INVAZIVNE PROCEDURE ZA LIJEČENJE KRONIČNE BOLI

Ivan Radoš
20.09.2019.
Banja Luka

OSIJEK

KLINIČKI BOLNIČKI CENTAR OSIJEK

KLINIKA ZA ANESTEZIOLOGIJU, REANIMATOLOGIJU I INTENZIVNO LIJEČENJE

ZAVOD ZA LIJEČENJE BOLI

REVIDIRANA WHO TROSTUPANJSKA LJESTVICA PREMA INTENZITETU BOLI

Slaba bol

Neopioidi

+ adjuvantni lijekovi

Umjerena bol

- **Male doze jakih opioida**
  neopioidi
  + adjuvantni lijekovi
  + *invazivne procedure*

Jaka bol

- Jaki opioidi
- neopioidi
- + adjuvantni lijekovi
- ***+ invazivne procedure***

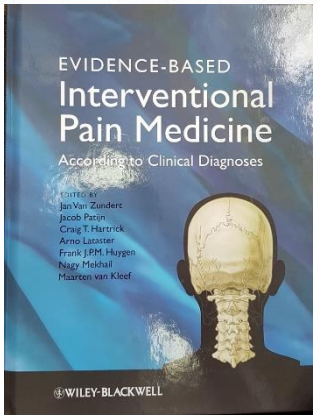
Marinageli F, Ciccozzi A, Leonardis M. Et al. 200..
Miaskowski C, Cleary J, Burney R, et al. 2005

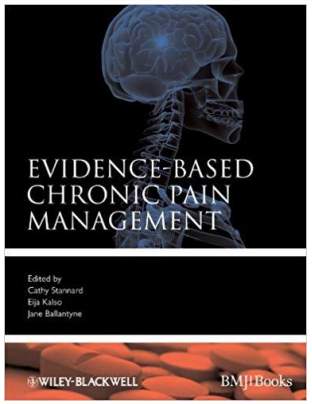
LIJEČENJE BOLI?!

MEDICINA UTEMELJENA NA DOKAZIMA
RAZINA PREPORUKE

Table 1. Summary of Evidence Scores and Implications for Recommendation.

Score	Description	Implication
1 A +	Effectiveness demonstrated in various RCTs of good quality. The benefits clearly outweigh risk and burdens	Positive recommendation
1 B +	One RCT or more RCTs with methodological weaknesses, demonstrate effectiveness. The benefits clearly outweigh risk and burdens	
2 B +	One or more RCTs with methodological weaknesses, demonstrate effectiveness. Benefits closely balanced with risk and burdens	
2 B ±	Multiple RCTs, with methodological weaknesses, yield contradictory results better or worse than the control treatment. Benefits closely balanced with risk and burdens, or uncertainty in the estimates of benefits, risk and burdens.	Considered, preferably study-related
2 C +	Effectiveness only demonstrated in observational studies. Given that there is no conclusive evidence of the effect, benefits closely balanced with risk and burdens	
0	There is no literature or there are case reports available, but these are insufficient to prove effectiveness and/or safety. These treatments should only be applied in relation to studies.	Only study-related
2 C –	Observational studies indicate no or too short-lived effectiveness. Given that there is no positive clinical effect, risk and burdens outweigh the benefit	Negative recommendation
2 B –	One or more RCTs with methodological weaknesses, or large observational studies that do not indicate any superiority to the control treatment. Given that there is no positive clinical effect, risk and burdens outweigh the benefit	





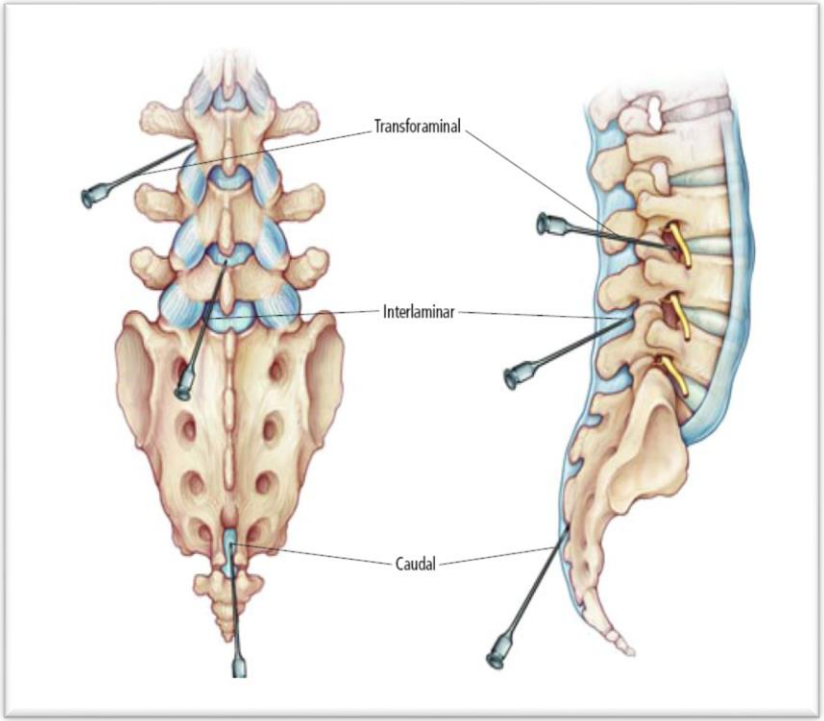
INVAZIVNI ZAHVATI U LIJEČENJU KRONIČNE BOLI

1. Blokade zglobova, osobito koljena
2. Blok ganglija Gasseri
3. Blok ganglija stelatuma prednji pristup
4. Lumbalni simpatički blok
5. Blok ganglija impar
6. Diskografija
7. Blokada fasetnih globova
8. Radiofrekventna denervacija fasetnih zglobova
9. Epiduralna primjena steroida
10. Epiduroliza -Racz procedure
11. Intervencijsko liječenje karcinomske boli pomoću trajnog epiduralnog katetera
12. Perkutana laserska dekompresija diska
13. Cryo analgezija
14. Stimulacija kralježnične moždine
15. ……..itd.

EPIDURAL STEROID INJECTIONS

Epidural injections are performed in the lumbar spine utilizing 3 different approaches:

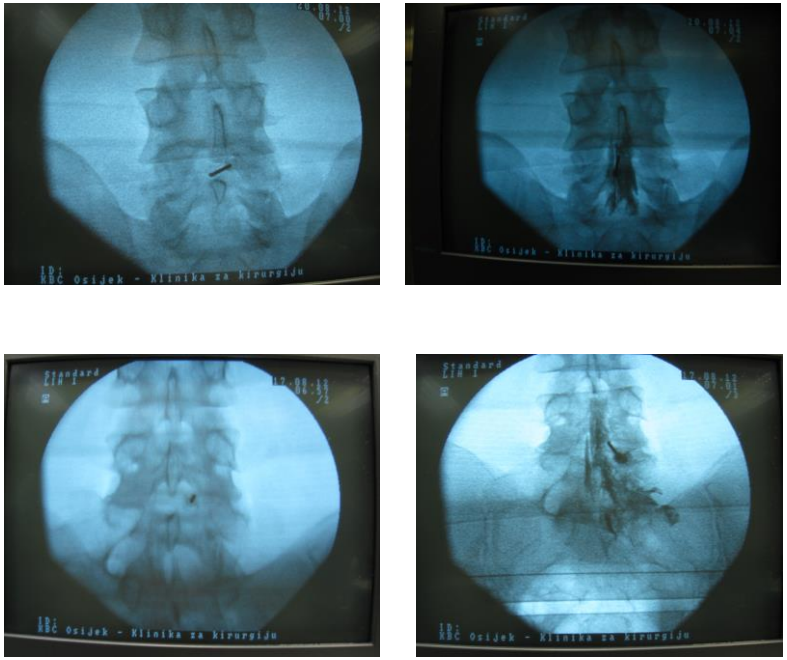
- Interlaminar
- Transforaminal
- Caudal



EPIDURAL STEROID INJECTIONS
THE INTERLAMINAR APPROACH

In the interlaminar approach, the injection can be performed through;

- midline approach
- parasagittal approach

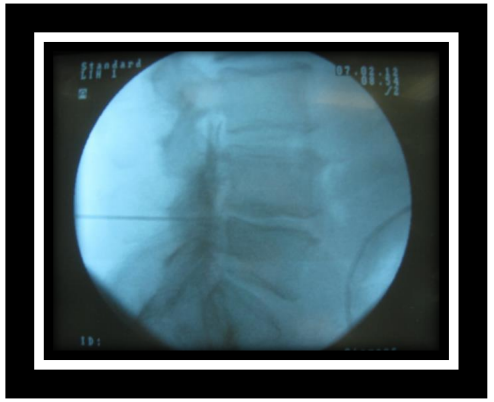


1. Deer T, Ranson M, Kapural L, Diwan S. Guidelines for the proper use of epidural steroid injections for the chronic pain. Techniques in Regional Anesthesia and Pain Medicine 2009; 13(4):288-295.
2. **Candido KD, Raghavendra MS, Chinthagada M, Badiee S, Trepashko DWA prospective evaluation of iodinated contrast flow patterns with fluoroscopically guided lumbar epidural steroid injections: the lateral parasagittal interlaminar epidural approach versus the transforaminal epidural approach.** Anesth Analg. 2008 Feb;106(2):638-44,

THE INTERLAMINAR EPIDURAL STEROID INJECTION

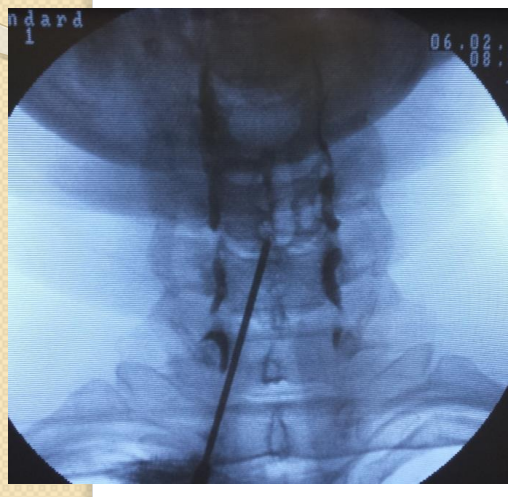
Research showed that:

- dorsal contrast of flow in epidural space occurred in **100%** of injections in IL approach
- ventral spread of the contrast in epidural space was seen only in **36%** of injections in IL approach.
- A unilateral filling pattern in **84%** of the patients; whereas, it was bilateral in **16%**.



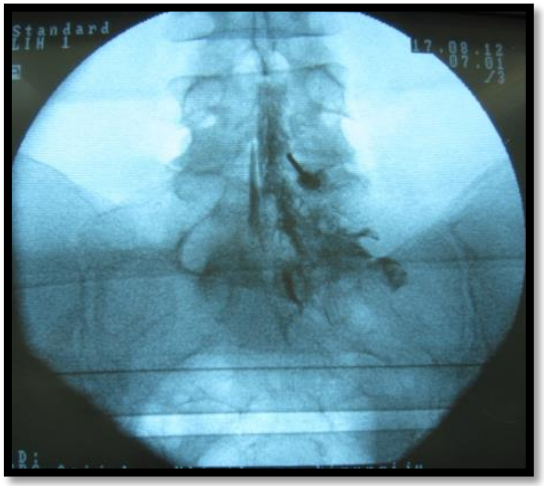
- Botwin KP, Natalicchio J, Hanna A. Fluoroscopic guided lumbar interlaminar epidural injections: A prospective evaluation of epidurography contrast patterns and anatomical review of the epidural space. *Pain Physician 2004; 7:77-* 80.

EPIDURAL STEROID INJECTIONS
INTERLAMINAR APPROACH



A

B

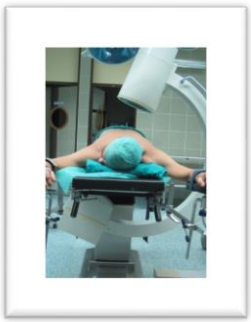


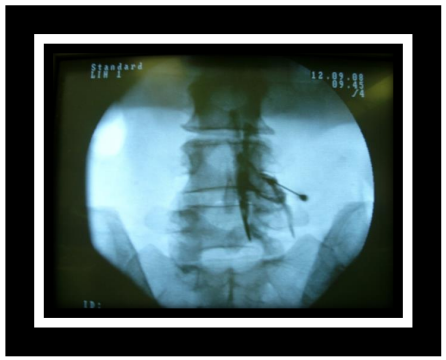
C

Slika 8. Epiduralna primjena steroida interlaminarnim pristupom u području vratne kralježnice (A). Potvrda položaja vrha igle kontrastom u lumbalnom dijelu kralježnice (B), te širenje kontrasta prikazano anteroposteriornom snimkom (C)

EPIDURAL STEROID INJECTIONS

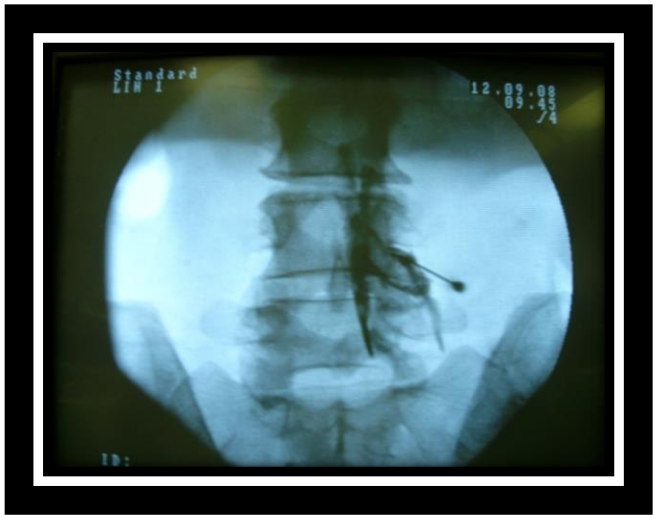
TRANFORAMINAL APPROACH





EPIDURAL STEROID INJECTIONS

TRANFORAMINAL APPROACH



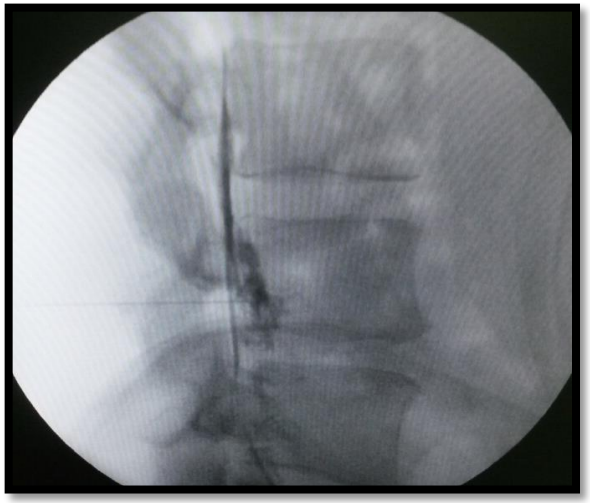
- Using the TF technique, injectate was frequently localized in the unilateral periradicular space and **did not cross the midline;** therefore, it did not cover the contralateral space.

1. Schaufele MK, Hatch L, Jones W. Interlaminar versus transforaminal epidural injection for the treatment of symptomatic lumbar intervertebral disc herniation. Pain Physician. 2006;9:361-366
2. Botwin K, Natalicchio J, Brown LA. Epidurography contrast patterns with fluoroscopic guided lumbar transforaminal epidural injections: a prospective evaluation. Pain Physician.2004;7:211-215

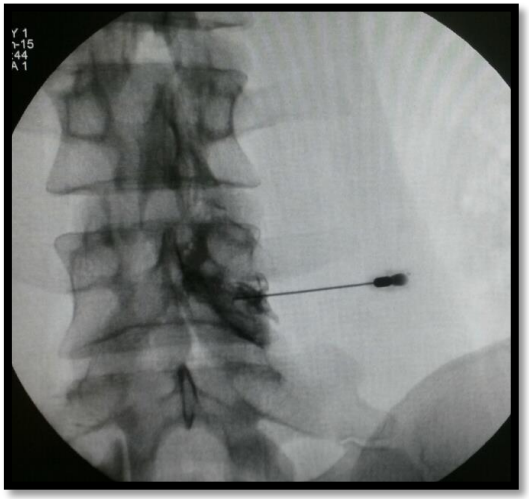
EPIDURAL STEROID INJECTIONS

TRANFORAMINAL APPROACH

A



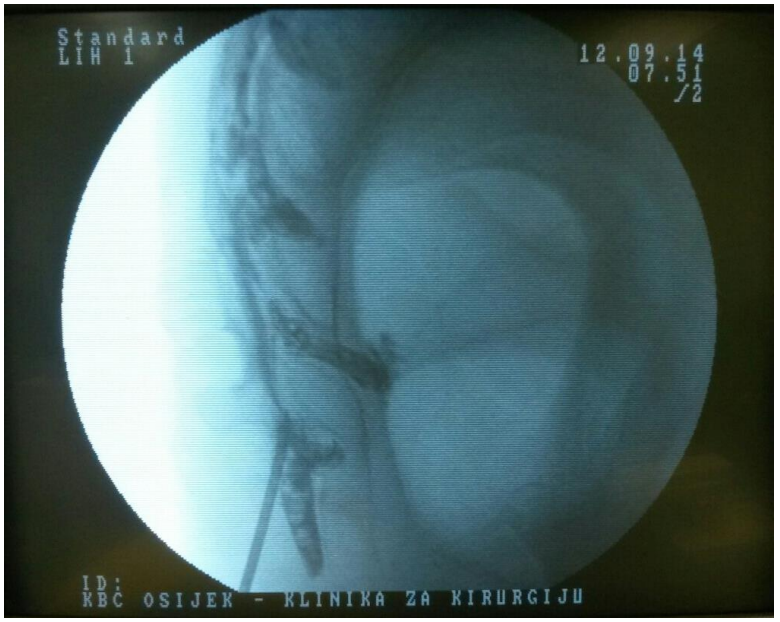
B



C

EPIDURAL STEROID INJECTIONS

CAUDAL APPROACH

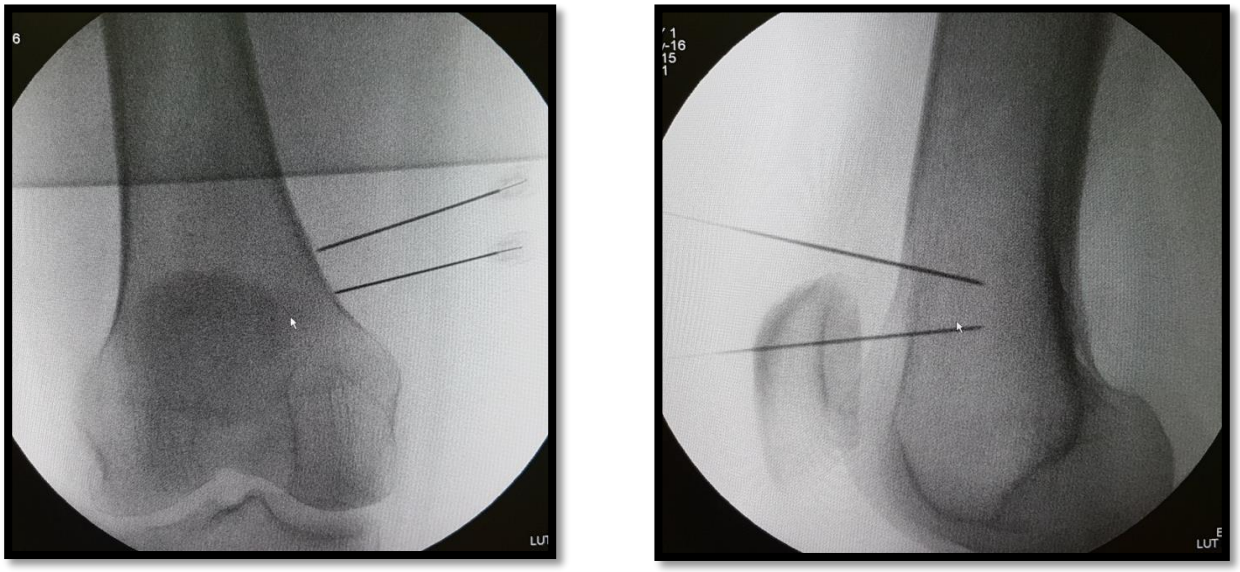


EPIDURAL STEROID INJECTIONS CONCLUSIONS

Recommendations must be EVIDENCE BASED MEDICINE

- IL ESI parasagittal approach is as efficient as TF ESI with unilateral lumbar radicular pain
- MIL approach is better for bilateral LBP than caudal approach
- Caudal approach should not be used for levels L4/L5 and above
- IL and TF approach are more efficient than caudal
- Caudal ESI is more acceptable option than IL following surgery
- IL should not be applied following surgery
- TF ESI should not be applied bilaterally because of possible catastrophic complications

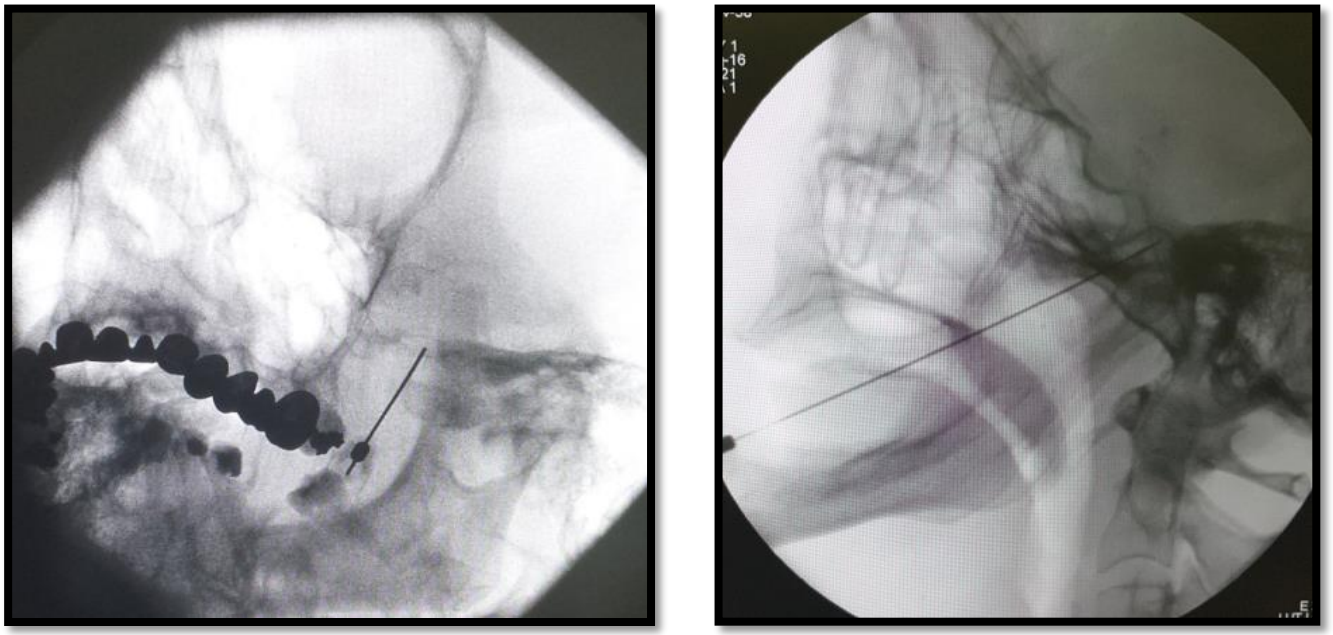
RADIOFREKVENTNA BLOKADA KOLJENA



A B

Slika 1. Anteroposterirna (A) i lateralna (B) RTG snimka položaja RF igala u području femura medijalno

BLOK GANGLIJA GASSERI



A B

Slika 2. Napredovanje igle kroz foramen ovale (A) te krajnji položaj igle kod dijagnostičkog bloka ganglija Gasseri (B)

BLOK GANGLIJA STELATUMA

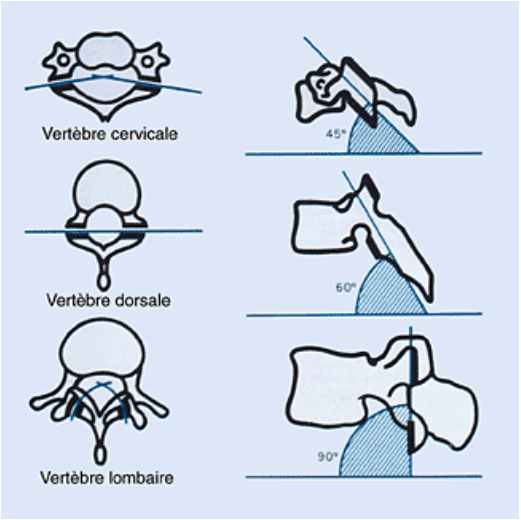
A

B

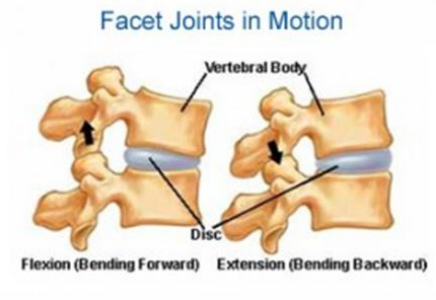
C

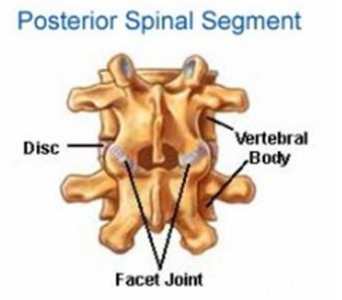
Slika 3. Položaj bolesnika za blok ganglija stelatuma u polažaju na leđima kod prednjeg pristupa (A). Položaj vrha igle na C6 (B), te provjera položaja igle ubrizgavanjem kontrasta (C)

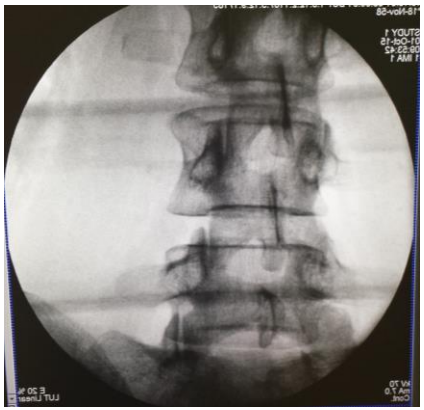
FACET JOINTS

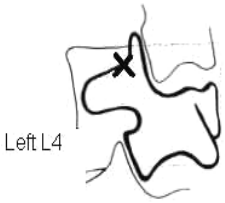


- Facet joints are the small joints located between each vertebrae that provide the spine with both stability and flexibility.
- The facet joints are oriented almost vertically in the lumbar spine.







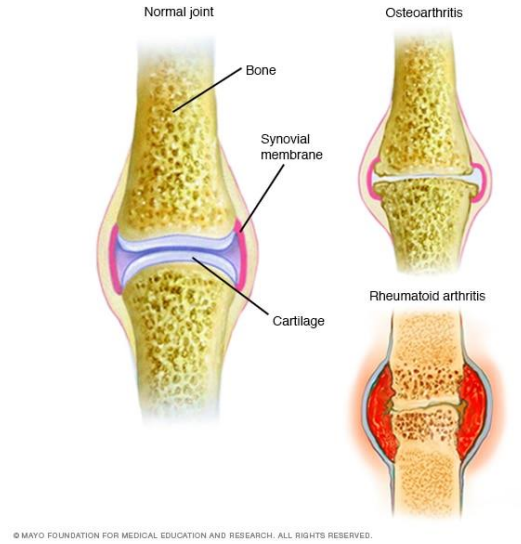


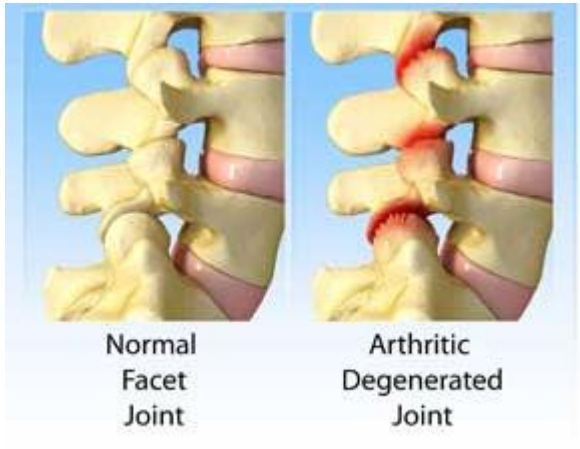
Bogduk N, Clinical Anatomy of the Lumbar Spine and Sacrum, 4thed., 2005 Bogduk N, Spine. 8(3) 1983

WHAT IS CAUSING PAIN FROM FACET JOINT SYNDROME?

- The most common cause of facet joint pain is the natural aging process when joints degenerate over time, reducing the amount of cartilage in between each bone.

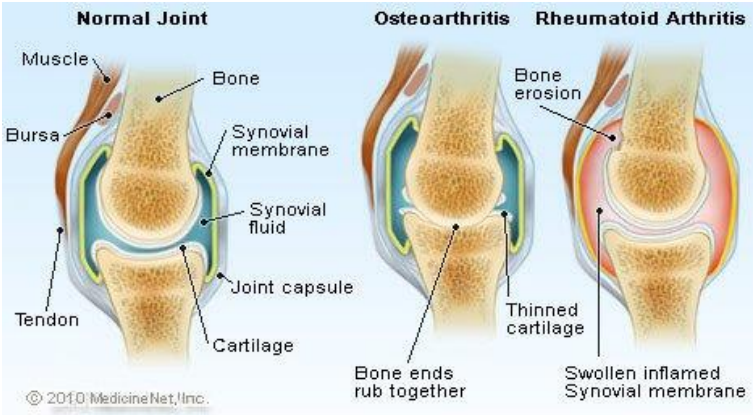
- Facet joint syndrome is heavily related to and can even be interchangeable with osteoarthritis of the spine, which is when cartilage surrounding bone wears down, which in turn causes swelling and pain.





FACET JOINT PAIN

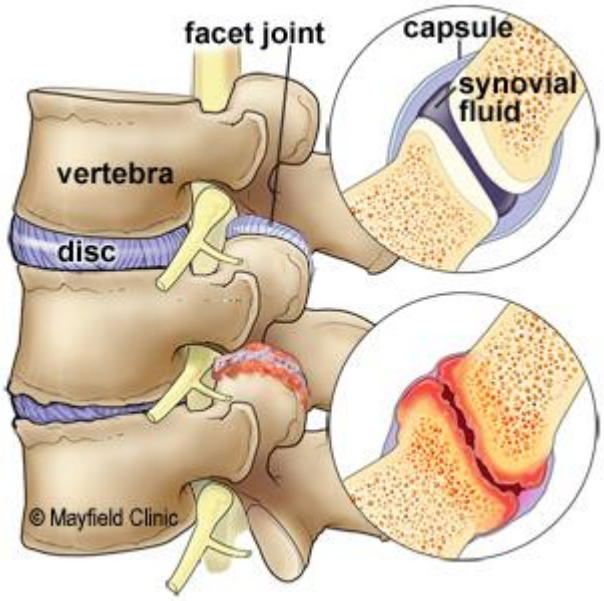
- Pain arises from any structure that is part of the facet joints, including the fibrous capsule, synovial membrane, hyaline cartilage, and bone.



Goldthwaite J.*Boston Med Surg J. 1911*
Ghormley R. *JAMA. 1933*
Cohen SP, *Anesthesiology. 2007*

FACET JOINT SYNDROME
THE MOST COMMON CAUSE

- One of the most important causes of facet pain are degenerative changes in the intervertebral disc
- Degenerative changes reduce the height of the intervertebral disc
- Decreasing the height of the disc leads to segmental instability of the spine
- There is more stress on the facet joints and the joint capsule with occurring osteoarthritic changes of the joint and possible pain generation



GOSSNER J 2009 *Radiofrequency denervation of the facet joints in chronic low back pain- a short review*. The Internet Journal of Radiology. Volume 12 Number 1

FACET JOINT PAIN

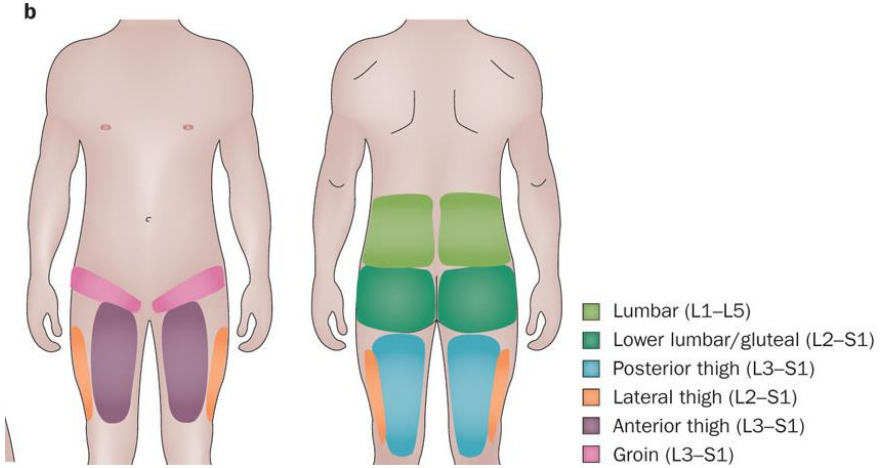
- Facet joint osteoarthritis can be found in about 90% of all patients older than 50 years
- Facet joint disturbances can be responsible for 10% to 50% of all cases of chronic lumbar pain.

- FREBURGER JK, HOLMES GM, AGANS RP, JACKMAN AM, DARTER JD, WALLACE AS 2009 The rising prevalence of chronic low back pain. Arch Intern Med. 169(3):251–8
- HIRSCH C, INGELMARK BE, MILLER M 1963 The anatomical basis for low back pain. Studies on the presence of sensory nerve endings in ligamentous, capsular and intervertebral disc structures in the human lumbar spine. Acta Orthop Scand. 33:1–17
- MCCALLl IW, PARK WM, O′BRIEN JP 1979 Induced pain referral from posterior lumbar elements in normal subjects. Spine (Phila Pa 1976) 4(5):441–6
- FAIRBANK JC, PARK WM, MCCALL IW, O′BRIEN JP 1981 Apophyseal injection of local anesthetic as a diagnostic aid in primary low-back pain syndromes. Spine (Phila Pa 1976) 6(6):598–605

FACET JOINT PAIN SYMPTOMS

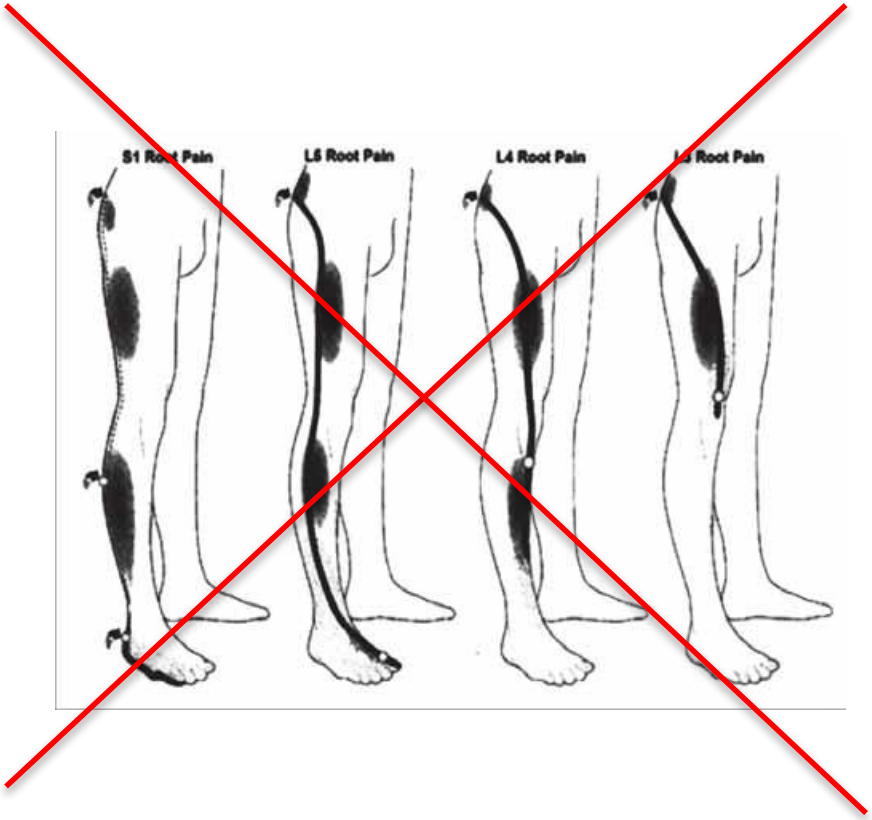
Symptoms of facet arthropathy include:

- Hip and buttock pain (hyperextension, lateral rotation)
- Pain, usually not lower than the knee,
- Low back stiffness, especially in the morning,
- Pain commonly aggravated by prolonged sitting or standing

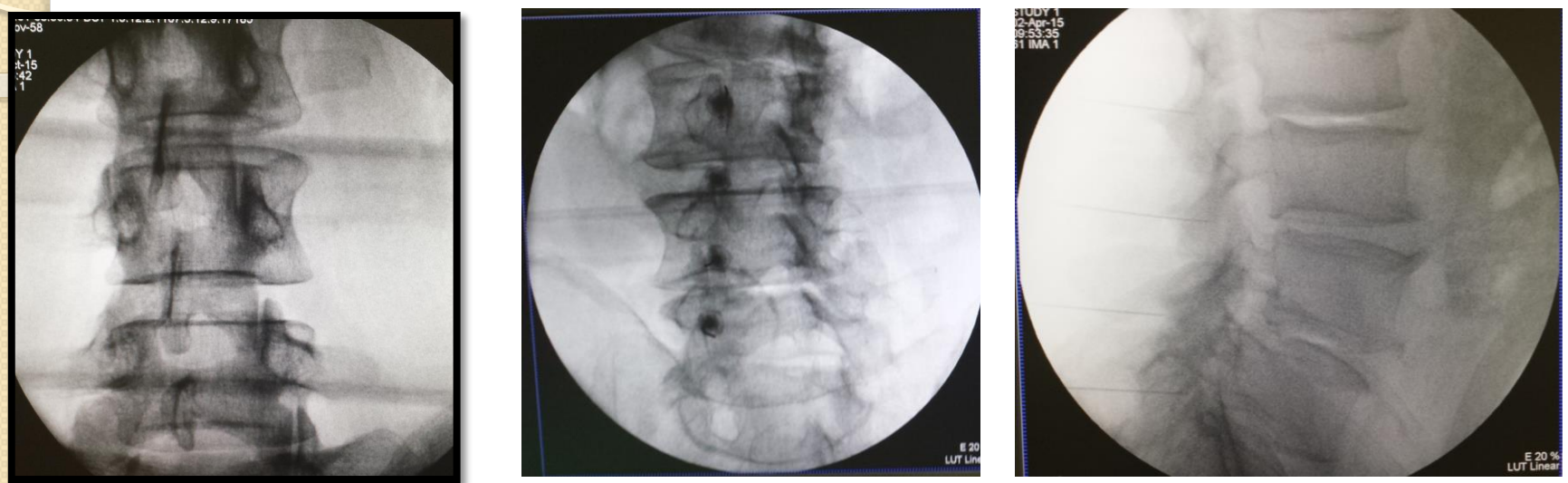


FACET JOINT PAIN

- In pure facet syndromes there are no signs and symptoms of nerve root irritation.
- There are no paresthesias, no radicular leg pain, no sensory deficit, no leg muscle weakness, no pain on flexion of the back and straight-leg raising do not affect pain intensity.



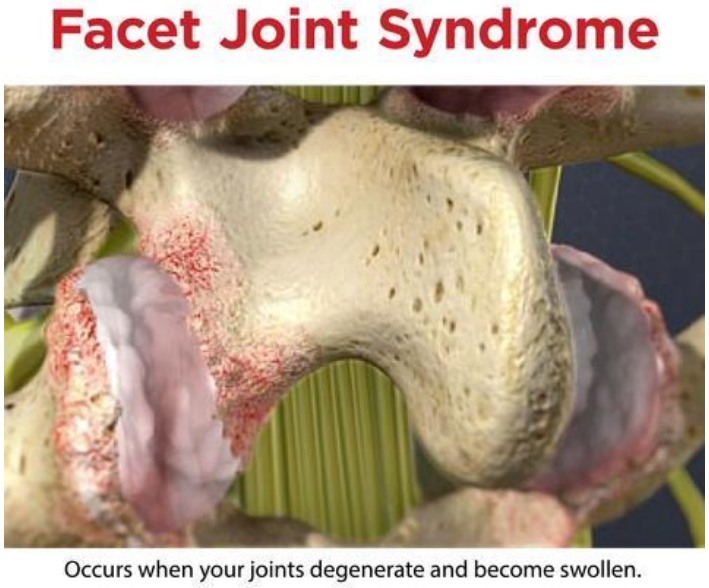
BLOKADA FASETNIH ZGLOBOVA



Slika 5. Snimka lumbosakralne kralježnice mobilnim RTG aparatom nakošenim za 15 stupnjeva (A), te blokada fasetnih zglobova na nivou LII/LIII, LIII/LIV, LIV/LV, LV/SI (B)

DIAGNOSTIC BLOCK

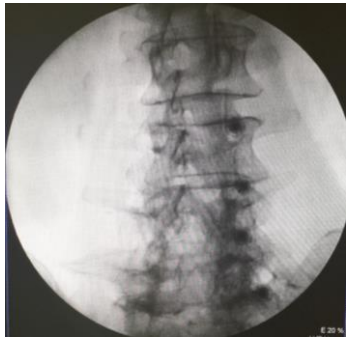
- Diagnostic blocks are performed using a local anesthetic that provides immediate feedback in confirming the source of pain
- The positive diagnostic supports the diagnosis that the facet joint is indeed the **“pain generator” and the cause of back pain**.

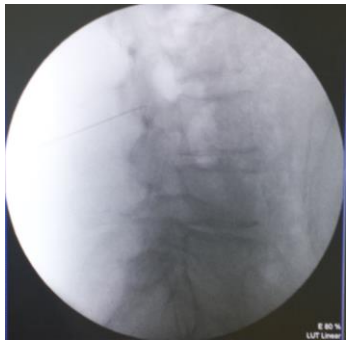


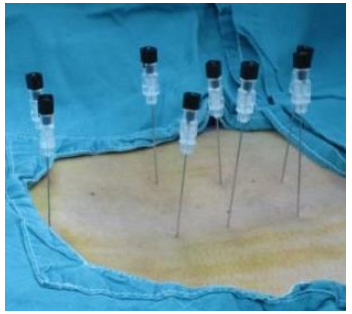
DIAGNOSTIC BLOCK

- The aim of any facet joint block is either to anesthetize the target joint by an intra-articular injection of a small dose of local anestethic and steroid (in total 1-1,5 ml 0,25 % bupivacaine or levobupivacaine with 10 mg DepoMedrol) or to block the medial branch that innervates the joint (0.5 ml of 2% lidocaina or 0.5% levobupivacaina)

MEDIAL BRANCH BLOCKS







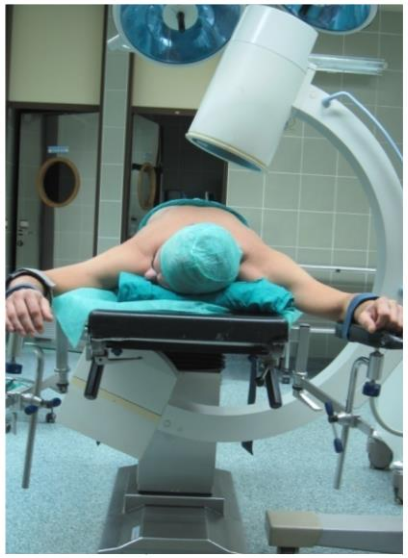
Medial branch blocks are performed to disrupt pain signals sent from the medial branch nerves, which supply the facet joint.

Medial branch blocks can also be used to precisely identify the facet joints as the cause of pain, and are the preliminary procedure prior to radiofrequency neurotomy of the medial branch nerves.

Most studies have found that facet injections provide temporary pain relief.

RADIOFREQUENCY FACET JOINT DENERVATION

- Radiofrequency facet joint denervation is performed as a day procedure.
- All patients are given intravenous sedation to ensure they are as comfortable as possible throughout the procedure.



RADIOFREKVENTNA DENERVACIJA FASETNIH ZGLOBOVA

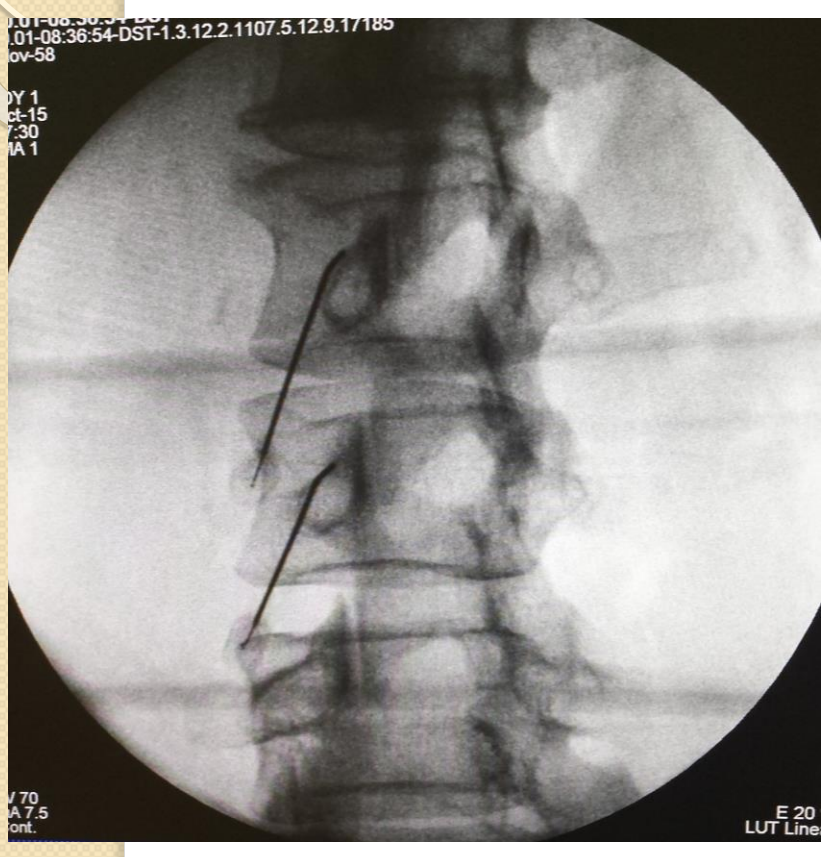
- If facet joints have been confirmed as the source of pain, usually by diagnostic medial branch blocks, then it is likely that radiofrequency facet joint denervation will be an effective treatment for facet joints pain.

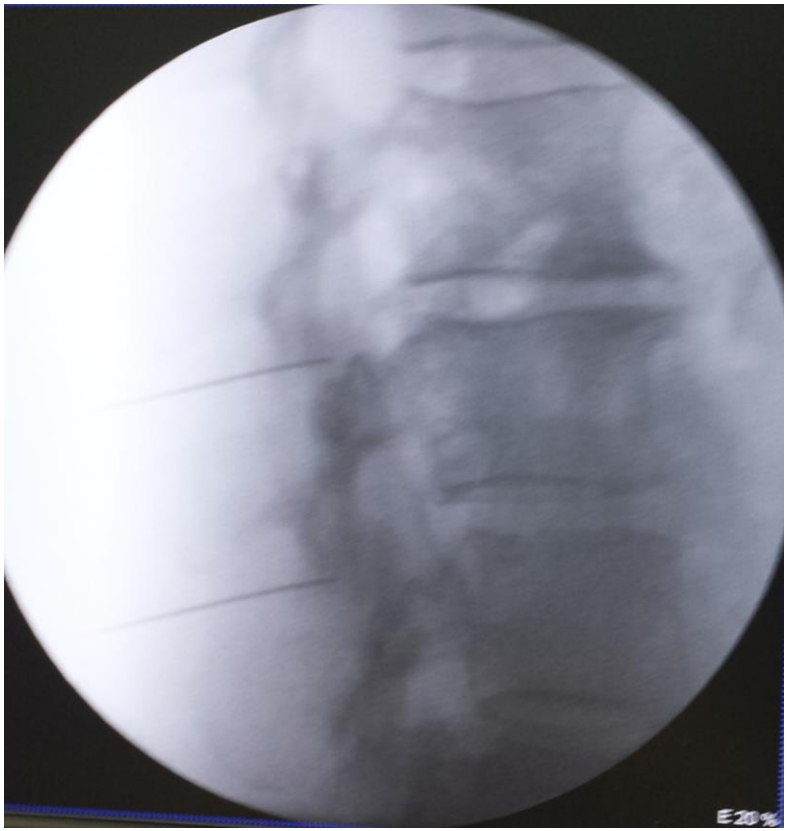
Slika 7. Izvođenje RF denervacije fasetnih zglobova lumbosakralne kralježnice pod kontrolom fluoroskopa, uz monitoriranje vitalnih funkcija, te nadzor medicinskog tehničara i rendgen tehničara.

RADIOFREQUENCY FACET JOINT DENERVATION

- Radiofrequency facet joint denervation procedures have been common practice for 2 decades in treatment of chronic low back pain.

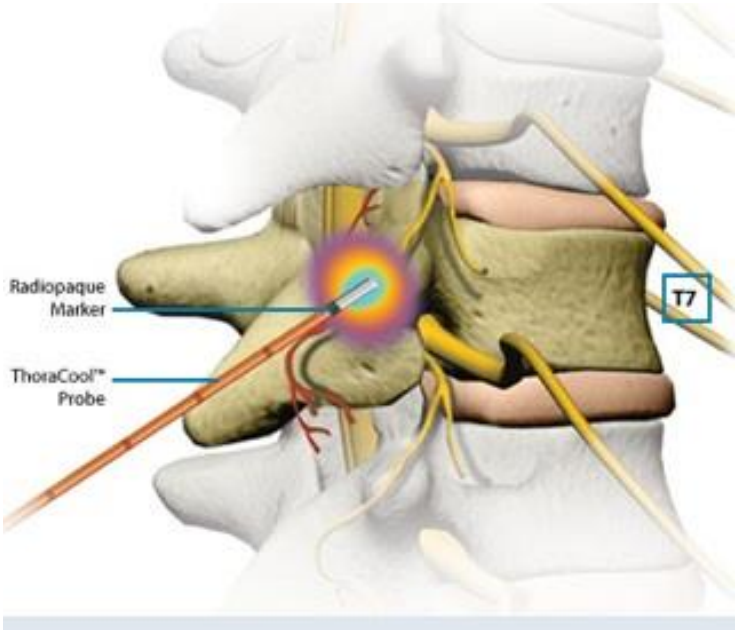
RADIOFREKVENTNA DENERVACIJA FASETNIH ZGLOBOVA





RADIOFREQUENCY FACET JOINT DENERVATION

- Radiofrequency ablation induce thermal necrosis of the facet neural fibers has been reported to provide significant pain reduction in patients for 6-24 months.



- BOGDUK N, LONG DM 1979 The anatomy of the so-called “articular nerves” and their relationship to facet denervation in the treatment of low-back pain. J Neurosurg. 51(2):172–7.
- PEDERSEN HE, BLUNCK CF, GARDNER E 1956 The anatomy of lumbosacral posterior rami and meningeal branches of spinal nerve (sinu-vertebral nerves); with an experimental study of their functions. J Bone Joint Surg Am. 38-A(2):377–91.

RADIOFREQUENCY FACET JOINT DENERVATION

Effects of radiofrequency on nerve tissue

- Above the level of 64 degrees celsius tissues are coagulated
- Direct placement of a RF electrode in the nervous tissue will give total loss of unmyelinated and myelinated nerve fibers, Wallerian degeneration of axons and disruption of there myelin sheats

- De Louw et al Eur.J Pain 2001
- Smith et al J Neurosurgery 1981
- Podhajsky et al Spine 2005

RADIOFREQUENCY FACET JOINT DENERVATION

- Nerves regenerate after radiofrequency facet joint denervation.
- This usually takes between six months and two years.
- Pain may or may not return when the nerve regenerates.
- If it does, the procedure can be repeated on multiple occasions if required.

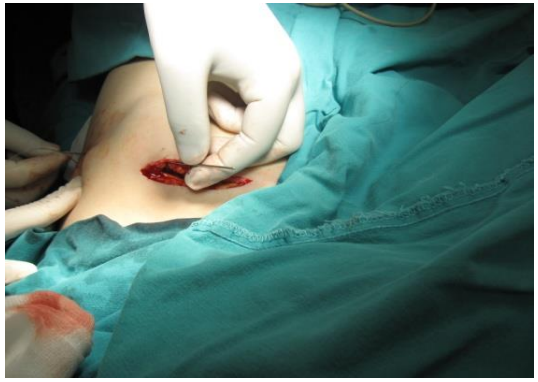
RADIOFREQUENCY FACET JOINT DENERVATION

Candidates for radiofrequency facet denervation should meet all of the following criteria:

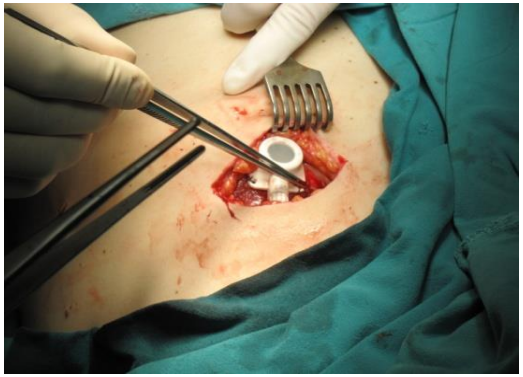
- No prior spinal fusion surgery in the vertebral level being treated;
- Low back (lumbosacral) or neck (cervical) pain, suggestive of facet joint origin as evidenced by absence of nerve root compression
- Pain has failed to respond to three months of conservative management which may consist of therapies such as nonsteroidal anti-inflammatory medications, acetaminophen, manipulation, physical therapy, and a home exercise program;
- A trial of controlled diagnostic medial branch blocks (2 separate positive blocks or placebo controlled series of blocks) under fluoroscopic guidance has resulted in at least a 50% reduction in pain; and
- If there has been a prior successful radiofrequency denervation, a minimum time of six months has elapsed since prior radiofrequency treatment (per side, per anatomical level of the spine).

TRAJNI EPIDURALNI KATETER

A

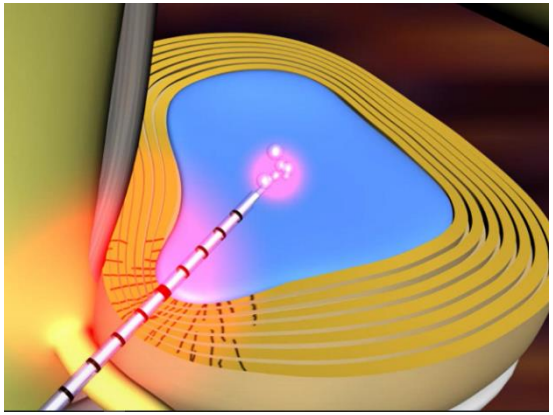


B



C

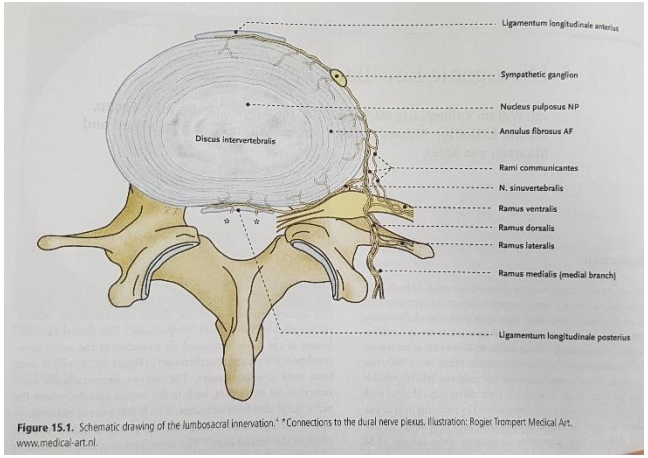
PERKUTANA LASERSKA DEKOMPRESIJA DISKA



- Perkutana laserska dekompresija diska (PLDD) je vrsta minimalno invazivnoga zahvata u kojem se **toplinska energija proizvedena LASER sondom koristi za smanjenje hernije interverterbralnoga diska** koja se nalazi unutar fibroznog prstena

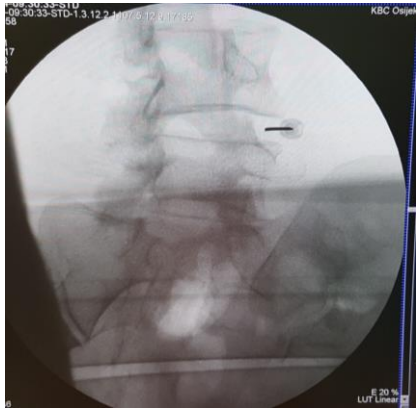
- To dovodi do **dekompresije zahvaćenih živaca** i smanjenja boli.

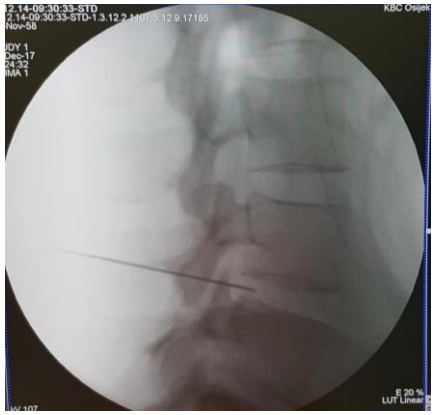
- postiže se **toplinsko uništenje intradiskalnih nociceptora**, što utječe na patofiziologiju diskogene boli

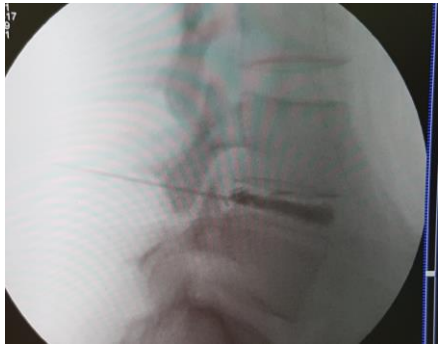


(Schroeder M. et al 2013)

PERKUTANA LASERSKA DEKOMPRESIJA DISKA(PLDD)







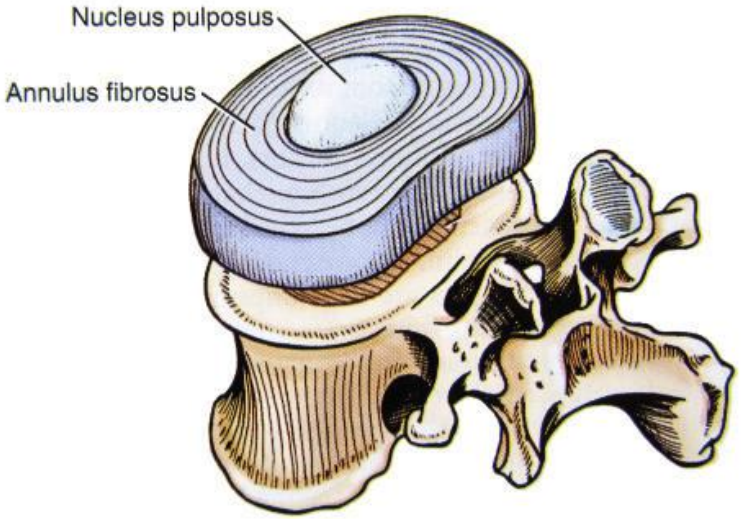
ODNOS TLAKA - VOLUMENA

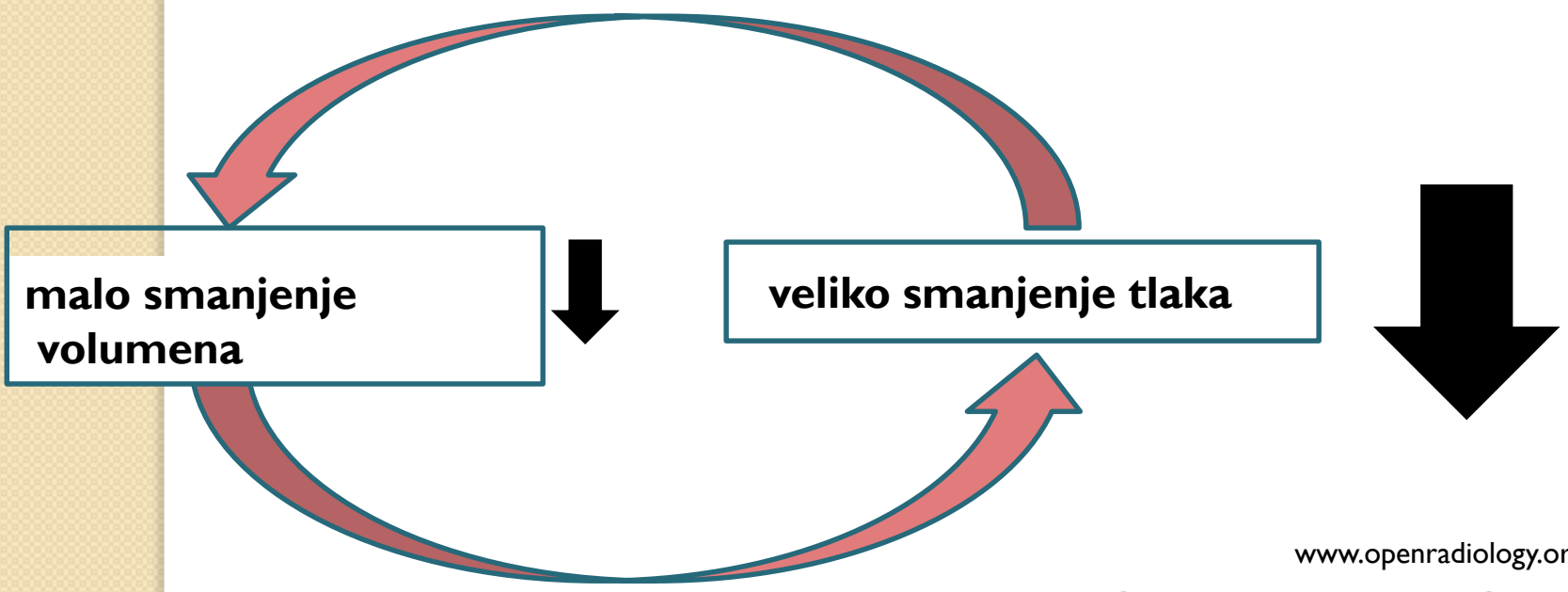
(Choy DS et al 1995)

Disk ima svojstva uskog hidrauličkog prostora:

- nukleus pulposus je okružen relativno neelastičnim fibroznim prstenom i čvrstim krajevima kralježaka

- **mali porast volumena redovito će rezultirati velikim porastom tlaka i obrnuto**





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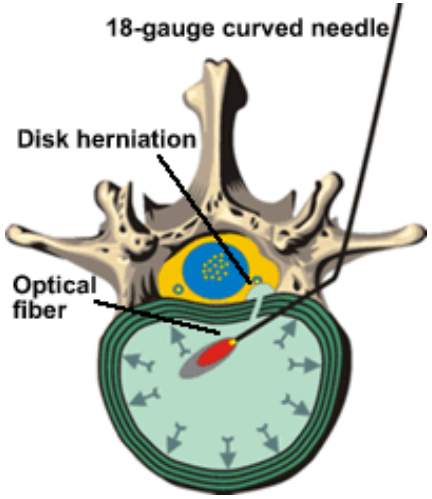
PRINCIP DJELOVANJA

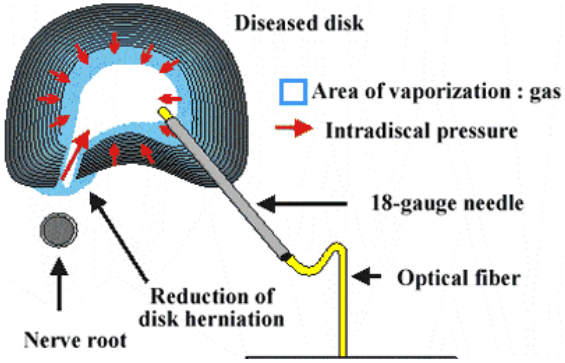
vaporizacija=isparavanje



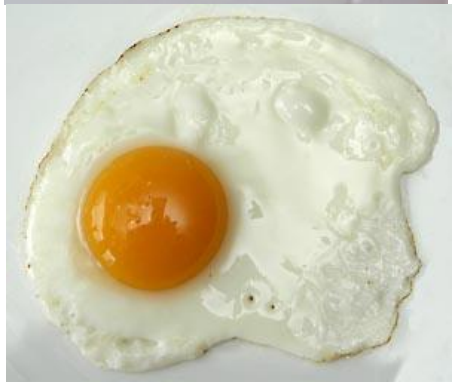
- **Isparavanje malog volumena** u zatvorenom hidrauličkom prostoru (nucleus pulposus) implicira termički **„učinak skupljanja“**

- smanjenje intradiskalnog tlaka [Hellinger 1998]

- povlačenje hernije diska i kompresije živčanog korijena



PRINCIPI DJELOVANJA



Otvrdnjavanje diska zbog ožiljaka (promjena strukture kolagena)

Denervacija receptora za bol u području anulusa fibrosusa i dorzalnog ligamenta (nociceptivni nemijelinirani živci) zbog urastanja vlakana u anulus [Freemont 1997]

G. Kienbacher, PLDD Training Center Graz, Austria

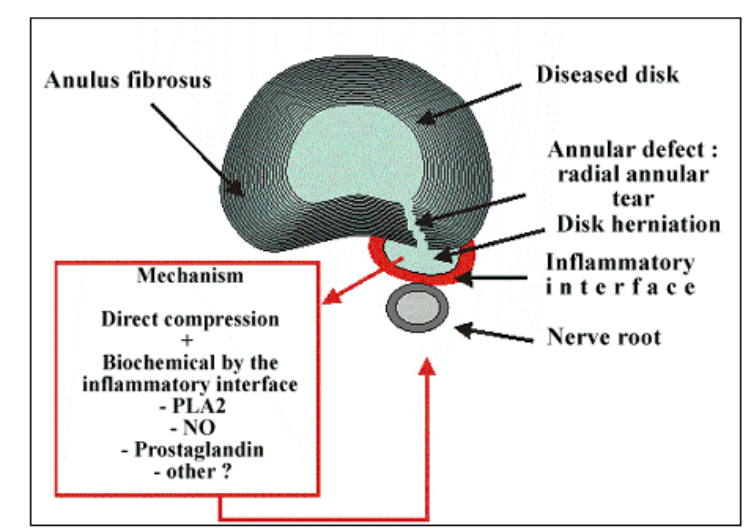
Dr. Pil Sun Choi

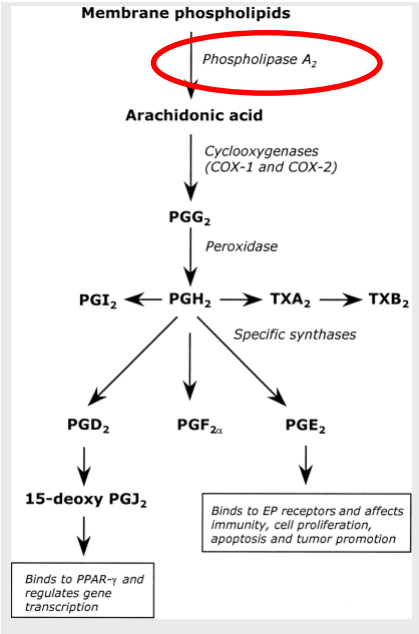
PRINCIPI DJELOVANJA

FOTOKEMIJSKI UČINCI LASERSKOG SVJETLA

- **uništavanje (destrukcija) citokina i neurokinina kao što su fosfolipaza A2, NO, TNF-a, IL-1a i supstanca P koja igraju važnu ulogu u upali i boli**

[Schroeder M et al. 2013]

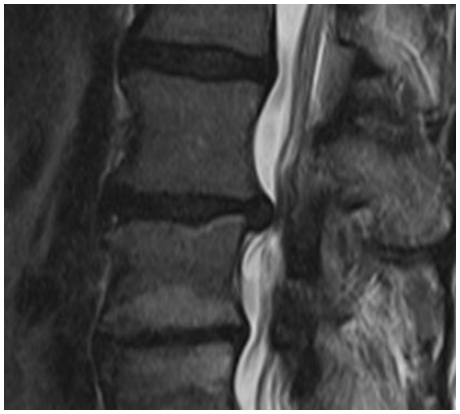


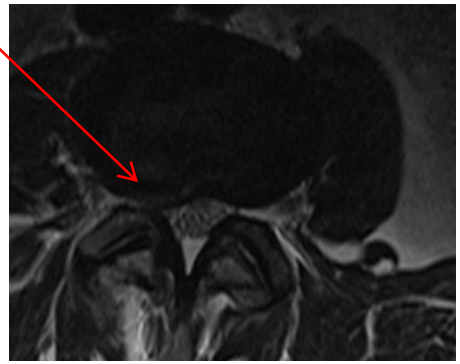


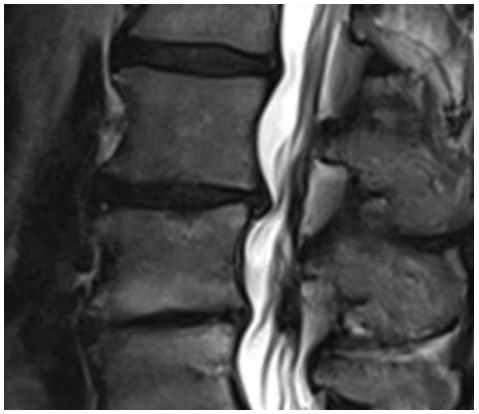
Značajan učinak smanjenja volumena

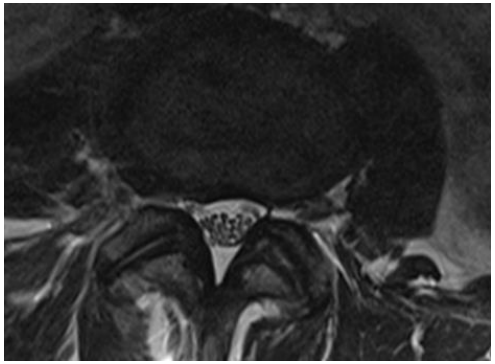
PRIJE

6 TJEDANA NAKON PLDD





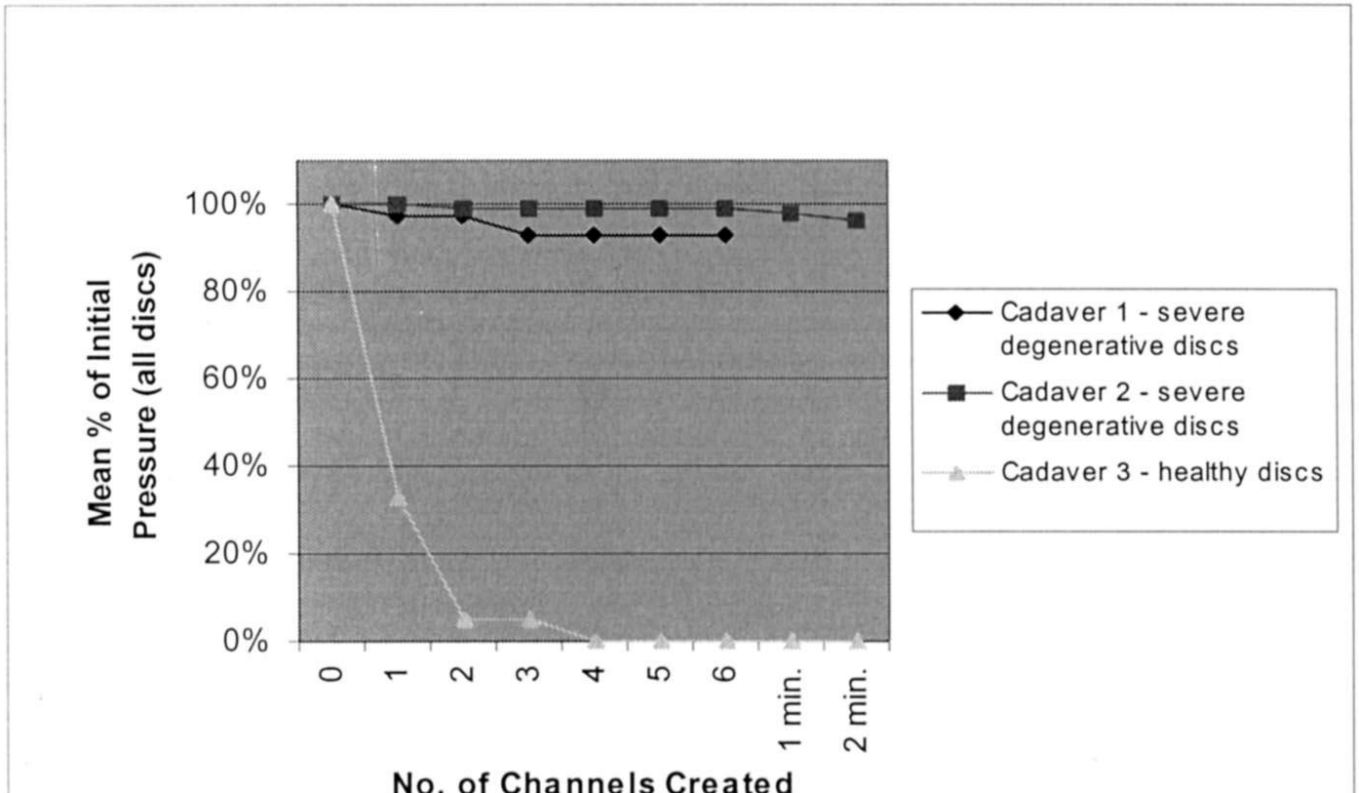




Tlak se brzo smanjuje kod zdravih diskova,

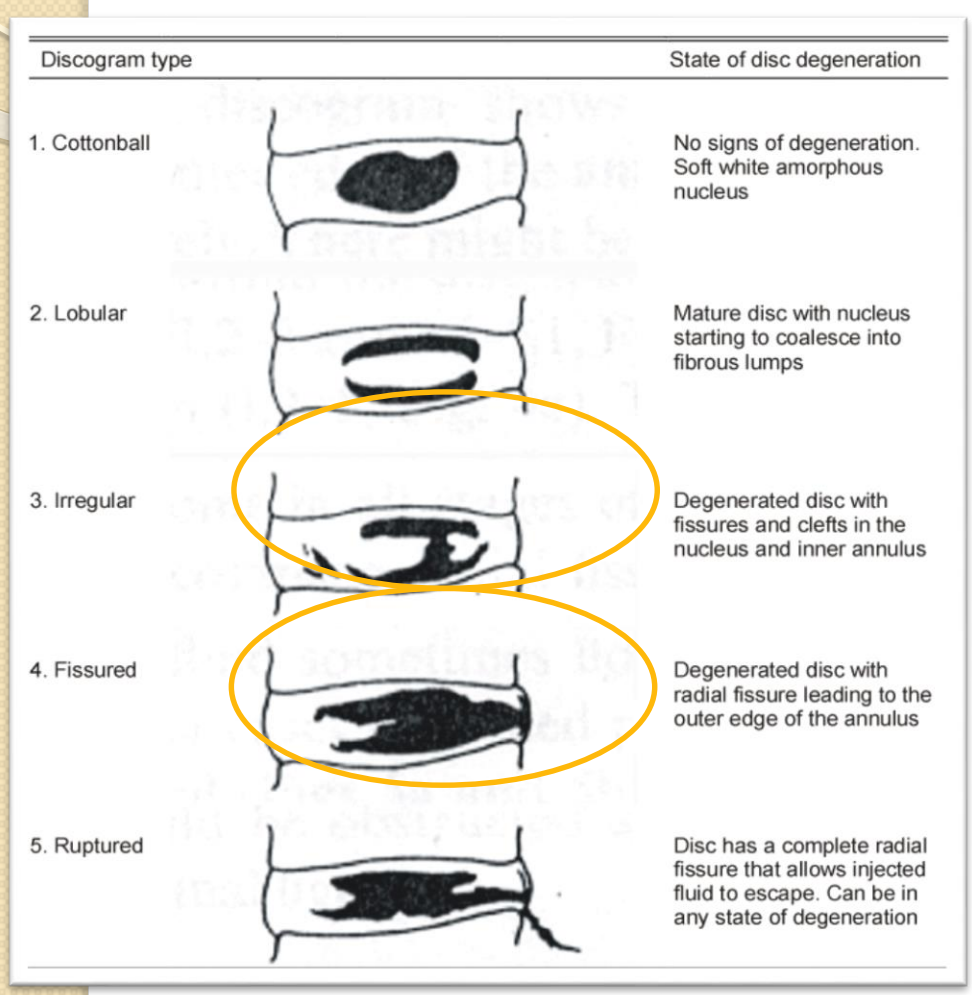
ali samo blago kod degenerativnih diskova!

(Chen YC et al., Spine 2003)



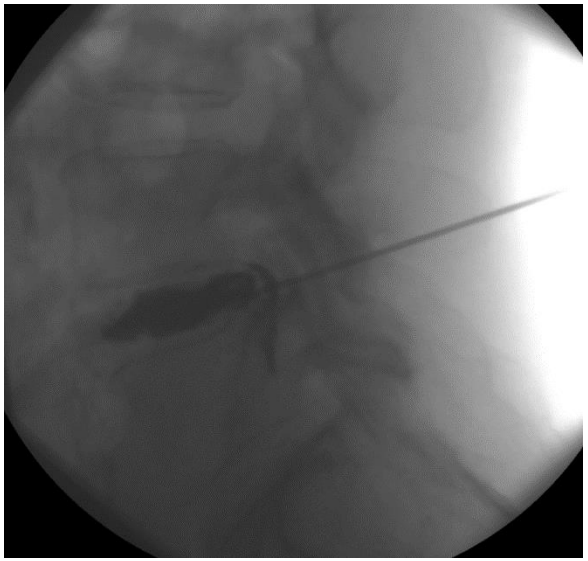
ning Center Graz,

Diskografska morfologija lateralne projekcije:



Discogram type	State of disc degeneration
1. Cottonball	No signs of degeneration. Soft white amorphous nucleus
2. Lobular	Mature disc with nucleus starting to coalesce into fibrous lumps
3. Irregular	Degenerated disc with fissures and clefts in the nucleus and inner annulus
4. Fissured	Degenerated disc with radial fissure leading to the outer edge of the annulus
5. Ruptured	Disc has a complete radial fissure that allows injected fluid to escape. Can be in any state of degeneration

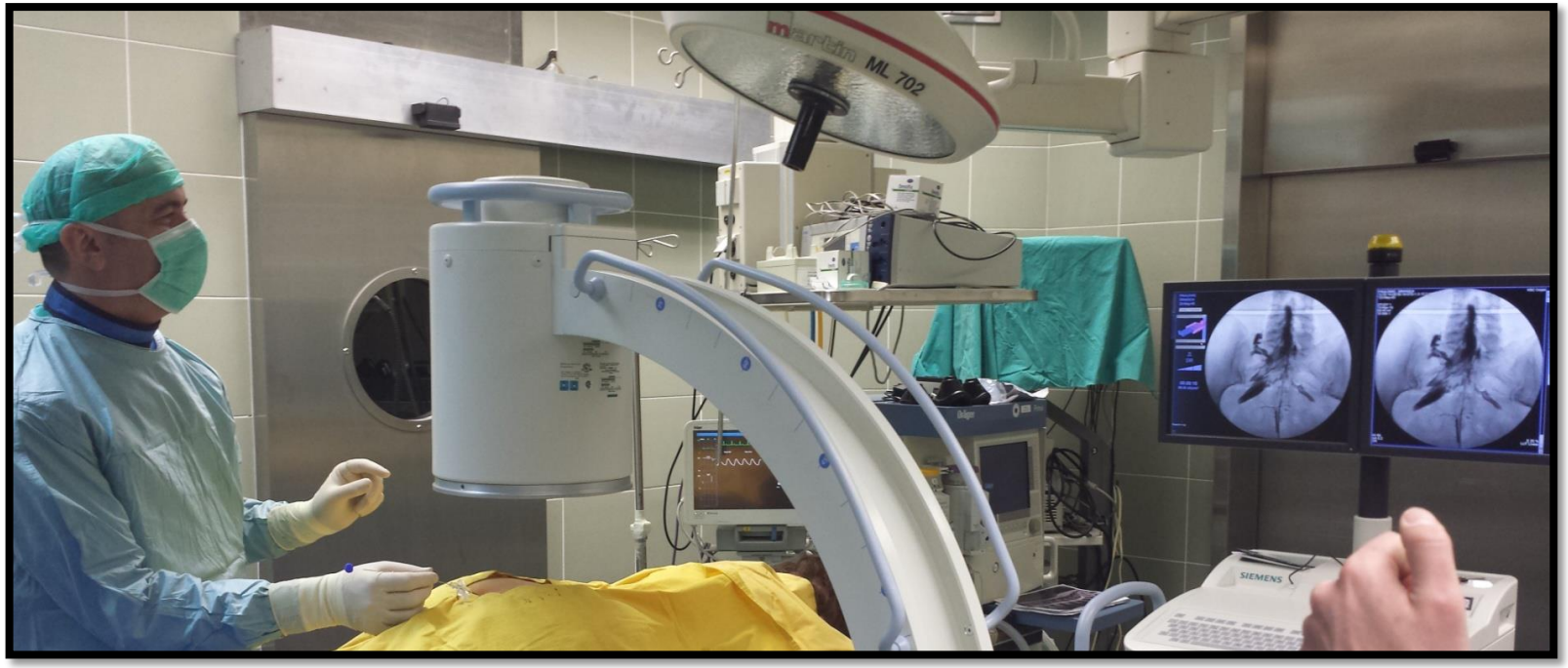
best indication for
PLDD Type 3 and 4



Epiduralno širenje kontrasta

EPIDUROLIZA

- Otapanje ožiljnog tkiva (fibroze) i oslobađanje korijena spinalnih živaca u epiduralnom prostoru kako bi se omogućio opristup lijekovima na samom mjestu patološkog zbivanja s ciljem umanjenja boli i oporavkom funkcije.



CRYO ANALGEZIJA

- dovodi do dugotrajnog smanjenja boli izlaganjem živaca temperaturi od –20 do –100 Celzijevih stupnjeva.

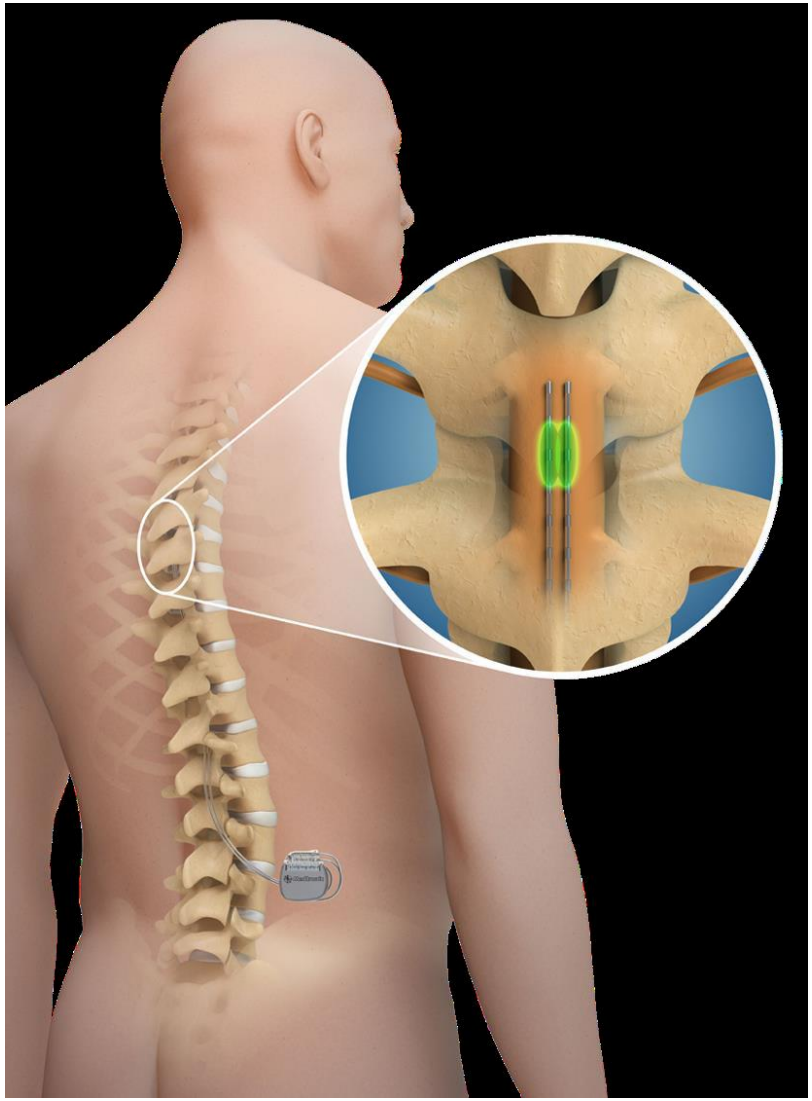
- Niska temperatura dovodi **do gubitka aksonalnog kontinuiteta bez rupture endoneurijuma** što ima za posljedicu blokadu provodljivosti bolnih impulsa prema središnjem živčanom sustavu.

- Ovim zahvatom u mogućnosti smo riješiti sva periferna bolna stanja koja su posljedica oštećenja perifernih živaca.

CRYO ANALGEZIJA

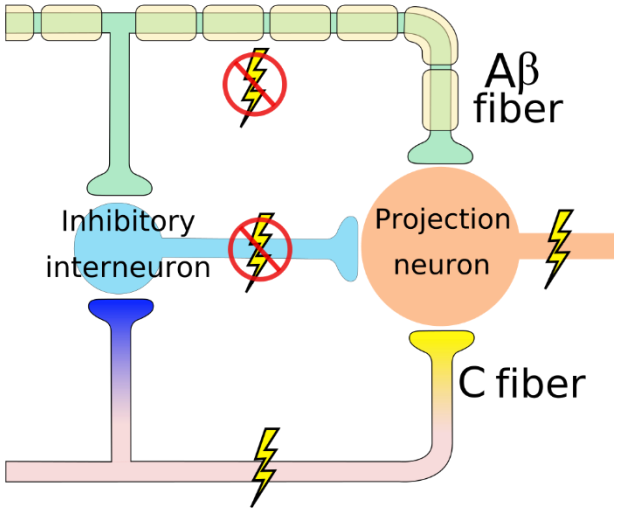
Što je SCS?

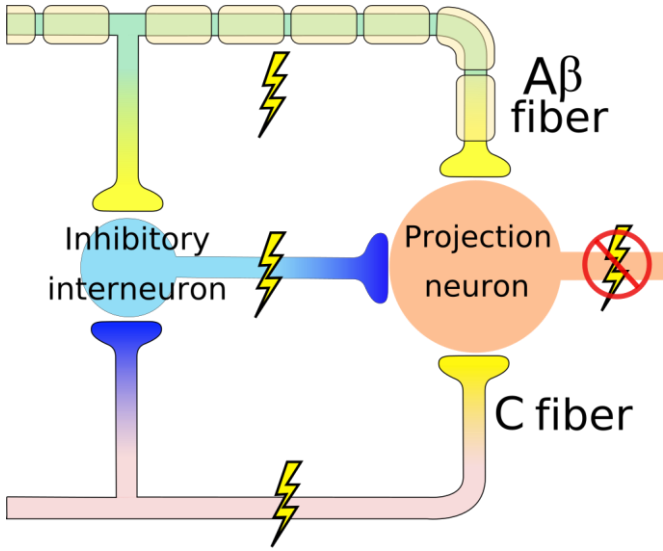
- Dokazana sigurna i učinkovita terapija
- Nisko voltažna (električna) stimulacija u epiduralnom prostoru
- Implantira se mala baterija kao generator struje
- Stvorena električna struja prekida prijenos bolnog signala
- Fini osjet trnjenja ili mravinjanja se javlja u području stimulacije



NEUROMODULACIJA BOLI

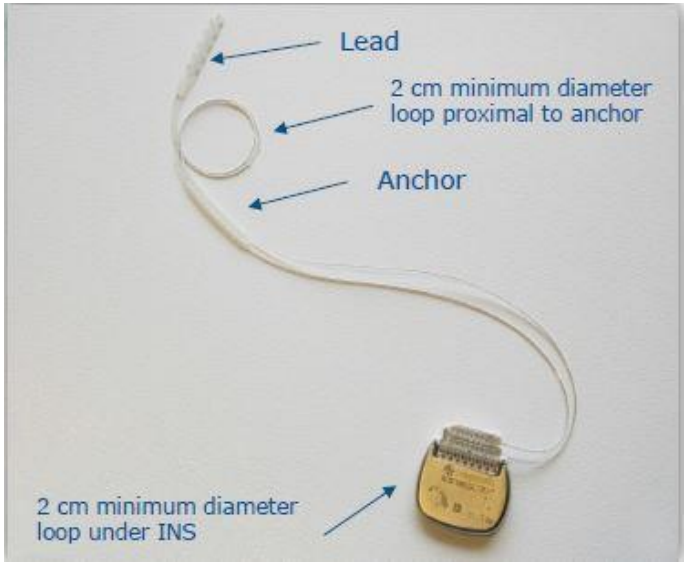
Gate Control Theory - Melzack i Wall 1965





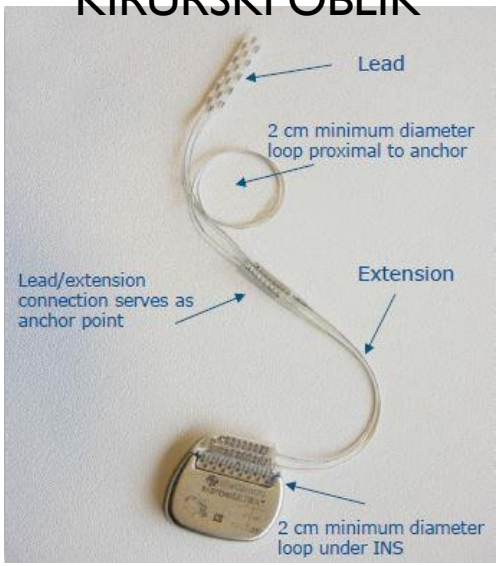
SCS – KOMPONENTE SISTEMA

PERKUTANI OBLIK



- Manje invazivan

KIRURŠKI OBLIK



- Više invazivni postupak
- Laminectomy / laminotomy
- Veće područje stimulacije
- Bolja fiksacija
- MRI kompatibilan (od 16. svibnja)

INDIKACIJE ZA SCS:

1. Sindrom neuspjele kirurške operacije kralježnice (FBSS)
2. Sindrom radikularne boli zbog FBSS ili hernije diska
3. Postlaminektomijska boli
4. Višestruke operacije kralježnice
5. Neuspjele operacije diska
6. Degenerativna bolest diska (DDD)
7. Periferna kauzalgija
8. Epiduralna fibroza
9. Arahnoiditis ili lumbalni adhesivni arahnoiditis
10. Kompleksni regionalni bolni sindrom (CRPS)

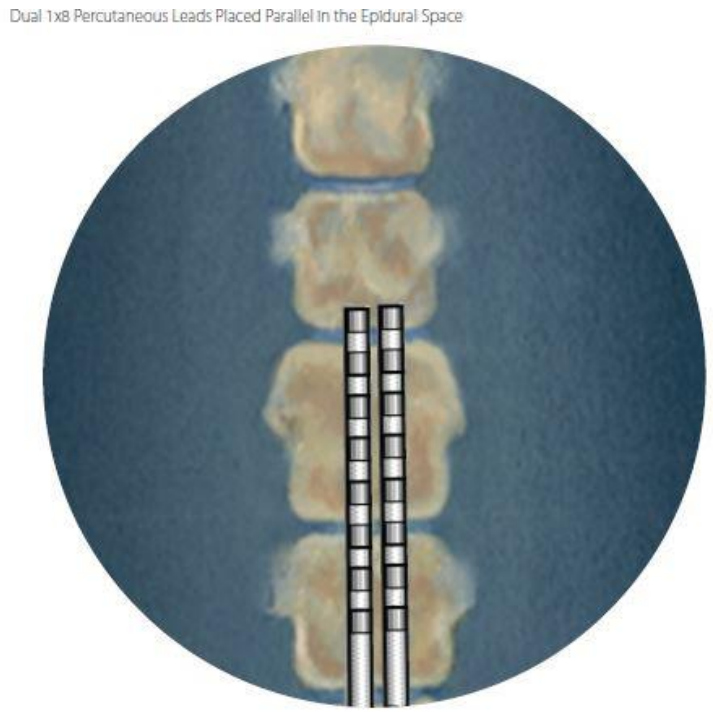
SINDROM NEUSPJELE OPERACIJE KRALJEŽNICE (FAILED BACK SURGERY SYNDROME (FBSS))

- Najčešća indikacija za SCS u USA je FBSS
- Višestruki neuspjeli oblici liječenja
- Dugoročne studije praćenja pokazale su uspjeh od 50% do 75% za FBSS na 5 godina

1. Warfield, C.A., & Bajwa, Z.H. (2004). Principles & Practice of Pain Medicine: Second Edition; pg. 299. The McGraw-Hill Companies.
2. Krames. E. Mechanisms of action of spinal cord stimulation. Interventional Pain Management. 1996;39:407-408

TESTIRANJE

- Probni testni stimulator za svakog bolesnika
- Postavite realistične i precizno definirane ciljeve terapije
- Prosječno 3 tjedna stimulacije s vanjskim NS
- Ako se postignu zadovoljavajući rezultati, nastavite s implantacijom

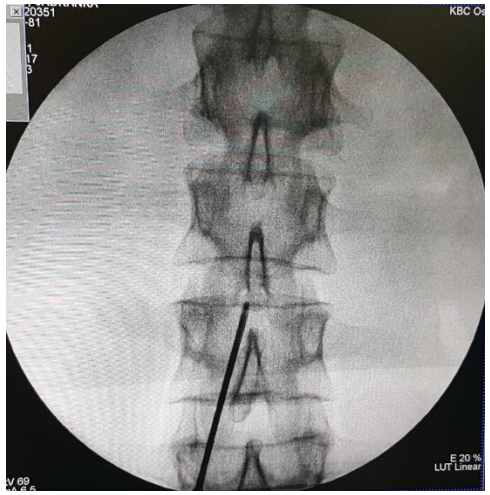


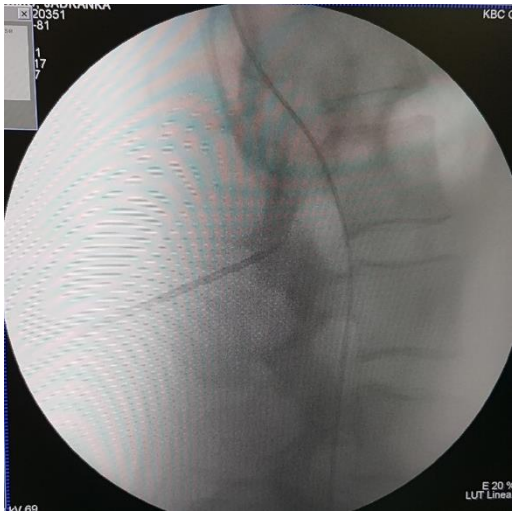
SCS

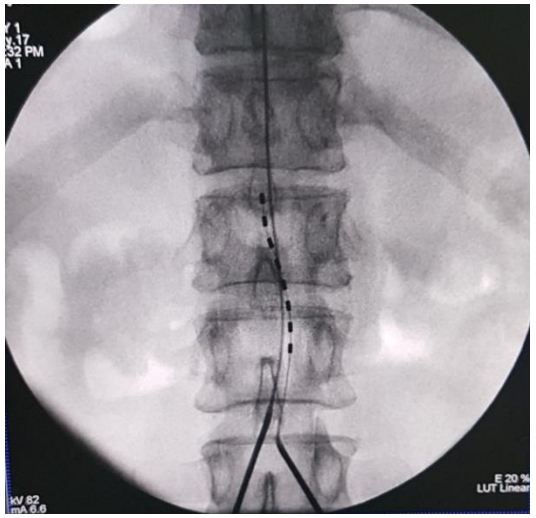
POSTUPAK SCS

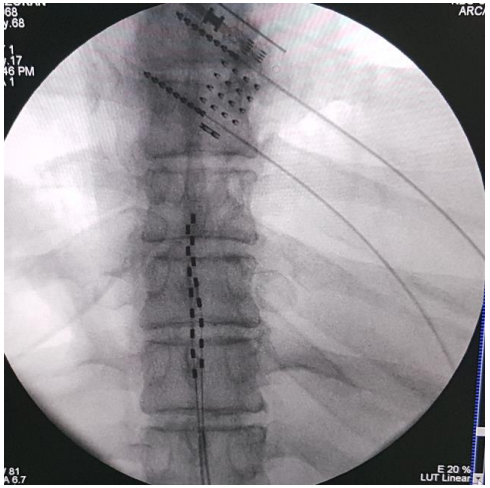
POSTUPAK SCS

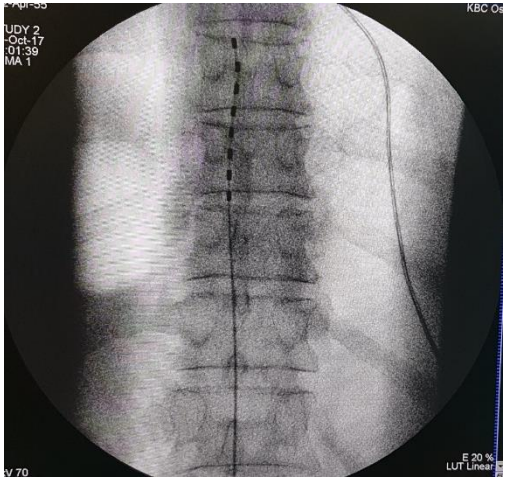
POSTUPAK

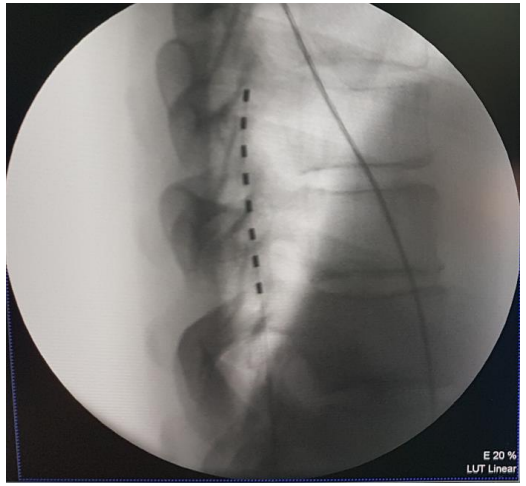












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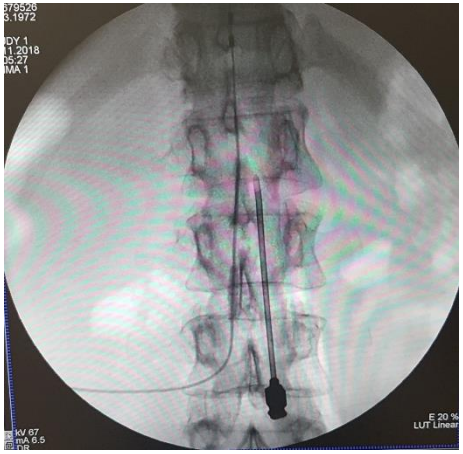

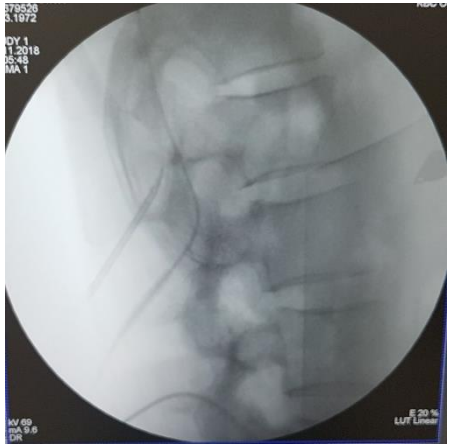

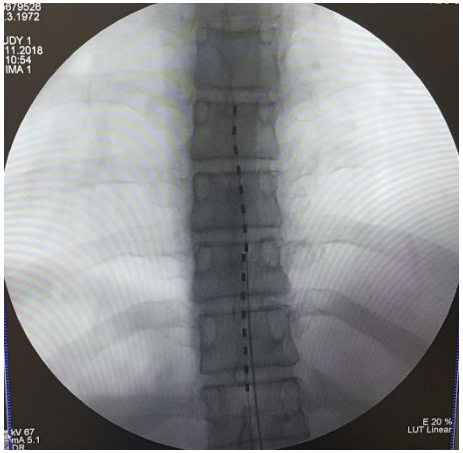

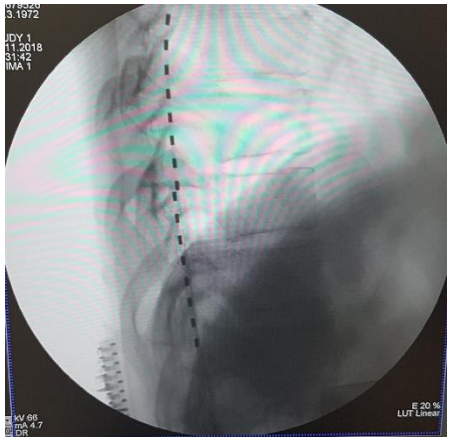

MEDICINA UTEMELJENA NA DOKAZIMA
RAZINA PREPORUKE

Table 2. Summary of the Evidence Rating Per Diagnosis.

Trigeminal neuralgia		
Radiofrequency (RF) treatment of the Gasserian ganglion	2 B +	Recommended
Pulsed RF treatment of the Gasserian ganglion	2 B –	Negative recommendation
Cluster headache		
RF treatment of the pterygopalatine ganglion (sphenopalatinum)	2 C +	To be considered
Occipital nerve stimulation	2 C +	To be considered in specialized centers and study related
Persistant idiopathic facial pain		
Pulsed RF treatment of the ganglion pterygopalatinum (sphenopalatinum)	2 C +	To be considered
Cervical radicular pain		
Interlaminar epidural corticosteroid administration	2 B +	Recommended
Transforaminal epidural corticosteroid administration	2 B –	Negative recommendation
RF treatment adjacent to the cervical ganglion spinale (DRG)	2 B +	Recommended
Pulsed RF treatment adjacent to the cervical ganglion spinale (DRG)	1 B +	Recommended
Spinal cord stimulation	0	Study related in specialized centers
Cervical facet pain		
Intra-articular injections	0	Study related
Therapeutic (repetitive) cervical ramus medialis (medial branch) of the ramus dorsalis block (local anesthetic with or without corticosteroid)	2 B +	Recommended
RF treatment of the cervical ramus medialis (medial branch) of the ramus dorsalis	2 C +	To be considered
Cervicogenic headache		
Injection of nervus occipitalis major with corticosteroid + local anesthetic	1 B +	Recommended
Injection of atlanto-axial joint with corticosteroid + local anesthetic	2 C –	Negative recommendation
RF treatment of the cervical ramus medialis (medial branch) of the ramus dorsalis	2 B ±	To be considered
Pulsed RF treatment of the cervical ganglion spinale (DRG) (C2–C3)	0	Study related
Whiplash-associated disorders		
Botulinum toxin type A	2 B –	Negative recommendation
Intra-articular corticosteroid injection	2 C –	Negative recommendation
RF treatment of the cervical ramus medialis (medial branch) of the ramus dorsalis	2 B +	Recommended

MEDICINA UTEMELJENA NA DOKAZIMA
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Table 2. Continued.

Occipital neuralgia		
Single infiltration of the nervi occipitales with local anesthetic and corticosteroids	2 C +	To be considered
Pulsed RF treatment of the nervi occipitales	2 C +	To be considered
Pulsed RF treatment of the cervical ganglion spinale (DRG)	0	Study related
Subcutaneous stimulation of the nervi occipitales	2 C +	To be considered in specialized centres
Botulinum toxin A injection	2 C ±	Only study related
Painful shoulder complaints		
Corticosteroid injections	2 B ±	To be considered
Continuous cervical epidural infusion	2 C +	To be considered
Pulsed RF treatment of the nervus suprascapularis	2 C +	To be considered
Thoracic pain		
Intercostal block	0	Study related
RF treatment of thoracic ganglion spinale (DRG)	2 C +	To be considered
Pulsed RF treatment of thoracic ganglion spinale (DRG)	2 C +	To be considered
Lumbosacral radicular pain		
Interlaminar epidural corticosteroid administration	2 B ±	To be considered
Transforaminal epidural corticosteroid administration in "contained herniation"	2 B +	Recommended
Transforaminal epidural corticosteroid administration in "extruded herniation"	2 B –	Negative recommendation
RF lesioning adjacent to the lumbar ganglion spinale (DRG)	2 A –	Negative recommendation
Pulsed RF treatment adjacent to the lumbar ganglion spinale (DRG)	2 C +	To be considered
Spinal cord stimulation (FBSS only)	2 A +	Recommended in specialized centers
Adhesiolysis—epiduroscopy	2 B ±	To be considered in specialized centers
Pain originating from the lumbar facet joints		
Intra-articular corticosteroid injections	2 B ±	To be considered
RF treatment of the lumbar rami mediales (medial branches) of the dorsal ramus	1 B +	Recommended
Sacroiliac joint pain		
Therapeutic intra-articular injections with corticosteroids and local anesthetic	1 B +	Recommended
RF treatment of rami dorsales and rami laterales	2 C +	To be considered
Pulsed RF treatment of rami dorsales and rami laterales	2 C +	To be considered
Cooled / RF treatment of the rami laterales	2 B +	Recommended
Coccygodynia		
Local injections corticosteroids/local anesthetic	2 C +	To be considered
Intradiscal corticosteroid injections, ganglion impar block, RF ganglion impar, caudal block	0	Study related
Neurostimulation	0	Study related
Discogenic low back pain		
Intradiscal corticosteroid administration	2 B –	Negative recommendation
RF treatment of the discus intervertebralis	2 B ±	To be considered
Intradiscal electrothermal therapy	2 B ±	To be considered
Biacuplasty	0	Study related
Disctrode	0	Study related
RF of the ramus communicans	2 B +	Recommended
Complex regional pain syndrome		
Intravenous regional block guanethidine	2 A –	Negative recommendation
Ganglion stellatum (stellate ganglion) block	2 B +	Recommended
Lumbar sympathetic block	2 B +	Recommended
Plexus brachialis block	2 C +	To be considered
Epidural infusion analgesia	2 C +	To be considered
Spinal cord stimulation	2 B +	Recommended in specialized centers
Peripheral nerve stimulation	2 C +	To be considered in specialized centers
Herpes zoster and post-herpetic neuralgia		
Interventional pain treatment of acute herpes zoster		
Epidural corticosteroid injections	2 B +	Recommended
Sympathetic nerve block	2 C +	To be considered

Table 2. Continued.

Prevention of PHN		
One-time epidural corticosteroid injection	2 B –	Negative recommendation
Repeated paravertebral injections	2 C +	To be considered
Sympathetic nerve block	2 C +	To be considered
Treatment of PHN		
Epidural corticosteroid injections	0	Study related
Sympathetic nerve block	2 C +	To be considered
Intrathecal injection	?	
Spinal cord stimulation	2 C +	To be considered in specialized centers
Painful diabetic polyneuropathy		
Spinal cord stimulation	2 C +	To be considered in specialized centers
Carpal tunnel syndrome		
Local injections with corticosteroids	1 B +	Recommended
Pulsed RF treatment median nerve	0	Study related
Meralgia paresthetica		
Lateral femoral cutaneous nerve (LFCN) infiltration with local anesthetic ± corticosteroid	2 C +	To be considered
Pulsed RF treatment of LFCN	0	Study related
Spinal cord stimulation	0	Study related in specialized centers
Phantom pain		
Pulsed RF treatment of the stump neuroma	0	Study related
Pulsed RF treatment adjacent to the spinal ganglion (DRG)	0	Study related
Spinal cord stimulation	0	Study related in specialized centers
Traumatic plexus lesion		
Spinal cord stimulation	0	Study related in specialized centers
Pain in patients with cancer		
Epidural and intrathecal administration of analgesics		
Intrathecal medication delivery	2 B +	Recommended
Epidural medication delivery	2 C +	To be considered
Unilateral oncologic pains below the shoulder or dermatome C5		
Cervical cordotomy	2 C +	To be considered in specialized centers
Upper abdominal pain due to cancer of the pancreas/stomach		
Neurolytic plexus coeliacus block	2 A +	To be considered
Neurolytic nervus splanchnicus block	2 B +	Recommended
Visceral pain due to pelvic tumors		
Neurolytic plexus hypogastricus block	2 C +	Recommended
Perineal pain due to pelvic tumors		
Intrathecal phenolization of lower sacral roots of cauda equina	0	Study related
Spinal pain due to vertebral compression fractures		
Vertebroplasty	2 B +	Recommended
Kyphoplasty	2 B +	Recommended
Chronic refractory angina pectoris		
Spinal cord stimulation	2 B +	Recommended in specialized centers
Ischemic pain in the extremities and Raynaud's phenomenon		
Ischemic vascular disease		
Sympathectomy	2 B ±	To be considered
Spinal cord stimulation	2 B ±	To be considered in specialized centers
Raynaud's phenomenon		
Sympathectomy	2 C +	To be considered
Pain in chronic pancreatitis		
RF nervus splanchnicus block	2 C +	To be considered
Spinal cord stimulation	2 C +	To be considered in specialized centers

UMJESTO ZAKLJUČKA

- Invazivni zahvati u liječenju kronične boli namjenjeni su manjem broju bolesnika s kroničnom boli
- Jaka i vrlo jaka bol su indikacija da intervencijsko liječenje kronične boli bude prva opcija u liječenju boli
- Potrebno je imati opremu prostor i educirano osoblje
- Svakog trenutka morate znati što radite, ako niste sigurni ili ne možete tehnički ispravno učiniti zahvat, provjerite položaj bolesnika, te položaj fluoroskopa
- Bolja selekcija bolesnika za pojedini zahvat znači bolji uspjeh liječenja

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