

Radiofrequente technieken bij chronische pijnproblemen

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Wie zijn onze patiënten ?

Grootste deel consulteert met pijn uitgaande van de wervelkolom en omliggende structuren

frequent oorzaak van disability en mobiliteitsverlies

70 -80 % volwassenen maakt tijdens zijn leven een periode door met rug/nekklachten

8-12 % wordt chronisch, psychologische en sociale factoren spelen mee een rol

Mechanisme van chronische pijn

Complex

slechts in 15 % wordt een specifieke oorzaak gevonden

majeur gedeelte

mechanisme onduidelijk

Rx afwijkingen aspecifiek / niet correlatief met de klachten

technische onderzoeken niet duidend

belang anamnese en klinisch onderzoek

Biomedisch denken

Interventionele technieken

Situering

Subacuut /radiculair

Chronisch : Radiofrequentie

- I. Epidural corticosteroid injections (ESI)
 - A. Lumbar
 - B. Cervical
 - C. Thoracaal

- A. de basis
- B. Spinale pijn

Subacute radiculaire pijn

- 54 jarige dame
- regelmatig eens ruglast maar nooit langer dan enkele weken
- nu begonnen met wat rugpijn maar nu schietende pijn in linker been tot aan de binnen enkel
- werkt in slagerij, nl BMI
- via huisarts : IM injecties NSAID, peros zwak opioïd
- kine opgestart : eerder toename van de klachten
- MBV : discoradiculair conflict L4L5 met compressie op L5
- Verwezen voor infiltraties

Subacuuut/radiculaire pijn

Epidurale toediening steroiden

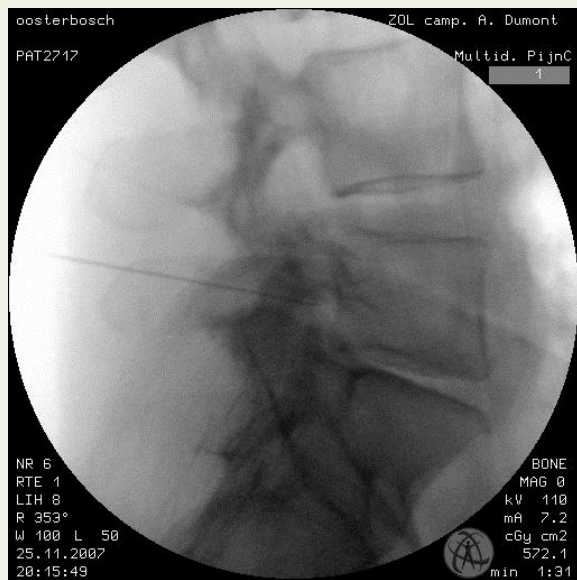
Lumbaal : transforamineel

Cervicaal : midline

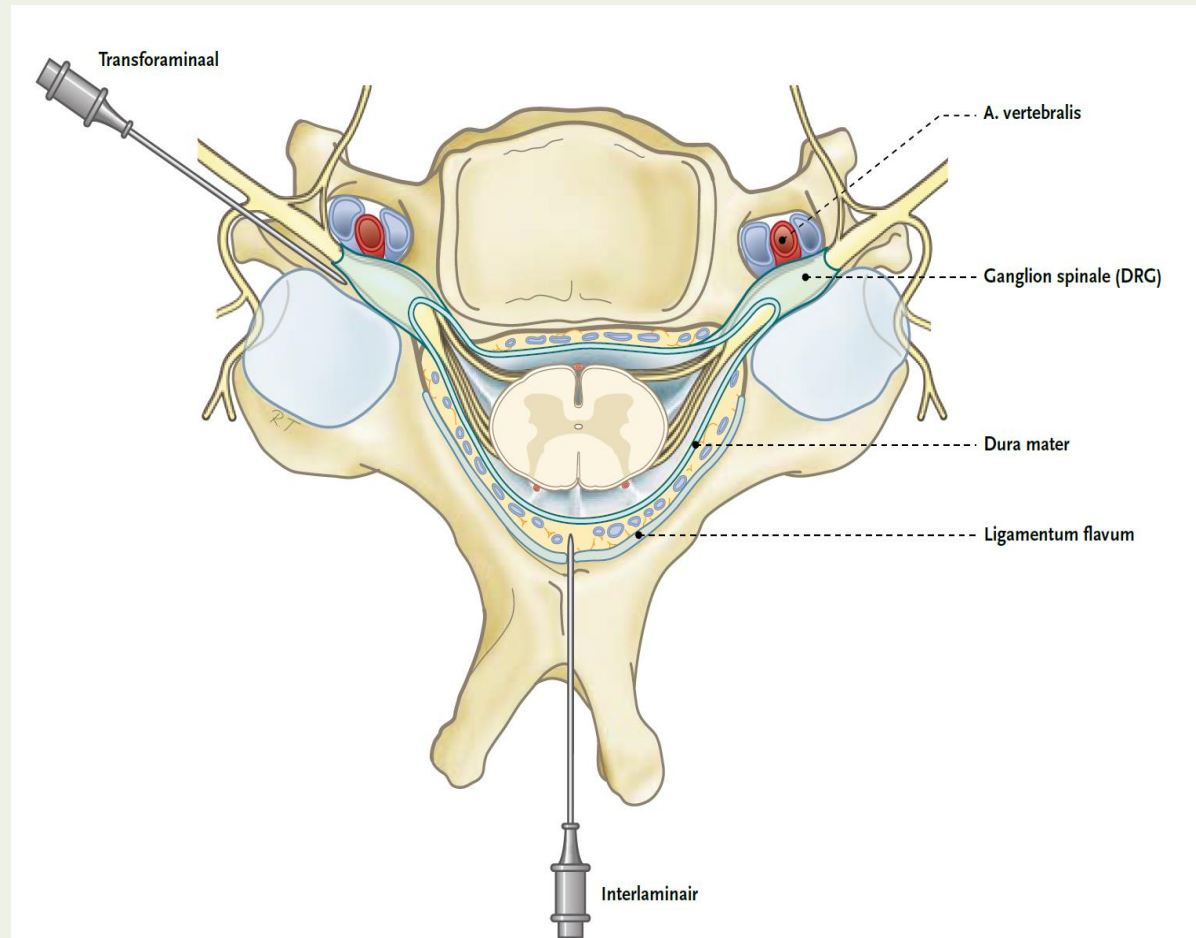
Thoracaal : midline

Anti inflammatoir/analgetisch effect steroiden

TECHNIEK TF



TECHNIEK



Figuur I.1-1: Interlaminaire en transforaminale benadering van de epidurale ruimte

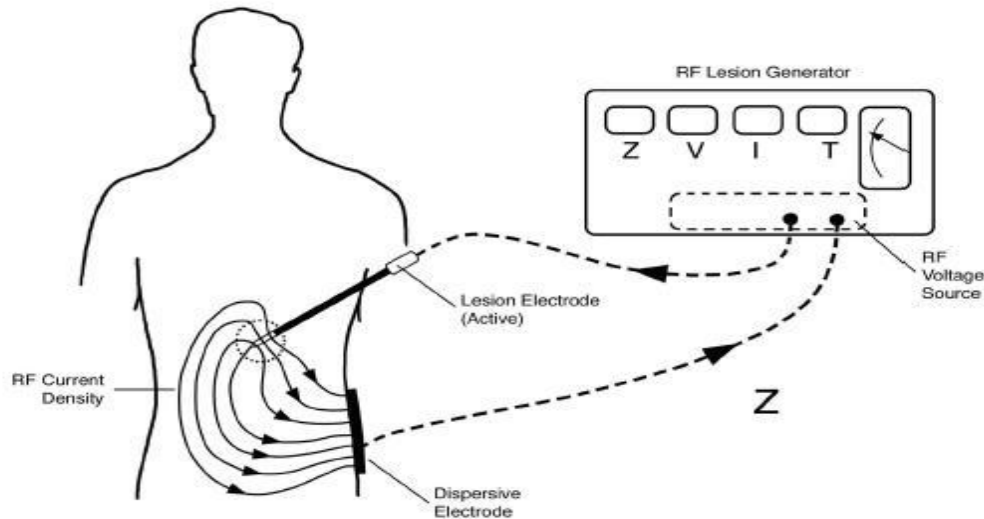
Interventionele technieken radiofrequentie

A. Basis

- Hoog frequente elektrische stroom aangrenzend aan een zenuwstructuur

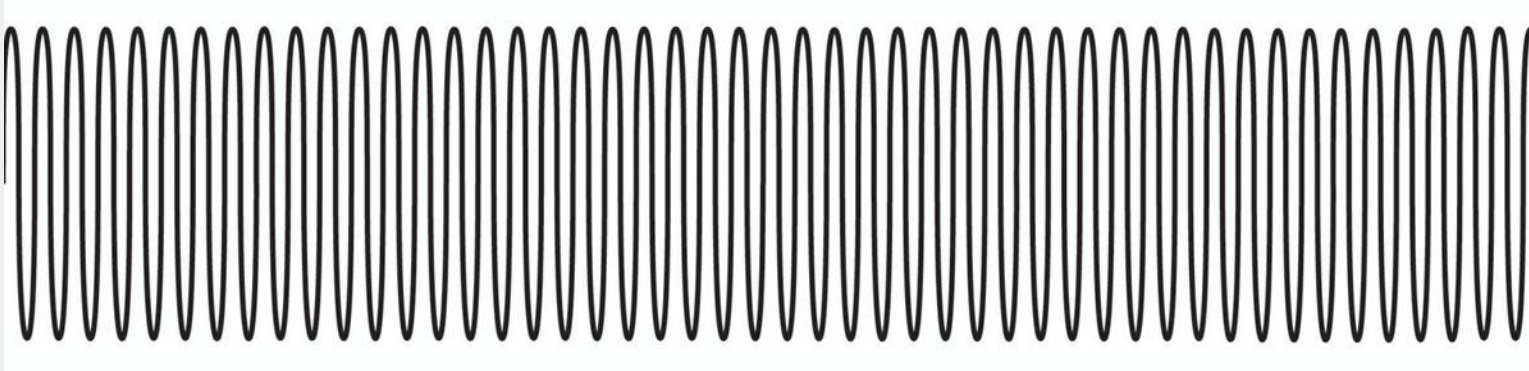
- Alternierende stroom ∞ radiowaves

- Opwarming omgevende weefsels
structuursveranderingen $\rightarrow$
gewijzigde pijnconductie

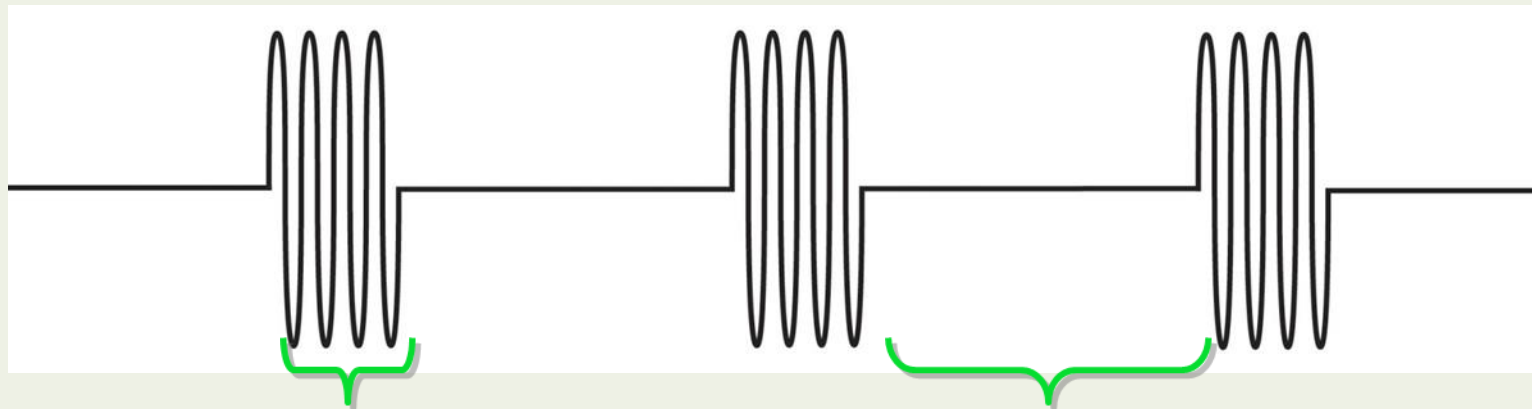


2 methodes van RF applicatie

Continuous radiofrequency (CRF)



Pulsed radiofrequency (PRF)



Burst of RF

No RF

RF stroom : 2 opties

67-80° C : radiofrequente stroom (RF)

- Zenuw*beschadiging*
- Vb facetdenervatie

<42° C : gepulseerde radiofrequente stroom (PRF)

- Zenuw*veranderingen*
- Vb radiculaire pijn

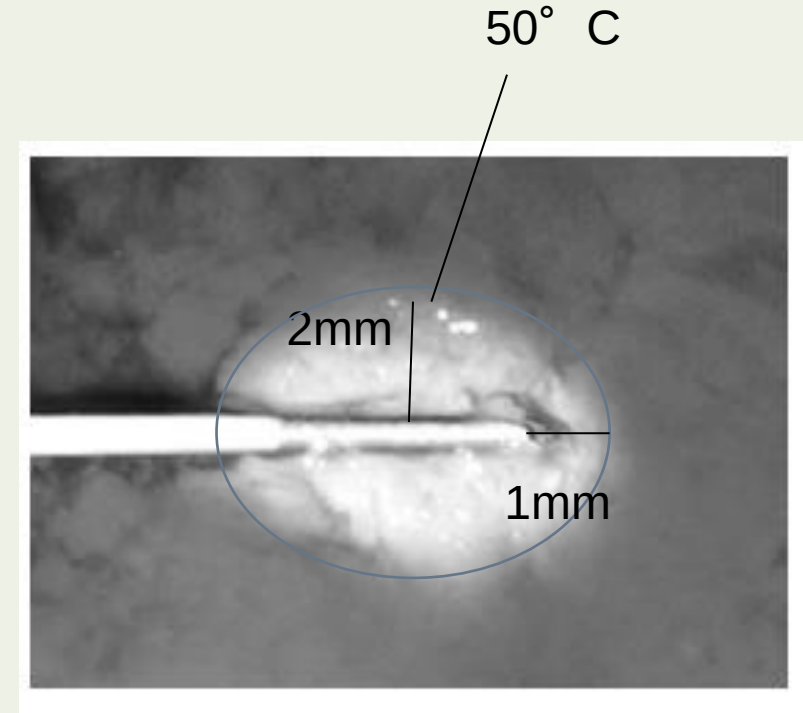
RF : lesion size

Liver tissue :

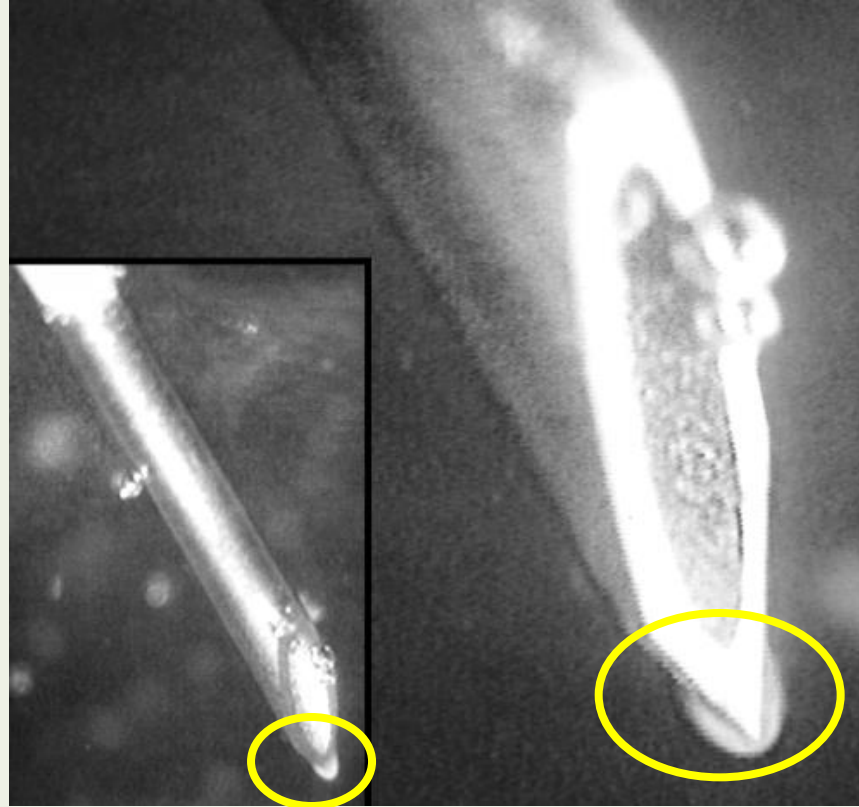
- 5 mm tip
 - 64-67 ° C
- **4 x 7 mm**

Muscle - bone tissue

- 10 mm tip, 150 sec
 - 80° C , 18 G
- lesion radius muscle : 2,68 mm
- lesion radius bone : 5,65 mm

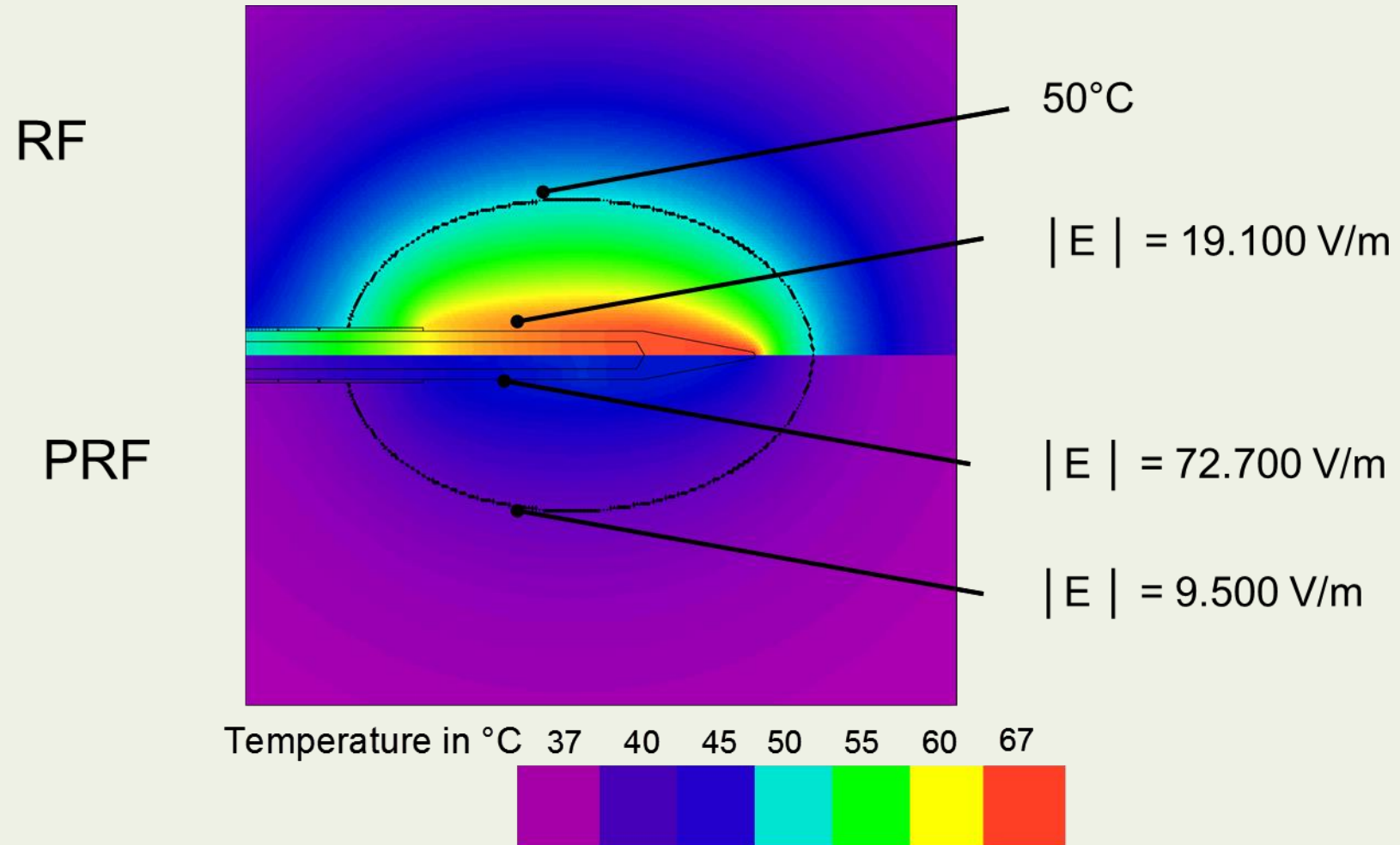


PRF : lesion size



Cosman and Cosman 2005

Model calculation of temperature and electric field



Mode of action

RF

> 45° C niet selectieve destructie van gemyeliniseerde /non myeliniseerde structuren

Long lasting blokkade van de synaptische transmission zelfs bij < 45°C

Neurodestructie op het DRG van het konijn

PRF

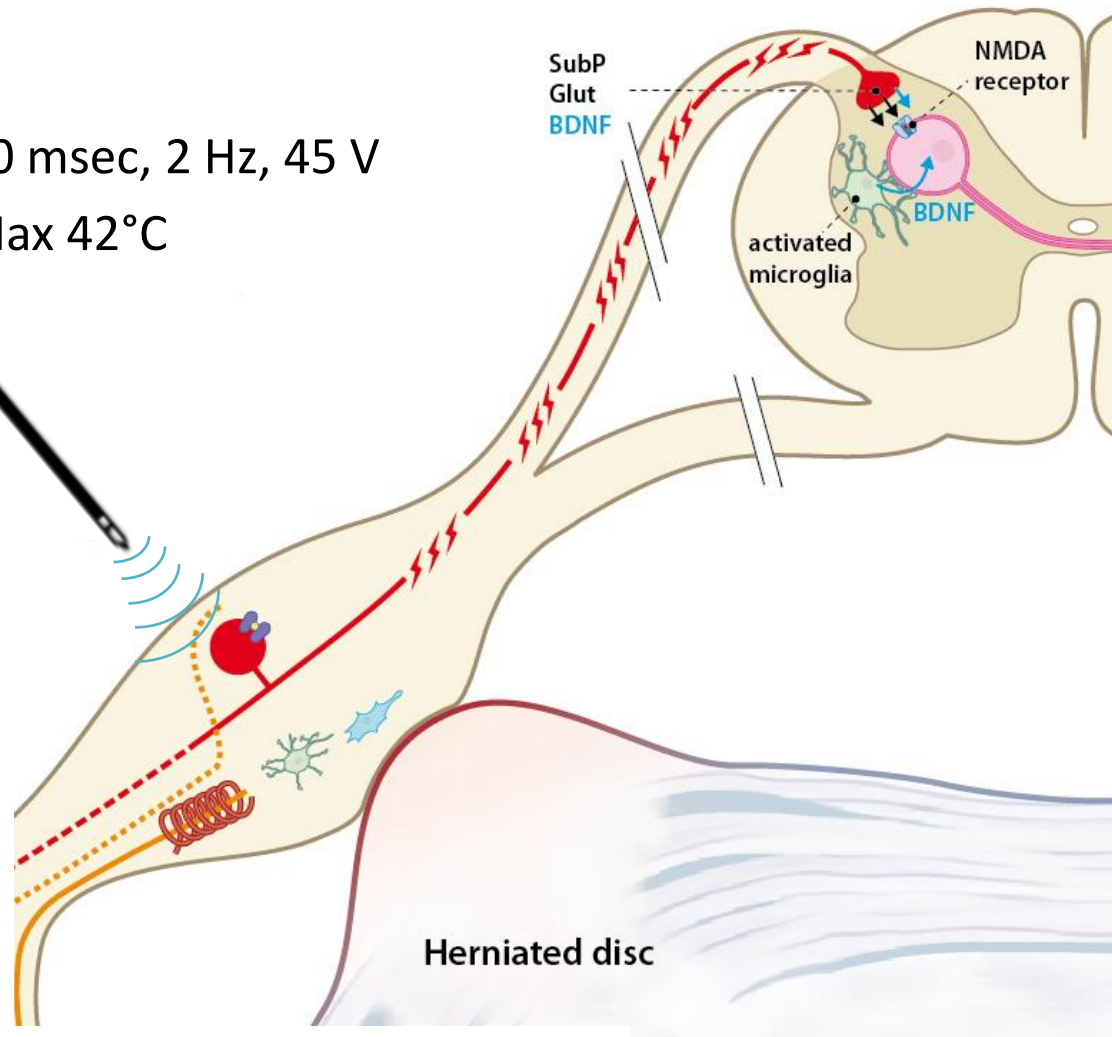
Verkregen Effect is niet gerelateerd aan de 'thermal damage', minimaal destructief

Biologisch effect :

- ❖ C-Fos activatie
- ❖ Long term effect tgv inhibitie van excitatory C-fibers
- ❖ Selectief : target neuronen zijn A delta en C nociceptive vezels
- ❖ Cel functioneren
- ❖ Glial respons / endogenous opioid
- ❖ Descending inhibitory pathway

→ geen lokaal effect : interferentie met verwerking prikkels

20 msec, 2 Hz, 45 V
Max 42°C

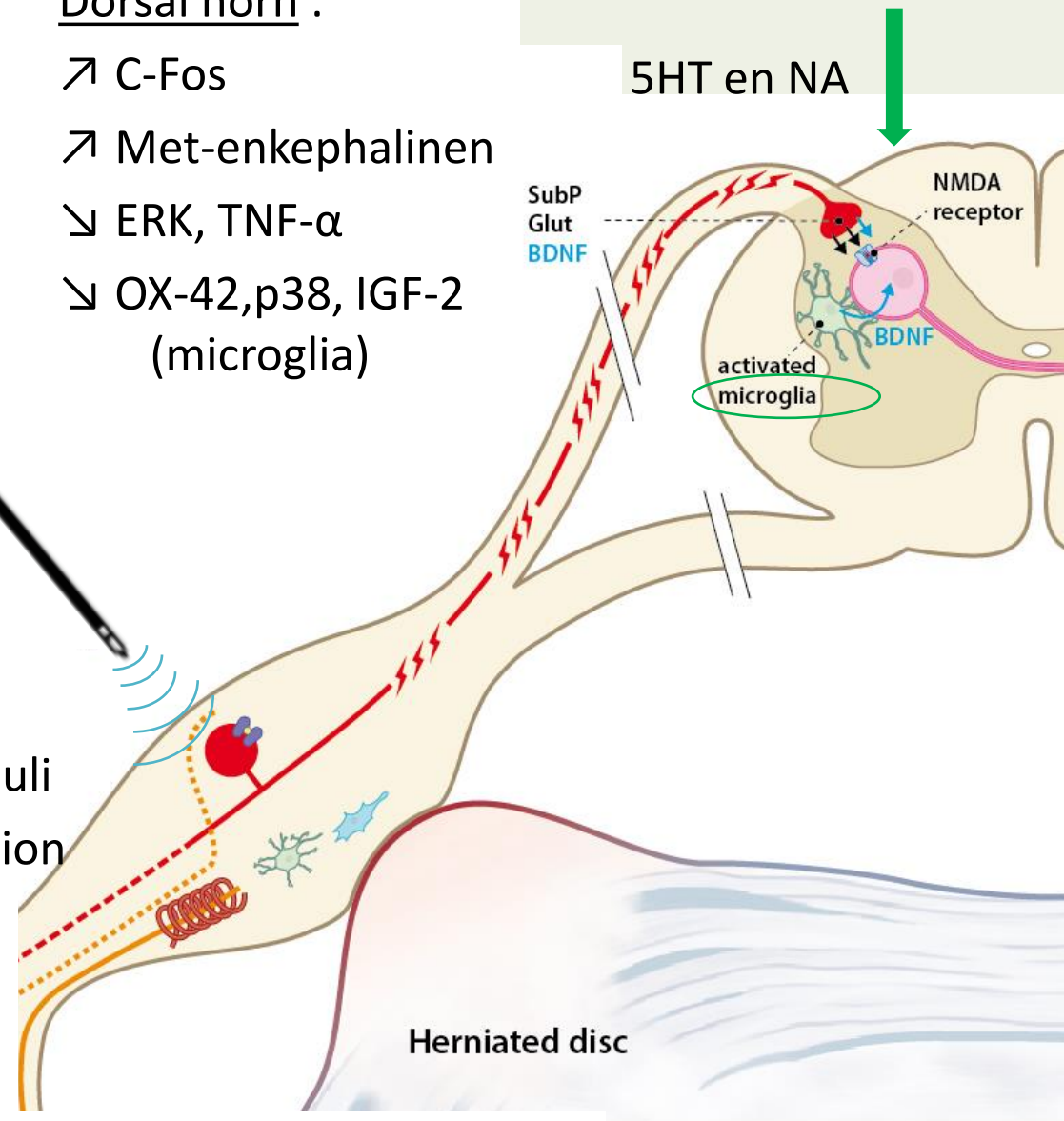


Dorsal horn :

- ↗ C-Fos
- ↗ Met-enkephalinen
- ↘ ERK, TNF- α
- ↘ OX-42, p38, IGF-2
(microglia)

Dorsal root ganglion :

Δ myeline, mitochondria,
microfilamenta, microtubuli
↗ ATF-3, channel expression



Optimal parameters ?

Continuous radiofrequency

Optimal : bigger lesions

67° - 80°C

larger needles

approach : adjacent, multiple sites

technique :

facet ?

cooled RF (SI)

biacuplasty (disc)

Pulsed radiofrequency

Optimal : ?

2 Hz, 20 msec

45 V, <42°C

2 → 4 min

Diagnostische blokkade

Als een bepaalde structuur als de **bron** van de pijn wordt beschouwd, kan deze hypothese worden getest door het **blokkeren van de structuur zelf of de zenuwvoorziening** ervan

Reproductieve test/selectieve test

Diagnostische blokkade :

- contrast : controle van injectie in vasculaire structuur, discus, correcte locatie, ...
- klein volume, hoge concentratie van locale anesthetica

Diagnostic blocks

Beperkingen

Vals positieve resultaten

Idealiter : 3 blocks

- 2 lokale anesthetica (bv kort en langwerkend)

- 1 sham

Moeilijk realiseerbaar

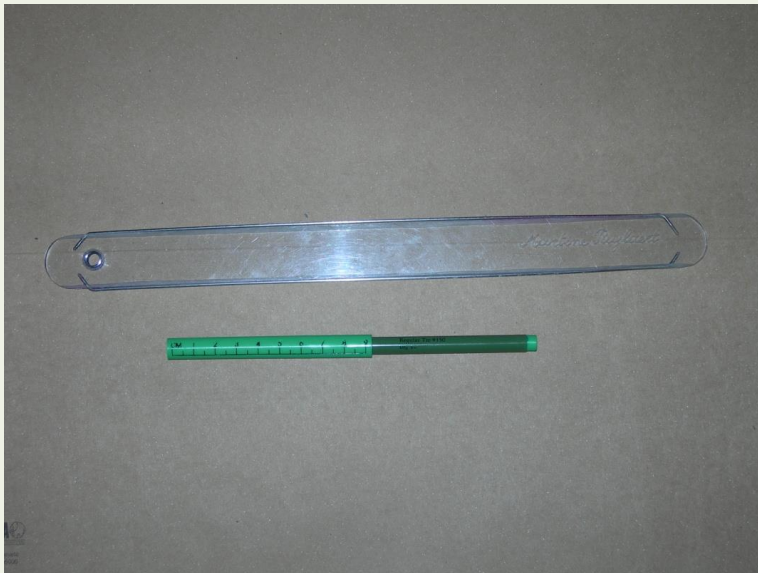
2 'andere' : diagnostisch block SIG en NOM : combinatie LA en steroid

Injectie technieken: ben

- Fluoroscopie :
- Radio-opaque tafel
- RF generator
- Latje/huidstift

techniek, training

nesthetica (lidocaine, k
sche oplossing
: non ionic water soluk



Spinal injection techniques : protection

dosimeter





TARGETS

Craniofaciale pijn

Trigeminus neuralgie

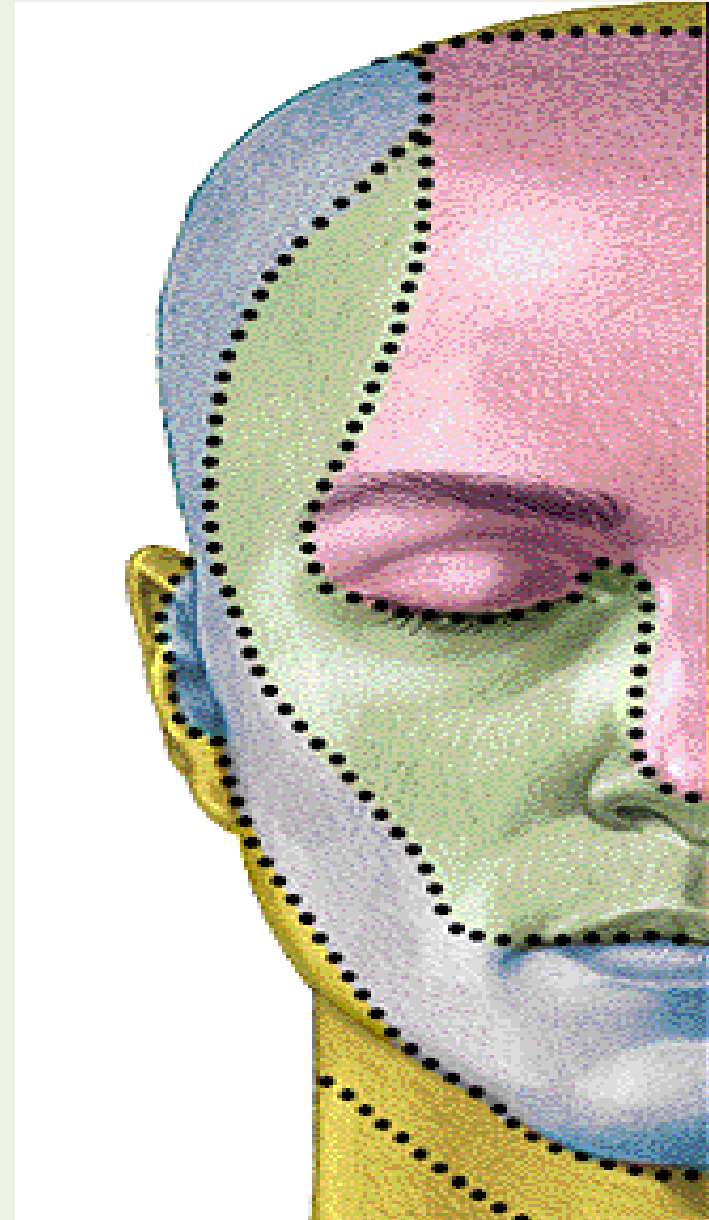
tic douloureux

aandoening van de vijfde hersenzenuw (de trigeminuszenuw)

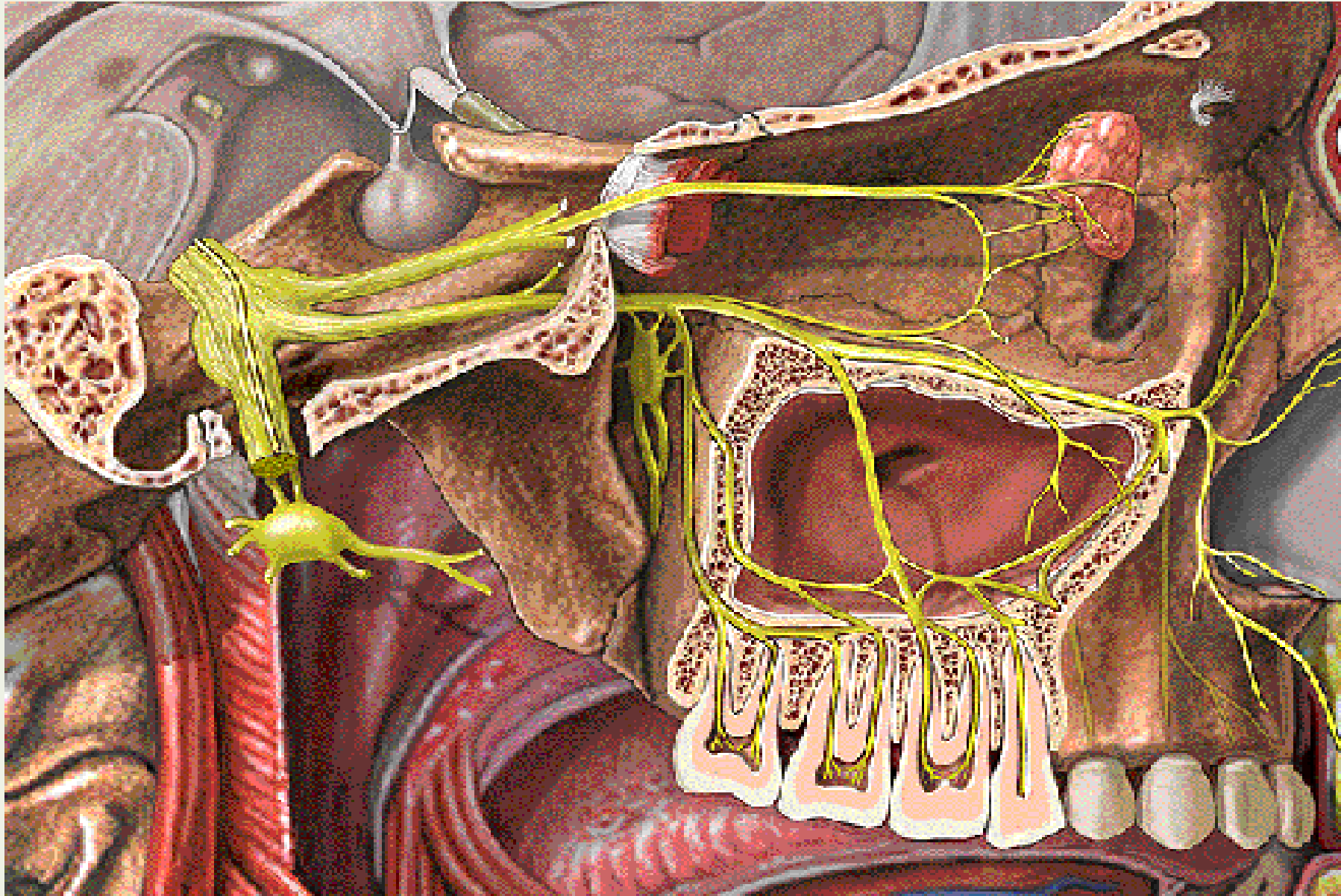
periodes van intense scherpe
messteekachtige, elektrische pijn

in de gebieden van gezicht, die deze
zenuw bezenuwt

minder frekwente vorm : atypische
trigeminusneuralgie : minder intens,
eerder constante doffe pijn veroorzaken



N. Trigeminus



RF

Acute pain relief in 97.6 %

Continued complete pain relief at 5 years follow-up
57.7 %.

Complications !

- diminished corneal reflex,
- masseter weakness and paralysis,
- dysesthesia,
- Anesthesia dolorosa, keratitis
- transient paralysis of cranial nerves II and VI..

PRF treatment of idiopathic neuralgia : limited
experience

Poster Castro PRF 88,85% succes no complications

Poster Erdine : RF 1400 pt retrospective high succes
rate / low amount of complications

PRF

PRF treatment of idiopathic neuralgia :

Poster Castro PRF 88,85% succes no
complications

Erdine S, Ozyalcin NS, Cimen A, *et al.* Comparison of pulsed radiofrequency with conventional radiofrequency in the treatment of idiopathic trigeminal neuralgia. *Eur J Pain* 2007; 11:309–313.

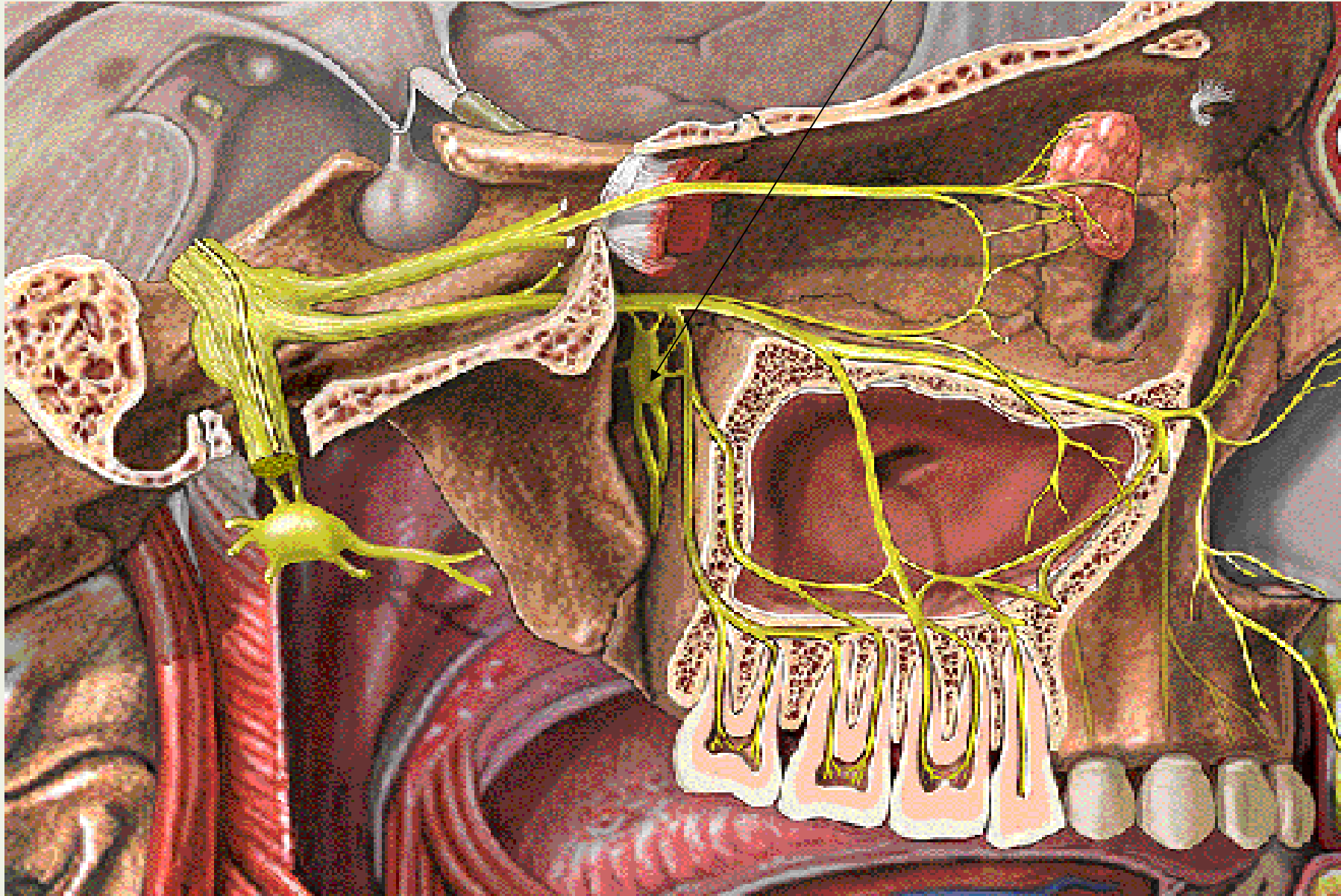
Fang L, Ying S, Tao W, *et al.* 3D CT-guided pulsed radiofrequency treatment for trigeminal neuralgia. *Pain Pract* 2014; 14:16–21.

De Naeyer S, Mestrum R, Vanelderren P, *et al.*, editors. Pulsed radiofrequency treatment of the Gasserian ganglion in trigeminal neuralgia: a 10 year retrospective analysis. Barcelona, Spain: European Anaesthesiology Congress (ESA); 2013.

28. Fang L, Tao W, Jingjing L, Nan J. Comparison of high-voltage- with standard-voltage pulsed radiofrequency of gasserian ganglion in the treatment of idiopathic trigeminal neuralgia. *Pain Pract* 2015; 15:595–603.

This RCT underlines the importance of defining the optimal treatment parameters. Patients treated with high voltage PRF have a better treatment outcome than those treated with standard voltage PRF. The effect in the standard voltage PRF group declined at 1 year follow-up, while it remained stable in the high voltage PRF group.

Ggl sphenopalatinum



Ggl sfenopalatinum

■ Efficacy :

■ Chronic cluster headaches (Sanders/Zuurmond)

RF 70°C 60 sec

chronic pain : 30 % pain relief

Epidodic pain : 60,7% pain relief

29 months follow up

■ Sphenopalatine neuralgia (Salar)

- 7 patients

- Pain free 6 till 34 months

- 60°C and 65 ° C 60 sec

■ Herpes Zoster ophthalmicus (Prasanna and Murthy)

- 12 months of pain relief

- Residual ear pain

OCCIPITALISNEURALGIE

consensus ivm diagnostische classificatie (Sjaastad)

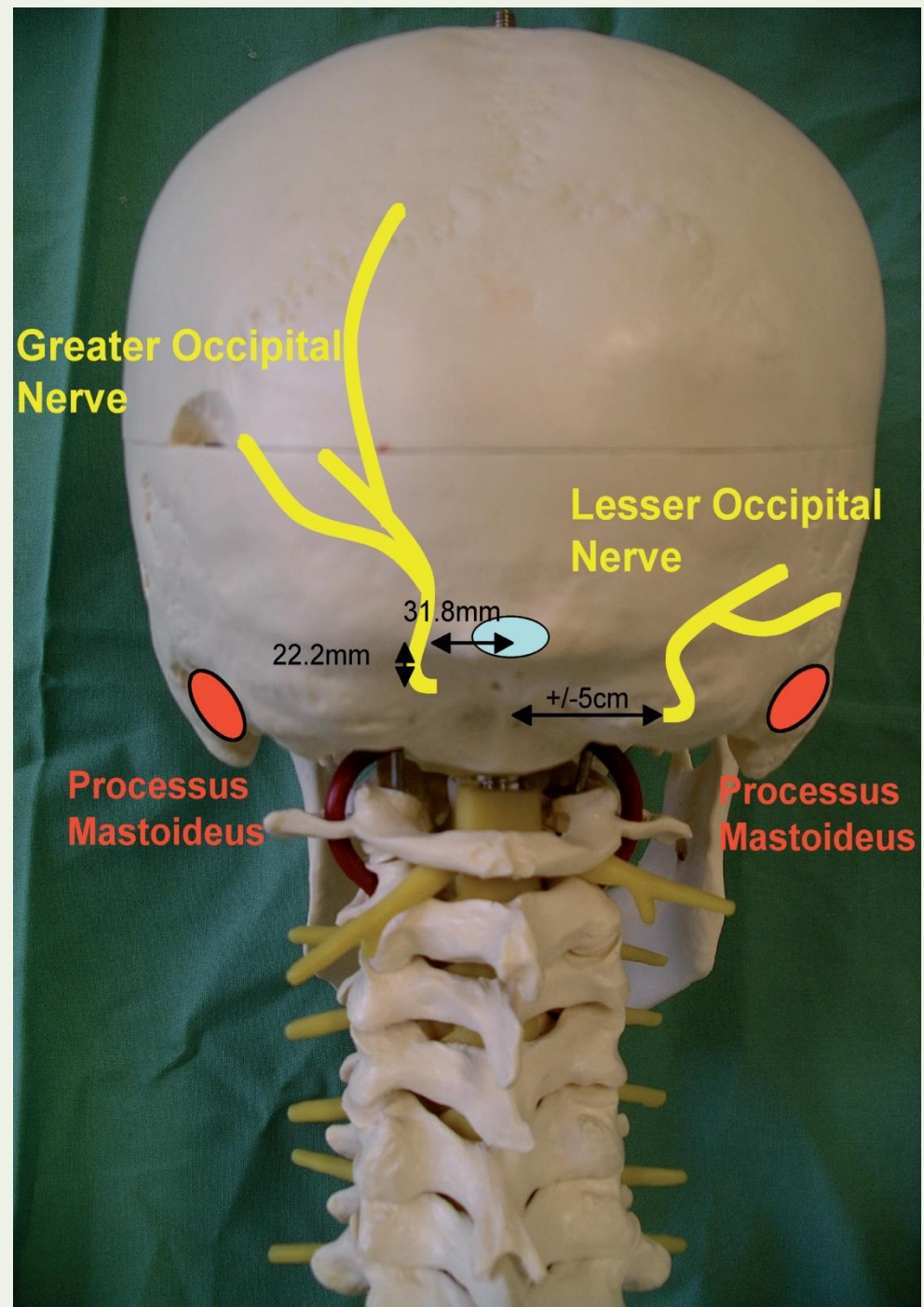
Unilaterale hevige schietende pijn in het gebied van de NOM/m

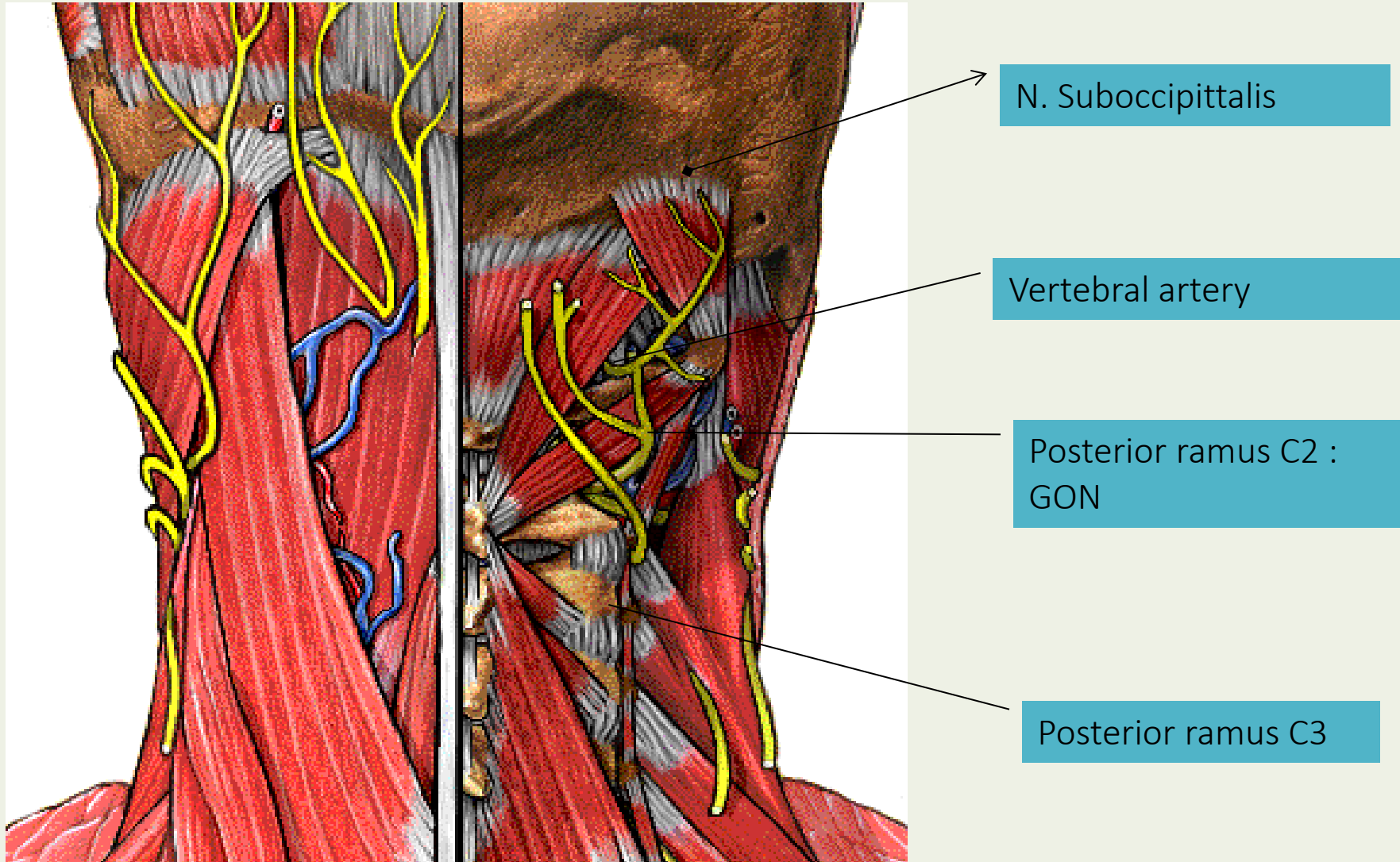
Origine : NOMaior , NOminor,

Druk doet de pijn uitlokken

Therapeutische opties :

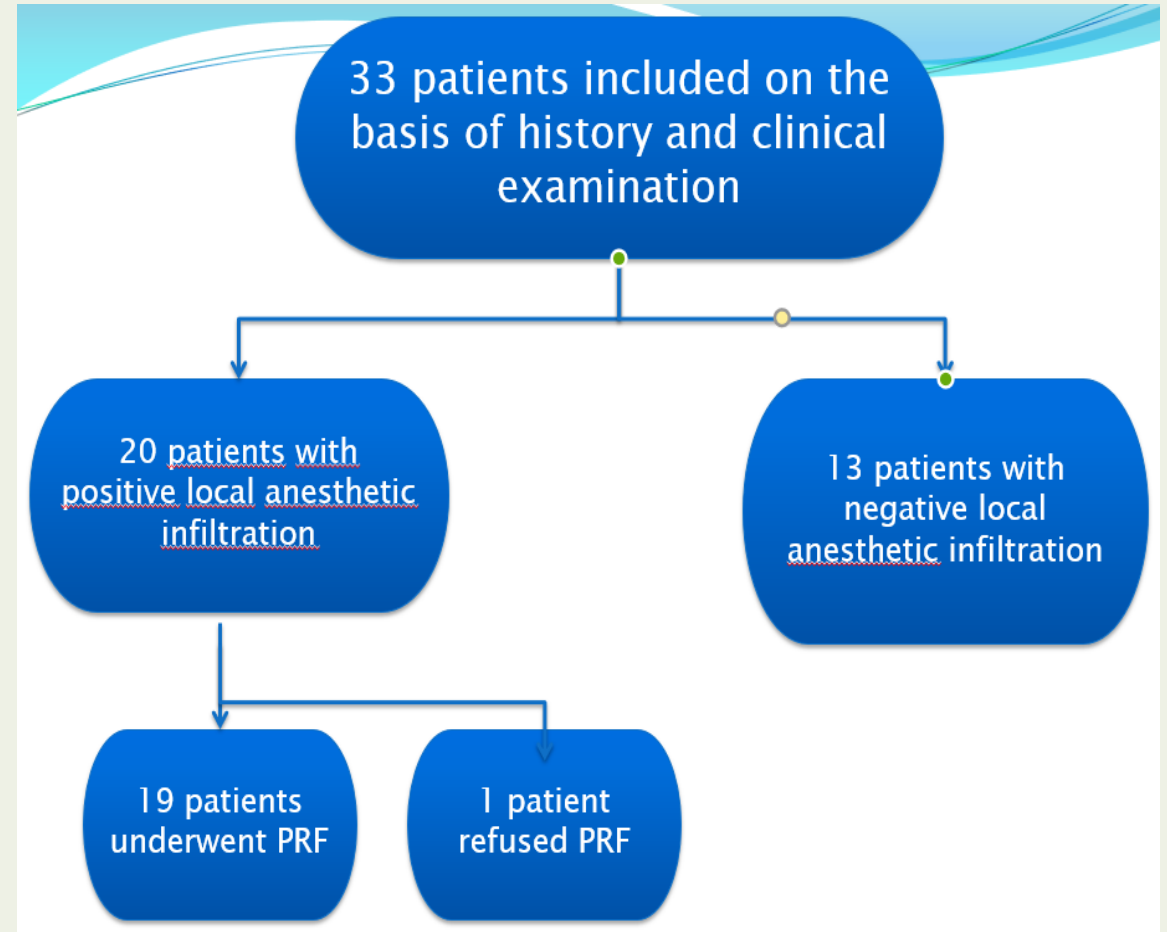
PRF NOMa/mi na een gunstig diagnostisch block





Occipitalisneuralgie

1. significante pijn vermindering gedurende 6 maanden
2. verbeterde slaapkwaliteit en dagelijkse activiteit gedurende 6 maanden
3. reductie in medicatie inname gedurende 6 maanden.
4. 61% van de patienten met een voorgeschiedenis en klinisch onderzoek typisch voor occipitalis neuralgia vertoonden een positief effect op infiltratie met lokaal anestheticum.



Cervicale pijn

Pijnbronnen

Facet

Discogenic

Nerve roots

Muscles

Ligaments

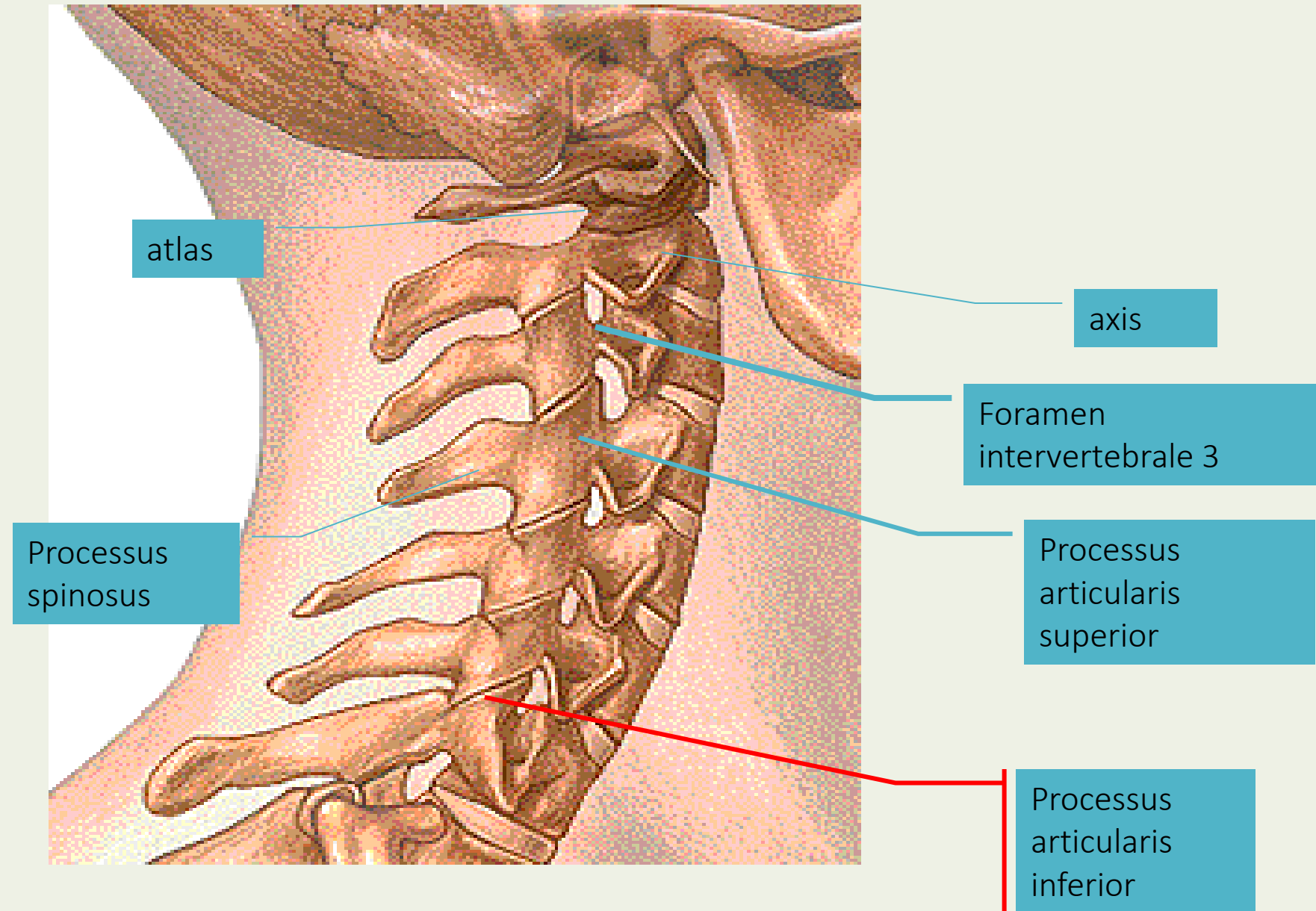
Pijn syndromen toegankelijk voor RF treatments

Cervicalgie

Cervicobrachialgie

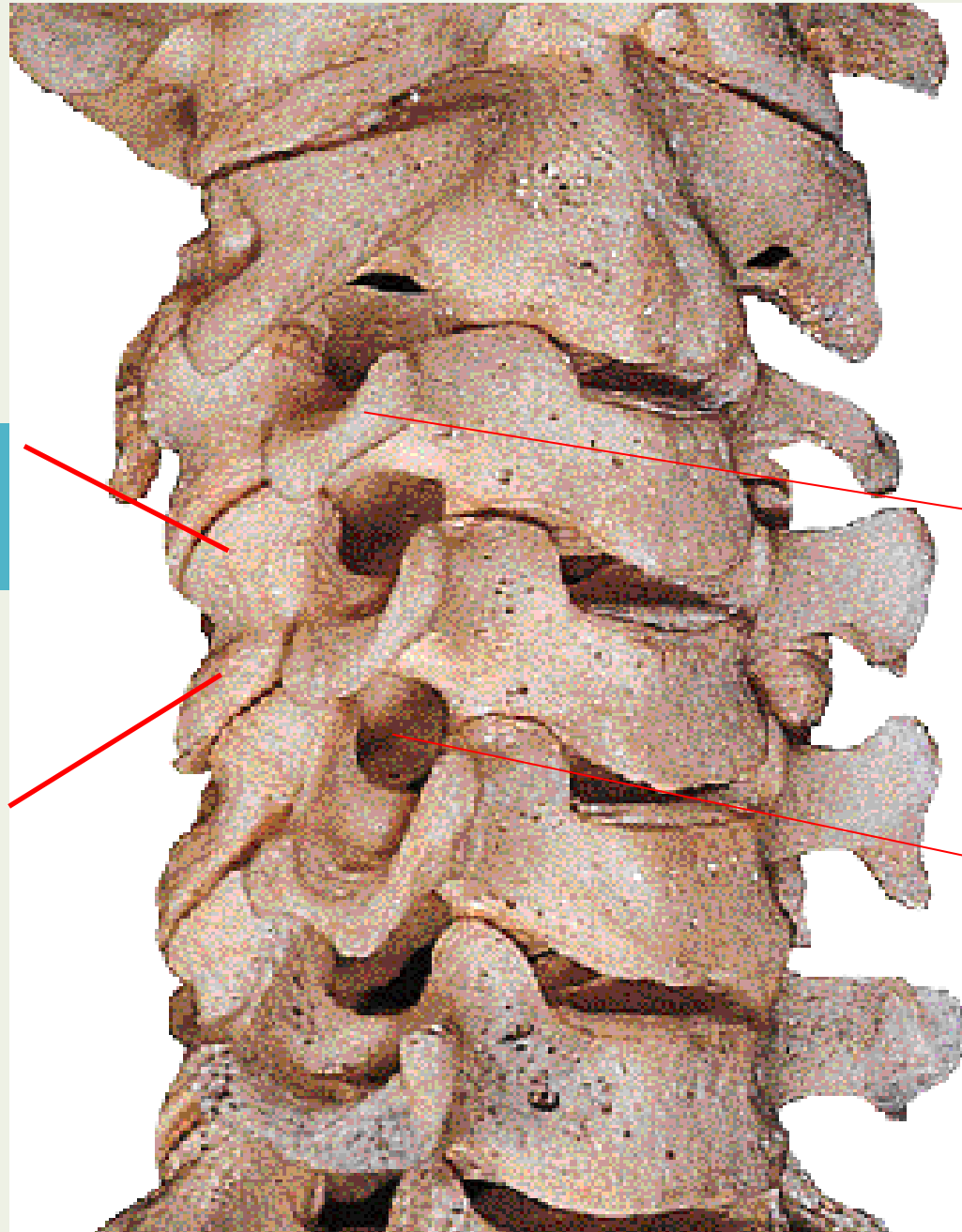
Cervicogene hoofdpijn





Proc.art.
superior

Proc.art.
inferior



Processus
transversus

Foramen
intervertebrale

Cervicaal : ?

Beste indicatie voor cervical facet
denervation ?

1. Whiplash Associated Disorder
2. Cervicogene hoofdpijn
3. Degeneratief neklijden

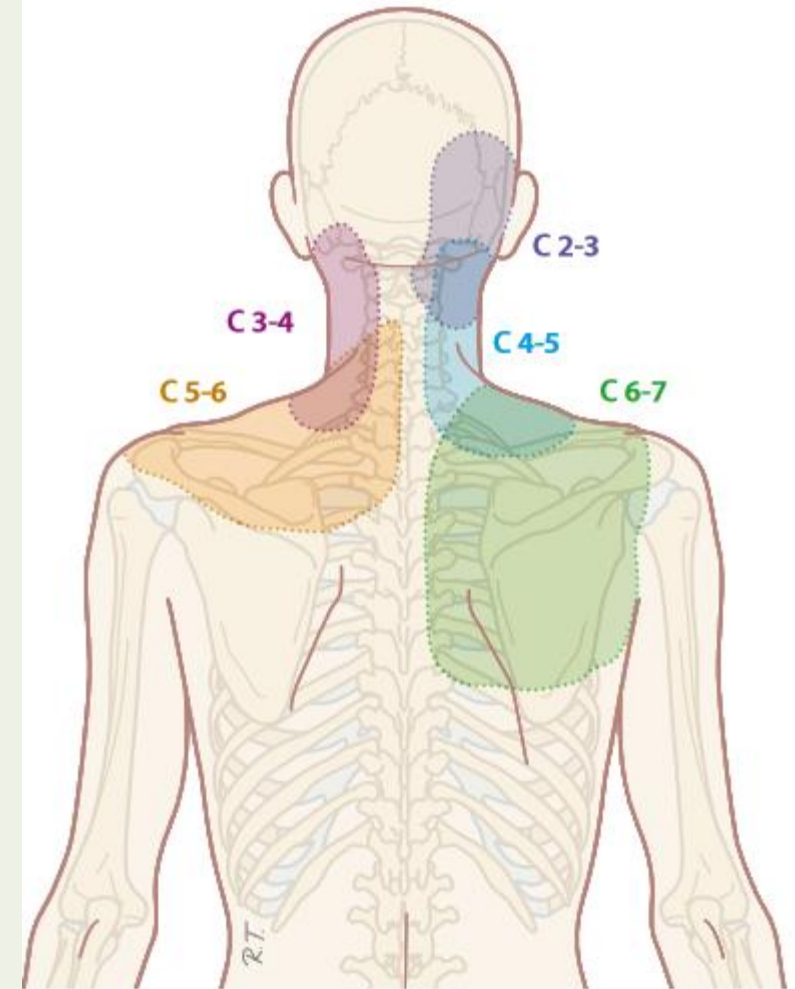
Cervicaal : ?

Beste indicatie voor cervical facet
denervation ?

1. Whiplash Associated Disorder
2. Cervicogene hoofdpijn
3. Degeneratief neklijden

Chronische cervicale pijn

RF behandeling van de medial branch
voor chronische cervicale pijn vanuit
de facetgewrichten



*Figuur 1.2-2: Uitstralingspatroon van cervicale facetpijn
(naar: Dwyer A, Aprill C, Bogduk N: Cervical zygapo-
physeal joint pain patterns. I: A study in normal volun-
teers. Spine. 1990; 15, (6): 453-7. Met toestemming van
de uitgever)*

COENEN

ZOL CAMPUS A D

PIJNTHERAPIE

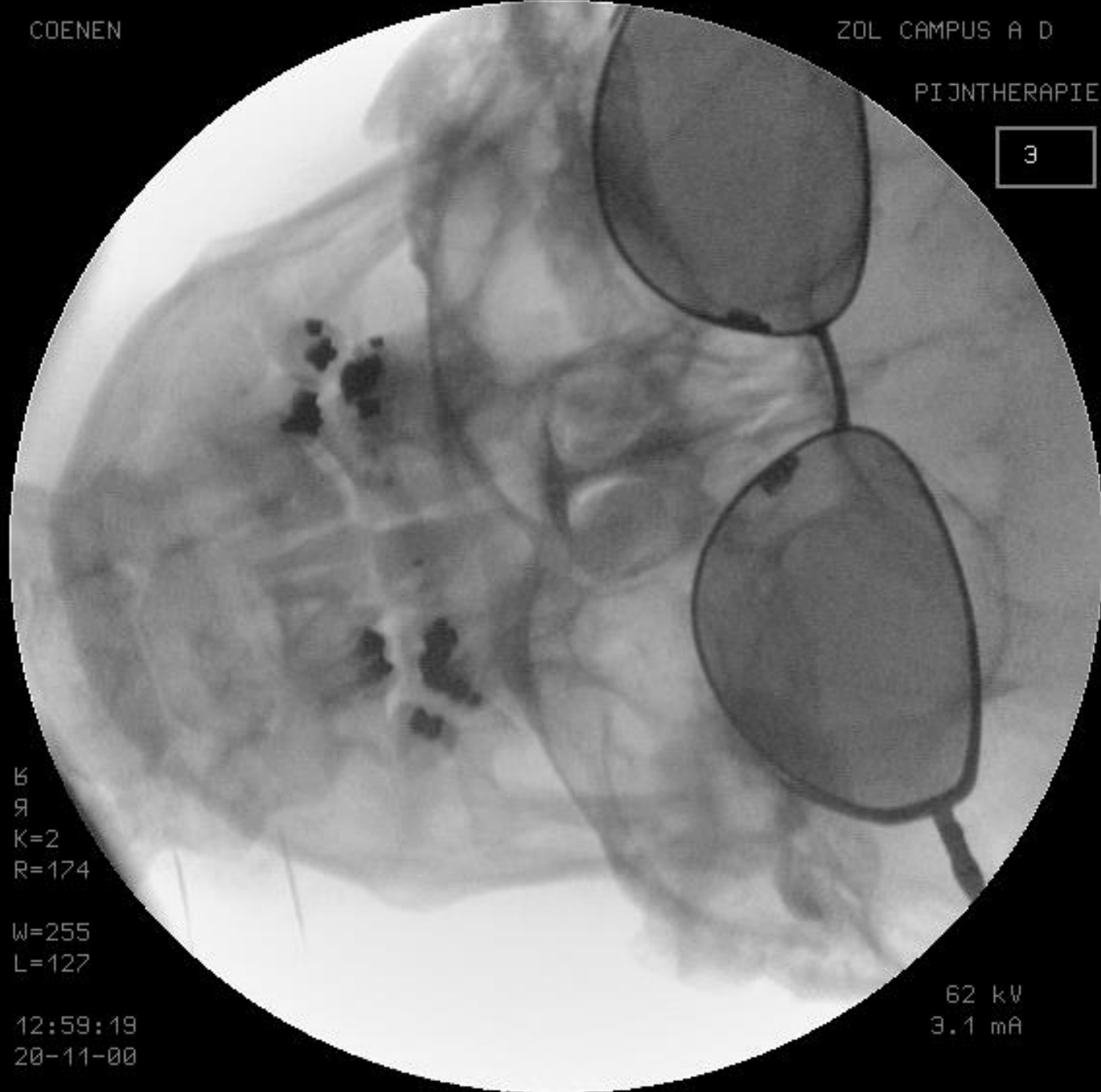
3

K
R
K=2
R=174

W=255
L=127

12:59:19
20-11-00

62 kV
3.1 mA



COENEN

ZOL CAMPUS A D

PIJNTHERAPIE

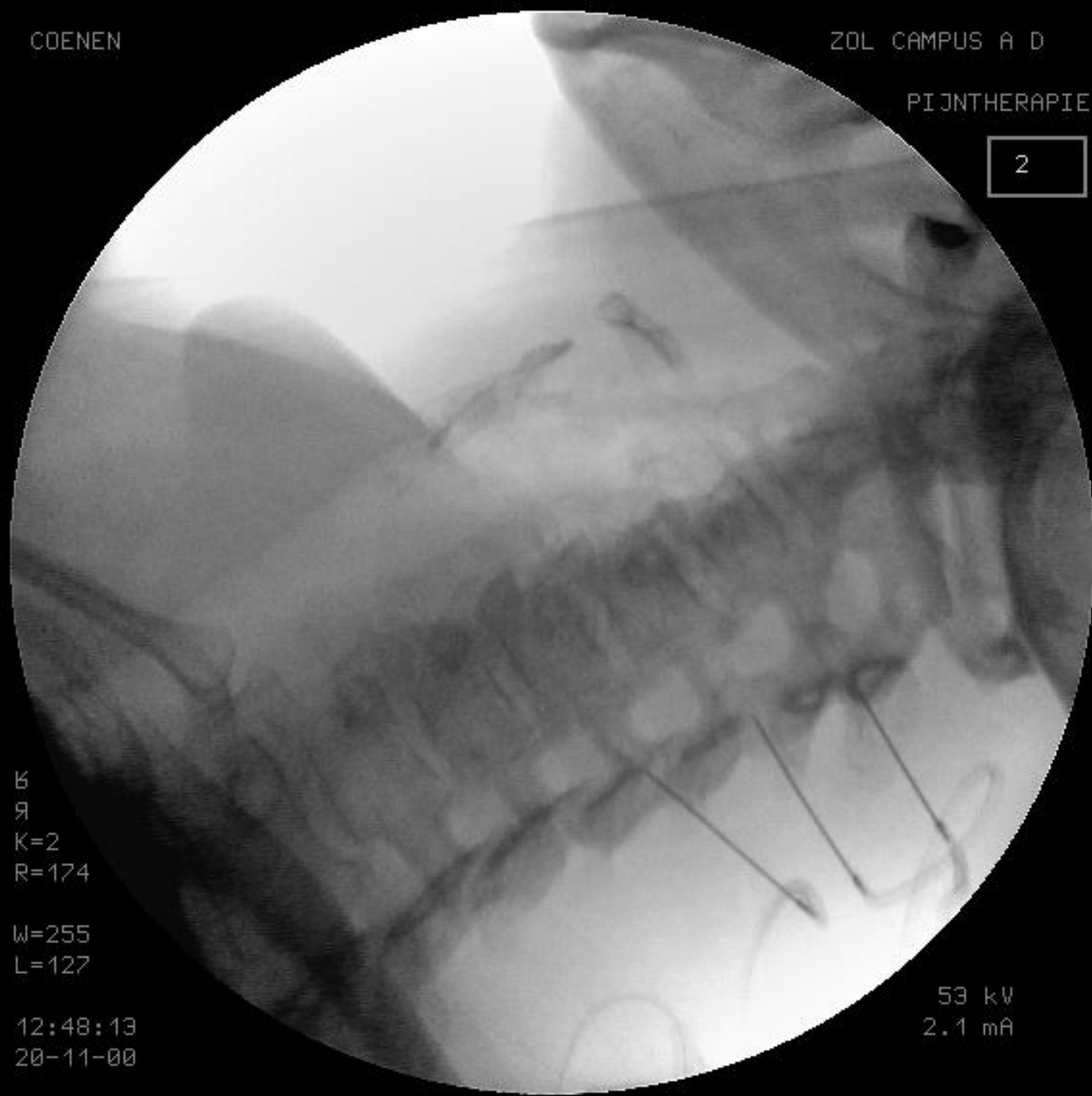
2

6
9
K=2
R=174

W=255
L=127

12:48:13
20-11-00

53 kV
2.1 mA



COENEN

ZOL CAMPUS A D

PIJNTHERAPIE

1

6
9
K=2
R=174

W=255
L=127

12:47:54
20-11-00

54 kV
2.3 mA



Cervicobrachialgie

Chronische uitstralingspijn nek arm

Dermatoom gebonden

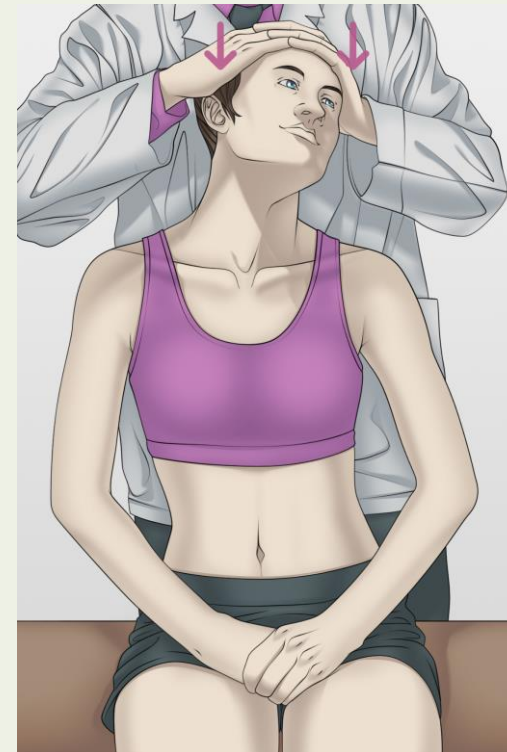
Positieve spurlingtest

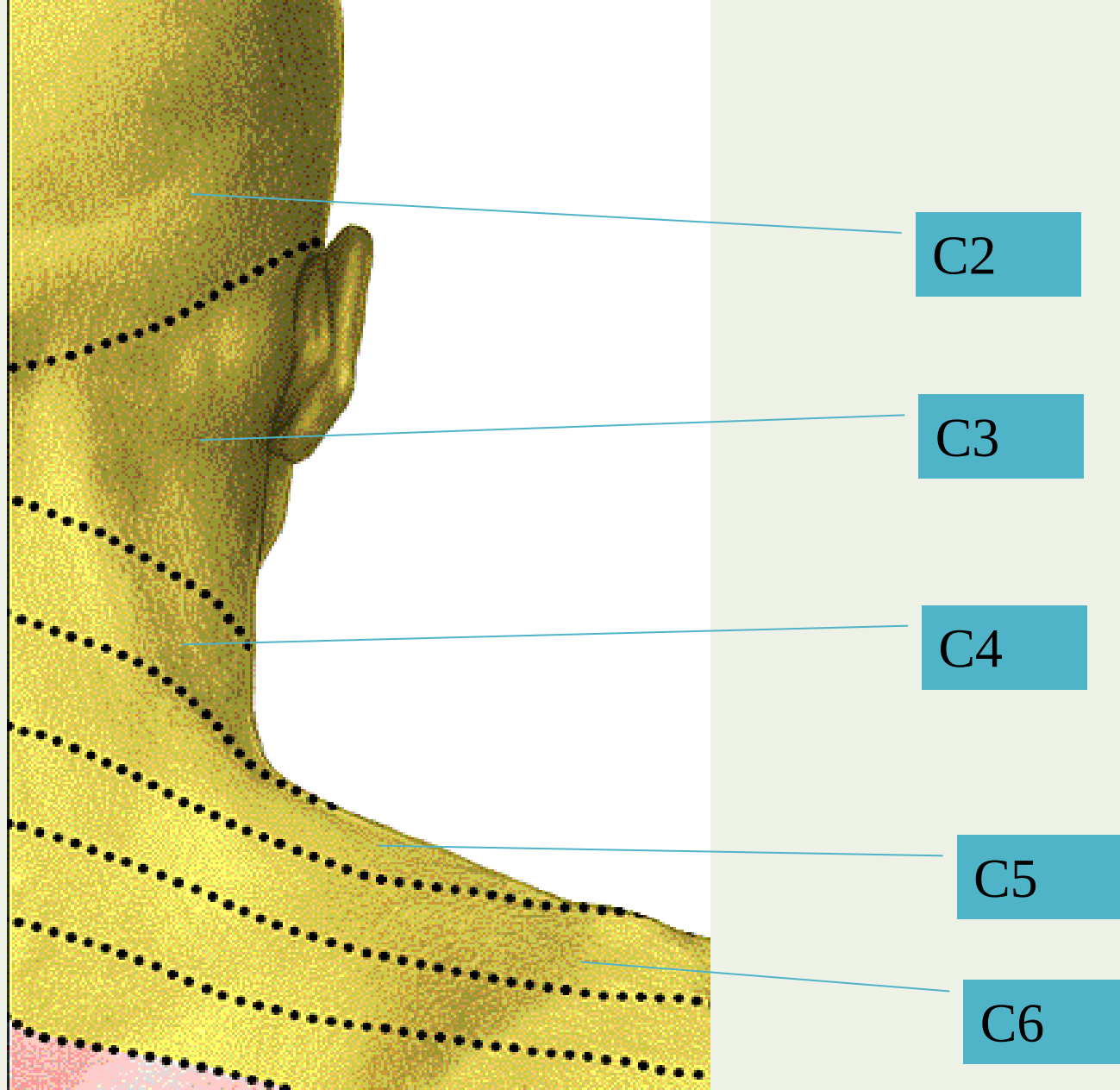
Oorzaken :

Discoradiculair conflict

Neuroforaminele stenose

+ Diagnostisch block





The innervation is described in terms of the related branches of the segmental nerves

Cervicobrachialgie

RF treatment

one open

two randomized controlled studies

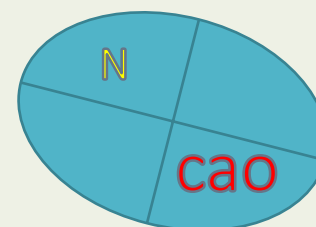
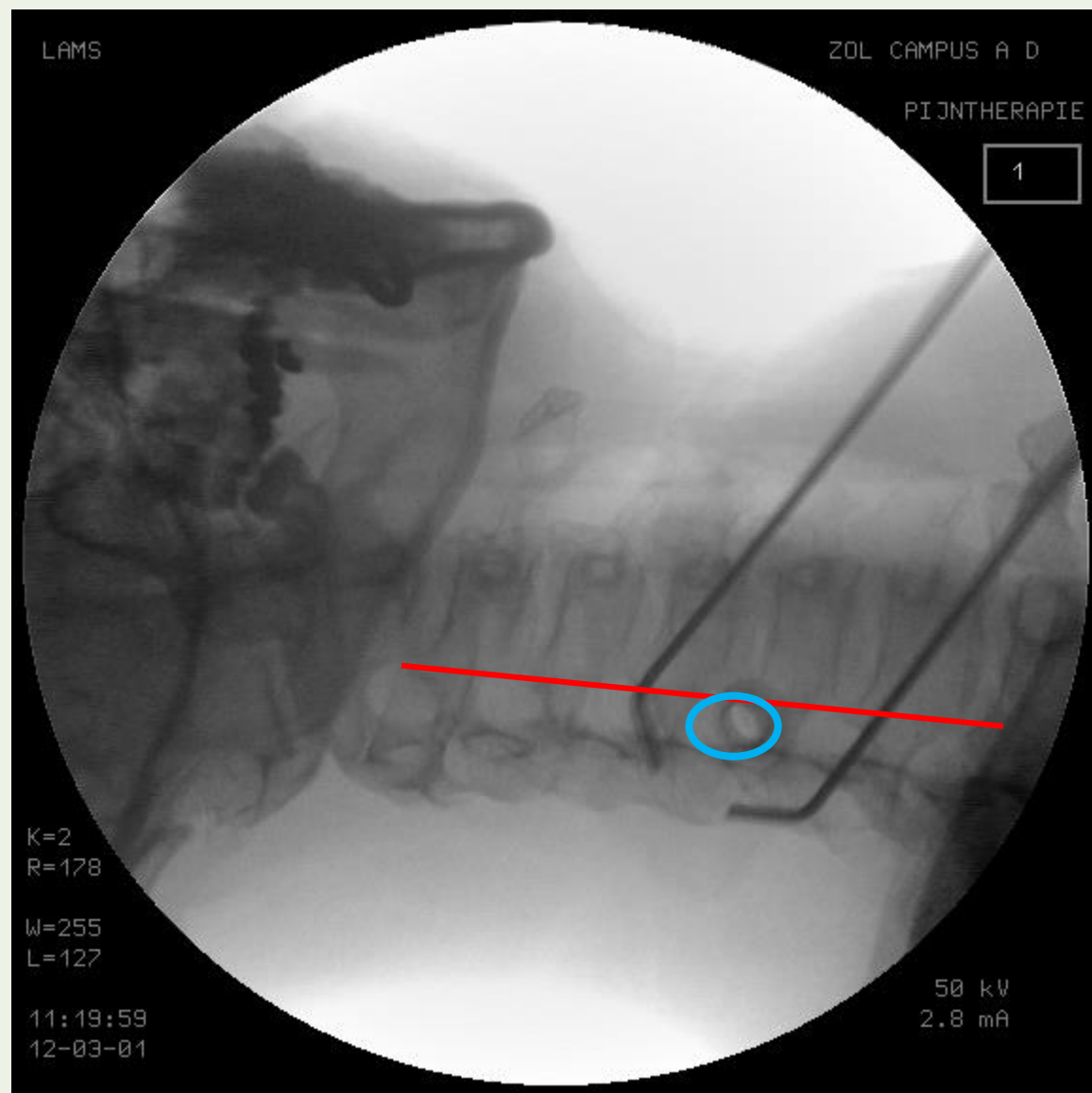
Slappendel 67°/40°

Van Kleef

PRF treatment

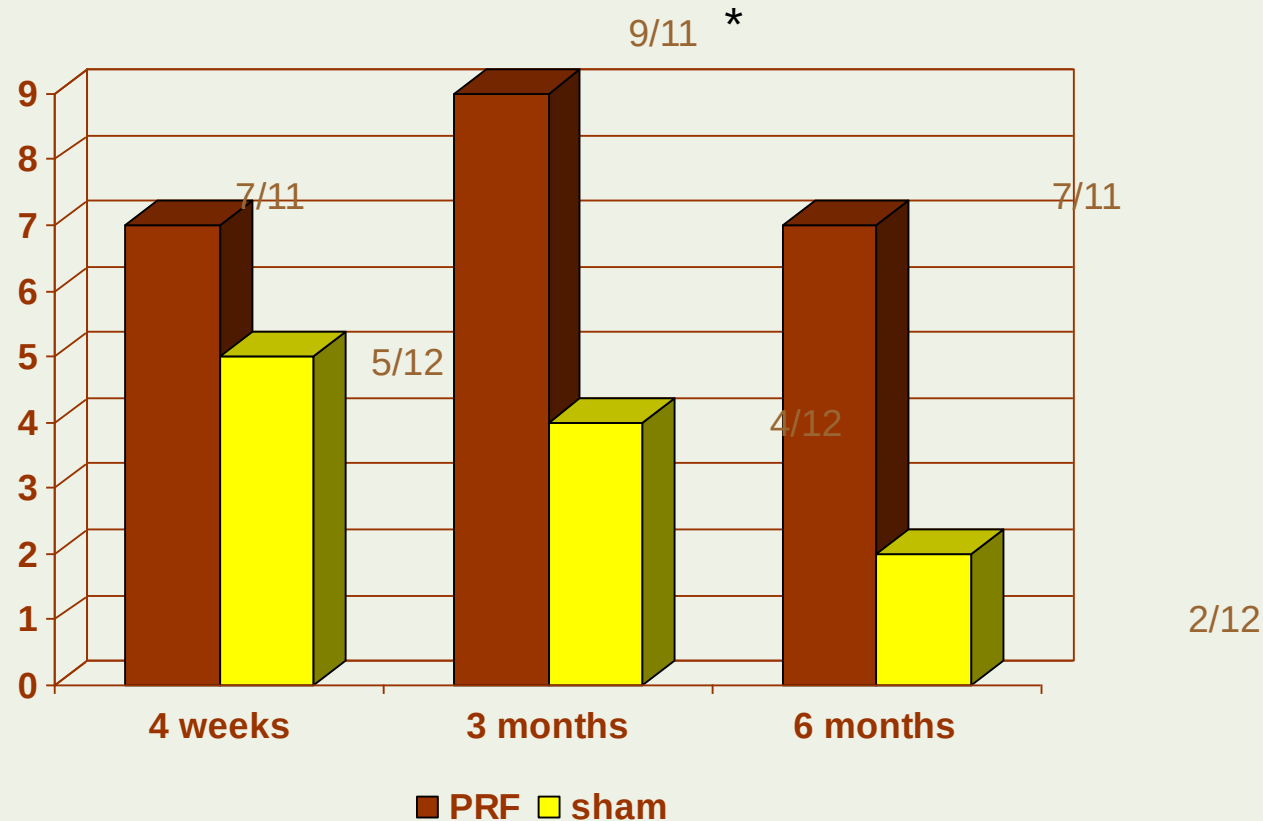
Van Zundert





Primary outcome: less pain and medication

RCT: Global Perceived Effect



Lage rugpijn



- Meestal verschillende structuren overbelast
 - Één enkele behandeling meestal onvoldoende
 - Ergonomie en rugoefeningen
- Evolutie vooral bepaald door individu

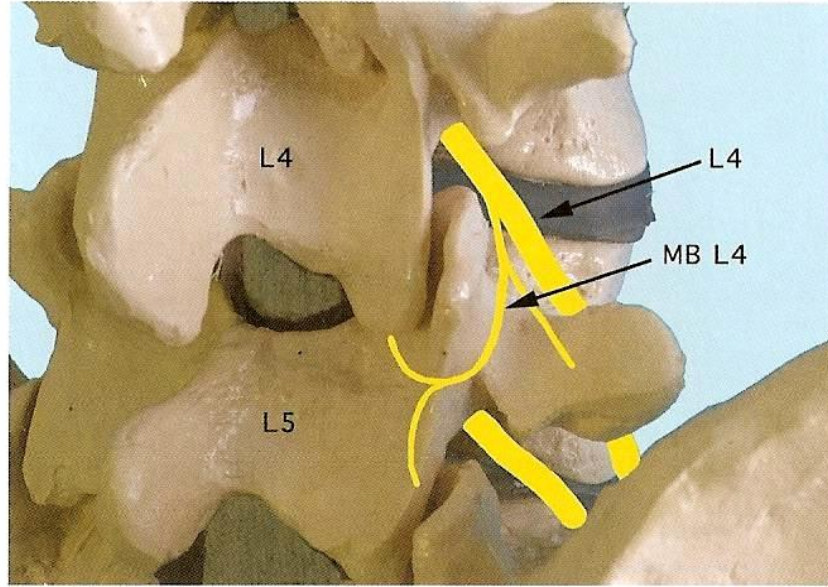
Lage rug pijn

Lumbaal facet

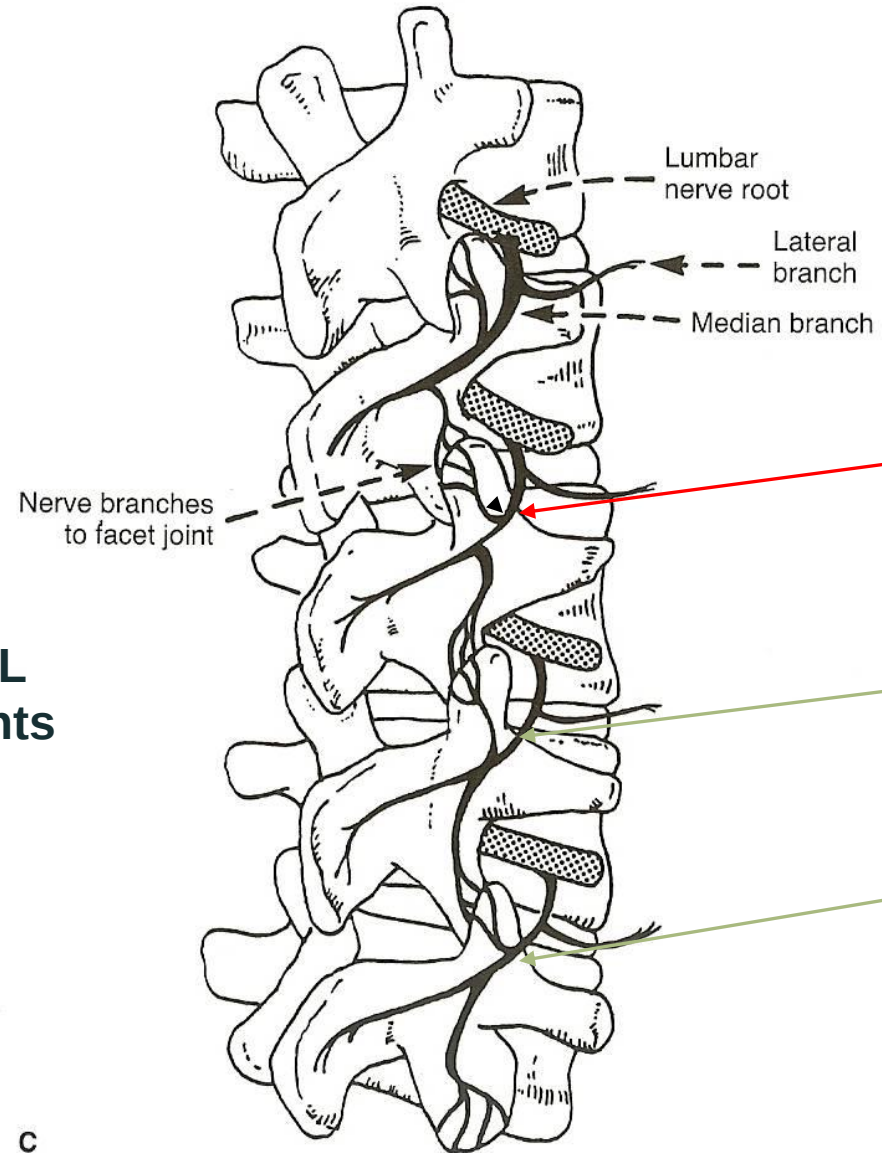
Discogeen

SI gewricht

(piriformis)



THE LUMBAR MEDIAL BRANCH : target points



Medial
branch
facet



NR 6
RTE 1
LIH 8

BONE
MAG 0
kV 68

RF Lumbaal facet

Diagnostische procedure

RF lumbar facet denervation.

Van Kleef et al, North et al, Gallagher et al, Sanders et al
positive effect

A systematic review of Geurts et al

Efficacy of radiofrequency procedures for the treatment of spinal pain : a systematic review of randomized clinical trials. Regional Anesthesia and Pain Medicine 2001; 26:394_400

moderate evidence for this technique

randomised controlled studies : a bigger patient population.

MINT studie : NL

SI joint

2 Articles : Way Yin

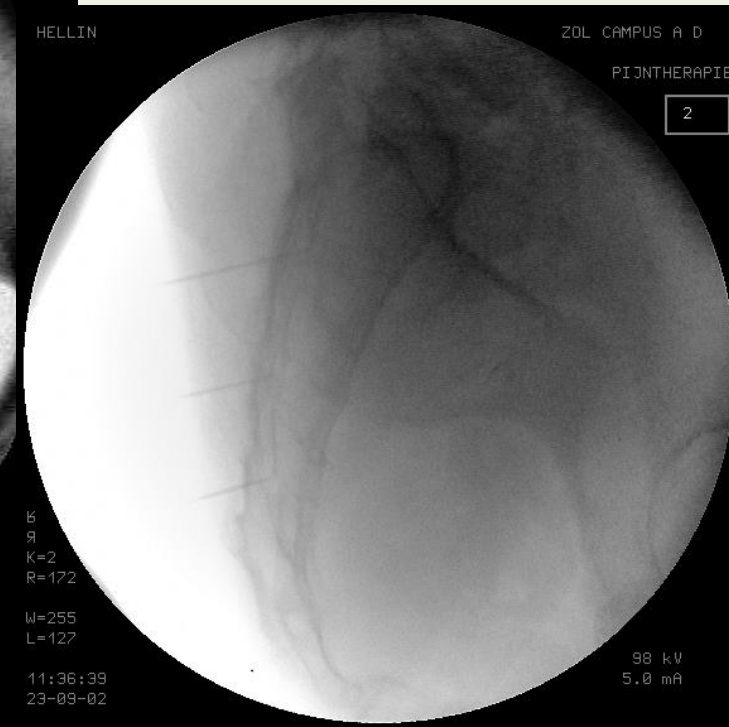
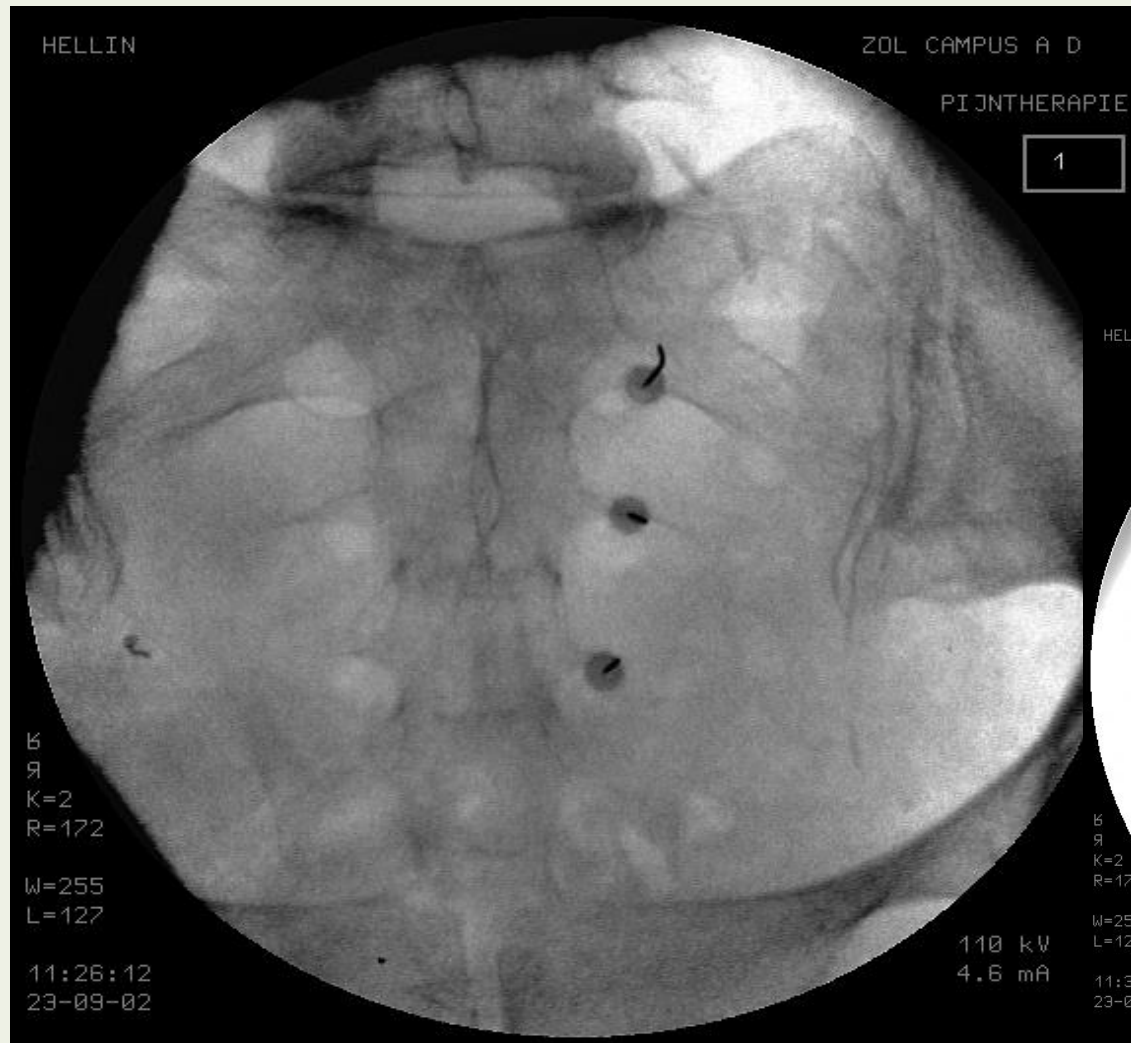
Ferrante

Results : variable

Bipolar RF

Cooled RF

catheter



Discus

Diagnostisch block : niet risicovol !

Opwarmen annulus

Initieel positieve resultaten retrospectieve studie

Barendse G et al Randomized controlled trial of percutaneous intradiscal radiofrequency thermocoagulation for chronic discogenic back pain: lack of effect from a 90-second 70 °C lesion. Spine 2001; 26: 287-292

Ercelen O, Radiofrequency lesioning using two different time modalities for the treatment of lumbar discogenic pain: a randomized trial. Spine 2003; 28: 1922-1927

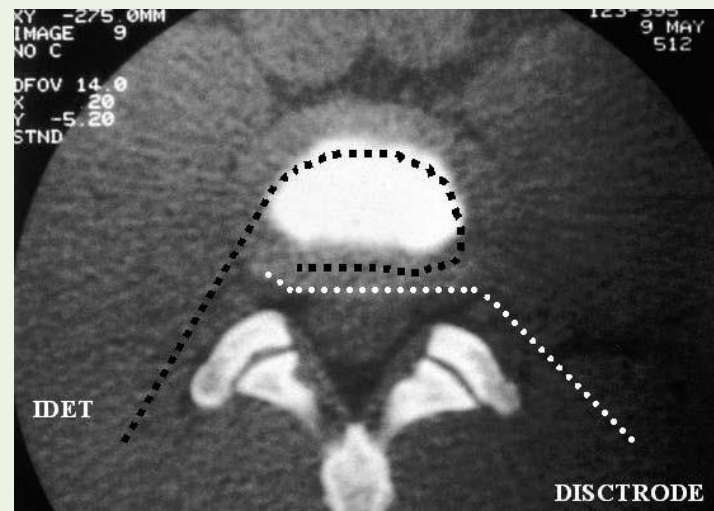
Flexibele catheters : heating of the nuclear/annular interface : IDET (3RCT), discrode, acutherm, bipolar RF
verlaten

RF Discogenic pain

Grade of recommendation :

6 RCT

ramus communicans	: Oh 2004	2B+
disc	: Barendse 2001 (-), Ercelen 2003(-)	2B+/-
IDET	: Pauza 2004 (+), Freeman 2005 (-)	2B+/-
PIRFT (Disctrode)	: Kvarstein 2009 (-)	0



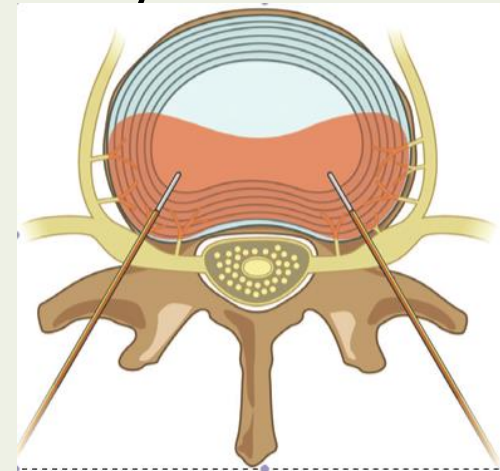
Rosen Pain Physician 2003

RF Disc

What's new ?

RCT : Biacuplasty vs sham

- N= 64
- 2 cooled RF needles
- 6 months : + pain, physical function, disability



Lumboischialgie

Chronische radiculaire pijn

Hernia, NFS,

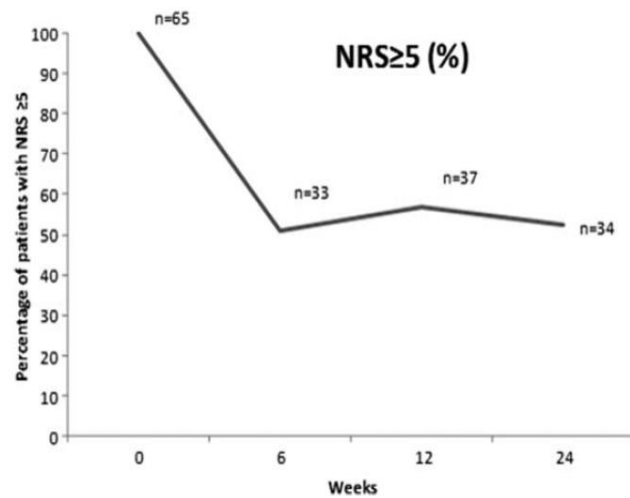


Figure 2 Evolution over time of percentage of patients with NRS of at least 5.

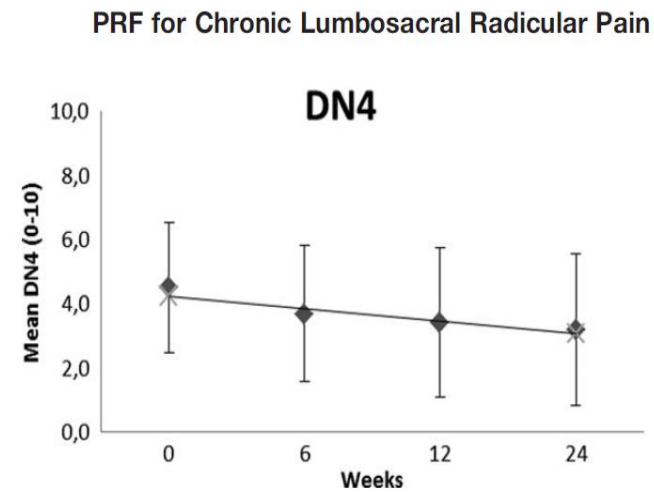


Figure 4 Evolution over time of the mean DN4 with standard deviation. The linear line represents linear regression after multilevel analysis.

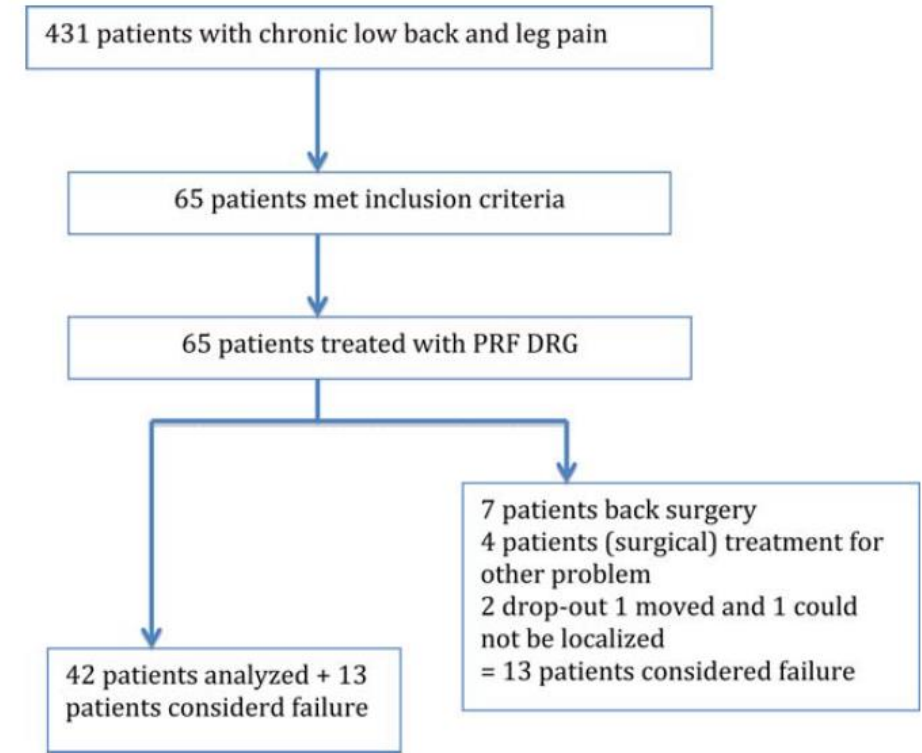


Figure 1 Patient flow, inclusion, and analysis.

Thoracaal DRG

PRF DRG thoracic

Pain Physician 2006;CohenS.P
case of postsurgical thoracic pain

PRF DRG of intercostal nerves in

Pain Physician. 2006;9:227-236, ISSN 1533-3159

A RETROSPECTIVE EVALUATION

PULSED RADIOFREQUENCY OF THE DORSAL ROOT GANGLIA IS SUPERIOR TO PHARMACOTHERAPY OR PULSED RADIOFREQUENCY OF THE INTERCOSTAL NERVES IN THE TREATMENT OF CHRONIC POSTSURGICAL THORACIC PAIN

Steven P. Cohen, MD, Anthony Sireci, BA, Christopher L. Wu, MD, Thomas M. Larkin, MD, Kayode A. Williams, MD, and Robert W. Hurley, MD, PhD

Sympathetisch zenuwstelsel

Viscerale pijn in de bovenbuik
splanchnic zenuw blok

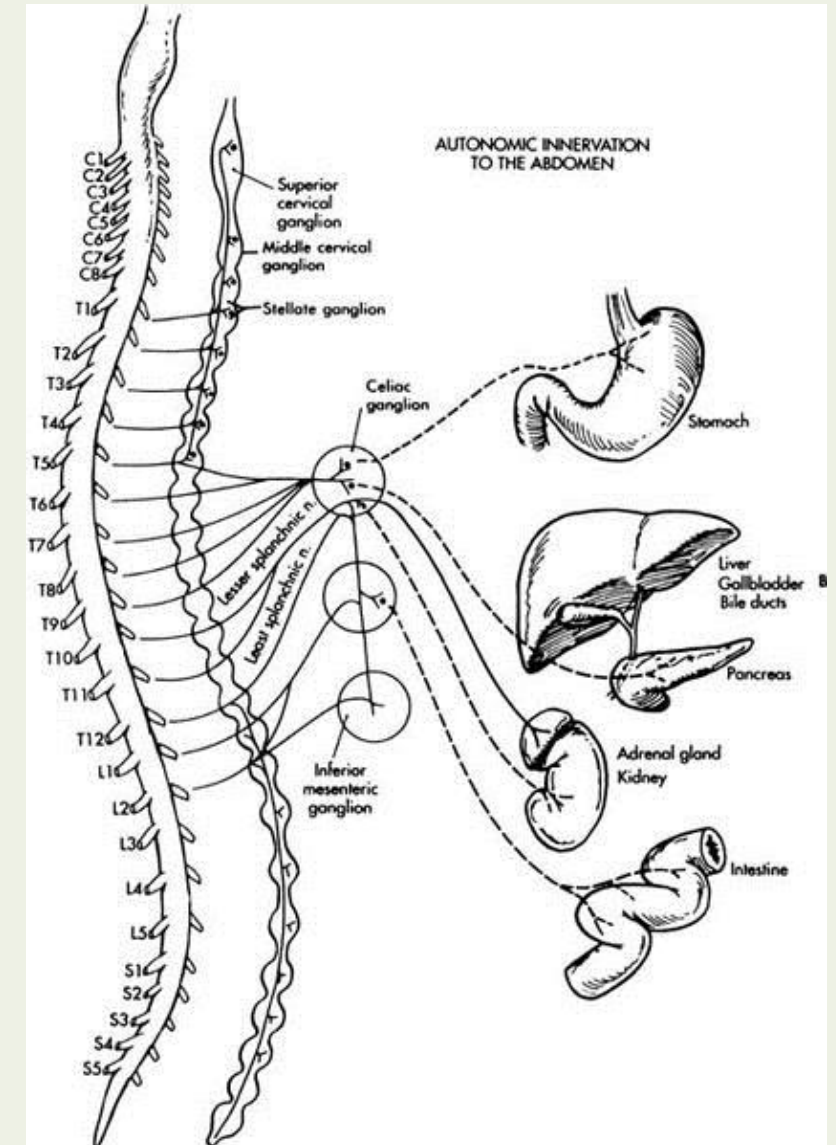
geen mogelijkheid om een drempel te
bepalen

selectiever dan alcohol, fenol,
chirurgische transectie

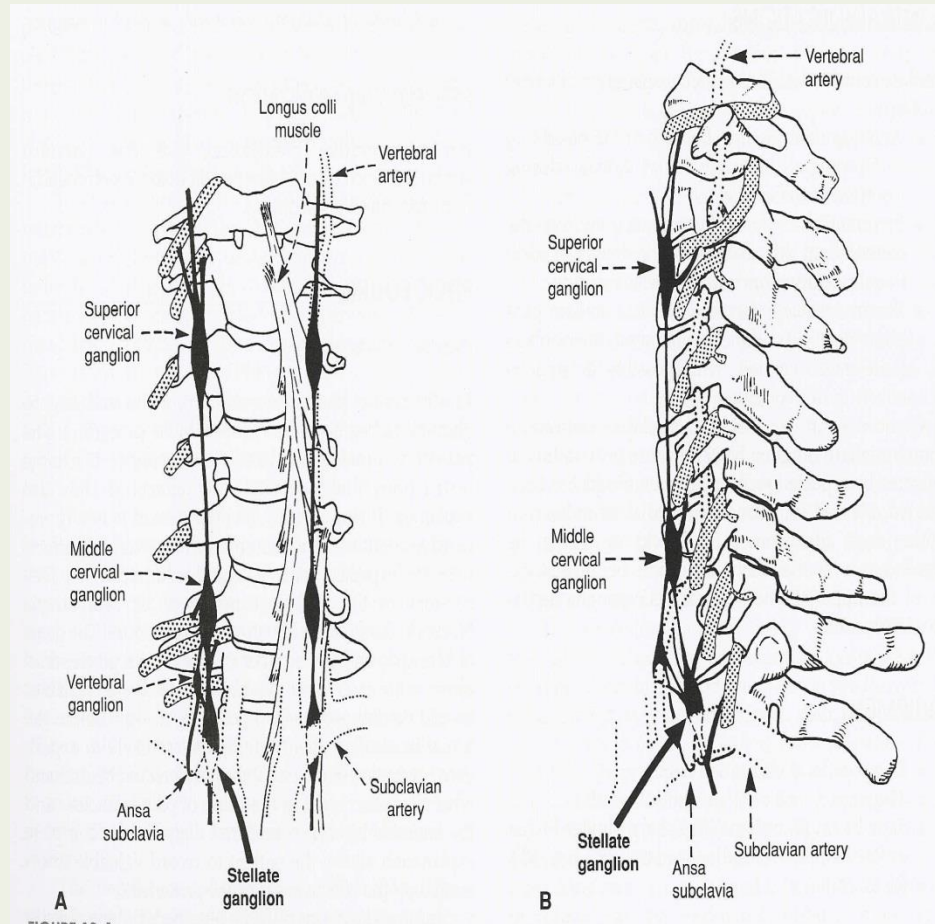
LSB : genitofemoral zenuw! (L1)

Viscerale pijn in de bovenbuik
splanchnic zenuw blok

Prithvi Raj P, Sahinder B, Lowe M. Radiofrequency lesioning of
splanchnic nerves. Pain Practice 2002; 2: 241-247



Ganglion Stellatum



Indications

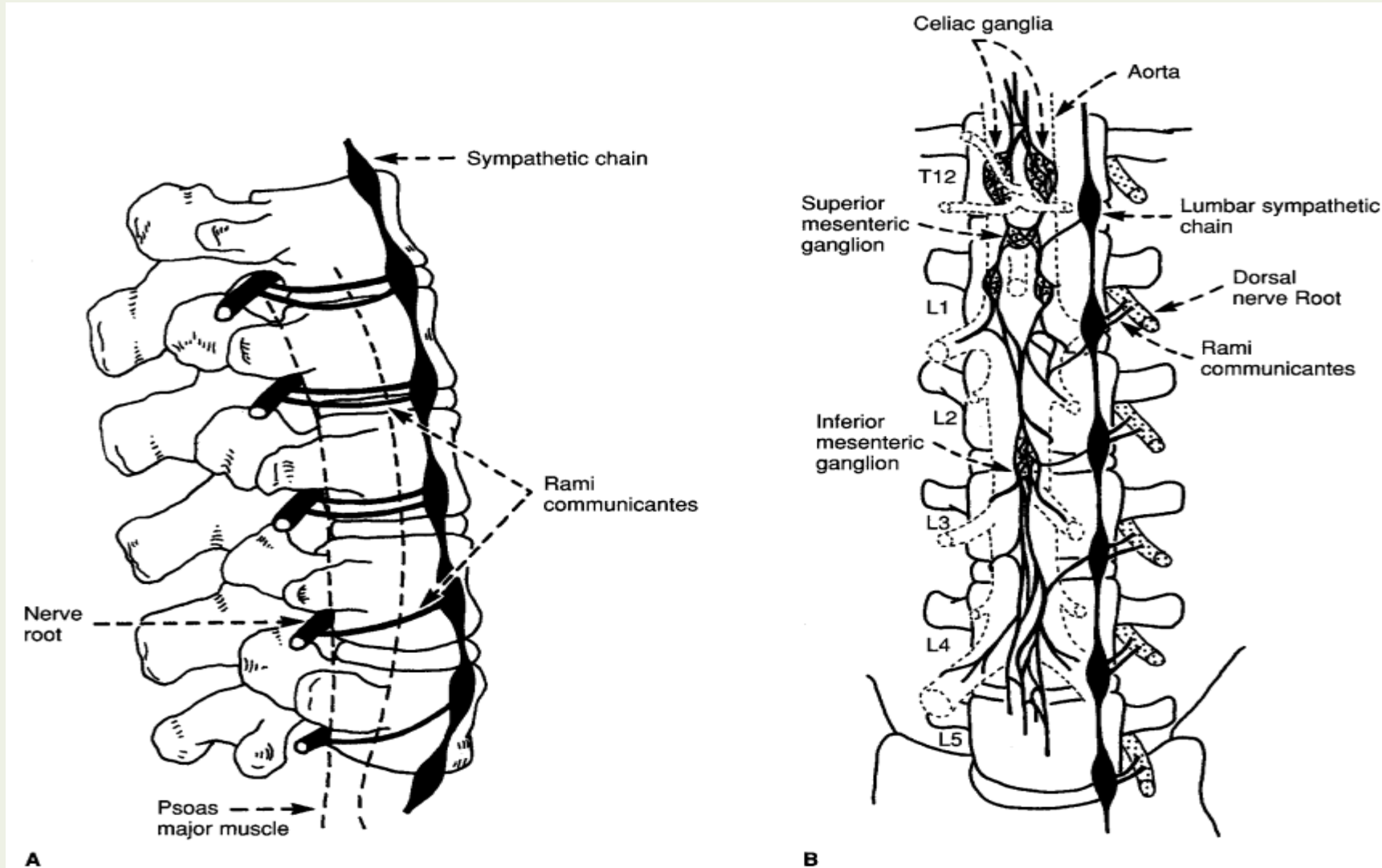
Raynaud's disease

Arteriele embolen in arm regio

Post herpetic neuralgia ?

CRPS I and II

Lumbale sympathetisch block: anatomie

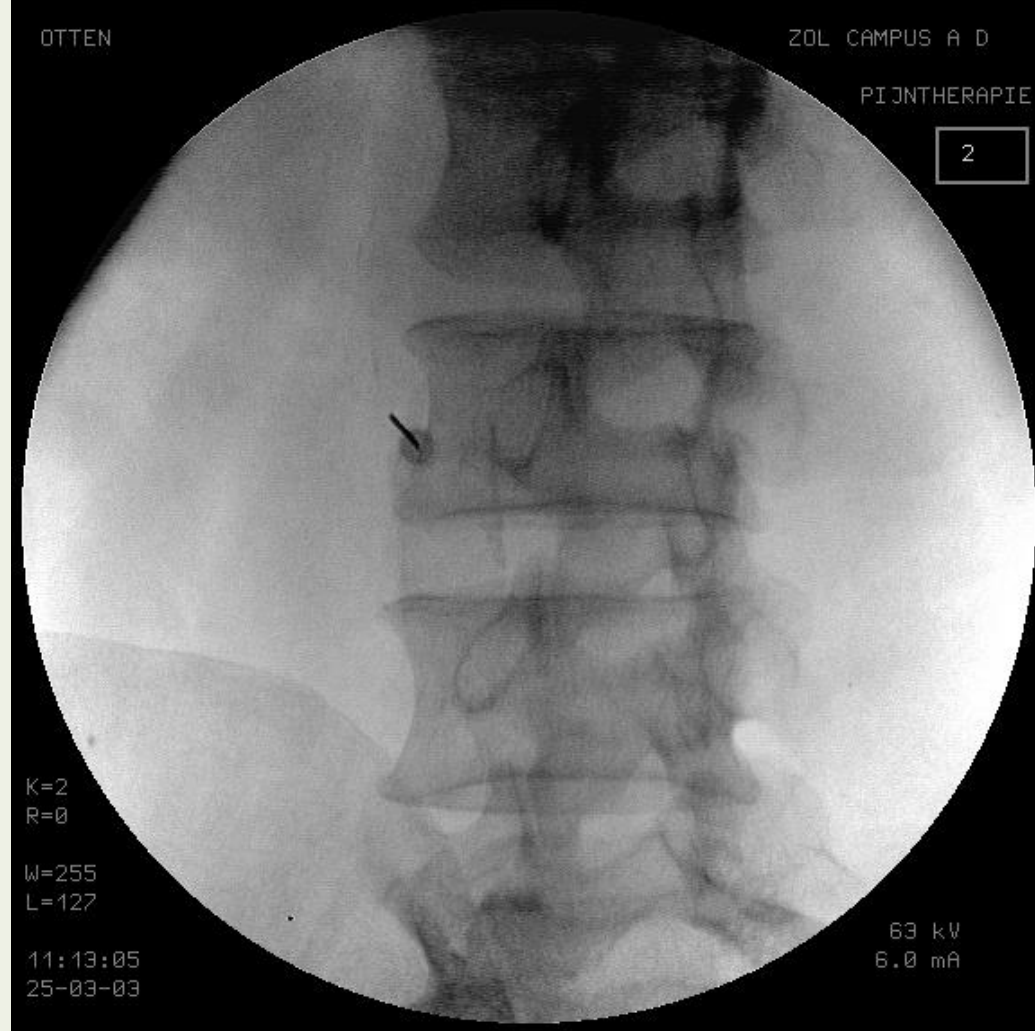


Lumbar sympathetic block: indicaties

Circulatoire problemen van het been
Neuropathisch pijn been
CRPS type I and II
Andere : hyperhydrosis

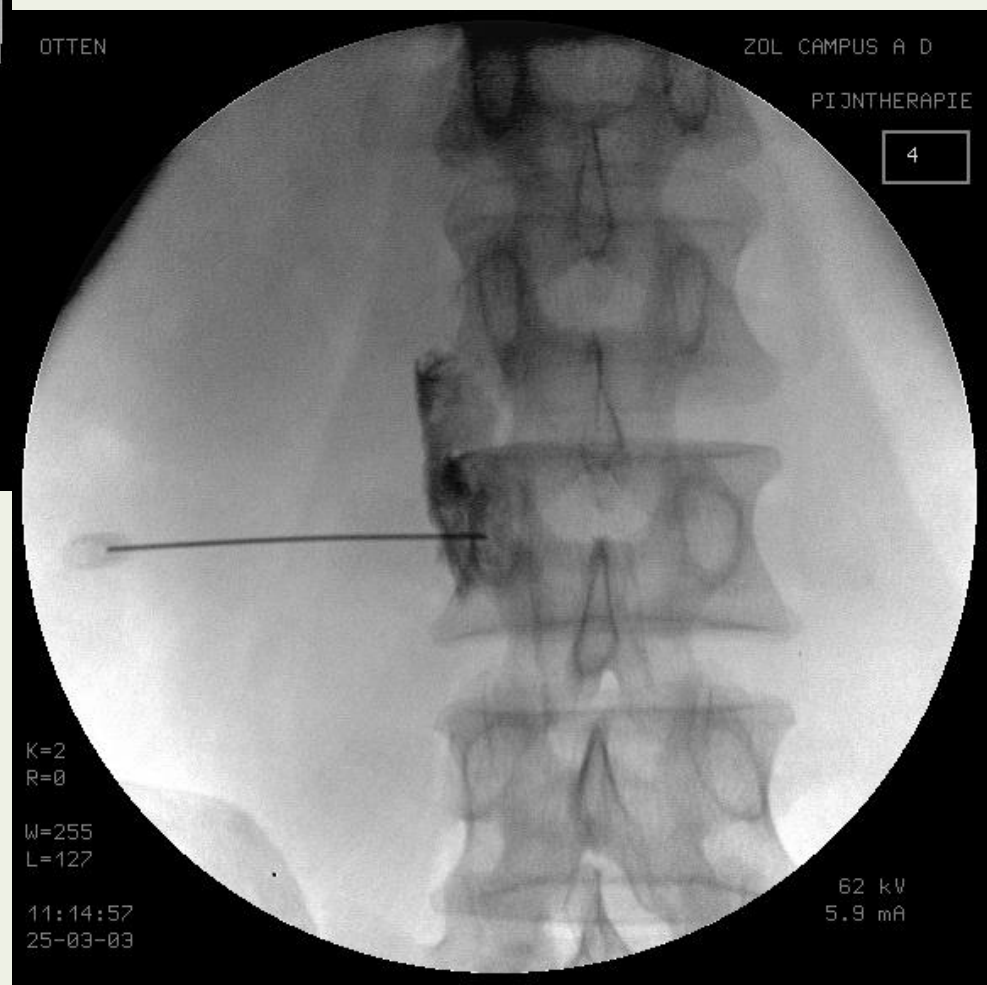
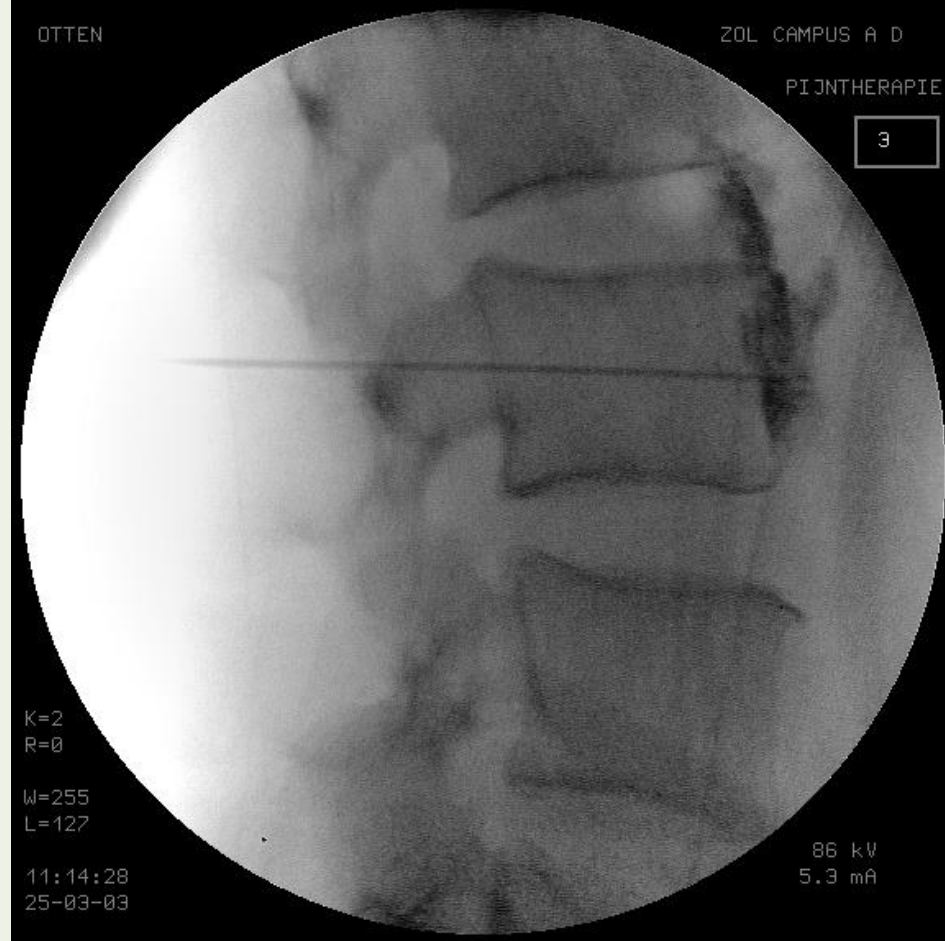
Evidence

Level C and D

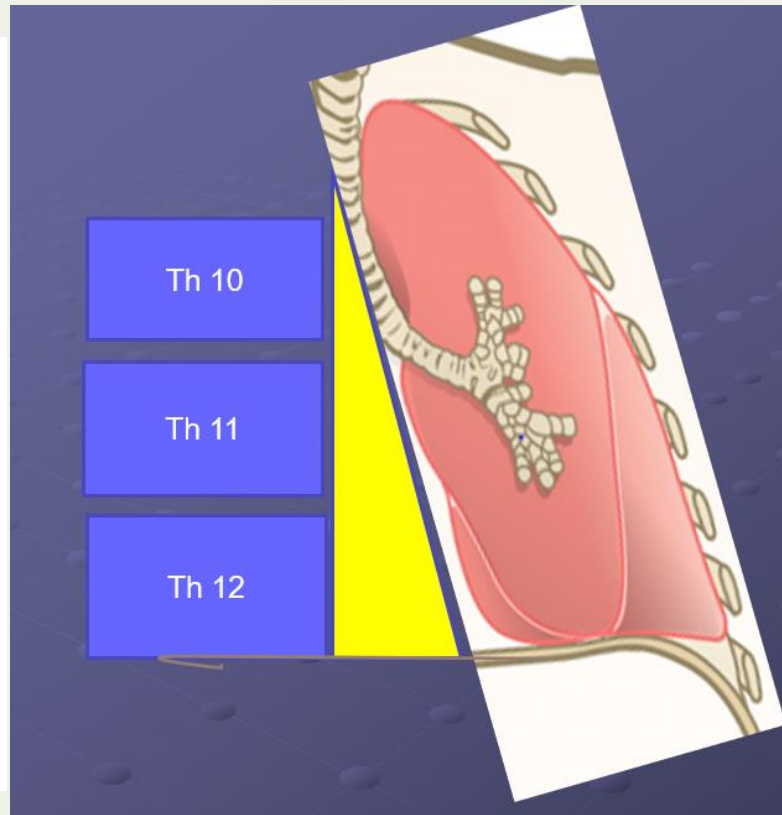
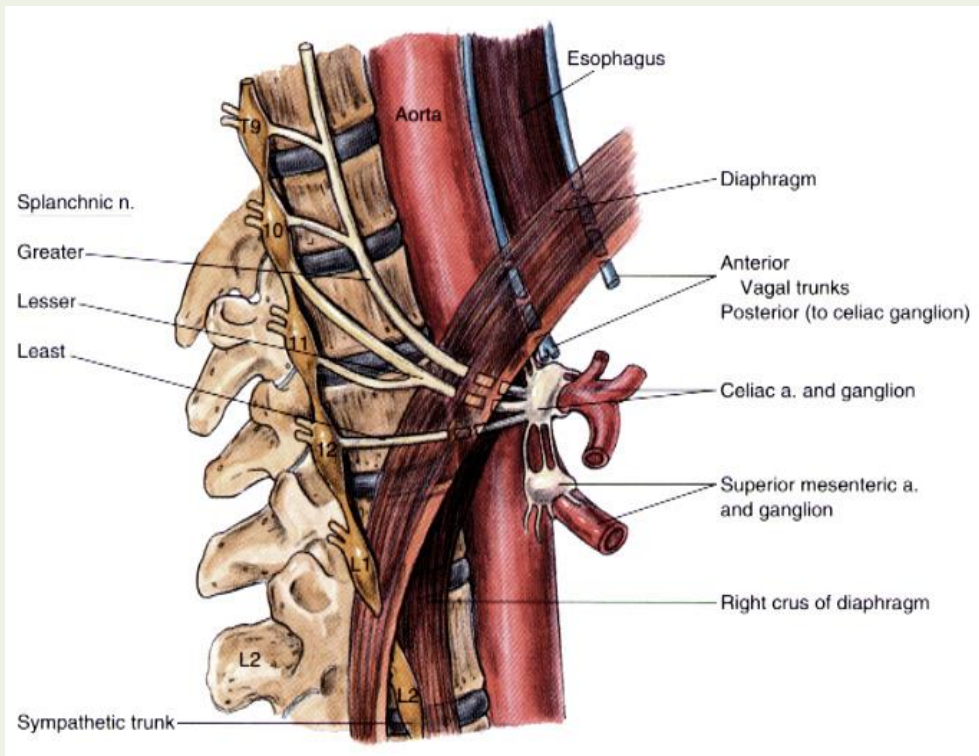


LSB

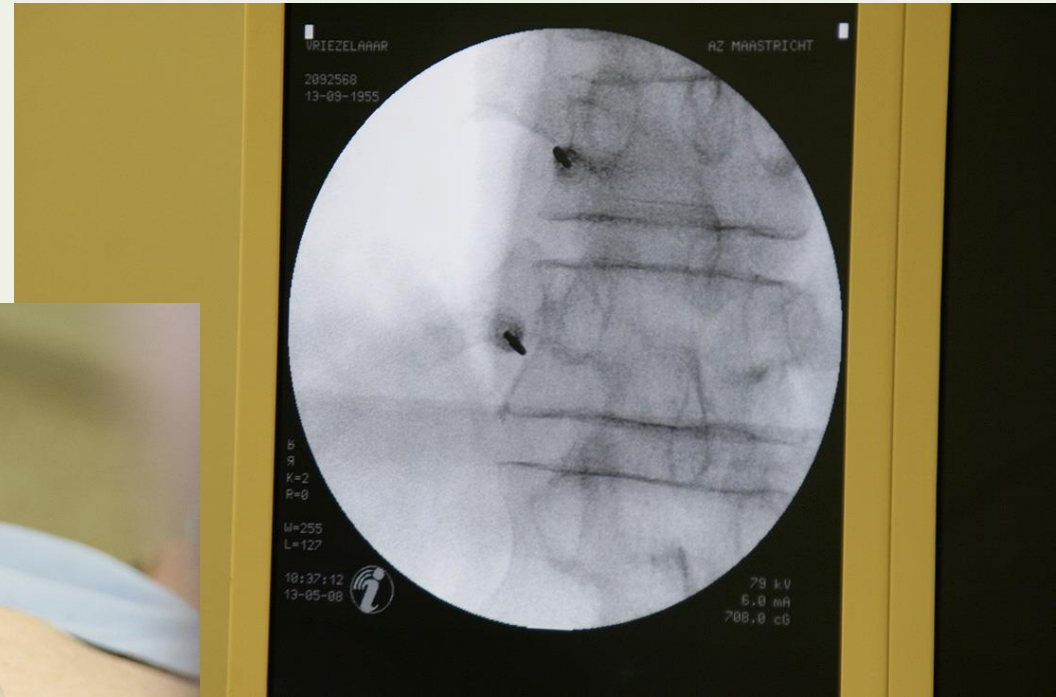
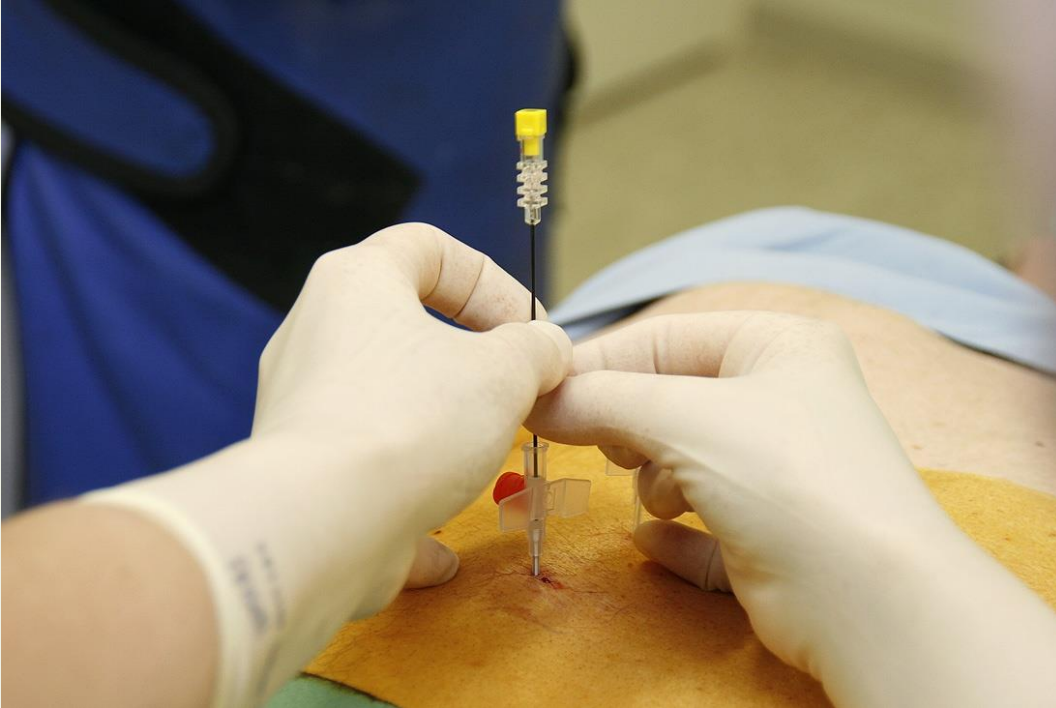




Splanchnische zenuwen



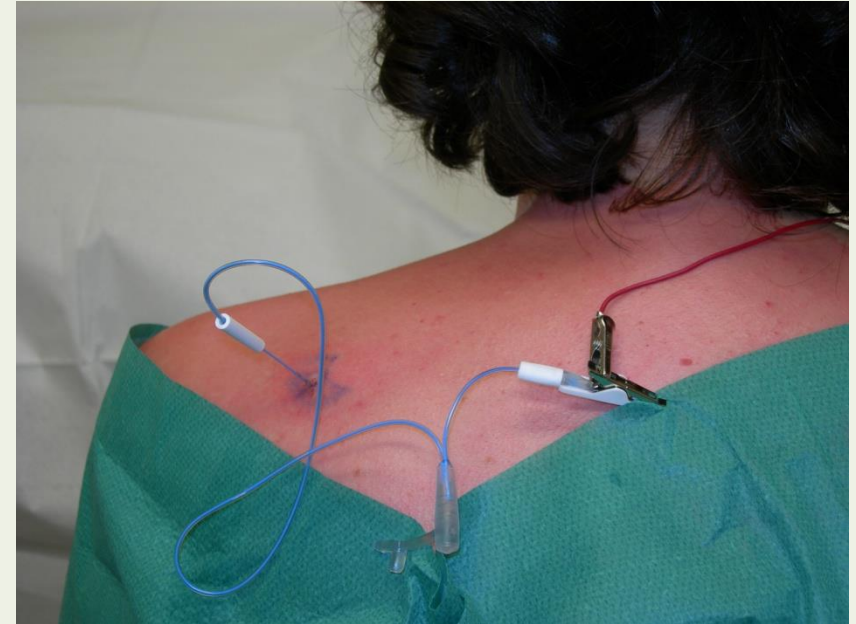
Pancreatitis
Oncologische problemen
bovenbuik



ia
tieve
Zorg

Perifere zenuwen

- ❖ Suprascapular nerve
- ❖ Ilioinguinal nerve
- ❖ N occipitalis
- ❖ Knie
- ❖ ...





Echo

Visualiseren waar je naartoe gaat

Veiliger

Reproduceerbaarheid groter

Meer targets

5mm active tip

Echogene Naald 6 or 10, SMK 5 or 10 cm

Zenuw positie wordt geverifieerd met 2 Hz and 50 Hz stimulation

Treshold $< 0,5$ V

Impedance

Radiofrequentie

KEY POINTS

- No neurological complications reported in over 200 articles published.
 - PRF adjacent to the dorsal root ganglion should be considered for the treatment of radicular pain.
 - PRF for trigeminal neuralgia has a shorter duration of effect but a better safety profile than conventional radiofrequency.
 - PRF of the nervi occipitales works better than steroid infiltrations for occipital neuralgia.
 - PRF shows promising results in treating shoulder pain and chronic postoperative knee pain.
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