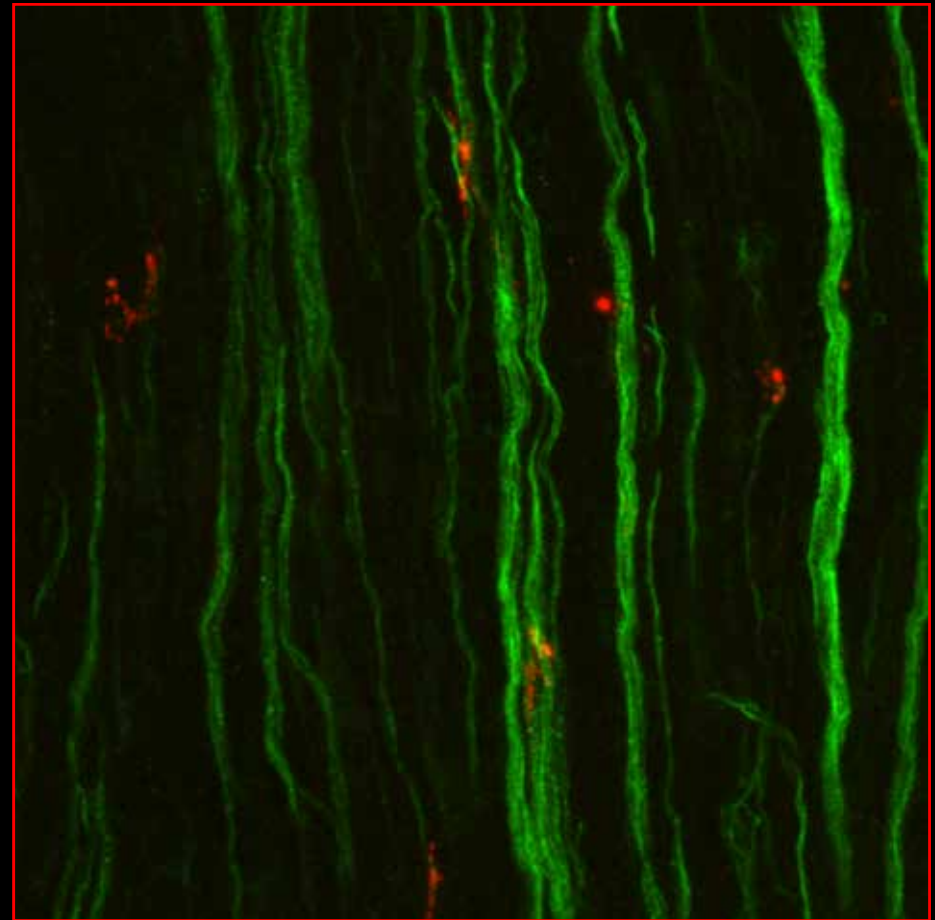


Intraneurale Entzündung

kontralateral



Kompression



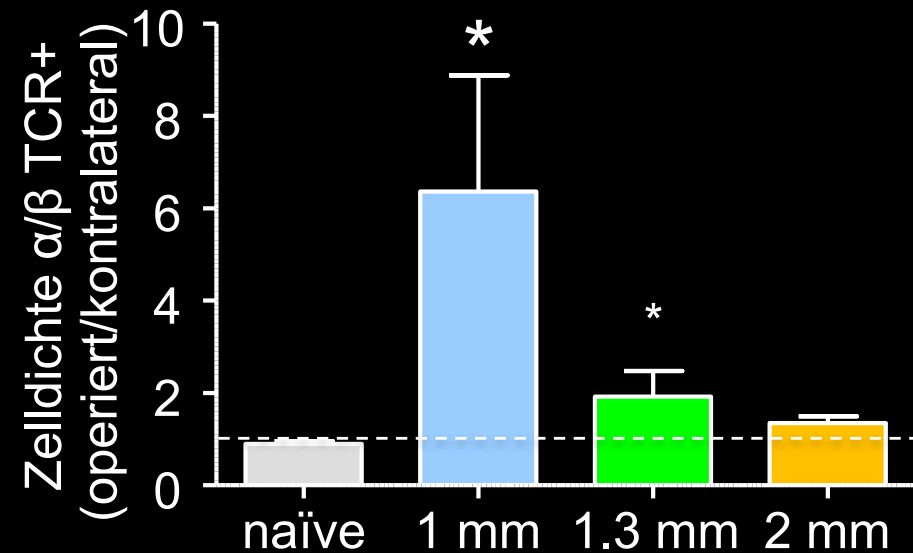
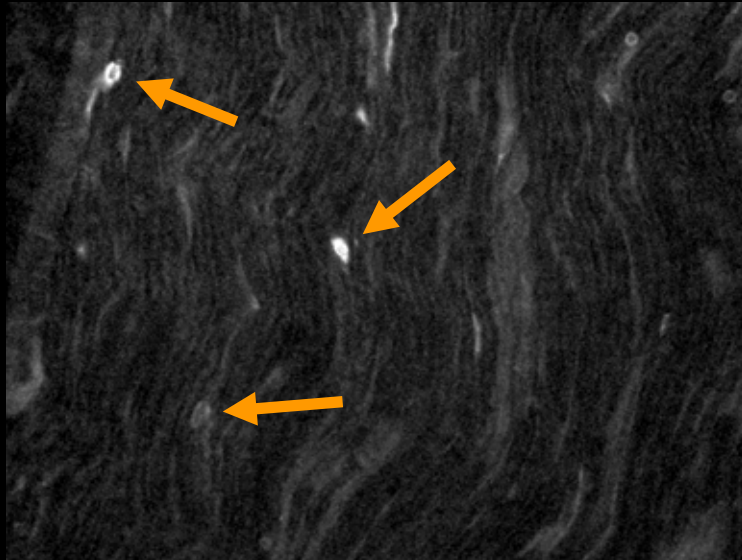
● CD68⁺ Makrophagen ● GFAP⁺ Schwannzellen

Schmid et al 2013



Intraneurale Entzündung

Kompression: α/β TCR

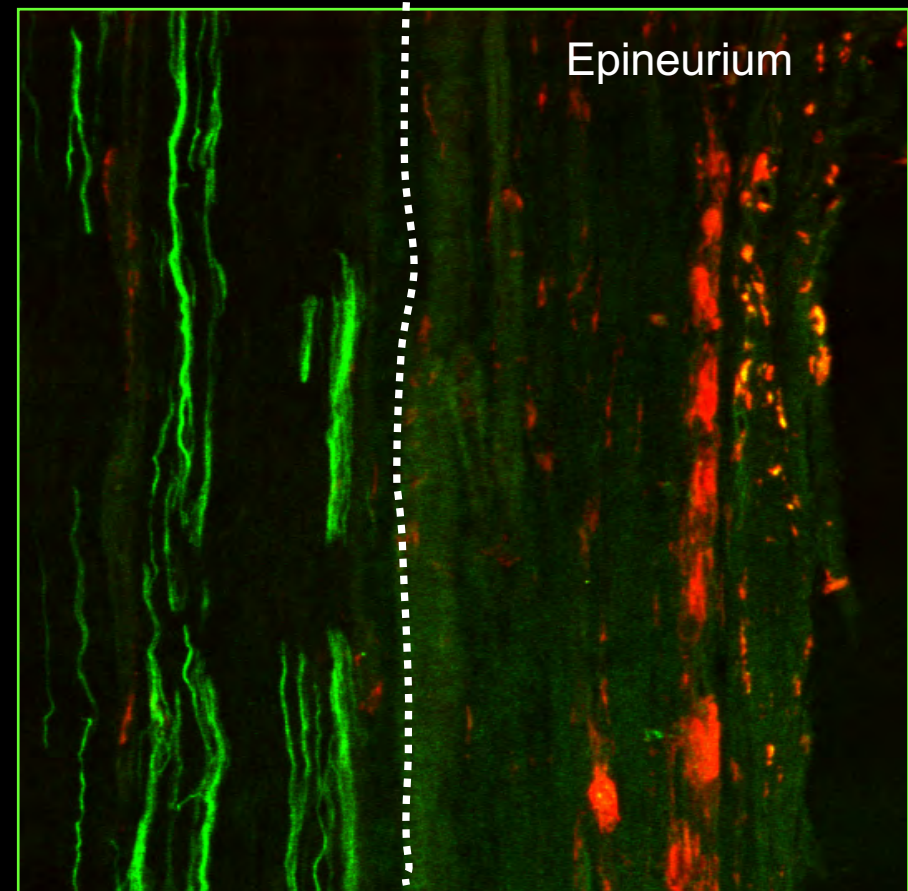
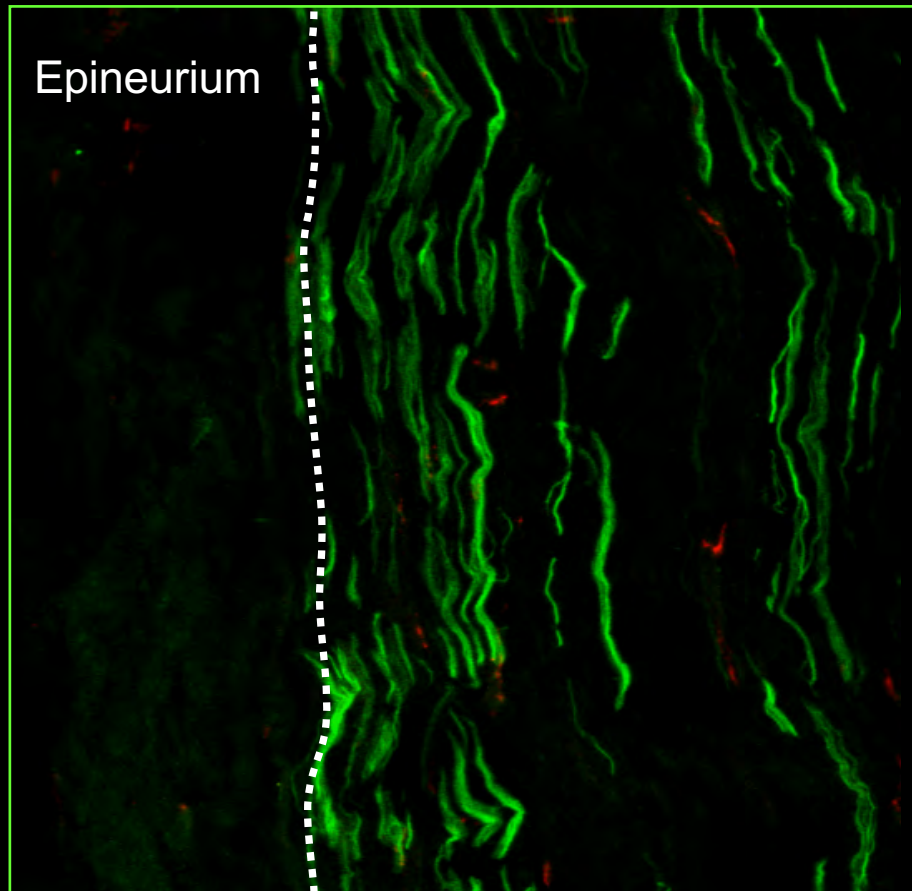


Kruskal-Wallis

Epineurale Entzündung

kontralateral

Kompression



● CD68⁺ Makrophagen ● GFAP⁺ Schwannzellen

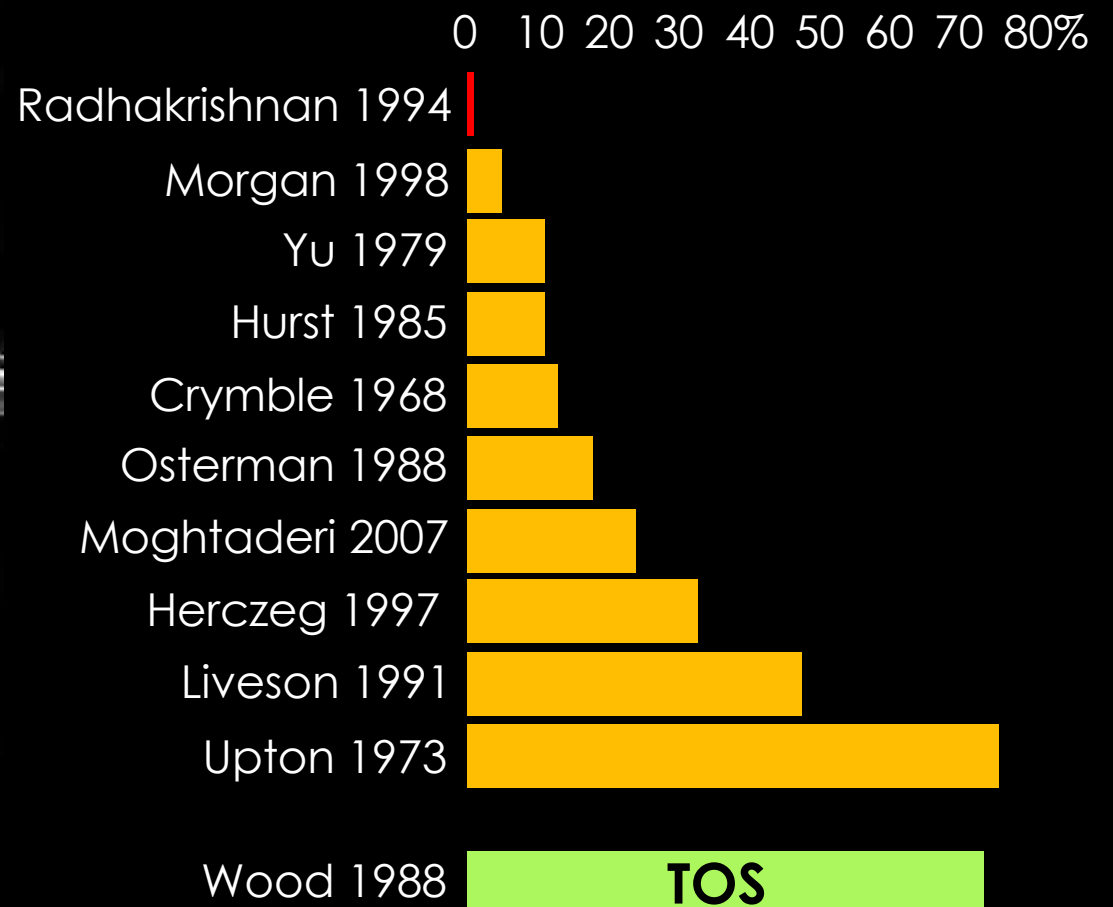
Schmid et al 2013



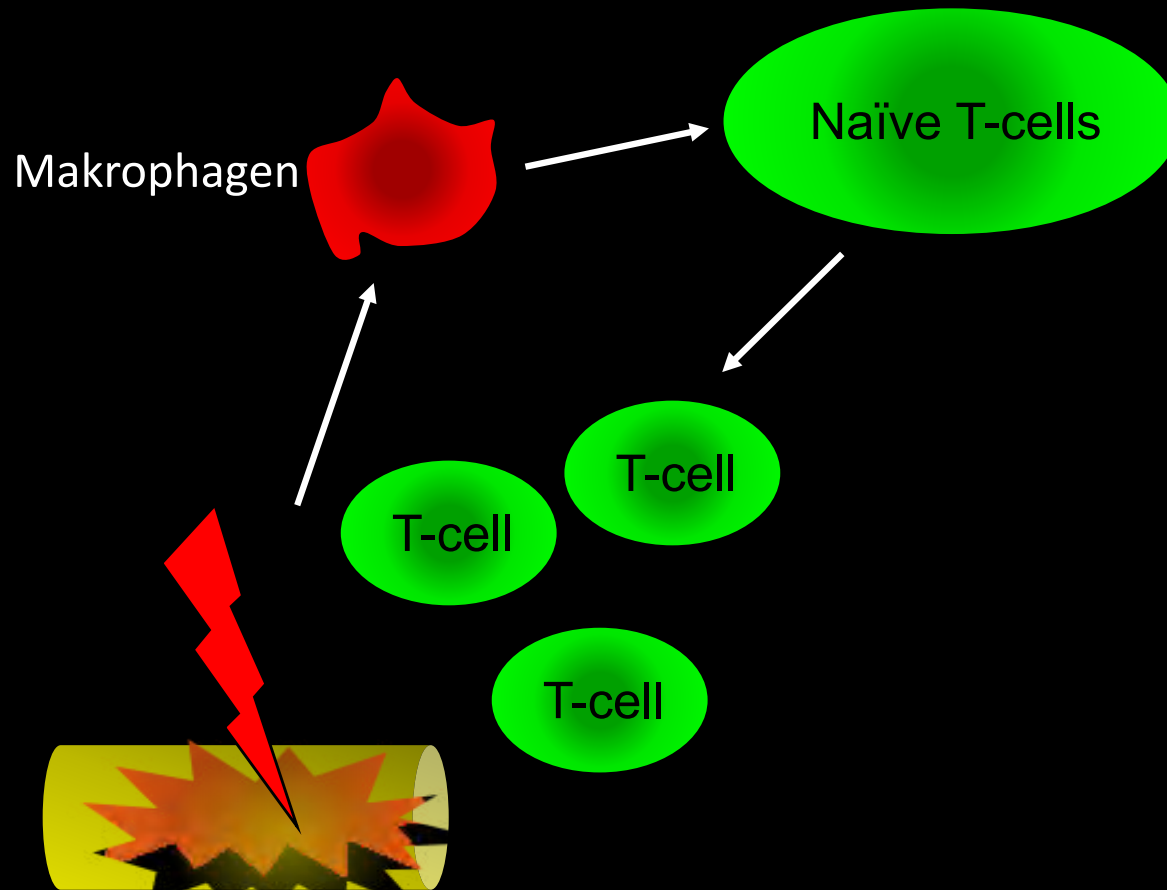
Nervi Nervorum



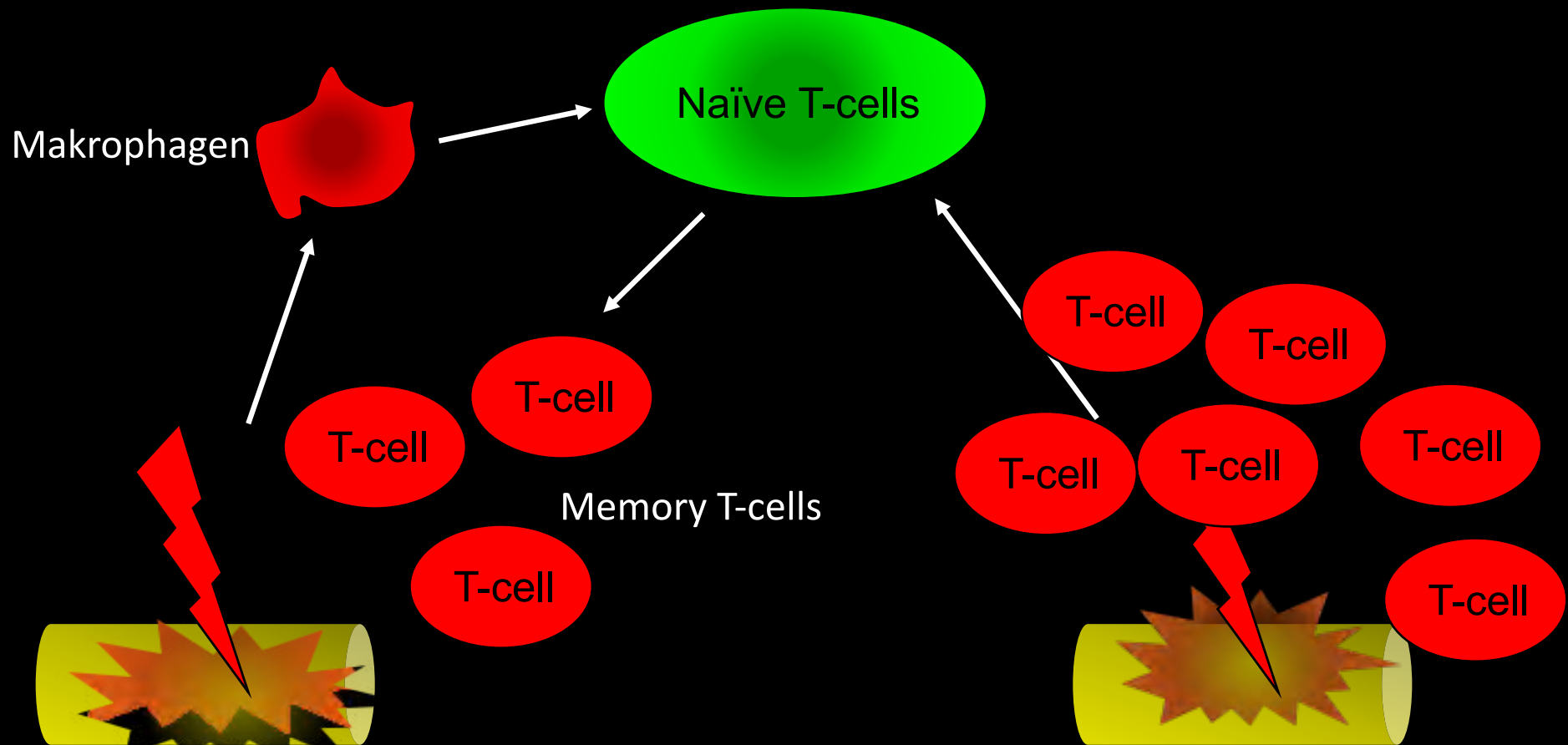
Double Crush Syndrom?



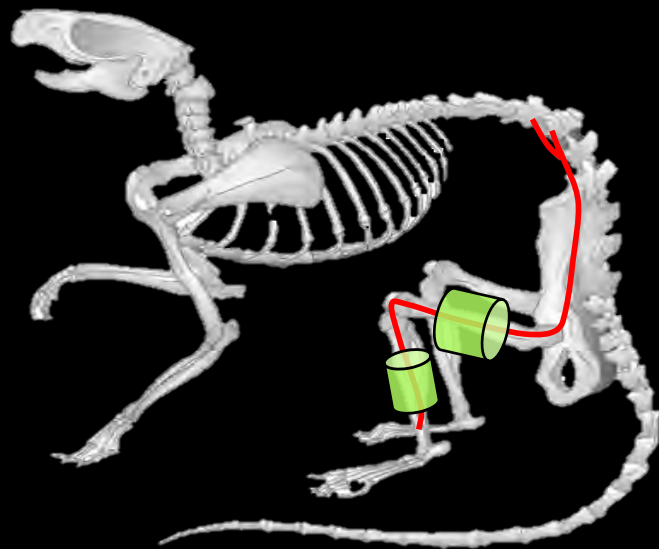
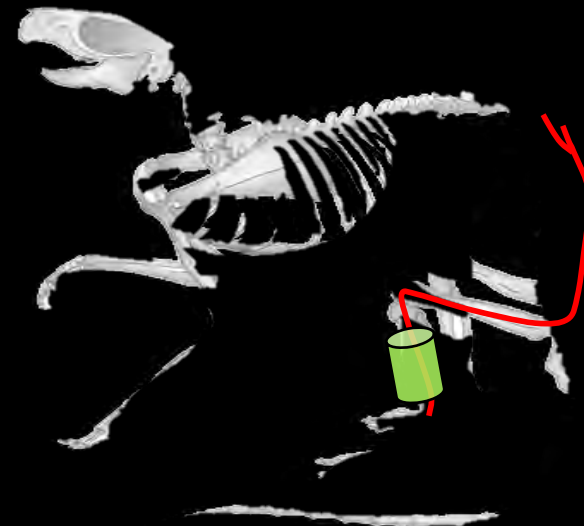
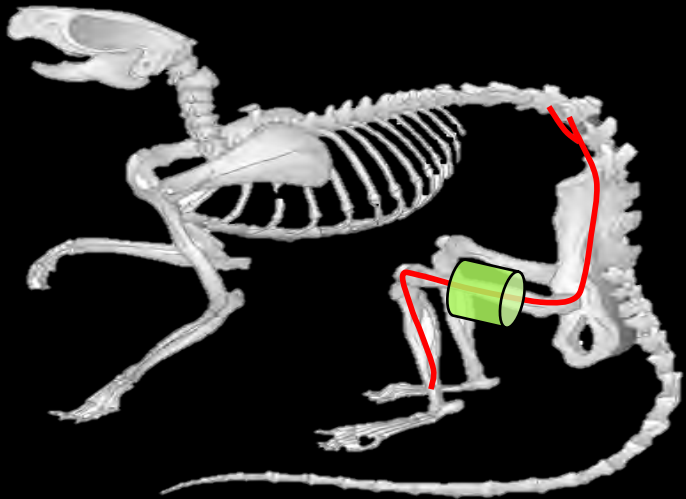
Immun Gedächtnis?



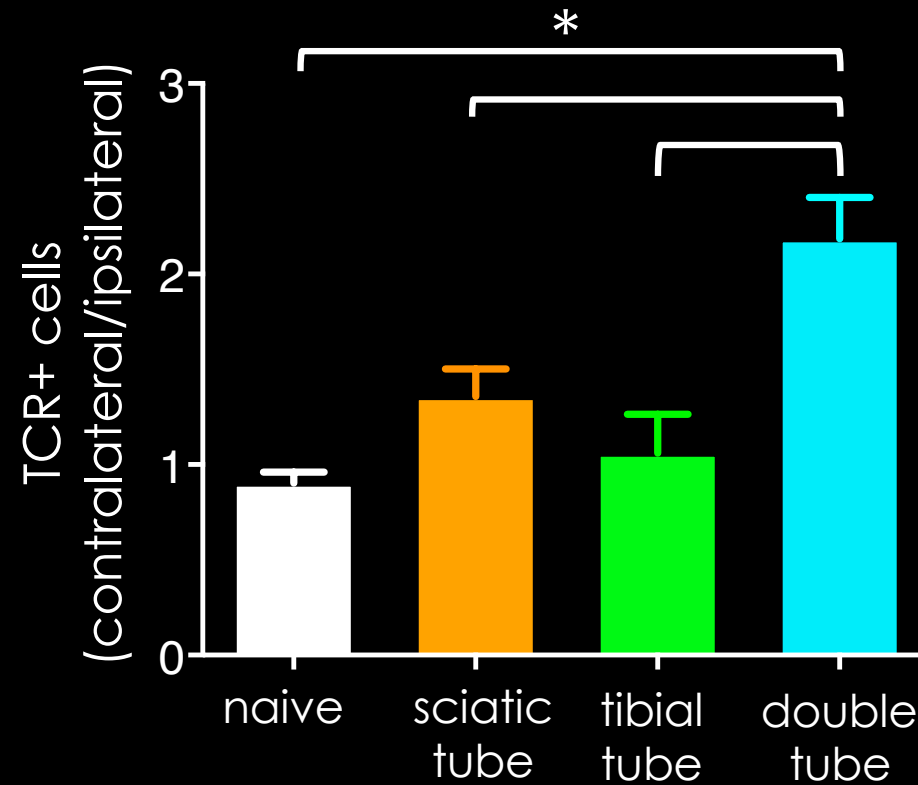
Immun Gedächtnis?



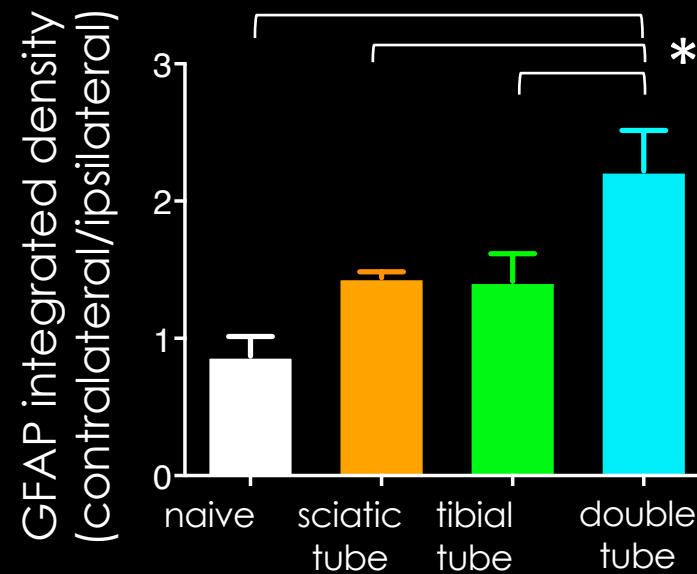
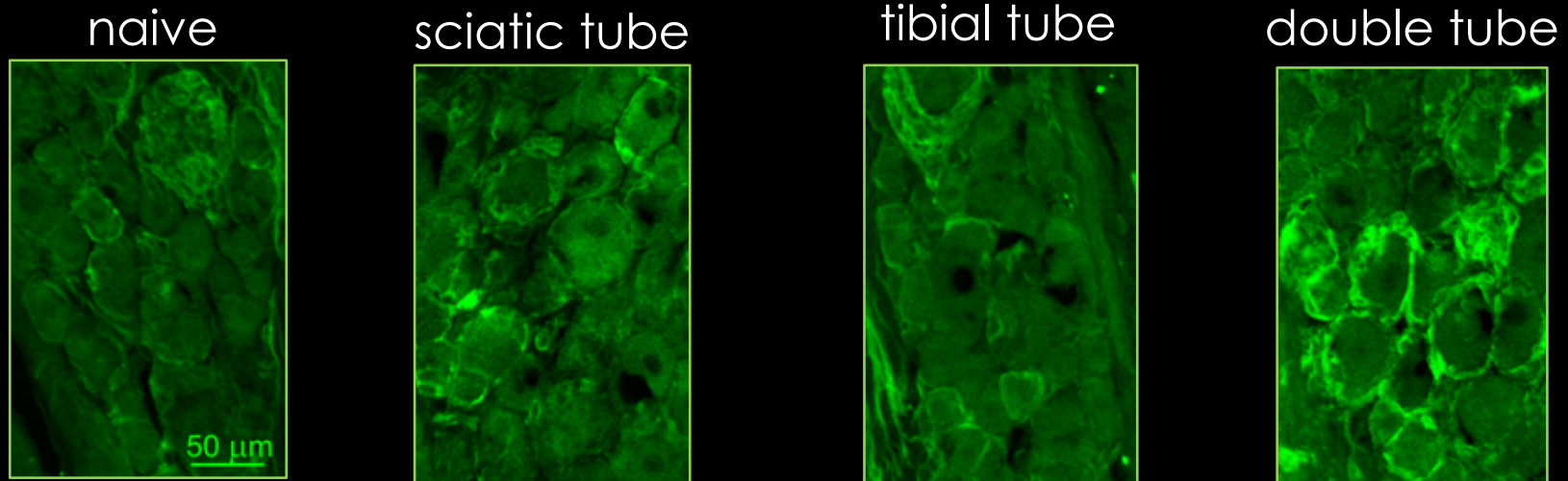
Studien Design



↑ T-Zell Aktivierung



↑ Satelliten Gliazellen Aktivierung



Munyanuki et al
in preparation

'Immungedaechtnis' ist ein
moeglicher Mechanismus der
das Nervensystem verwundbar
macht fuer multiple
Nervenprobleme

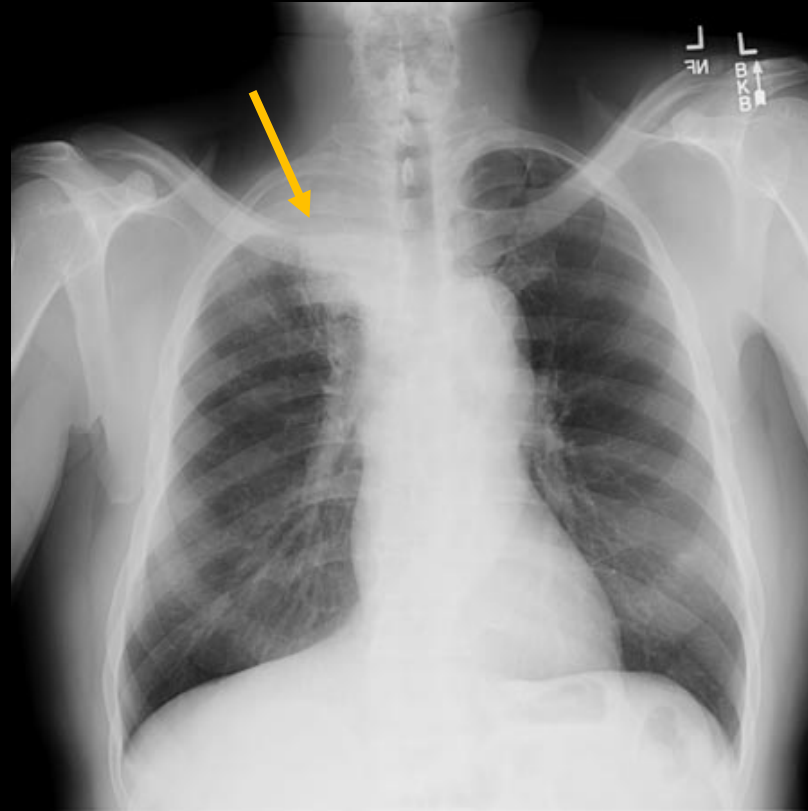
Management

“Despite many reports on conservative and surgical interventions, rigorous scientific investigation of this syndrome and its management is lacking.”

Beitragende Faktoren

- Ueberkopftaktivitäten (Schwimmer, Speerwerfer)
- Haltung, z. B. hängende Schulter, Schlafposition mit Hyperabduktion (Lee 2011)
- Elevierte 1. Rippe z.B. bei Asthma, flacher oberer BWS
- Tonus der oberflächlichen Halsmuskulatur
- niedriger Blutdruck, Diabetes, Schilddruesenprobleme, etc

Aufgepasst: TOS-Masquerade



Zusammenfassung

- Unspezifisch neurogen > klassisch neurogen
- Neurale Mechanosensitivitaet
- Pathomechanismen spekulativ
- Keine Evidenz fuer Management
- Empirisch: ↓ Druck, ↑ Neurale Resilienz
 - Aufklaerung, Information
 - Funktions- und Haltungsaspekte
 - Muskulaere Techniken
 - Diaphragmal Atmung
 - Neurodynamisches Management

Danke!

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FNSNF

FONDS NATIONAL SUISSE
SCHWEIZERISCHER NATIONALFONDS
FONDO NAZIONALE SVIZZERO
SWISS NATIONAL SCIENCE FOUNDATION



Australian Government
National Health and
Medical Research Council

N H M R C



International Association for the Study of Pain

IASP

Working together for pain relief