Rtg-, ct , mri ja kartiokeilalöydöksiä

Seppo Villanen LL, fysiatri, yleislääket. erikl. kivunhoidon ja kuntoutuksen erit. pätevyys, neuromodulaatio invasiivinen kivunhoito

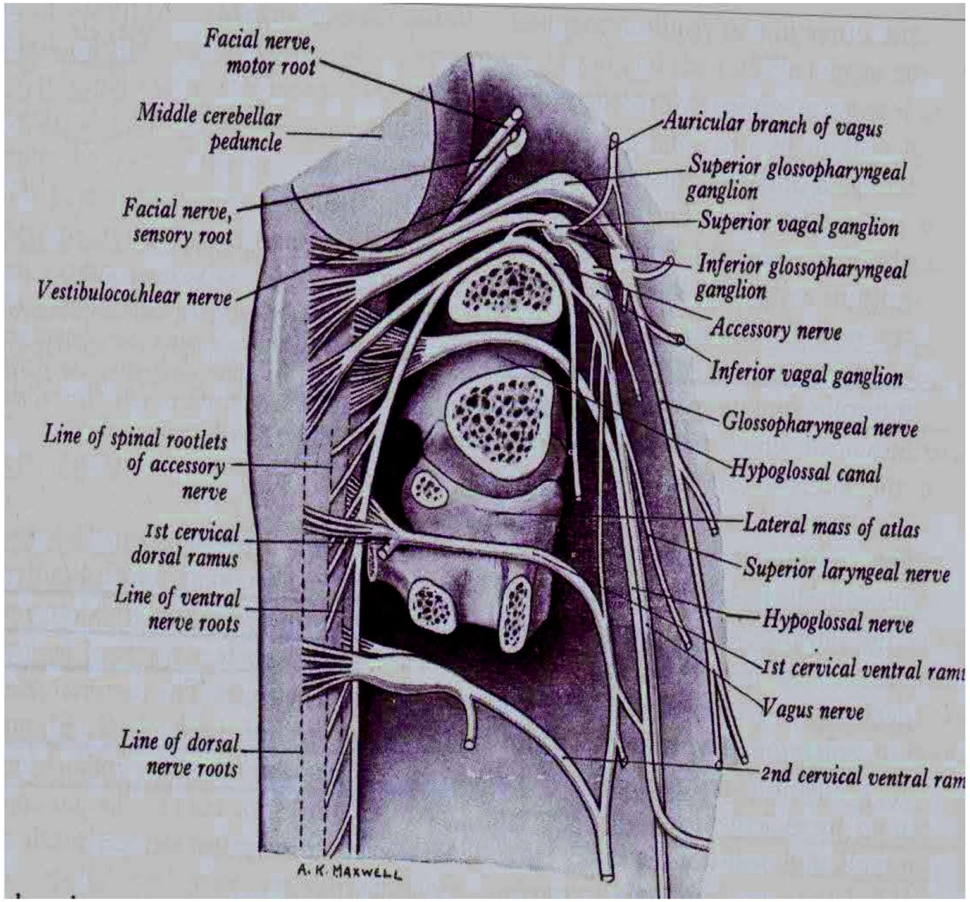
Mehiläinen

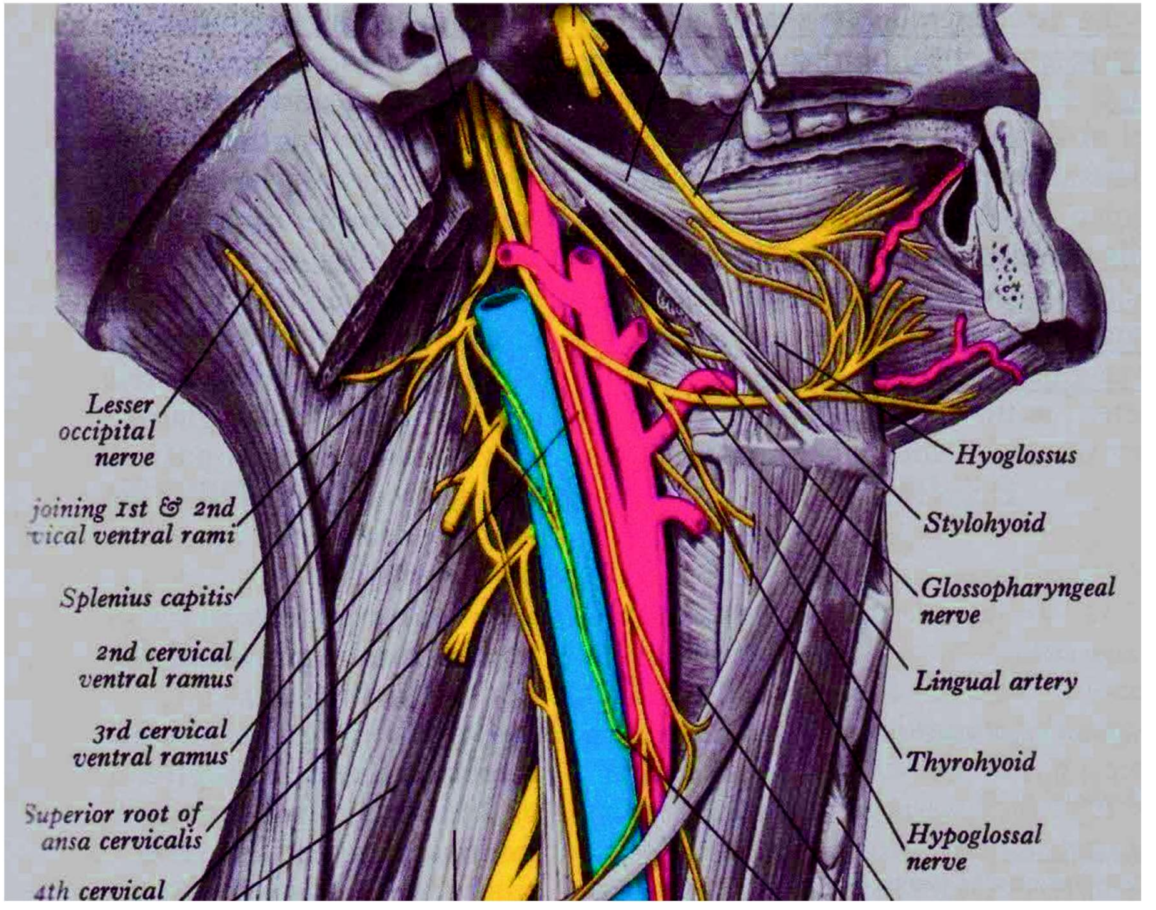
www.neuromodulation.com

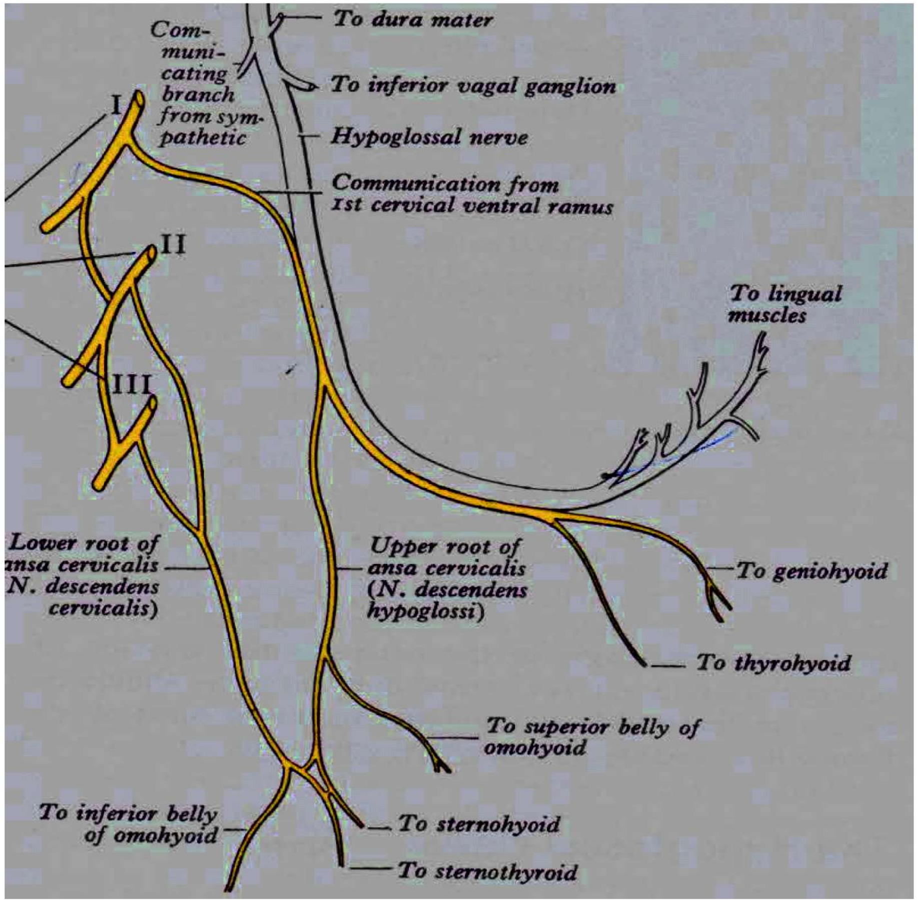
www.worldinstituteofpain.org

Historiaa, lääket. muisti 20 v ?

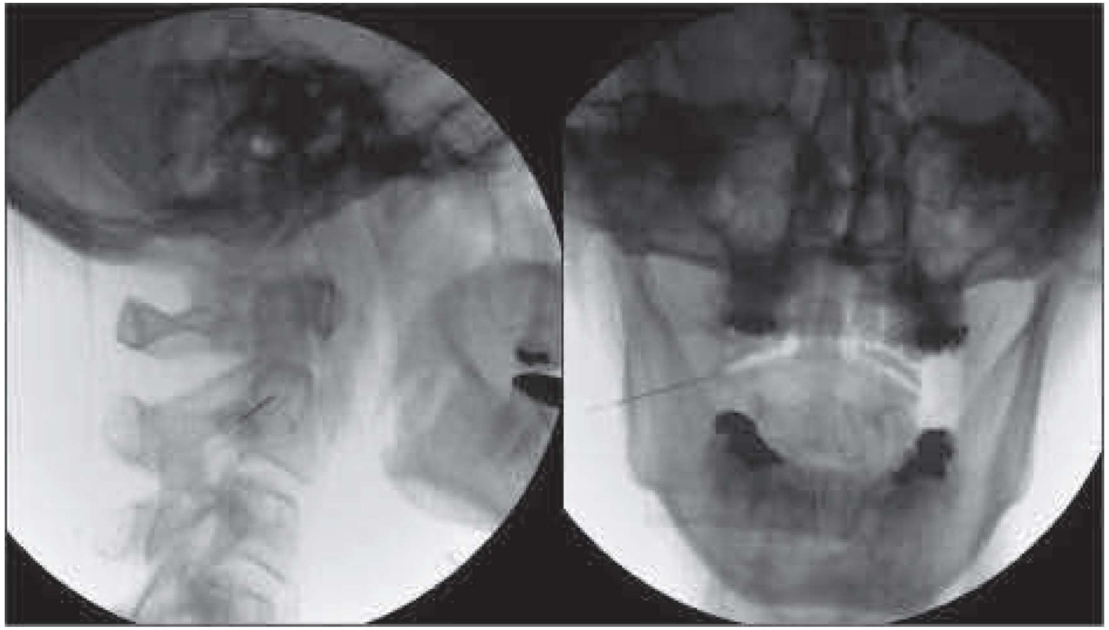
- Natiivi rtg, taivutuskuvat (siirtymä, kulmamuutos), funktiokuvaukset läpivalaisu hermojuuriblokadit yms.. Puudutukset
- Ilmakallokuvaukset
- Myoleografiat, discocrafiat , Dallas CT-discocrafia luokitus (DDD) 1987. nimiä: Heikki Vanharanta, Videman Tapio, Nachemsom Alf, Hirsc C, Knutsson F.
- Reppukuvaukset, Ora Friberg, 1987
- Kompressio CT 1990 luku, CT funktiokuvaukset
- MRI tutkimukset 1990 luku. Lepokuvaus. Kipu ei näy
- Tules eläkkeet 50% lasku 1990-2010 (SLL, Timo Pohjolainen 2014)
- Tieto anatomiasta ja fysiologiasta lisääntyy koko ajan.

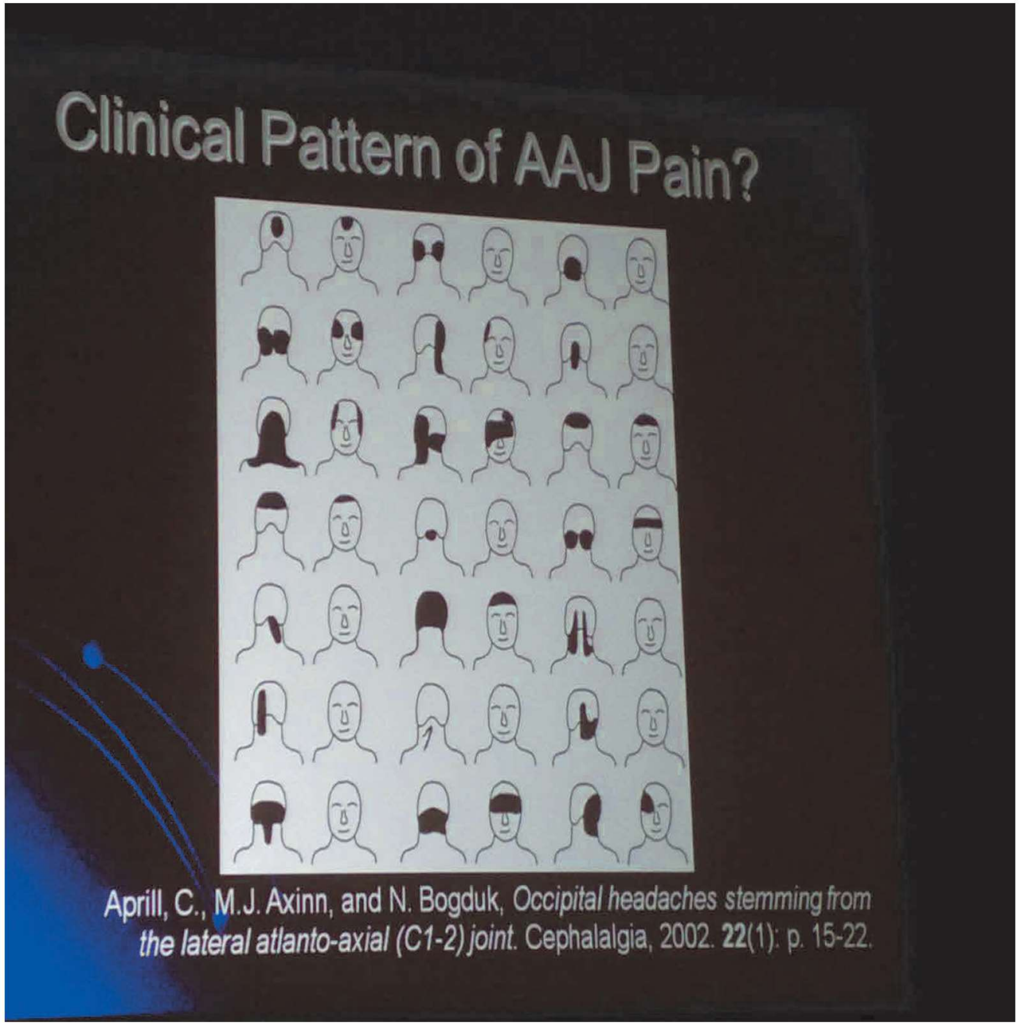

Facial nerve, motor root
Middle cerebellar peduncle
Facial nerve, sensory root
Vestibulocochlear nerve
Line of spinal rootlets of accessory nerve
1st cervical dorsal ramus
Line of ventral nerve roots
Line of dorsal nerve roots
Auricular branch of vagus
Superior glossopharyngeal ganglion
Superior vagal ganglion
Inferior glossopharyngeal ganglion
Accessory nerve
Inferior vagal ganglion
Glossopharyngeal nerve
Hypoglossal canal
Lateral mass of atlas
Superior laryngeal nerve
Hypoglossal nerve
1st cervical ventral ram
Vagus nerve
2nd cervical ventral ram
A. K. MAXWELL


Lesser occipital nerve
joining 1st & 2nd
vical ventral rami
Splenius capitis
2nd cervical ventral ramus
3rd cervical ventral ramus
Superior root of ansa cervicalis
4th cervical
Hyoglossus
Stylohyoid
Glossopharyngeal nerve
Lingual artery
Thyrohyoid
Hypoglossal nerve

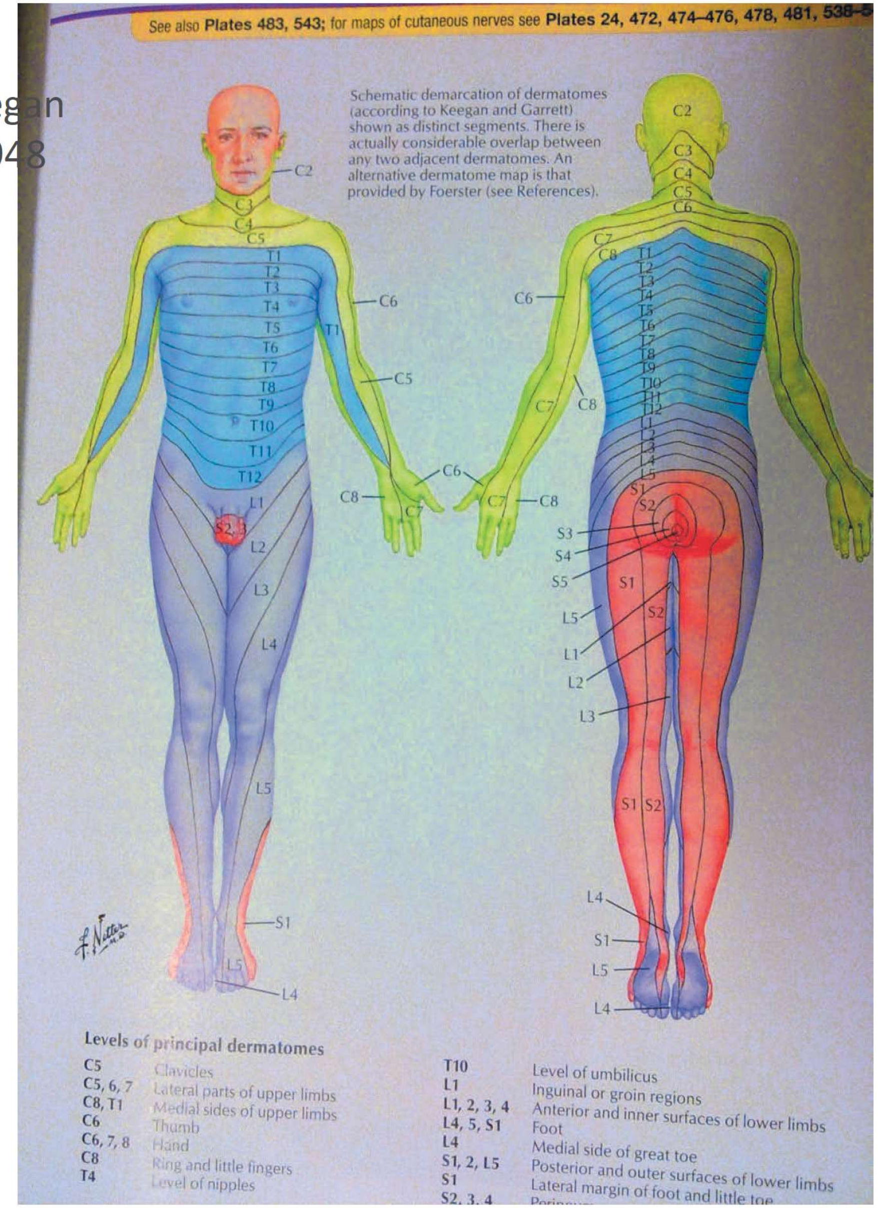


Com-
muni-
cating
branch
from sym-
pathetic
To dura mater
To inferior vagal ganglion
Hypoglossal nerve
Communication from
1st cervical ventral ramus
I
II
III
To lingual
muscles
Lower root of
ansa cervicalis
(N. descendens
cervicalis)
Upper root of
ansa cervicalis
(N. descendens
hypoglossi)
To geniohyoid
To thyrohyoid
To superior belly of
omohyoid
To inferior belly
of omohyoid
To sternohyoid
To sternothyroid




Clinical Pattern of AAJ Pain?
Aprill, C., M.J. Axinn, and N. Bogduk, Occipital headaches stemming from the lateral atlanto-axial (C1-2) joint. Cephalalgia, 2002. 22(1): p. 15-22.

Star 1892, Keegan and Carrett 1948



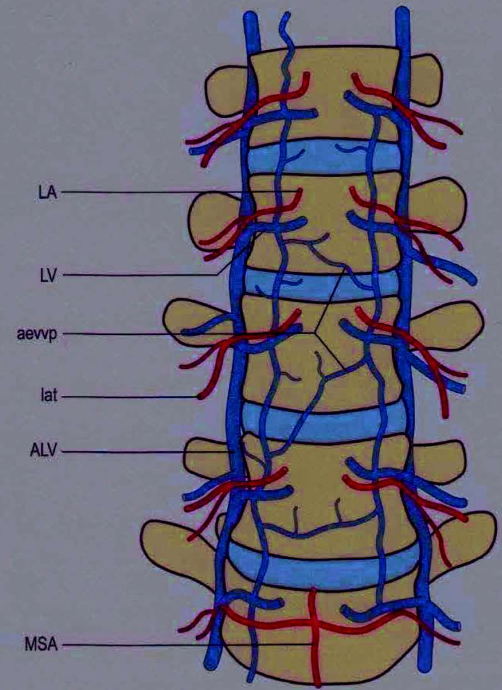


Figure 11.1 An anterior view of the lumbar spine showing its intrinsic blood vessels. aevvp, elements of the anterior external vertebral venous plexus; ALV, ascending lumbar vein; LA, lumbar artery; lat, lateral branches of the lumbar arteries; LV, lumbar vein; MSA, median sacral artery.

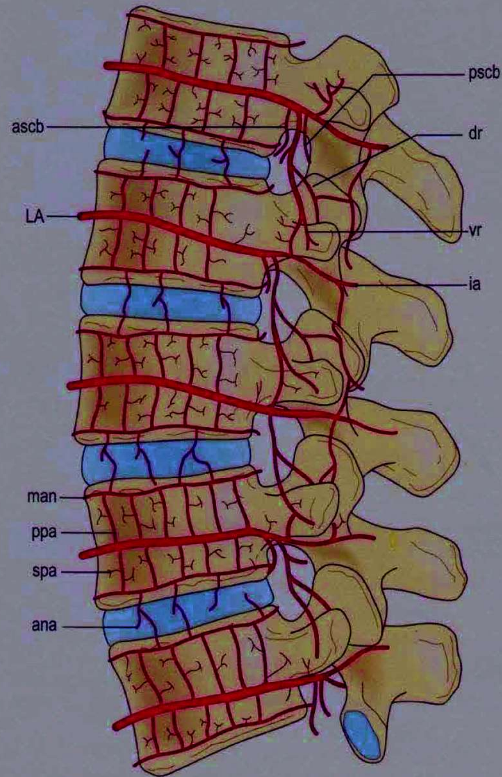


Figure 11.2 A lateral view of the lumbar spine showing the lumbar arteries and their branches. ana, anastomosis over the surface of the intervertebral disc; ascb, anterior spinal canal branch; dr, branches accompanying dorsal ramus of spinal nerve; ia, posterior branch related to the pars interarticularis of the lamina; LA, lumbar artery; man, metaphysial anastomosis; ppa, primary periosteal artery; pscb, posterior spinal canal branch; spa, secondary periosteal artery; vr, branches accompanying ventral ramus of spinal nerve.

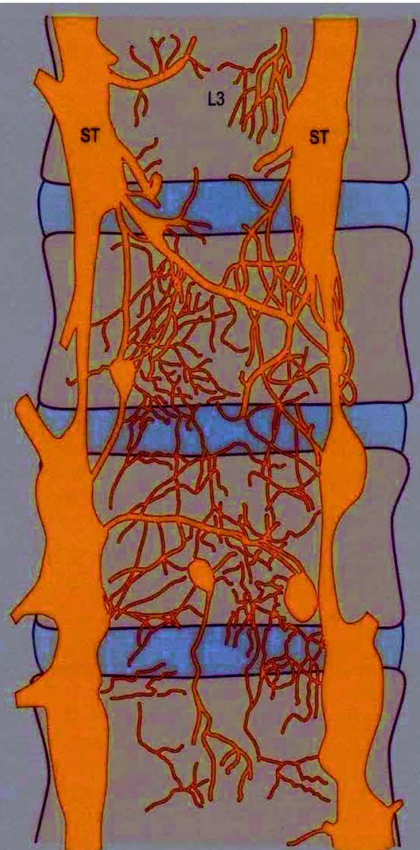


Figure 10.9 The nerve plexus accompanying the anterior longitudinal ligament at the levels of L3 and lower vertebrae, as seen in whole mounts of human fetuses. ST, lumbar sympathetic trunk. *(Based on Groen et al. 1990.[57])*

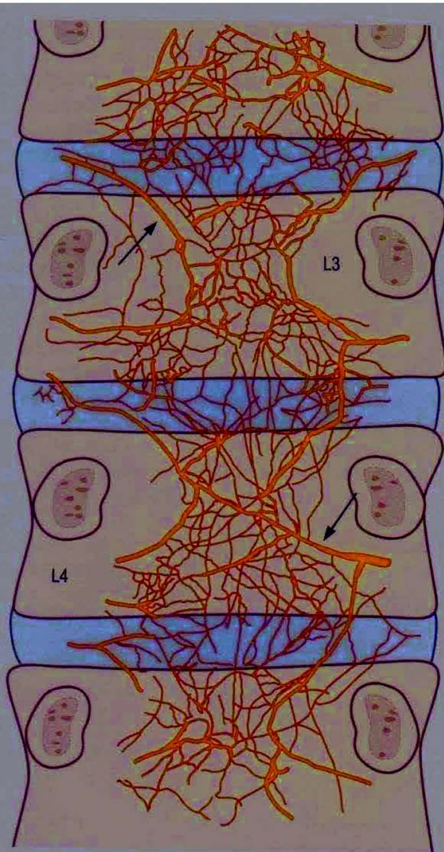


Figure 10.10 The nerve plexus accompanying the posterior longitudinal ligament at the levels of L3 and lower vertebrae, as seen in whole mounts of human fetuses. (Based on Groen et al. 1990.[57]) The large fibres arrowed represent what would be found, on dissection, to be the sinuvertebral nerves.

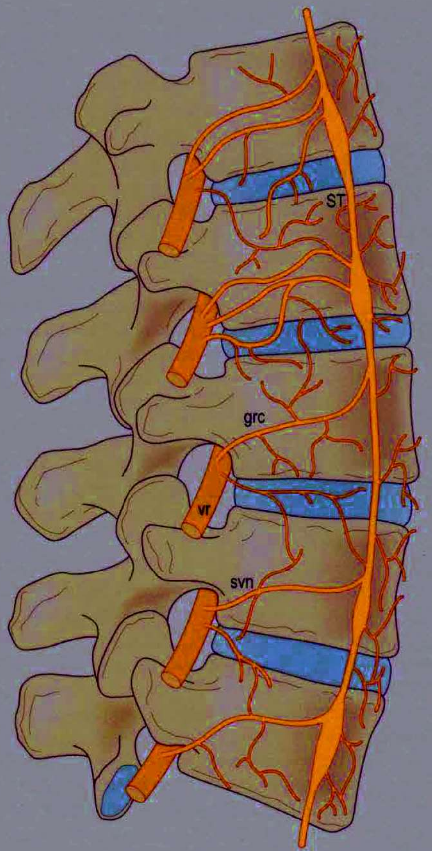


Figure 10.11 The lateral plexus of the lumbar spine and its sources. The plexus innervates the lateral aspects of the vertebral bodies and discs. The plexus is formed by branches of the grey rami communicantes (grc) and branches of the ventral rami (vr). Posteriorly, the lateral plexus is continued as the sinuvertebral nerves (svn) entering the intervertebral foramina. Anteriorly, the plexus blends with the anterior plexus and sympathetic trunks (ST).

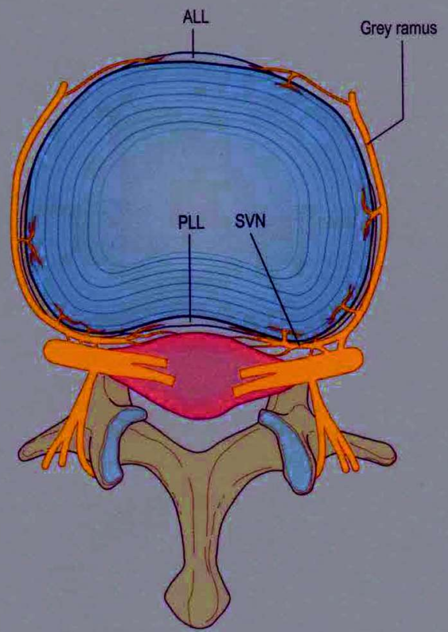


Figure 10.12 The nerve supply of a lumbar intervertebral disc depicted in a transverse view of the lumbar spine. Branches of the grey rami communicantes and the sinuvertebral nerves (SVN) are shown entering the disc and the anterior and posterior longitudinal ligaments (ALL, PLL). Branches from the sinuvertebral nerves also supply the anterior aspect of the dural sac and dural sleeve.

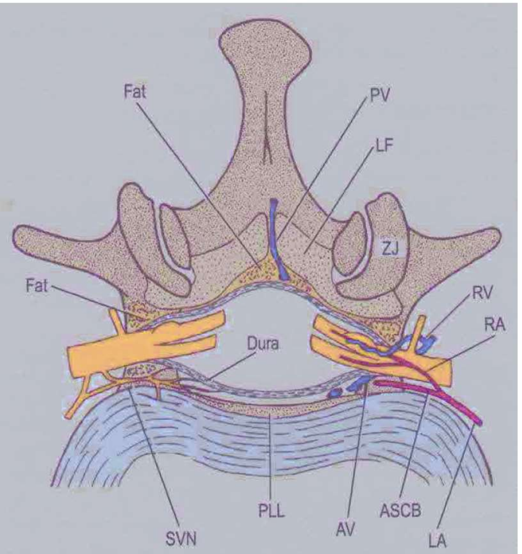


Figure 10.4 A transverse section through the vertebral canal and intervertebral foramina to demonstrate the relations of the lumbar nerve roots. The roots are enclosed in their dural sleeve, which is surrounded by epidural fat in the intervertebral foramina. Radicular veins (RV) and radicular arteries (RA) run with the nerve roots. Anteriorly, the roots are related to the intervertebral disc and posterior longitudinal ligament (PLL), separated from them by the sinuvertebral nerves (SVN), elements of the anterior internal vertebral venous plexus (AV) and the anterior spinal canal branches (ASCB) of the lumbar arteries (LA). Posteriorly, the roots are separated from the ligamentum flavum (LF) and zygapophysial joints (ZJ) by elements of the posterior internal vertebral venous plexus (PV) and epidural fat, which lodges in the recess between the ligamentum flavum of each side.

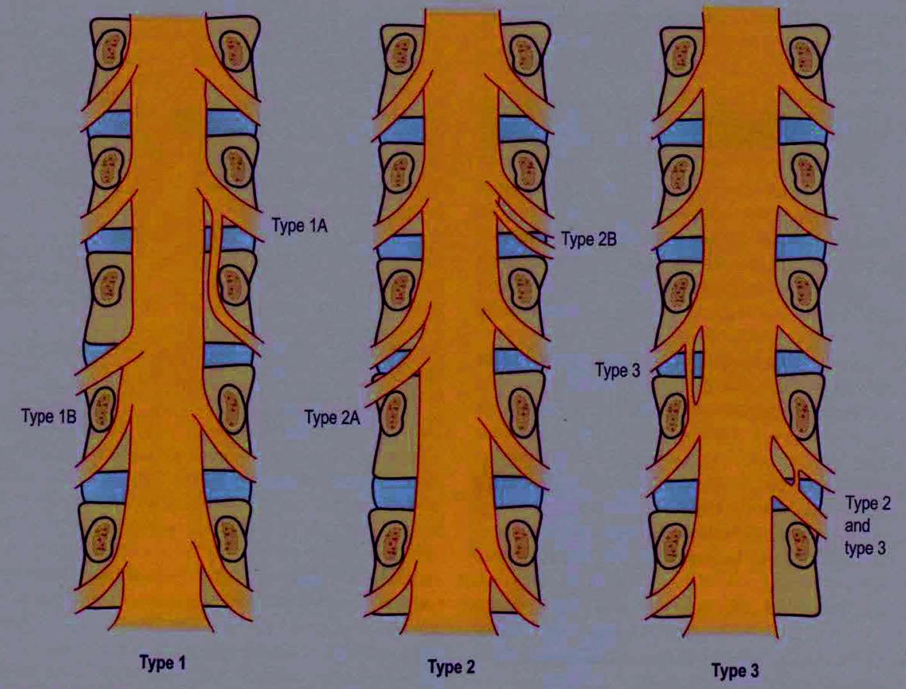


Figure 10.5 Extradural anomalies of the lumbar nerve roots. *(Based on Neidre and MacNab 1983.[16])*

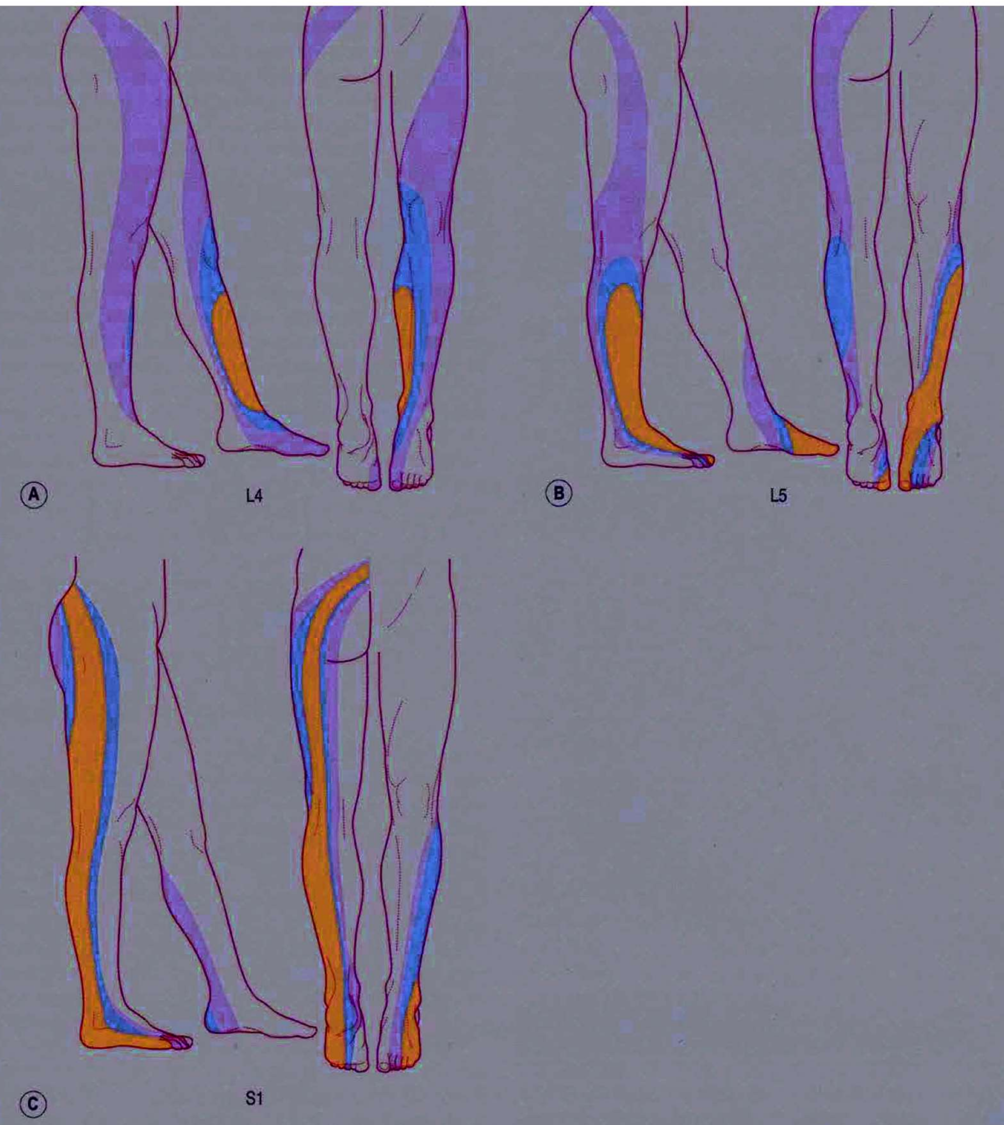
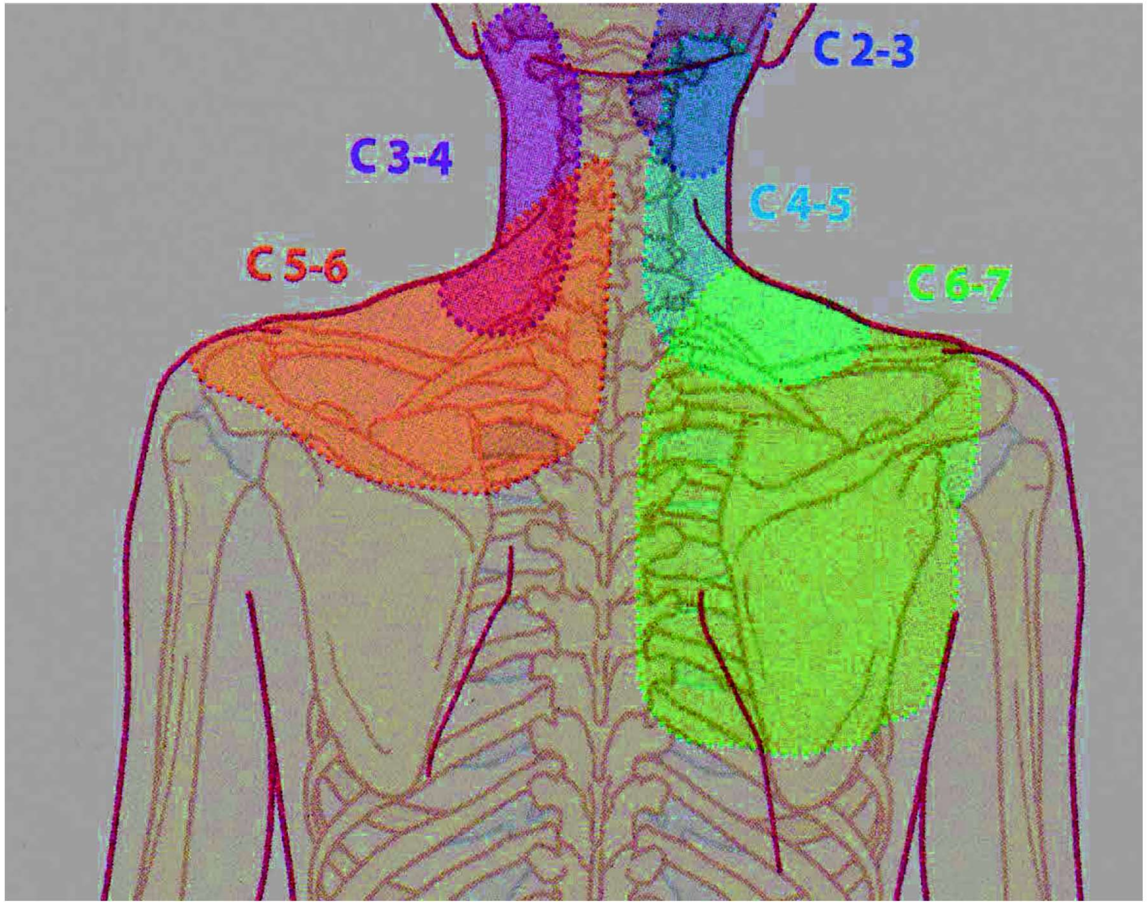


Figure 10.7 The (A) L4, (B) L5 and (C) S1 dermatomes. In each figure, the dermatomes are illustrated as contours according to the percentage of individuals who exhibit the particular pattern. The yellow zones are exhibited by at least 75% of the population, the blue zones by at least 50% and the purple zones by some 25% of individuals. *(Based on Nitta et al. 1993.[50])*

Fasettien ”kipualueet” injektiotutk.

Sama tulos ko nivelten sähköärystyksellä



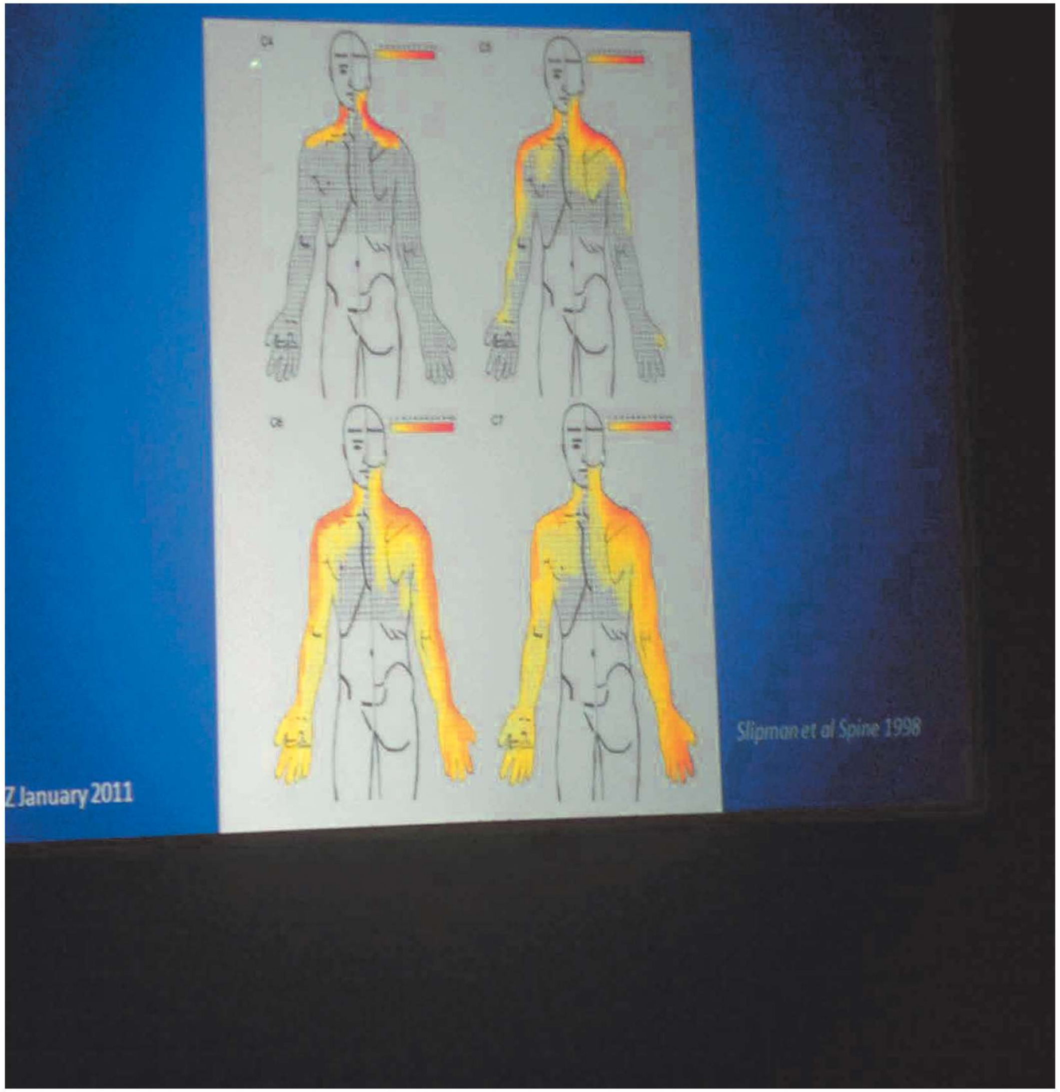

C4
C5
C6
C7
Slipman et al Spine 1998
Z January 2011

Fig. 2A. A composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right third occipital nerve.

Fig. 2B. A composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C3 medial branch.

Fig. 2C. A composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C4 medial branch.

Fig. 2D. Is composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C5 medial branch.

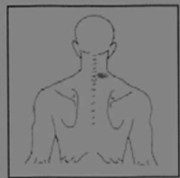


Fig. 2E. Is a composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C6 medial branch.

Fig. 2F. A composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C7 medial branch.

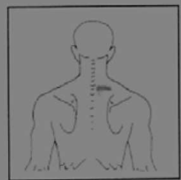


Fig. 2G. A composite drawing of the referral zones of all subjects derived from the minimal threshold stimulation of their right C8 medial branch.

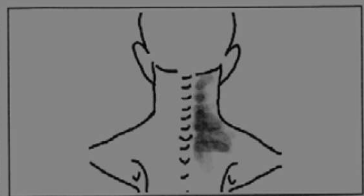


Fig. 3. A composite drawing of the referral patterns of all subjects derived from the minimal threshold stimulation of their right third occipital nerve and C3-C8 medial branches.

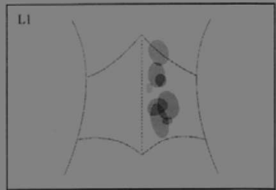


Fig 4a. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L1 medial branch

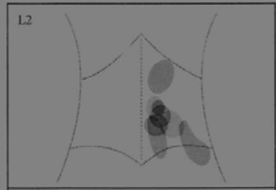


Fig 4b. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L2 medial branch

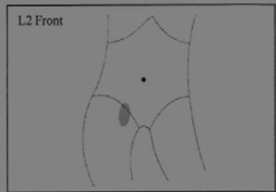


Fig 4c. Drawing of one volunteer who obtained anterior right inguinal stimulation from the minimal threshold stimulation of his right L2 medial branch.

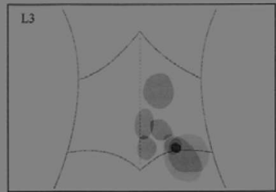


Fig 4d. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L3 medial branch.

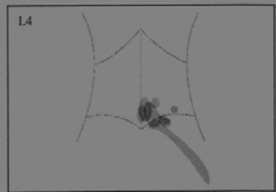


Fig 4e. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L4 medial branch.

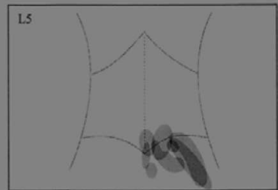


Fig 4f. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L5 dorsal ramus

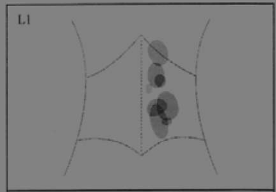


Fig 4a. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L1 medial branch

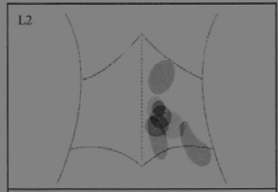


Fig 4b. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L2 medial branch

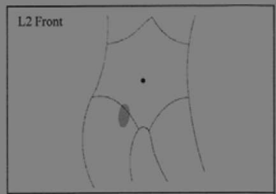


Fig 4c. Drawing of one volunteer who obtained anterior right inguinal stimulation from the minimal threshold stimulation of his right L2 medial branch.

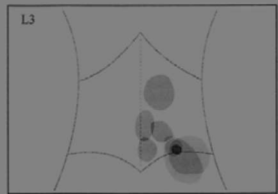


Fig 4d. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L3 medial branch.

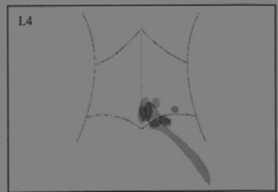


Fig 4e. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L4 medial branch.

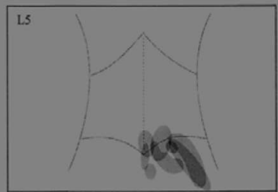


Fig 4f. Composite drawing of the referral zones of all eight subjects derived from the minimal threshold stimulation of their right L5 dorsal ramus

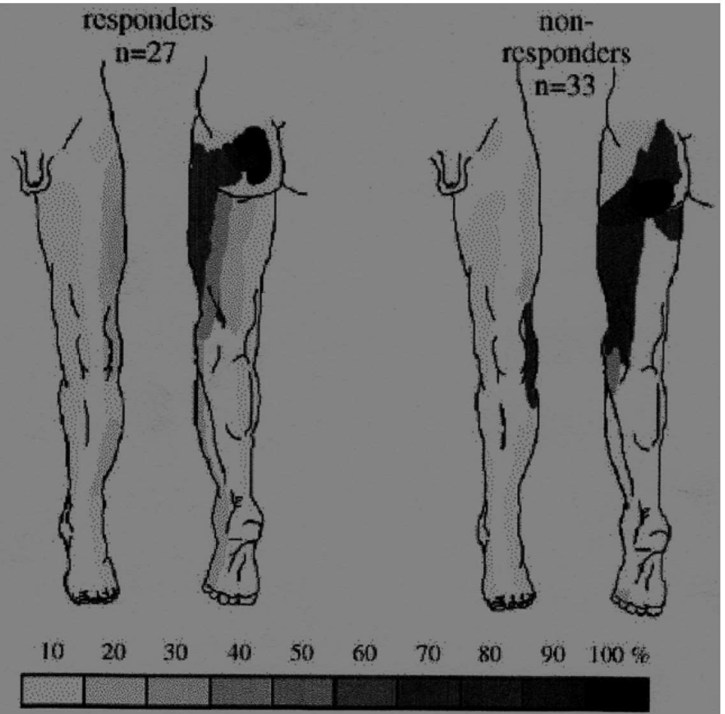
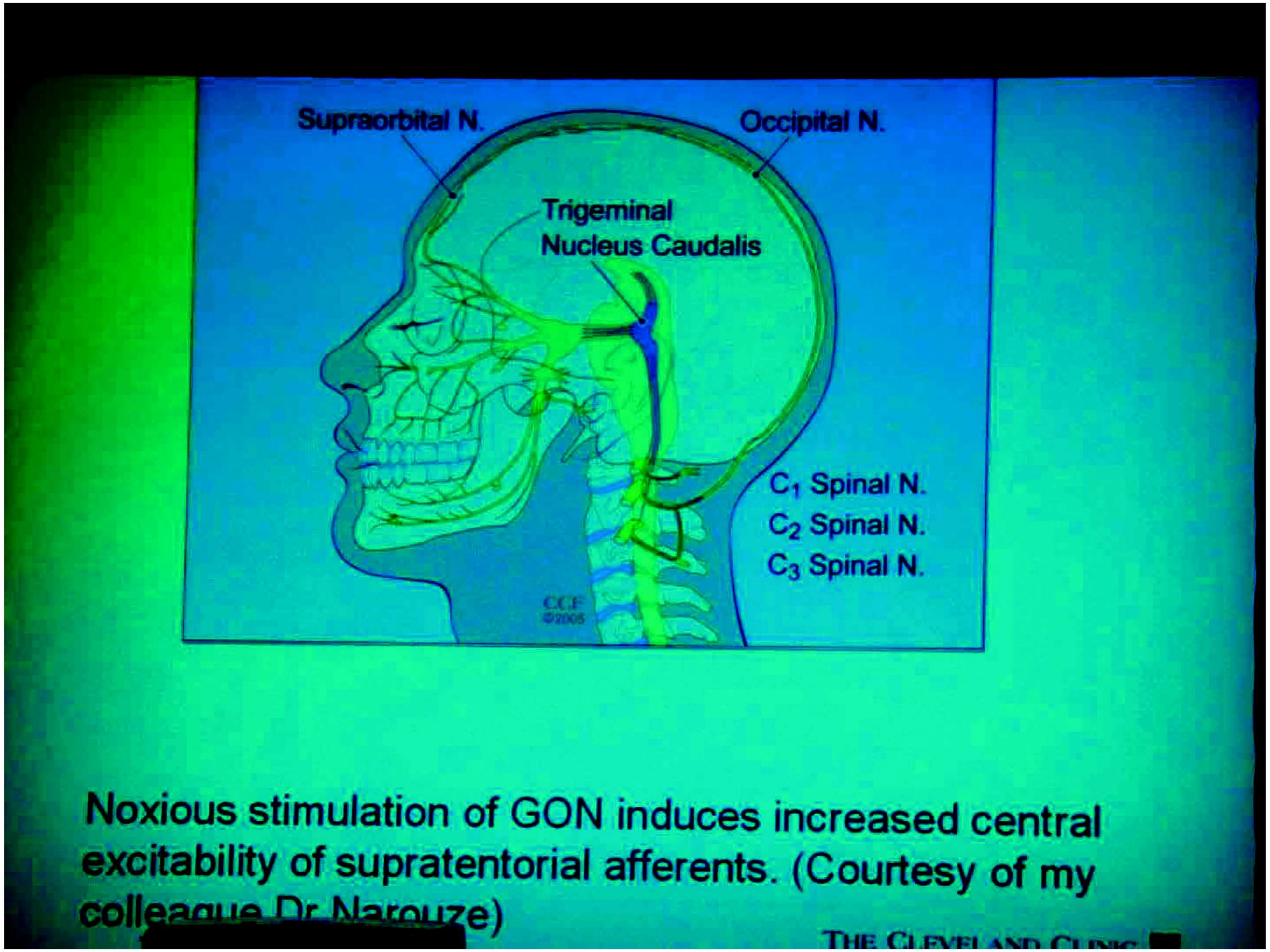
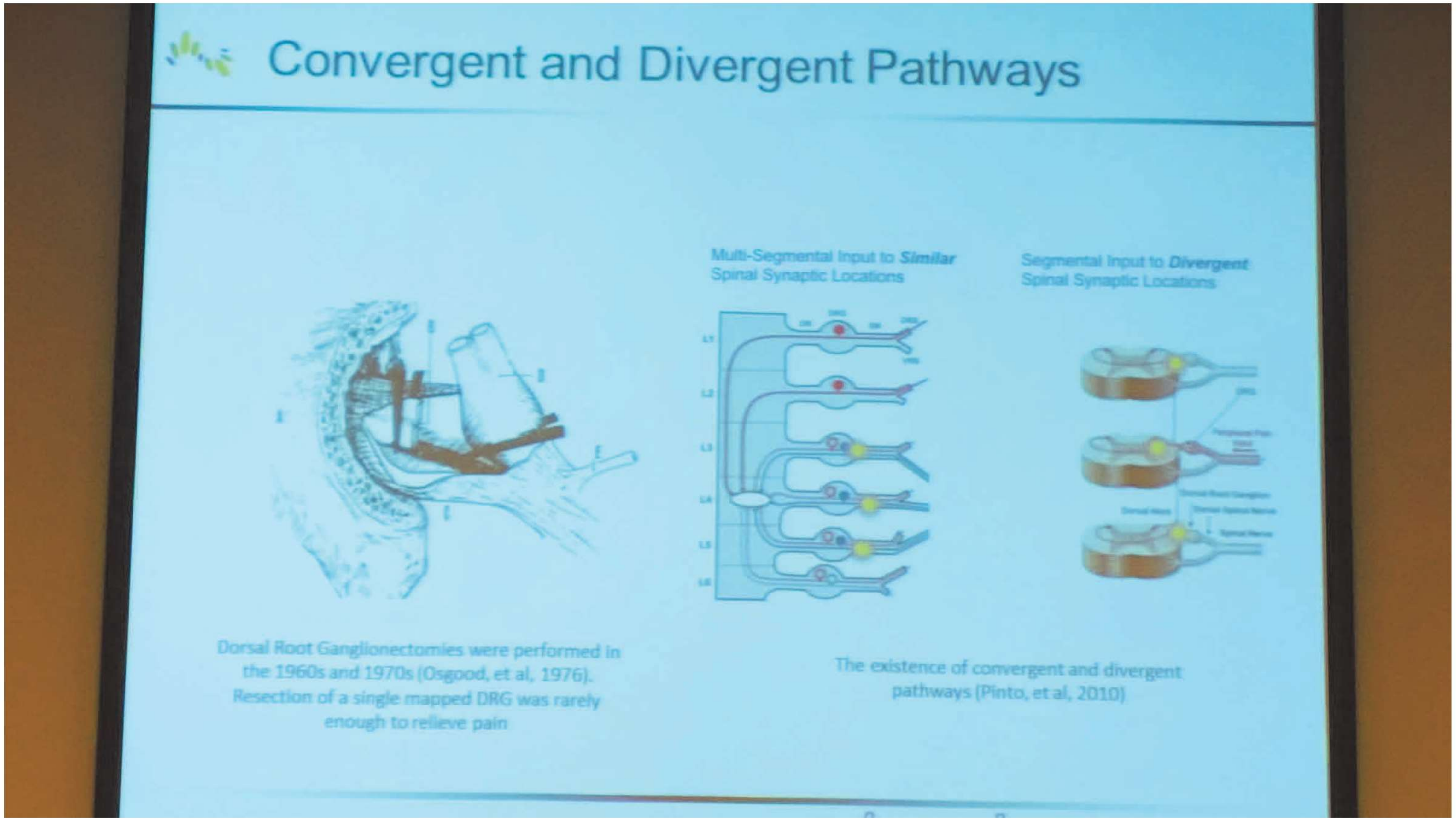
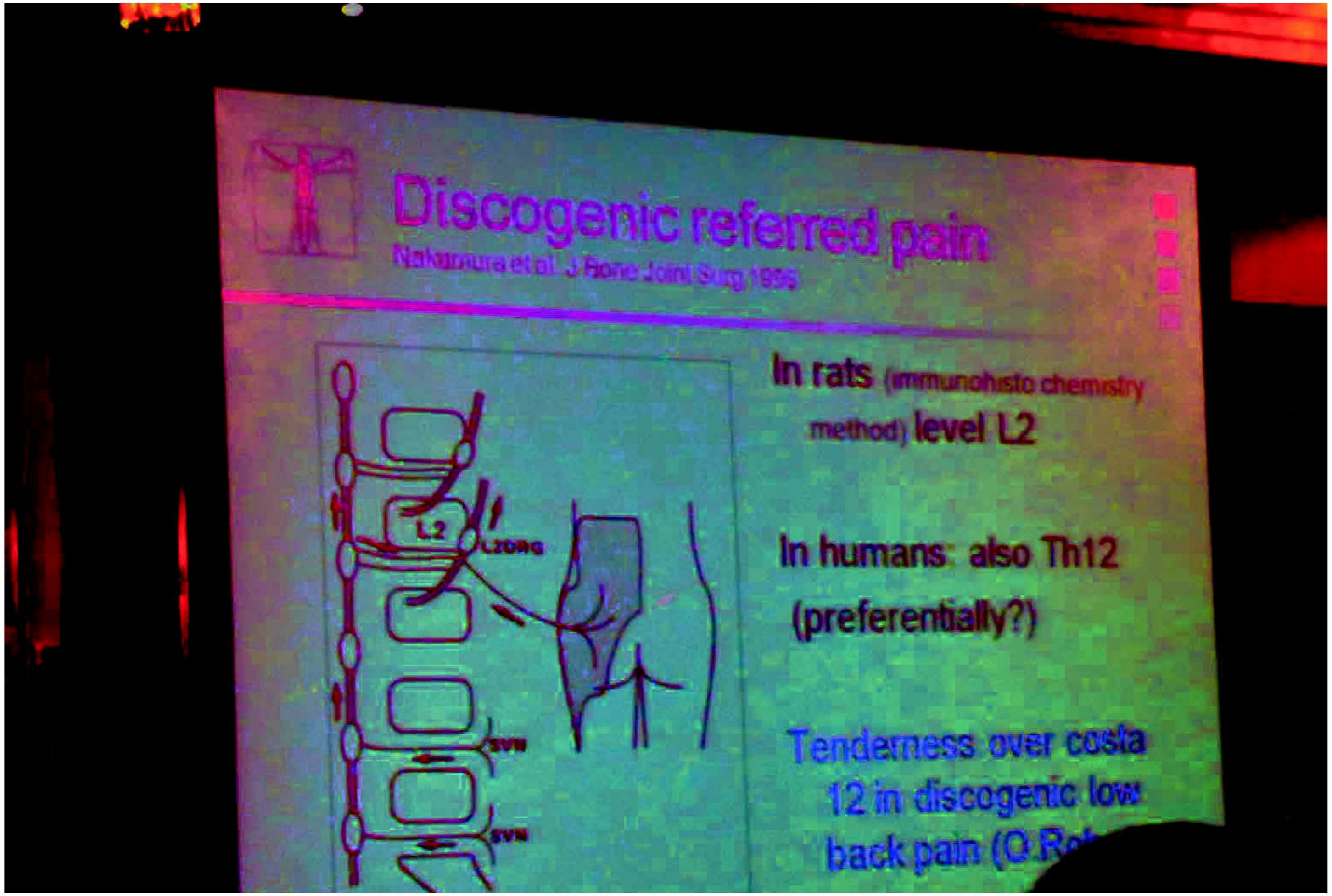


Fig 2. *Intensity map of pain referral patterns in responders and nonresponders.*



Supraorbital N.
Occipital N.
Trigeminal
Nucleus Caudalis
C_1 Spinal N.
C_2 Spinal N.
C_3 Spinal N.
CCF
Noxious stimulation of GON induces increased central excitability of supratentorial afferents. (Courtesy of my colleague Dr Narouze)
[redacted]

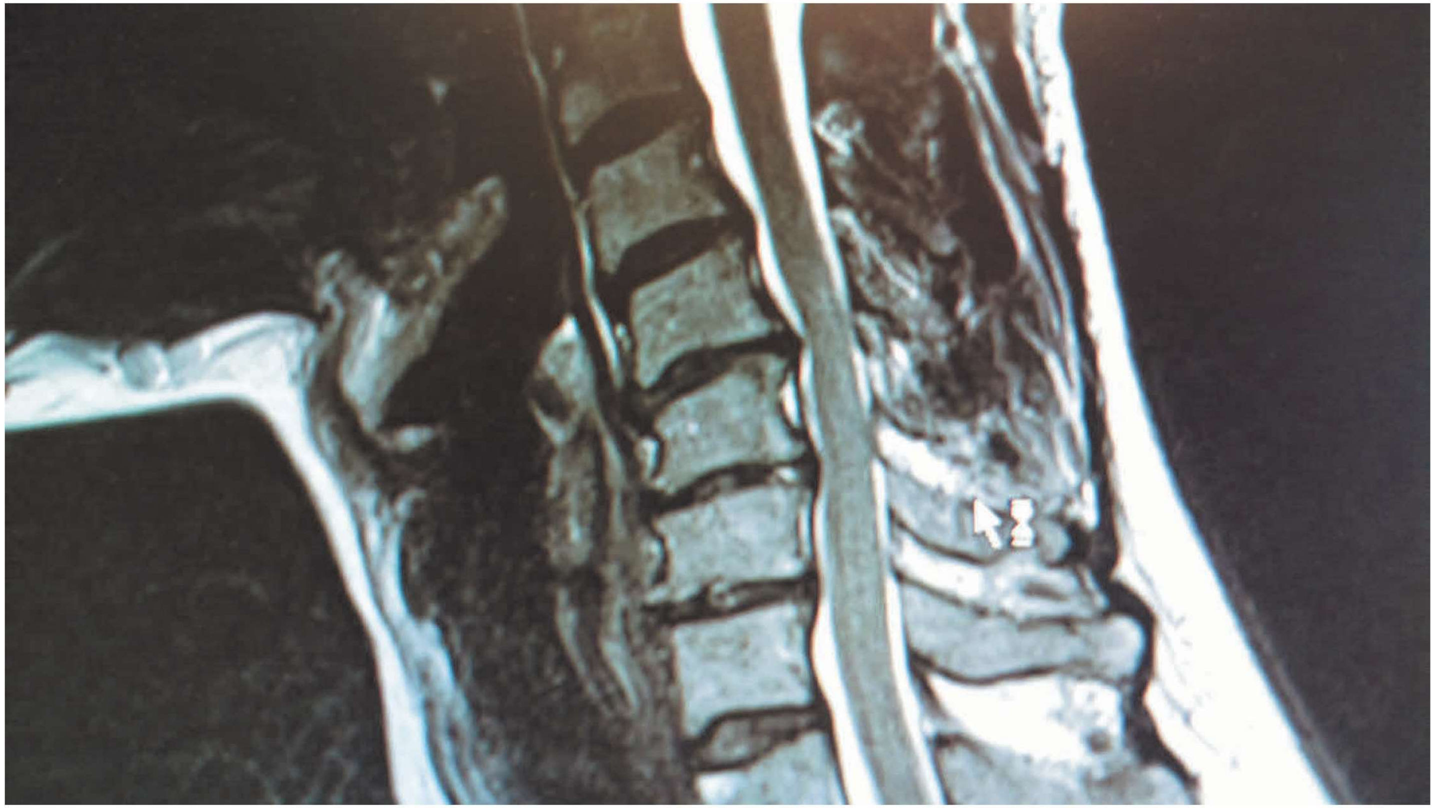

Convergent and Divergent Pathways
Multi-Segmental Input to Similar Spinal Synaptic Locations
Segmental Input to Divergent Spinal Synaptic Locations
Dorsal Root Ganglionectomies were performed in the 1960s and 1970s (Osgood, et al, 1976). Resection of a single mapped DRG was rarely enough to relieve pain
The existence of convergent and divergent pathways (Pinto, et al, 2010)


Discogenic referred pain
Nakamura et al. J Bone Joint Surg 1996
L2
L2DRG
SVN
SVN
In rats (immunohisto chemistry method) level L2
In humans: also Th12 (preferentially?)
Tenderness over costa 12 in discogenic low back pain (O.R

Niskan kliininen tutkimus

- Alaraajat refleksit ja lihastonus, babinski
- Naparefleksi
- Yläraajat refleksit ja lihastonus, käsien funktiot
- Olat ja lapojen stabiliteetti
- Niskan liikkuvuus seisten, tuettuna, ei kompressioita, ei ääriasentoja
- Fasettipalpaatio ensin oikea sitten vasen
- Juuriaukkopalpaatio ensin oikea sitten vasen
- C1/2 nivelpalpaatio, CO/C1 liikkuvuus, C1/2 liikkuvuus

Niskan tutkimus varoen

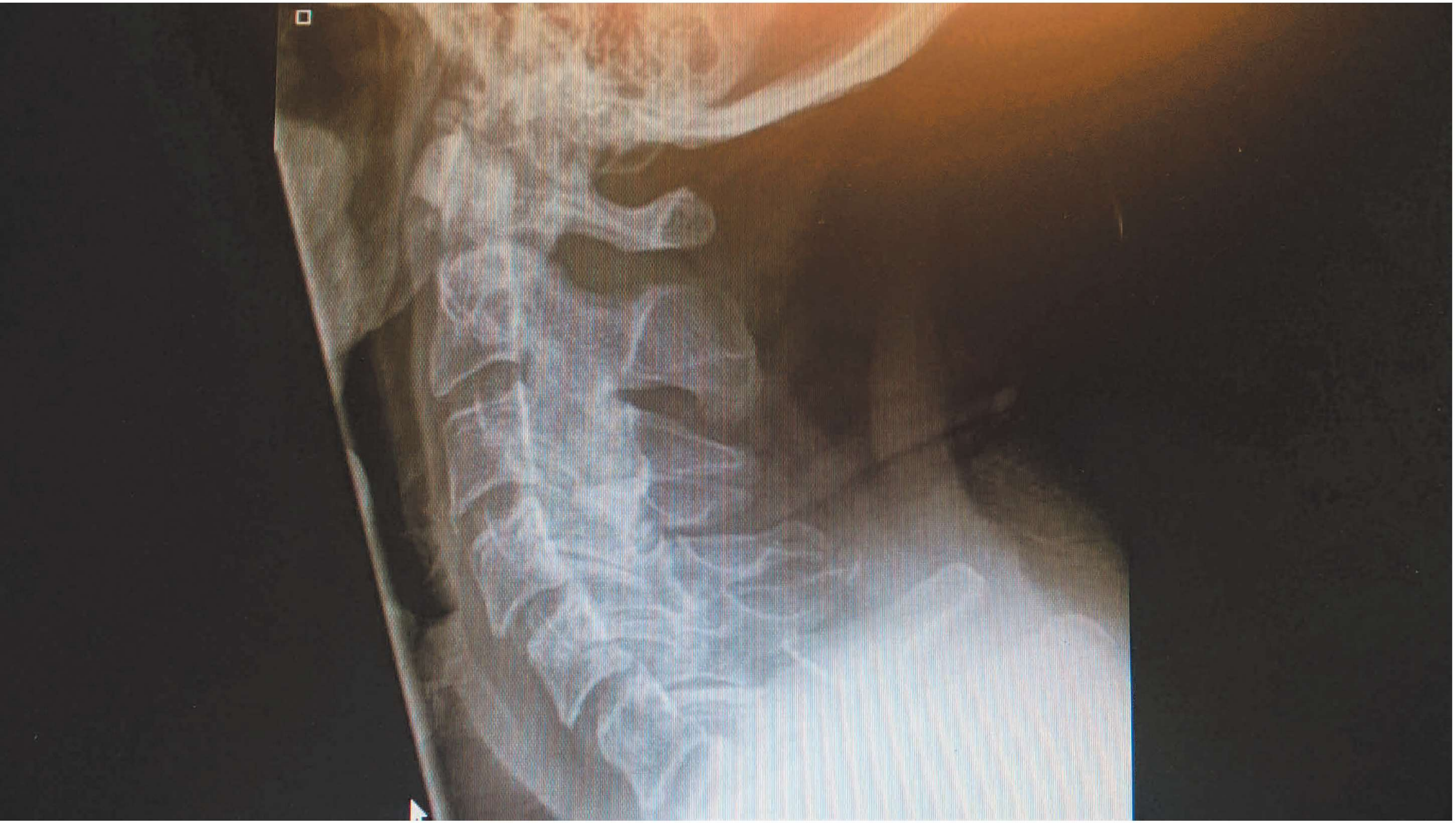


selkäydinvaurio

Kaksi syrinksiä, tonsillat

C1/kallonpohja

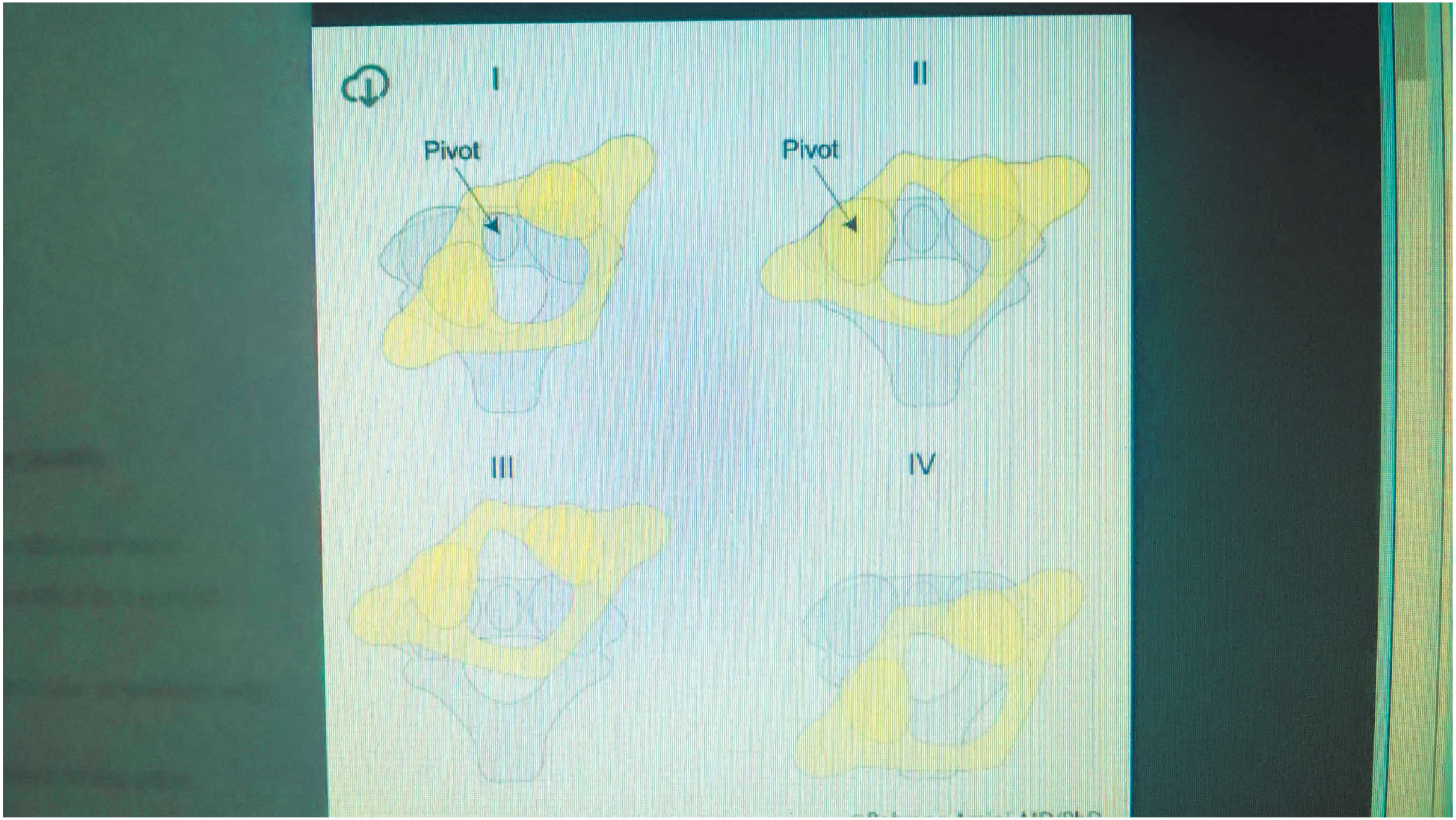
Co/c1 assimilaatio



fasettiankyloosi

C1/2 luksaatiot/subluksaatiot

- Antero-posterior subluksaatio
- Rotatorinen subluksaatio: atlantoaxial rotatory fixation (AARF), Fielding –Hawkins luokitus:
- Tyyppi 1. atlas kiertynyt densin, ei anteriorista siirtymää
- Tyyppi 2. atlas kiertynyt – akseli toisessa c1/2 nivelessä, 3-5 mm.
- Tyyppi 3. atlas kiertynyt, siirtymä mol c1/2 nivelissä yli 5 mm
- Tyyppi 4. atlaksen kiertymä ja posteriorinen siirtymä
- Vertikaalinen subluksaatio
- Lateraalinen subluksaatio


I
II
Pivot
Pivot
III
IV

Köhler/Zimmer

Grenzen des Normalen und Anfänge des Pathologischen im Röntgenbild des Skeletts

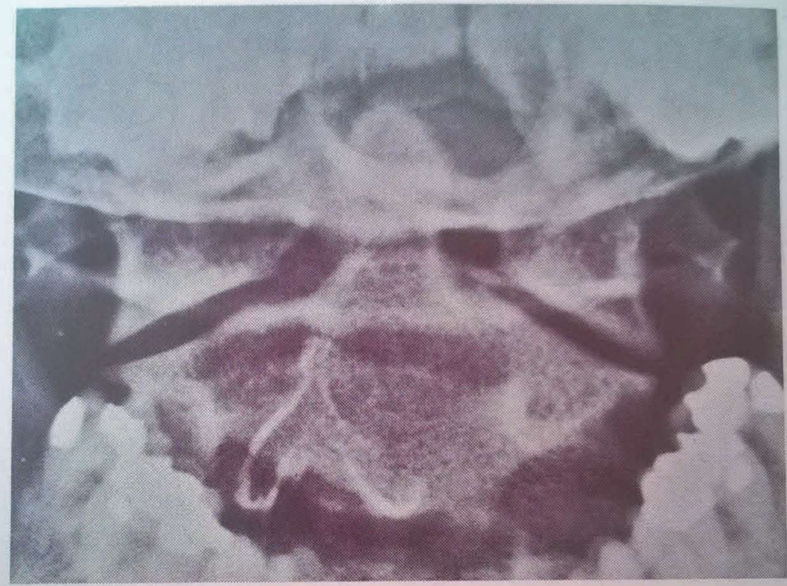
E. A. Zimmer

12. neubearbeitete und erweiterte Auflage

5.254 Torsion des Atlas, ablesbar an der einseitigen Überlagerung des Zwischenwirbelraumes links

5.25
gen

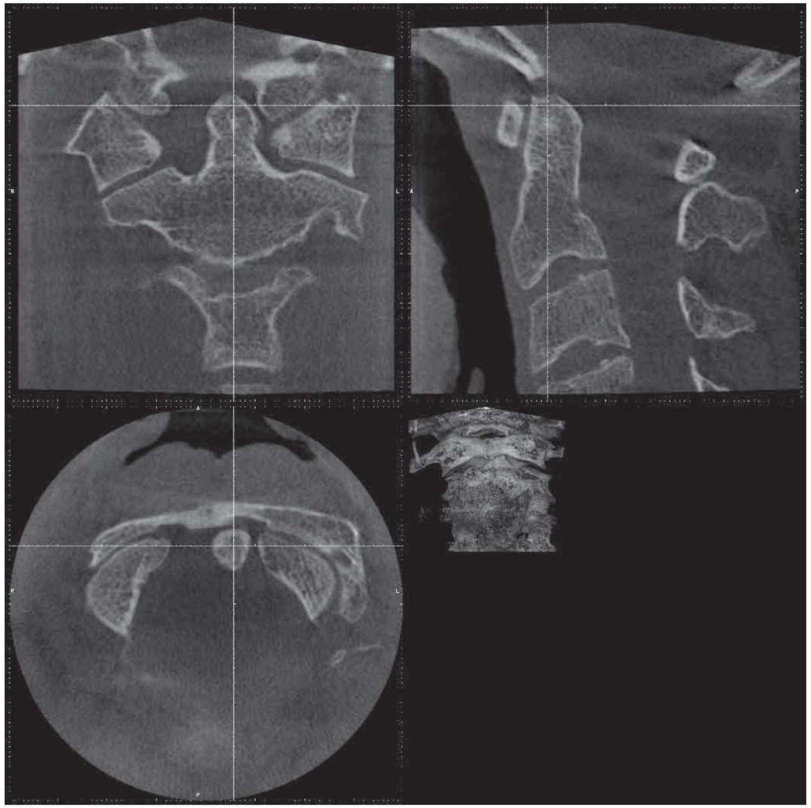
einseitigen Überla-



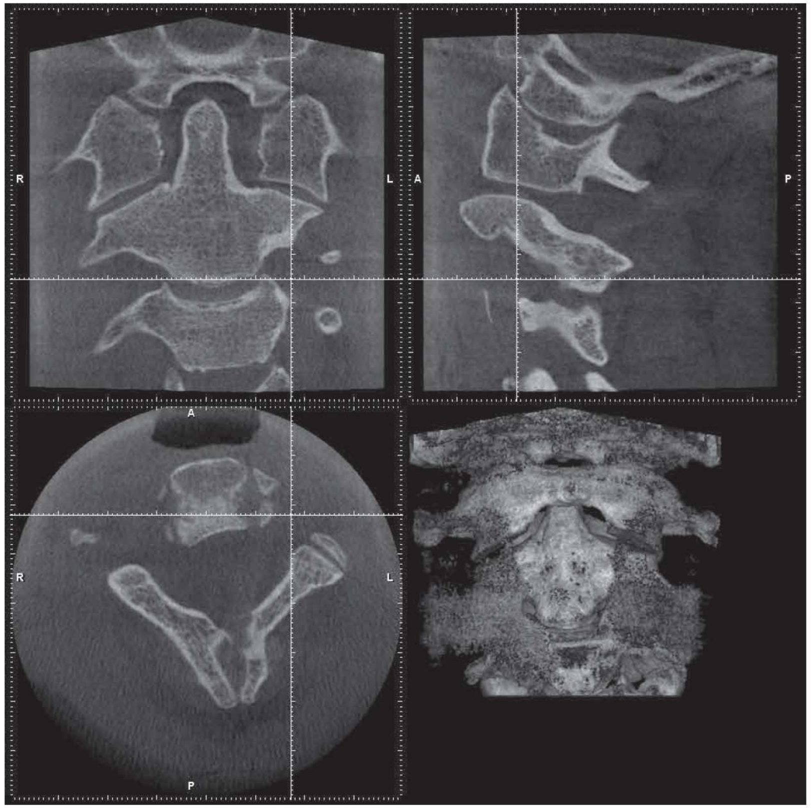
5.257 Torsion des Axis. Asymmetrie der Stellung seiner Bogenwurzeln sowie Schrägstand seines Dornfortsatzes

C2 rotaatio, dens ja proc spin eivät ole linjassa

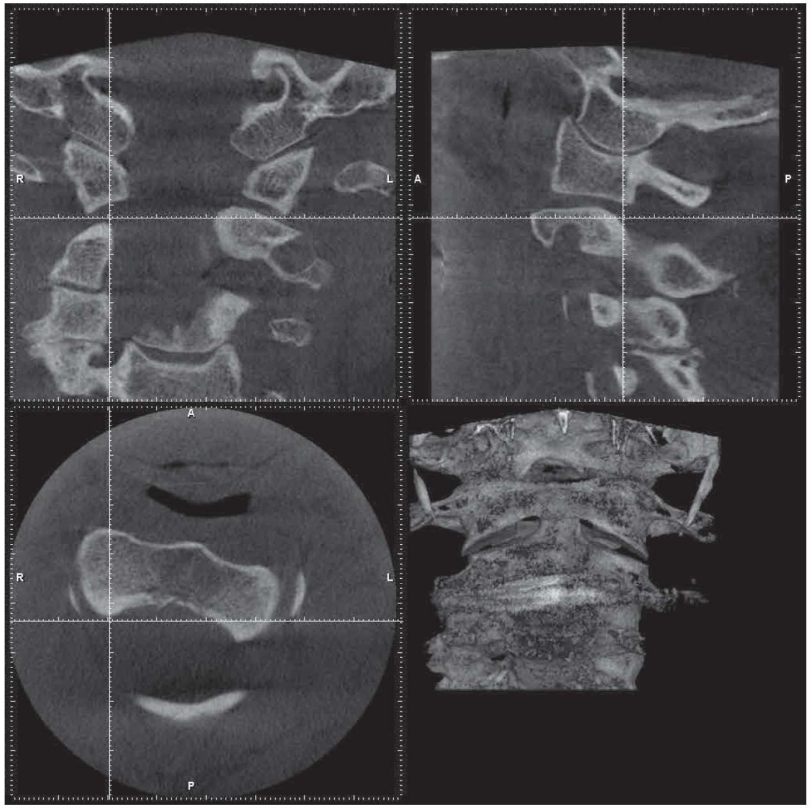
Moottoripöyrällä ojaan ja 15 m ilmalento pellolle (kuvaus 2v. myöhemmin jolloin 30v)



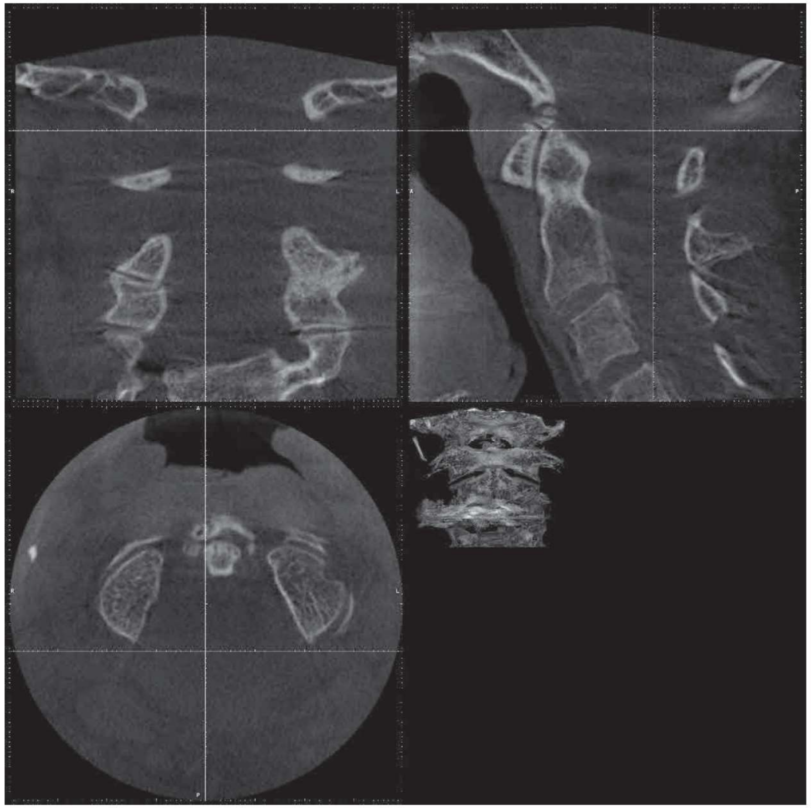
Rekanperään moottoritiellä 90 km/h (kuvaus 4 v myöhemmin jolloin 26 v)



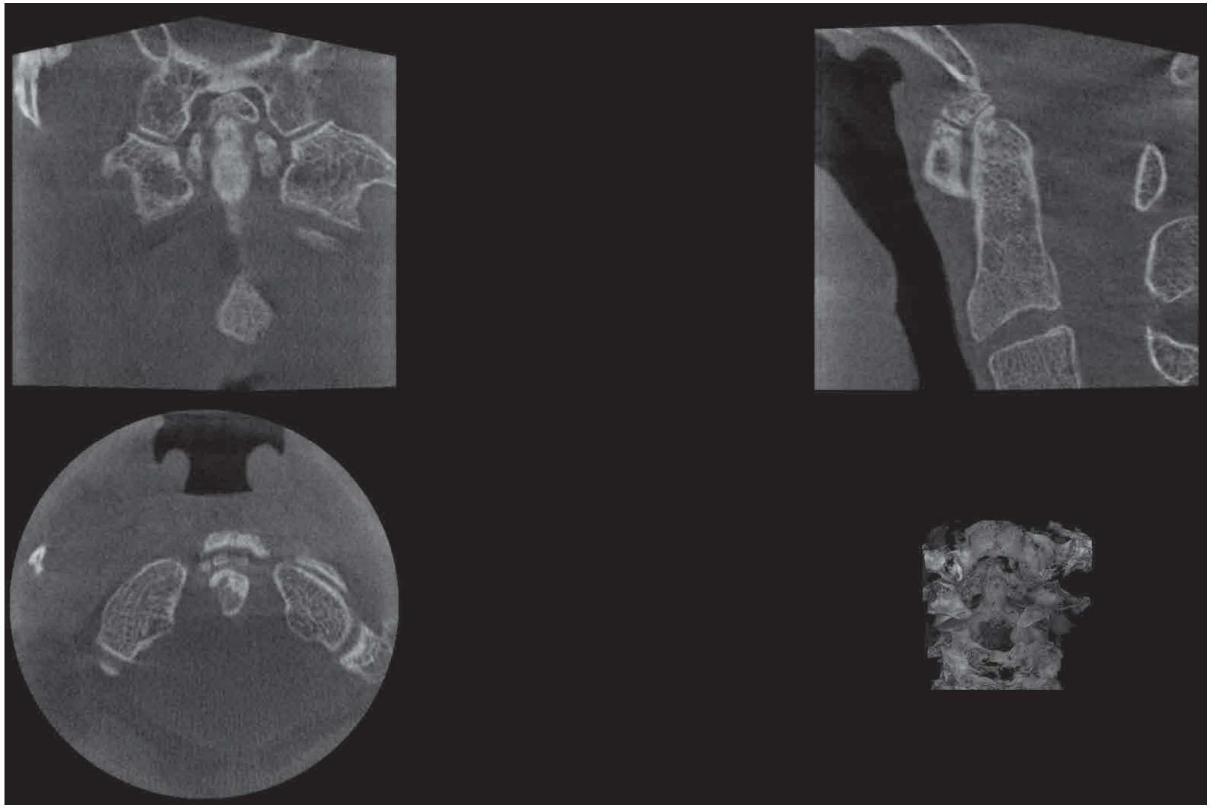
Kolarin jt , vastakkain 90 km/h, (kuvaus 18 v myöhemmin jolloin 54 v)



45 v nainen, vaikea niskapäänsärky

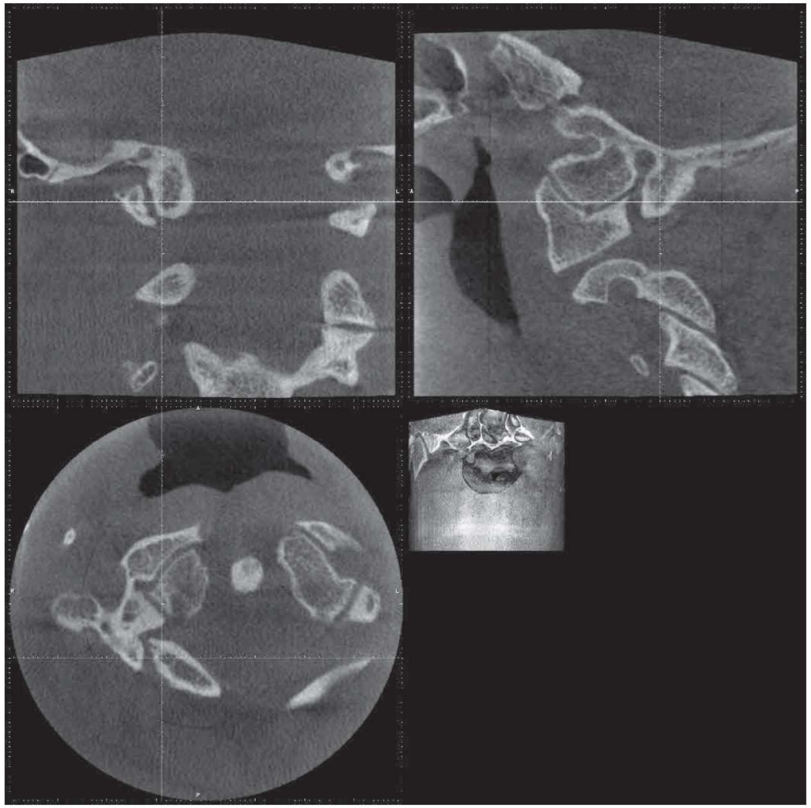


Kallonpohja-dens alue, 47 v



C2/3 fasettirikko, c1 ligamenttiluutuma

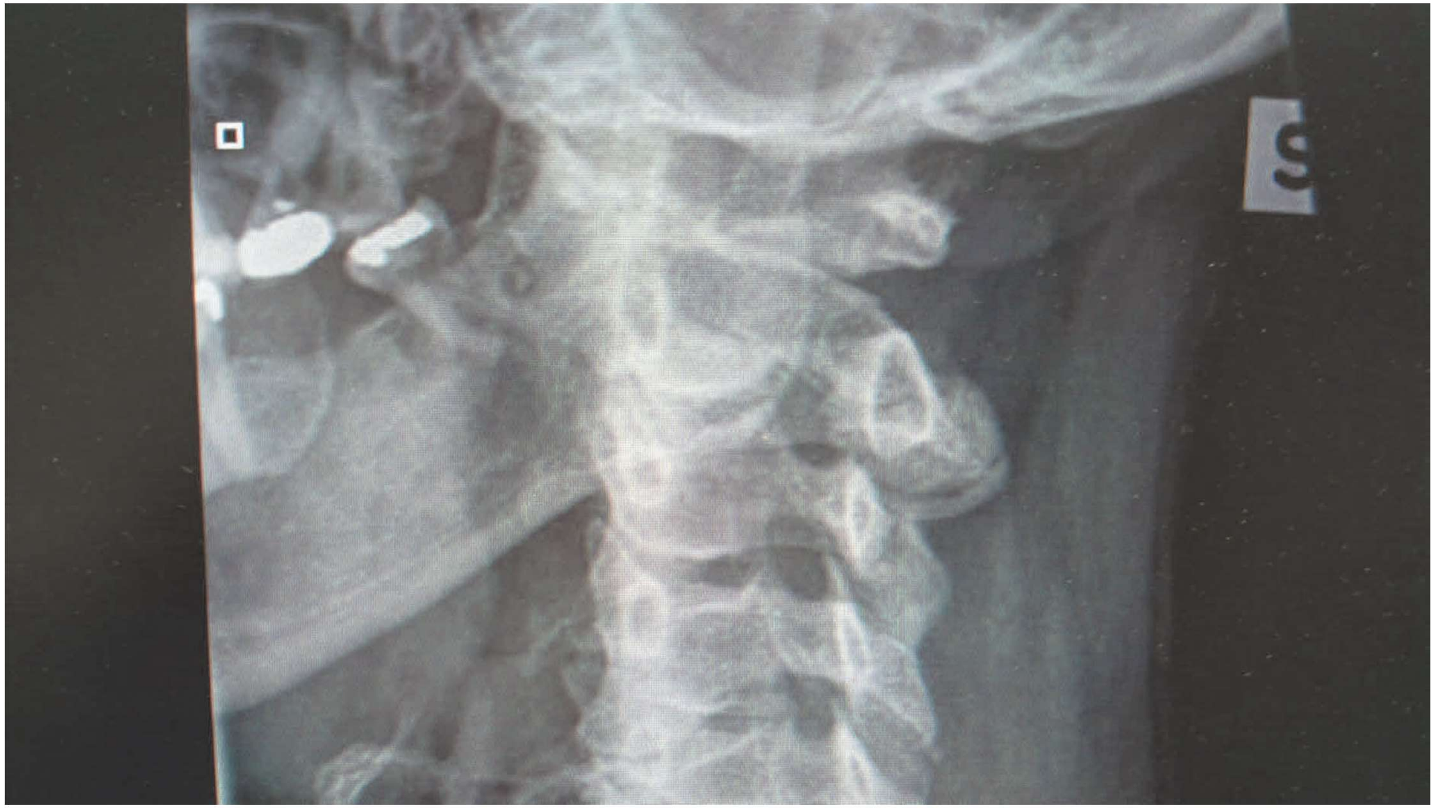
Kallonpohjamuutos, condylos tertius



Runsas fasettiankyloosiv (60 v)

Vaikea fasettirikko c2/3, c2 kiertyy

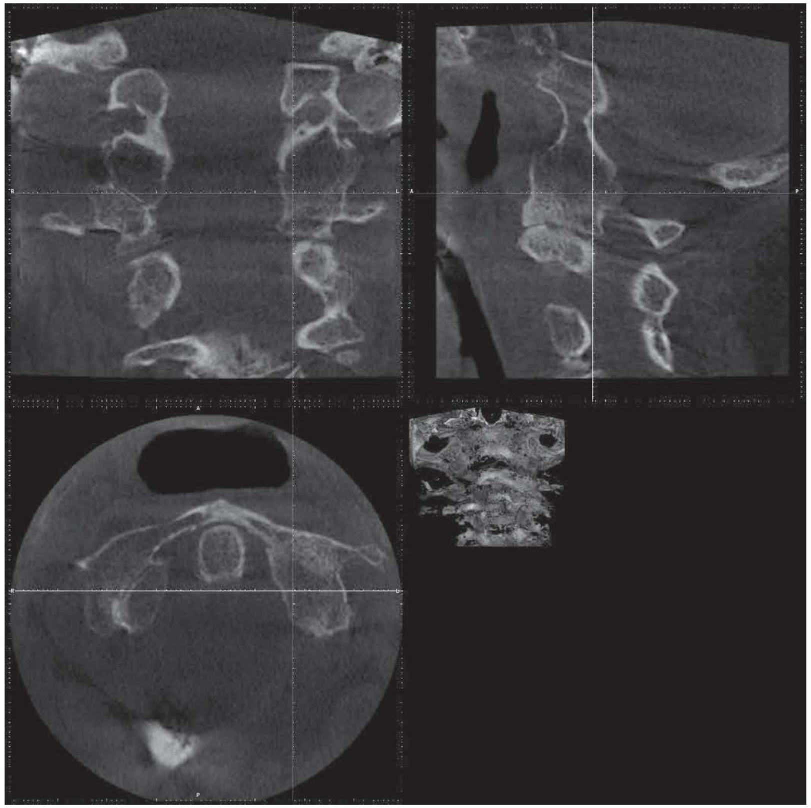
C2/3 fasettirikko (55 v)



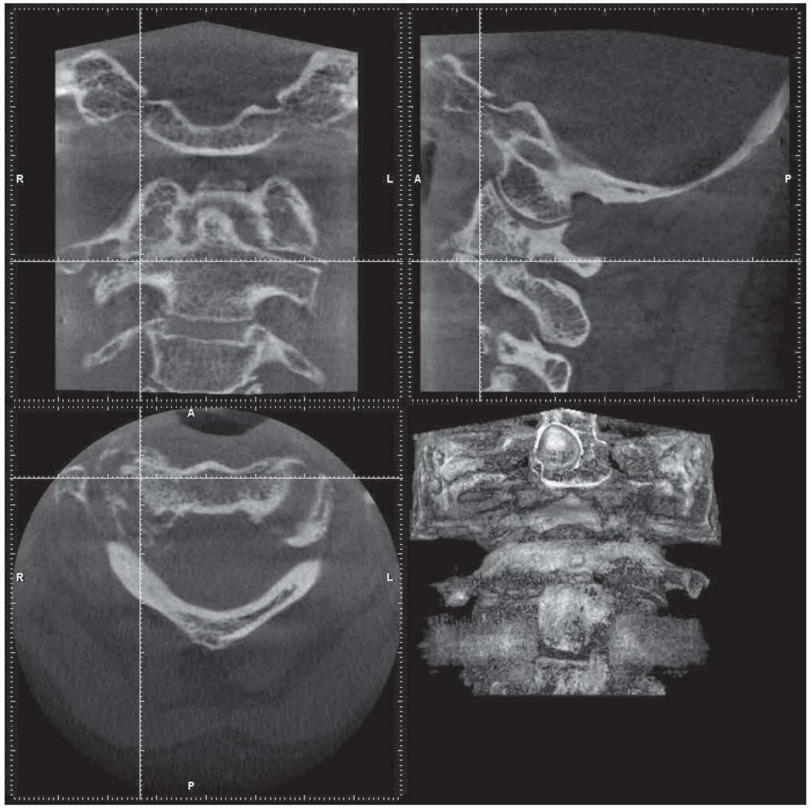
C2/3 vasen fasetti ankylysoitunut

Chiari I, oper jt, kallonpohja (15 v)

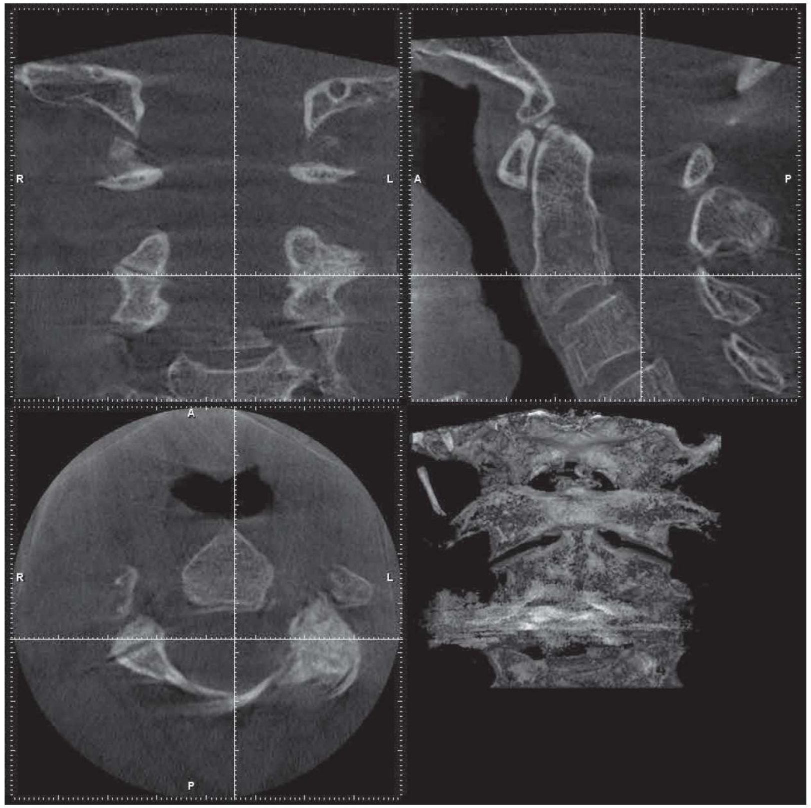
Vaikea reuma (70v)



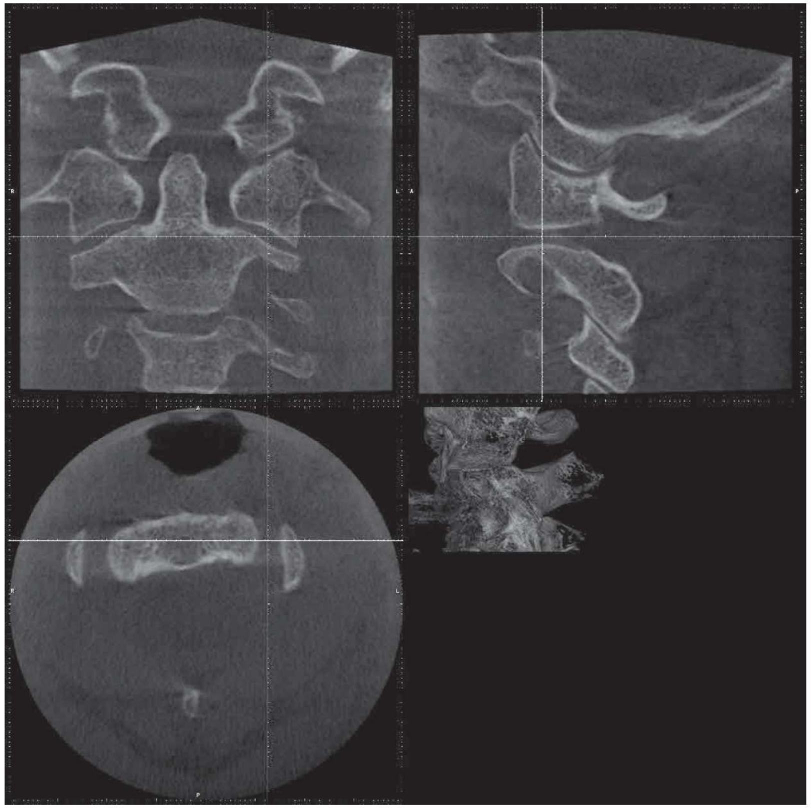
Erosiivinen nivelrikko (59 v)



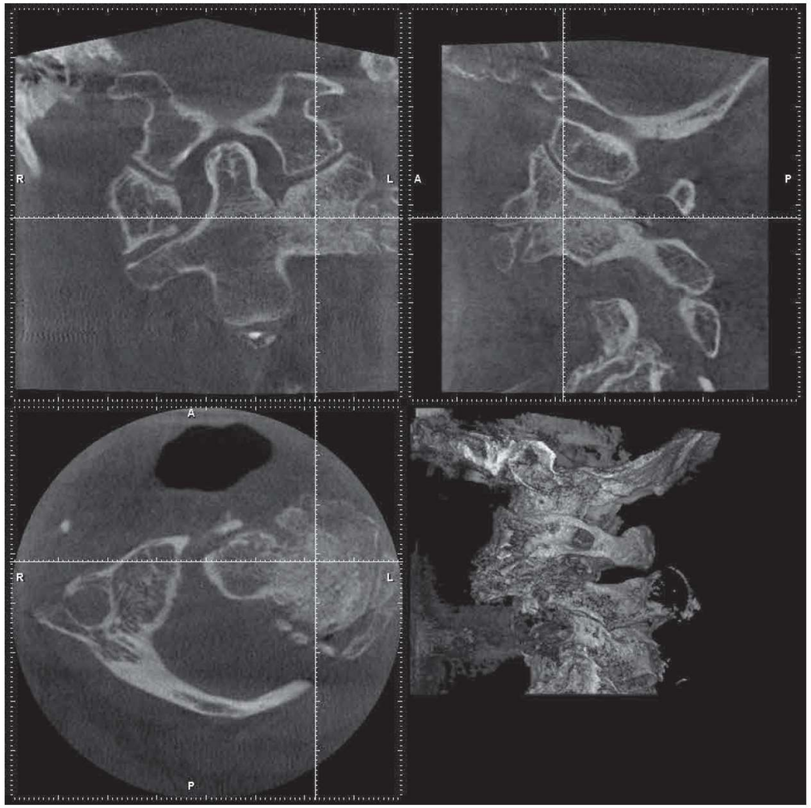
Kallonpohja ja c2/3 nivelrikko (48 v)



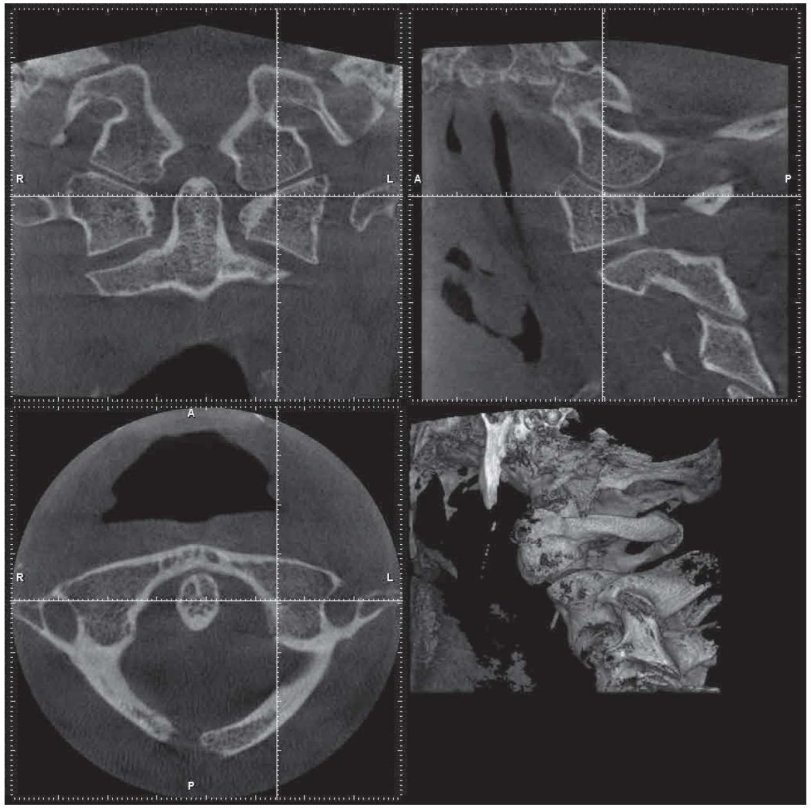
Kolari, subluksaatio c1/2, rotaatio



Ankyloosi c1/2, runsas lisäluu



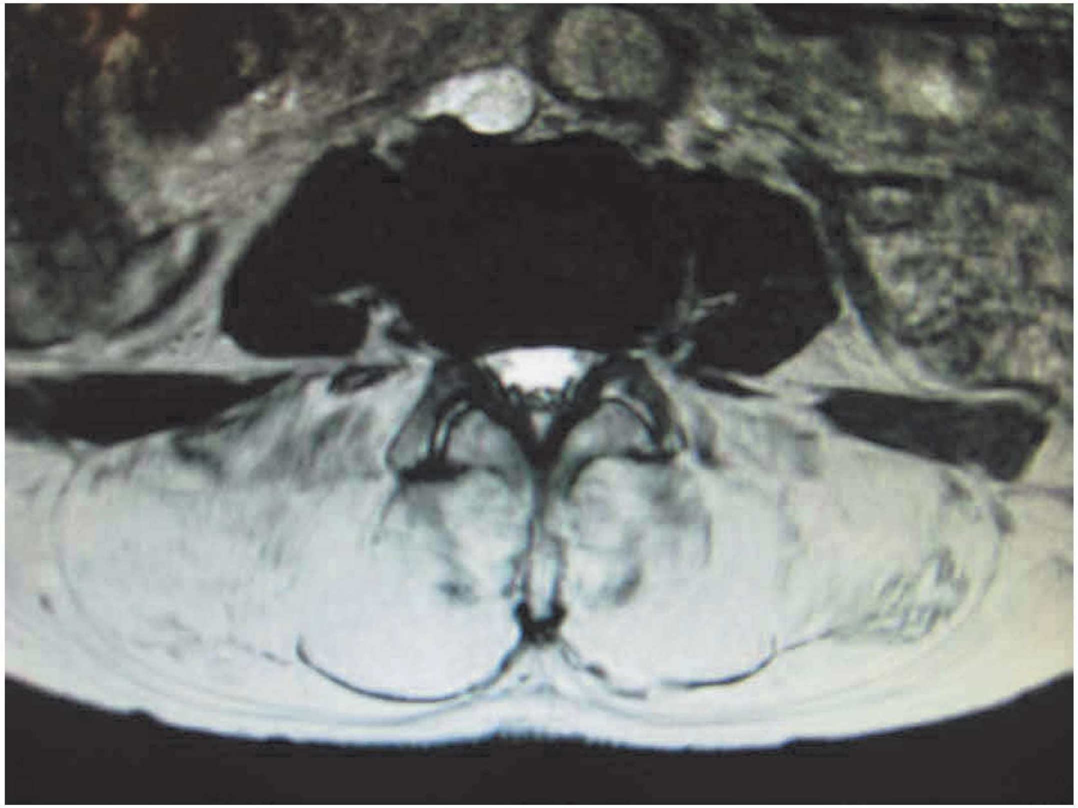
Ratsastusvammav (20 v, vammasta 1 v)



diagnoosit

- G44.2 jännityps, G50 kolmoishermosärky, G50.1 epätyypillinen kasvokipu, G44.3 post traumaattinen ps,
- M43.3 toistuva atlantoaksiaalinen subluks johon liittyy selkäydinvamma ja M43.4 vastaava ilman selkäydinvammaa M43.6 kierokaula
- S02.1 kallopohjan fr, S12.0 atlas fr, S12.1 axis fr, S12.7 useat kaulan alueen fr
- S13 luksaatiot (WAD), S14 kaulan alueen hermovammat, S15 verisuonivammat, S16 ligamentti -ja lihasvammat

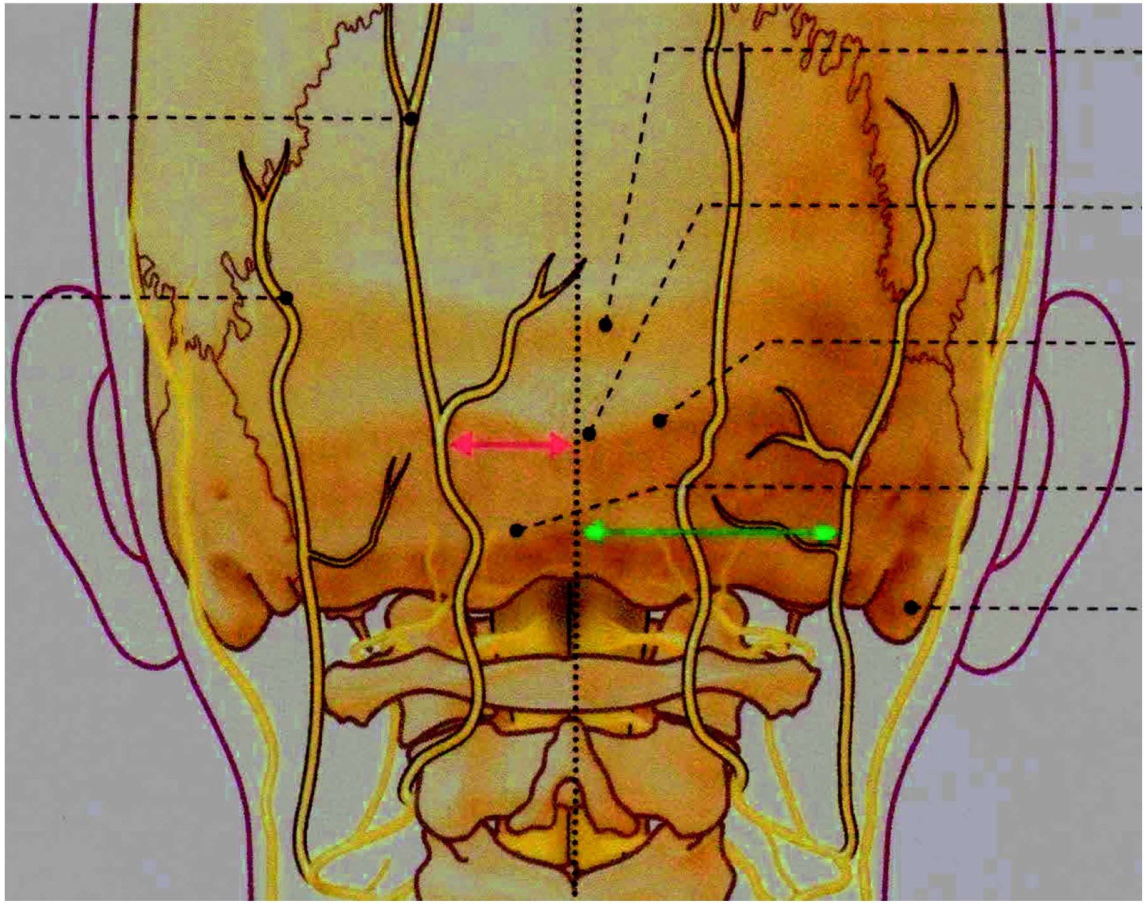
Dropped head syndrome, aksiaalinen myopatia

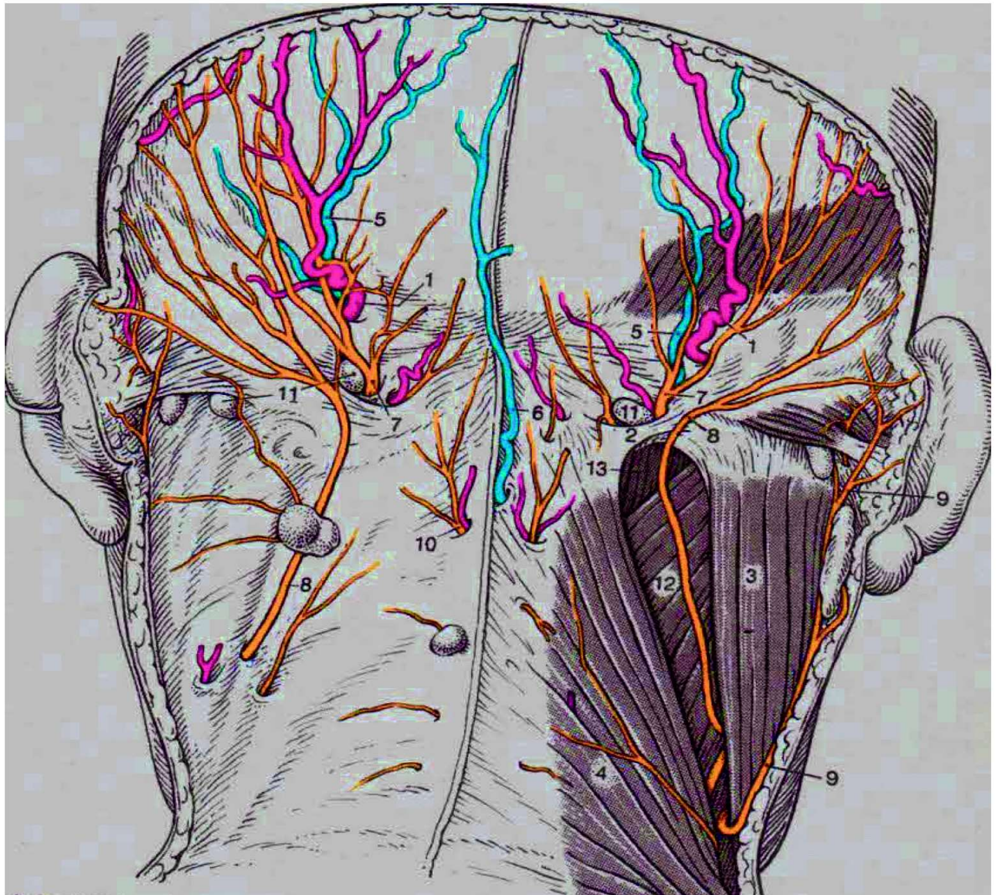


discusproteesi

Punainen nuoli noin 32 mm, vihreä noin 50 mm

Nervus occipitalis major ja minor , protuberentia occipitalis externa





A Occipital and nuchal regions;
left: subcutaneous layer
right: subfascial layer

Psori/fasettinivelet injektio suunnitelma

S1,S2,S3,S4 puudutus + tatuointi

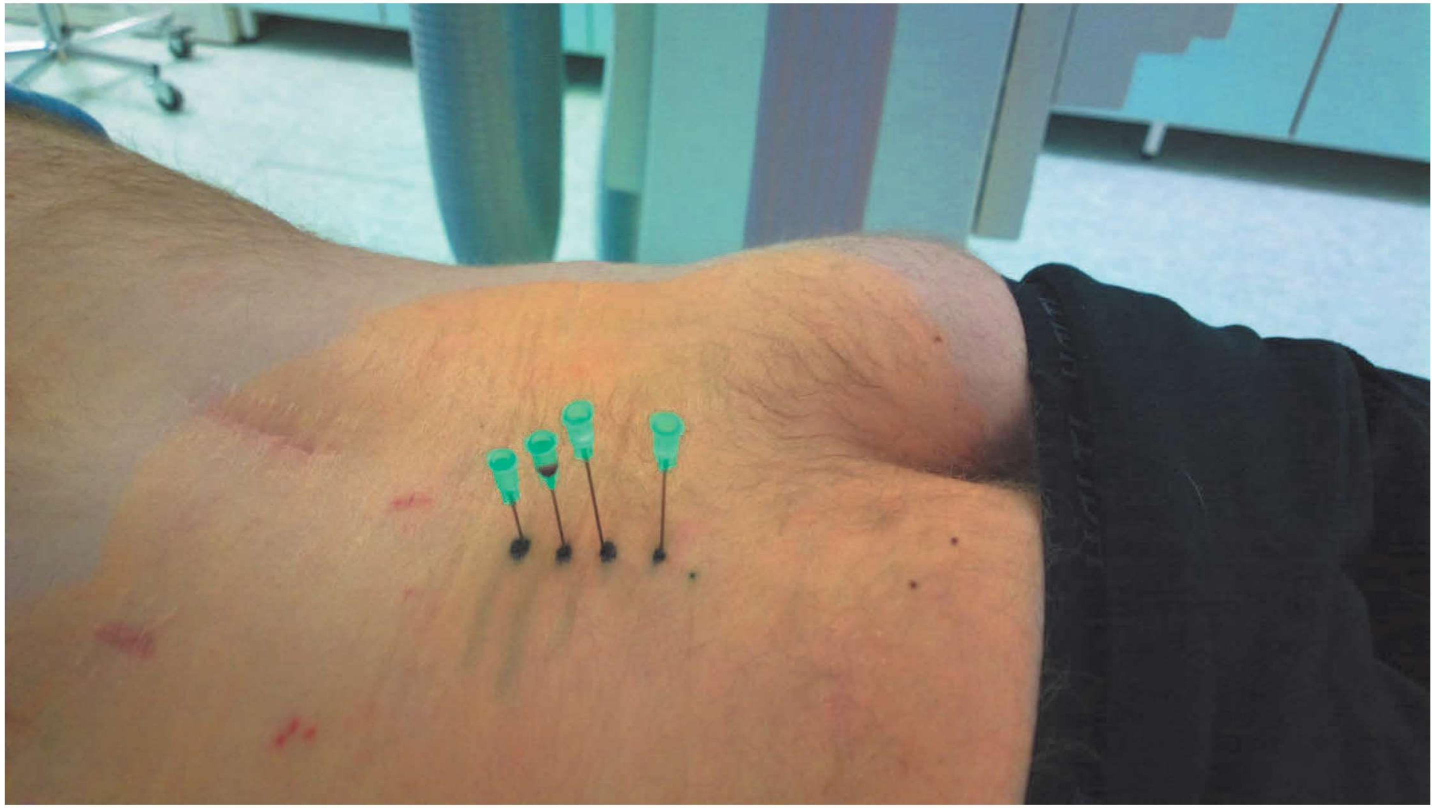
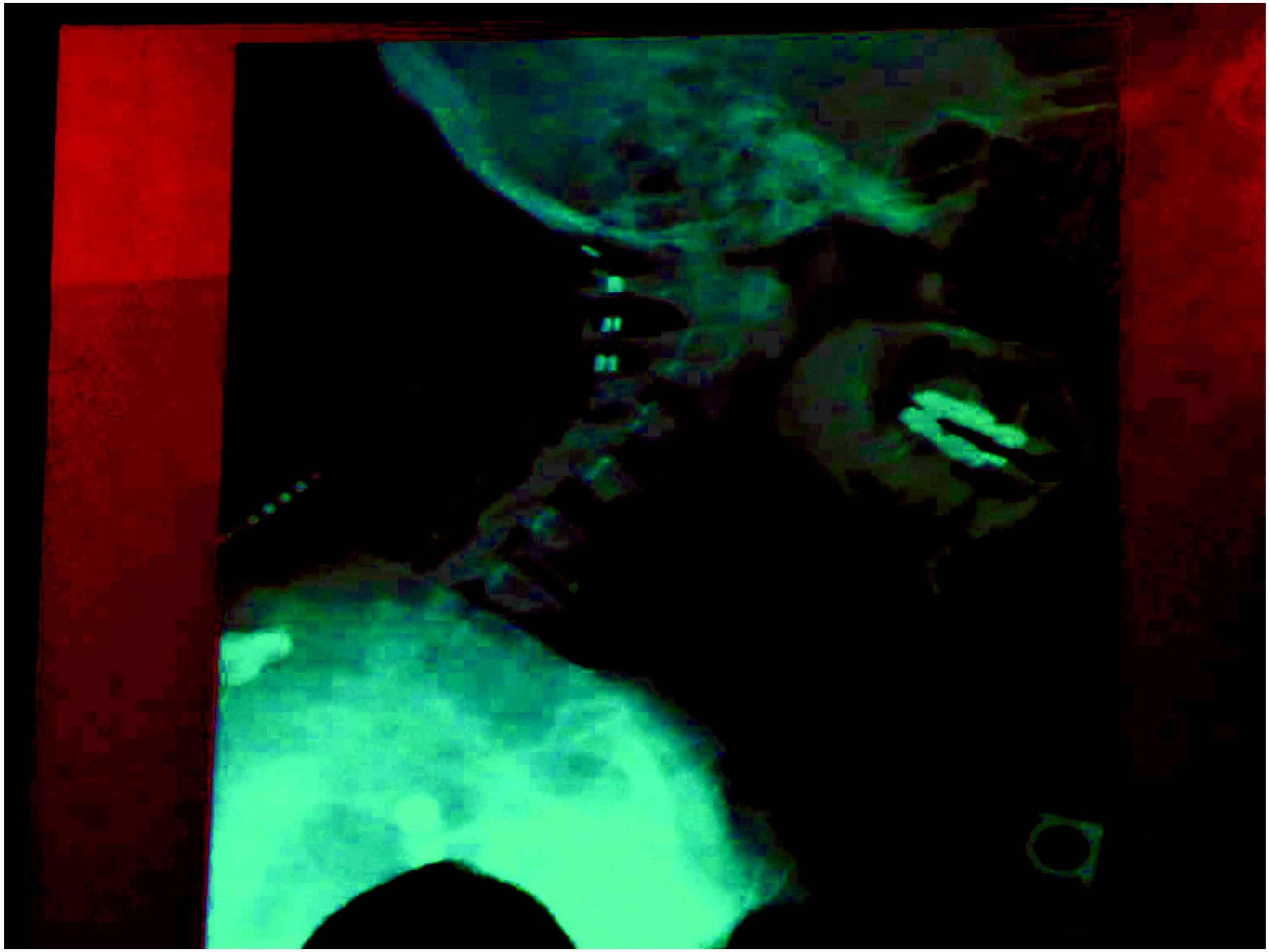
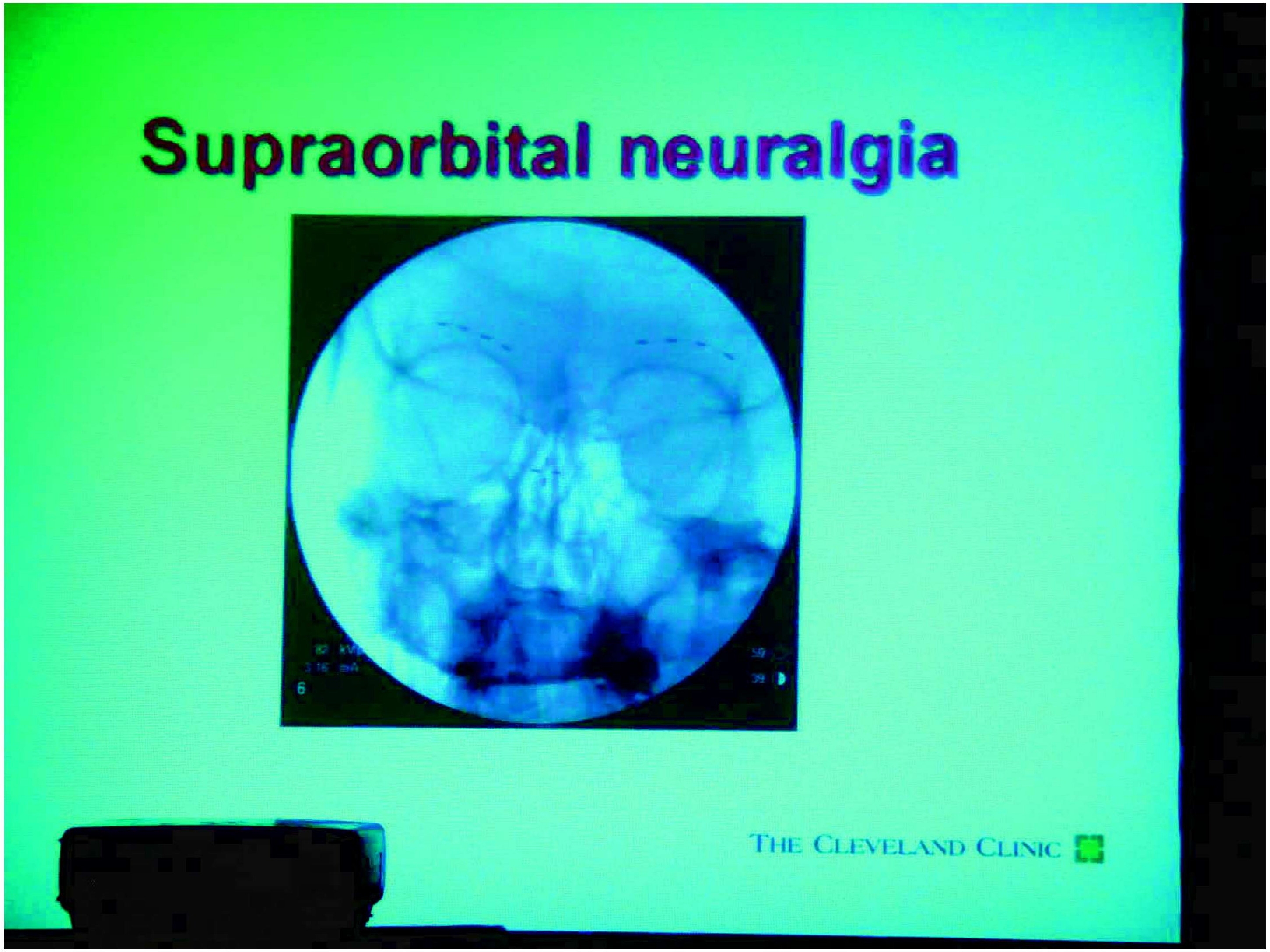
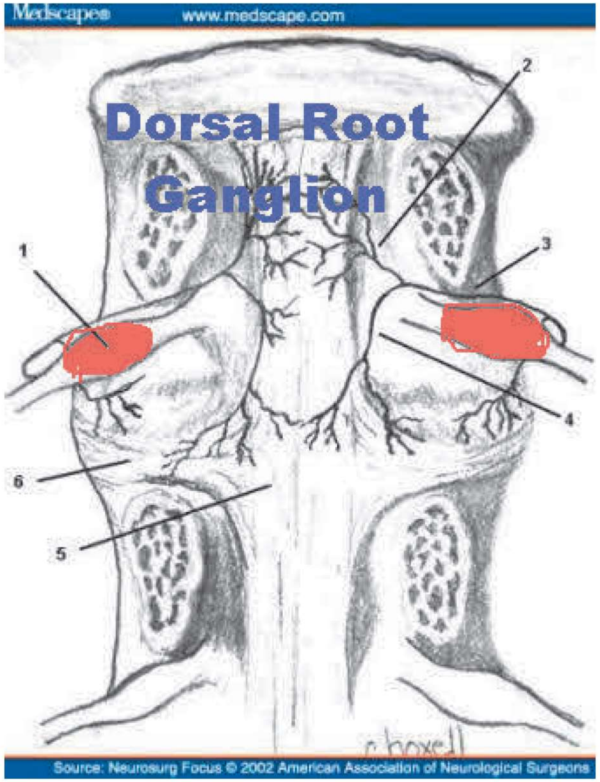
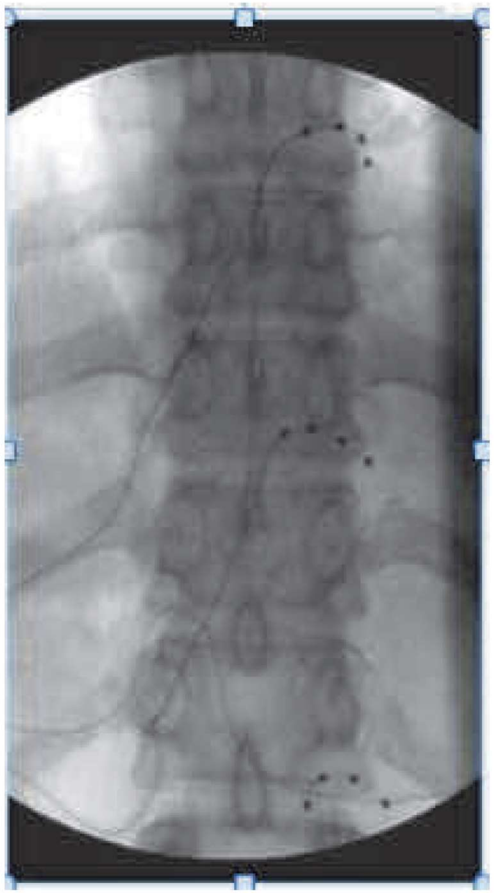


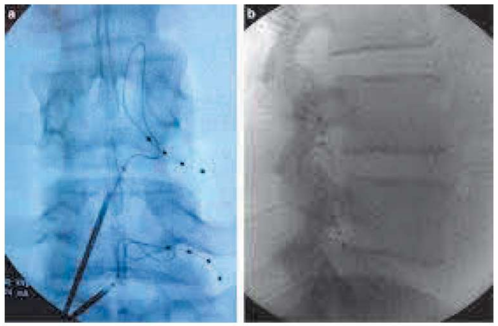
FIGURE 1. Bilateral subcutaneous occipital stimulator leads permanently implanted at the C1 level.




Supraorbital neuralgia
THE CLEVELAND CLINIC


Medscape®
www.medscape.com
Dorsal Root
Ganglion
1
2
3
4
5
6
Source: Neurosurg Focus © 2002 American Association of Neurological Surgeons




a
b

Neuromodulaatio Mehiläisessä 2016

- 2015 asennettiin ensimmäiset stimulaattorit anest. l. Markku Taittonen, Turun Mehiläinen
- Potilasvalinta ja ohjelmointi Seppo Villanen/Markku Taittonen
- Mahdollisuus moniammatilliseen arvioon mm psykiatri Seppo Hietanen, sh Henna Mustola, Sonja Rosenqvist ja esim. työelämän kunt. palvelut.
- Useita vaihtoehtoja; keskusyksikkö(ladattava ei ladattava, elektrodit, perinteinen ohjelmointi, multiohjelmointi, korkeafrekventtinen tai burst ohjelmointi.
- Koestimulaatio aina ensin, 50 % oirevähentymä
- Hermovauriokipu, CRPS, FBSS, angina pectoris yms
- Mitä aikaisemmin stimulaatio aloitetaan sen paremmat tulokset.
- Kustannustehokasta, 3 v kuluttua laitteisto on ”maksettu takaisin”
- Asennuksia myös Töölössä ?

JOURNAL OF NEUROTRAUMA 30:1587–1595 (September 15, 2013)

DOI: 10.1089/neu.2013.2943

Assessing the State of Chronic Spinal Cord Injury Using Diffusion Tensor Imaging

Eerika Koskinen,[1] Antti Brander,[2] Ullamari Hakulinen,[2,3] Teemu Luoto,[1] Mika Helminen,[4] Aarne Ylinen,[5,6] and Juha Öhman[1,7]

Abstract

The aim of this study was to quantify the association between diffusion tensor imaging (DTI) parameters of the cervical spinal cord and neurological disability in patients with chronic traumatic spinal cord injury (SCI). A cervical spinal cord 3T magnetic resonance imaging (MRI) with DTI sequences was performed on 28 patients with chronic traumatic SCI and 40 healthy control subjects. DTI metrics, including fractional anisotropy (FA), apparent diffusion coefficient (ADC), axial diffusivity (AD), and radial diffusivity (RD), were calculated within the normal-appearing spinal cord area at levels C2 or C3. Clinical assessment of the patients was performed according to the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) and the motor subscale of the Functional Independence Measure (FIM). The FA values of the patients with SCI were significantly lower than those of healthy control subjects ($p<0.000001$). In contrast, the ADC and RD values of these patients were significantly higher than those of control subjects (ADC $p<0.0001$, RD $p<0.00001$). In patients with SCI, the FA values were positively correlated with the motor (pr=0.56, $p<0.01$) and sensory (pr=0.66, $p<0.001$) scores of ISNCSCI and with the motor subscale of FIM (pr=0.51, $p<0.01$). DTI revealed spinal cord pathology, which was undetectable using conventional MRI. DTI changes in regions that were remote from the site of primary injury were most likely the result of secondary degeneration of white matter tracts. Decreased FA values were correlated with poorer motor and sensory function, as well as a lack of independence in daily living. DTI is a promising quantitative and objective tool that may be used in the clinical assessment of patients with SCI.

Key words: assessment tools; DTI; traumatic SCI

Jossakin on vaan kaunista, kiitos