

# TREATMENT OF THERAPEUTICALLY RESISTANT LUMBOSACRAL PAIN WITH THE INTERVENTIONAL PERCUTANEOUS RADIOFREQUENCY METHOD

BORYS PAVLOV,  
VOLODYMYR ROMANENKO

NEUROSPINE CLINIC. Kyiv. Ukraine



# Conflict of Interest Disclosure Form

Name	BORYS	Surname	PAVLOV	State	UKRAINE
------	-------	---------	--------	-------	---------

Please indicate if you have a conflict of interest arising from any type of interaction with a pharmaceutical company or a manufacturer of medical equipment or health products.

<input checked="" type="checkbox"/>	No conflict of interest
<input type="checkbox"/>	There is a conflict of interest

## Off-Label drug use

Will you talk about off-label use of a drug or product?	
<input checked="" type="checkbox"/>	No
<input type="checkbox"/>	Yes

# A bit of history...



- 1950 first device for radio frequency destruction / BD Cosman & ER Cosman
- 1974 RF is used to treat pain
- 1981 introduction of special cannulas expands indications for RF
- 1998 beginning of PRF (pulse radiofrequency )

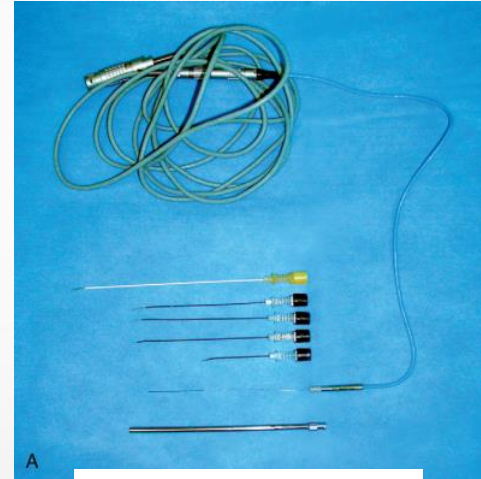
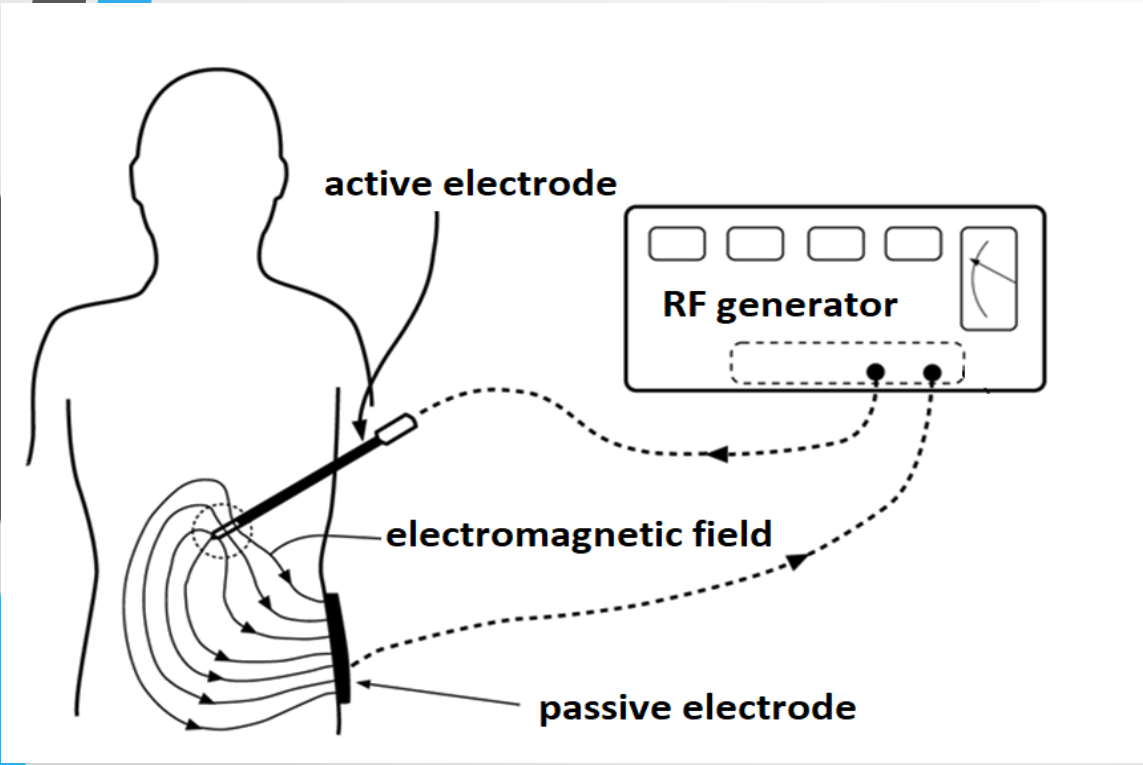


<https://comedical.nl/products-cosman-medical/>

# Scheme of RF-execution



B



A

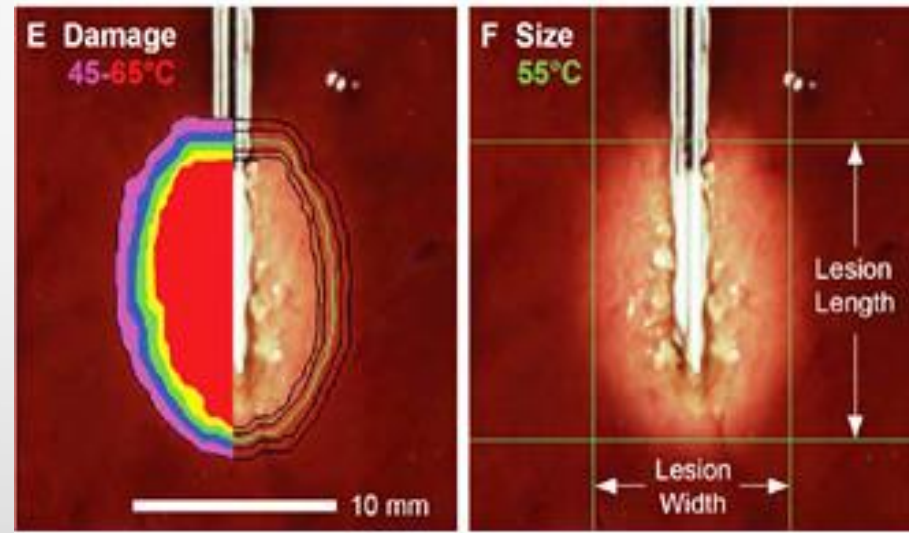


Charles D. Gauci. *Manual of RF technique*. 2008  
James P. Rathmell. *Atlas of Image-guided intervention in regional anesthesia and pain management*. 2011

# FEATURES OF PROCEDURE



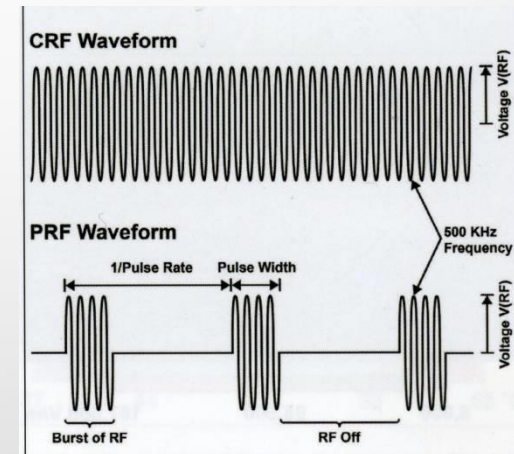
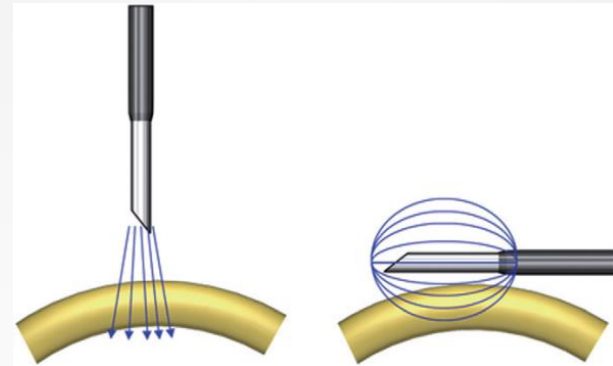
- **RFA** - radiofrequency destruction ( $t=60-80^{\circ}\text{C}$  - coagulative necrosis).
- **PRF** - pulsed radiofrequency ( $t\leq 42^{\circ}\text{C}$  - change in electrical conductivity of tissues).



<https://comedical.nl/products-cosman-medical/>

## Pulsed mode - PRF

- Introduced into practice in the mid-90s by Cosman
- The generator produces "bursts" of pulses at a frequency of 500 kHz with a duration of 20 ms and at intervals of 480 ms
- Large intervals do not allow the tissues to heat up above 40-42°C



Kim DH, Kim Y-C, Kim K-H. Minimally invasive percutaneous spinal techniques. 2011

Charles D. Gaudi. Manual of RF technique. 2008

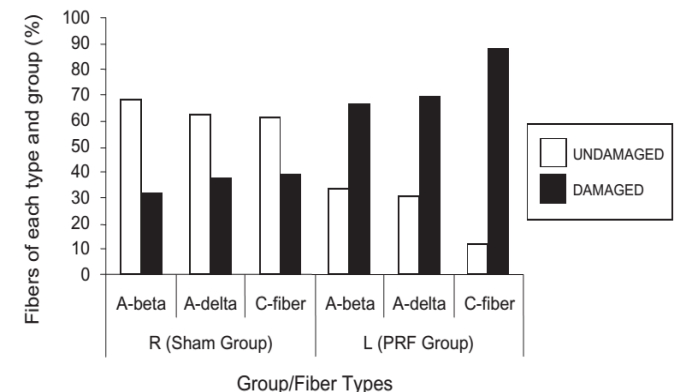
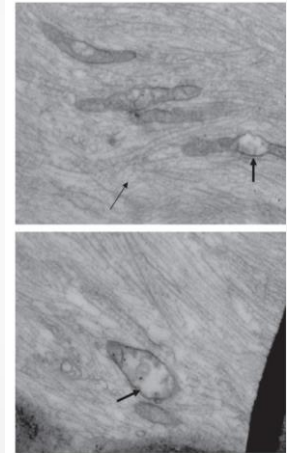
# PRF causes damage to cellular microstructures

The intrinsic ultrastructural components of axons have been found to show microscopic damage after exposure to PRF, including: membranes and mitochondrial morphology, and disruption - disorganization of microfilaments and microtubules. Damage is more pronounced for C-fibers than for A-delta and A-beta fibers.

## ORIGINAL ARTICLE

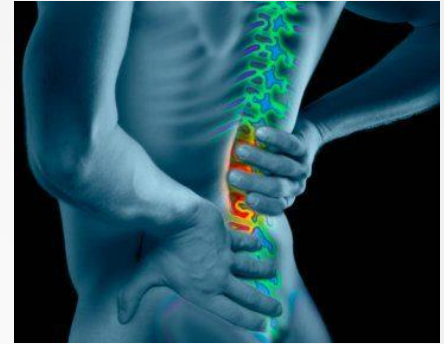
### Ultrastructural Changes in Axons Following Exposure to Pulsed Radiofrequency Fields

Serdar Erdine, MD\*; Ayhan Bilir, MD<sup>1</sup>; Eric R. Cosman Sr., PhD<sup>5</sup>;  
Eric R. Cosman Jr., PhD<sup>1</sup>



*Erdine S, Belir A, Cosman ER. Ultrasound changes in axons following exposure to pulsed radiofrequency fields. Pain practice. 2009.*

# EPIDEMIOLOGY



Prevalence of the lower back pain (LBP) in developed countries has the size of a pandemic and is serious not only medical, but and socio-economic problem as well. In the USA and countries of Western Europe, the prevalence of LBP reaches 40–80%, and the annual incidence- 5 %. It is the second most common (after respiratory diseases) the reason for going to the doctor and the third- by the frequency of hospitalizations.

*Chistik T. Pain in the lower back: diagnostic algorithms and effective treatment. Pain'. Joints. Spine .2015*  
*Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians. Report of the Quebec Task Force on Spinal Disorders. Spine . 1987.*



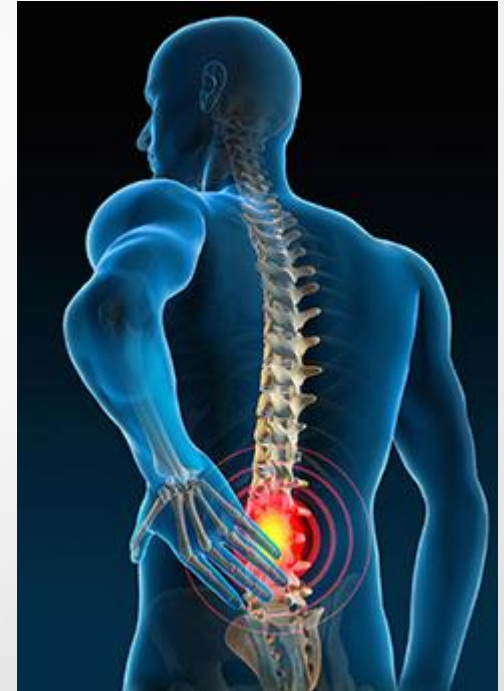
# LBP classification

## Specific (15%)

- **Protrusion / Extrusion of the disc**
- Spondylolisthesis
- Spinal stenosis
- Segmental instability
- Infections, tumors, fractures etc.

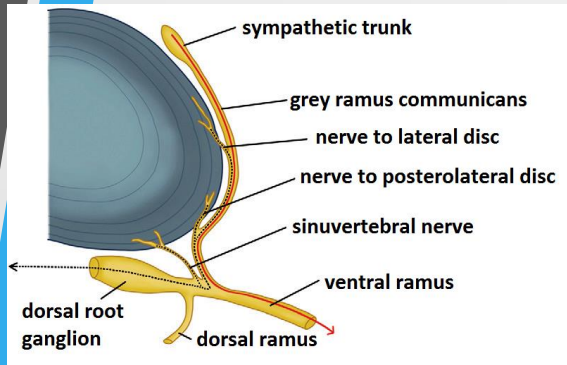
## Non-specific (85%)

## Radicular (5%)



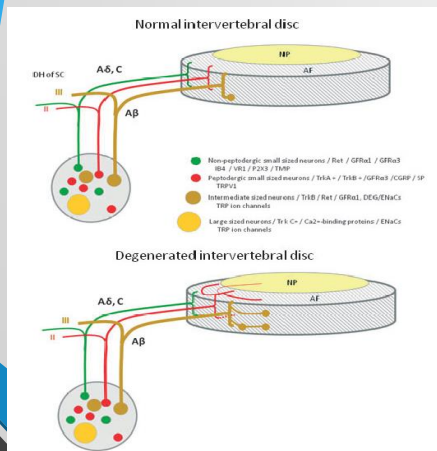
*Spitzer et al. Scientific approach to the assessment and management of activity-related spinal disorders. 1987*

# INNERVATION OF THE INTERVERTEBRAL DISC



Kim DH, Kim Y-C, Kim K-H. Minimally invasive percutaneous spinal techniques. 2011

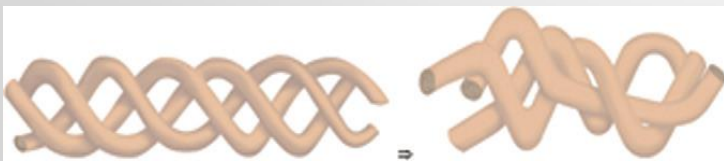
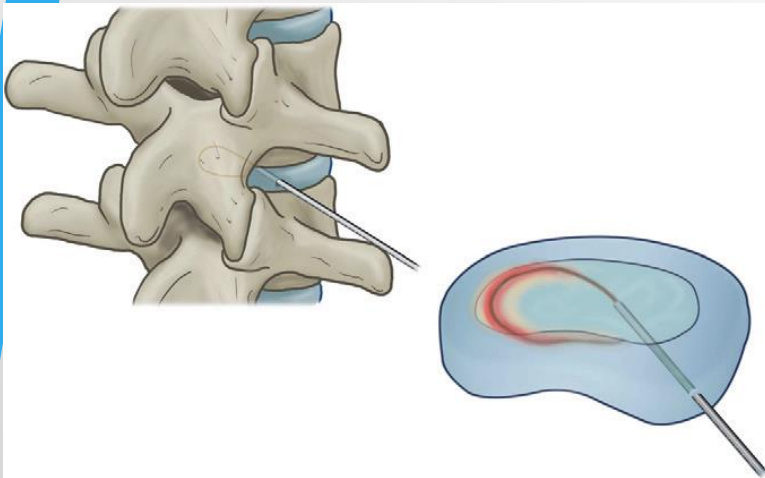
- ❑ The connection of lumbar pain with IVD irritation was established by C. Hirsch and K. Lindblom in 1948. Later, the data were refined by N. Bogduk.
- ❑ During the disc degeneration, not only the germination of nerve fibers in the central sections of the disc is observed, but also an increase in the density of its innervation.
- ❑ In the nerve fibers of the disc and in the spinal nodes, immunoreactivity to substance P was found, i.e. at least some of the fibers and receptors of the disc are nociceptive and their stimulation can be a source of discogenic pain.
- ❑ An inflammatory response (experimentally) can lead to a change in the phenotype of neurons, as a result of which most of them become nociceptive.



Coppes MH, Marani E, Thomeer RT, Groen GJ. Innervation of "painful" lumbar discs. Spine.1997

C. Hirsch, K. Lindblom. 1948  
 N. Bogduk. 1980  
 Roberts S et al. 1995  
 Coppes MH. et al 1997  
 Brown MF. et al 1997  
 Fagan A. et al 2003  
 Aoki Y. et al 2004

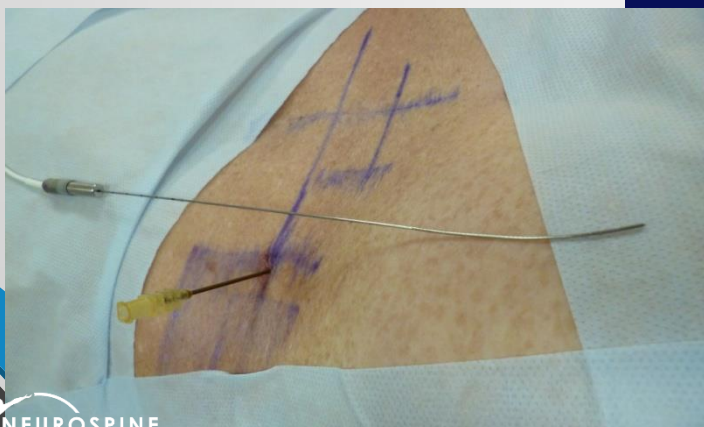
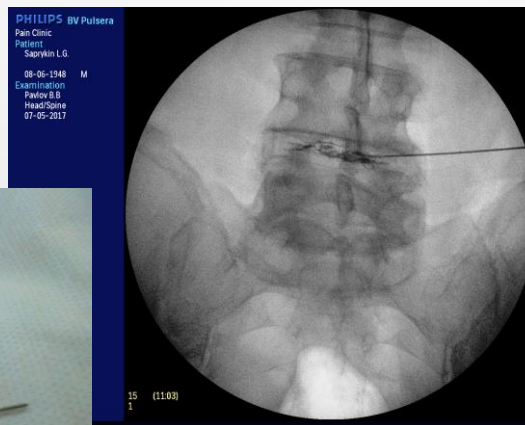
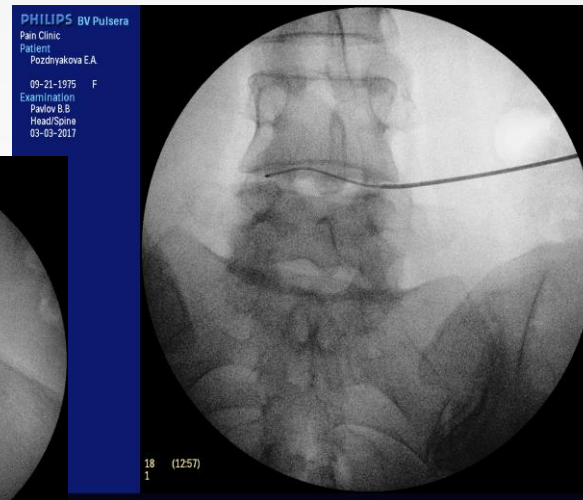
# IDET – INTRADISCAL ELECTROTHERMAL THERAPY



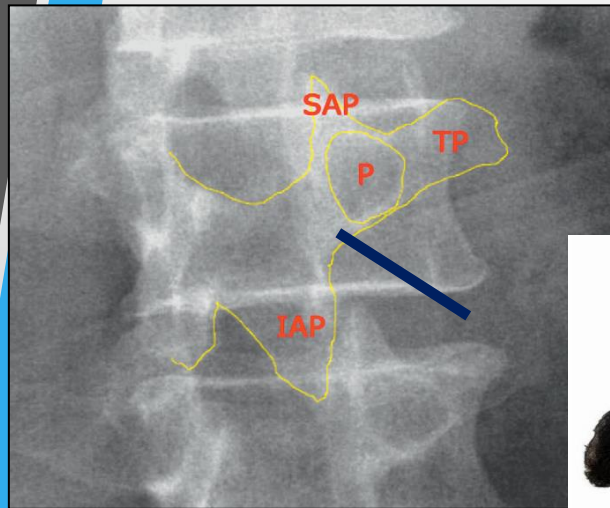
- A minimally invasive method for releasing heat energy into the intervertebral disc.
- Radiofrequency electrode catheter system (DiscTRODE, FlexTRODE) uses heat to coagulate, dereceptive, and decompress the disc.
- Stepwise (120 - 240 s) increase in t from 50° to 65°C.

*Kim DH, Kim Y-C, Kim K-H. Minimally invasive percutaneous spinal techniques. 2011*

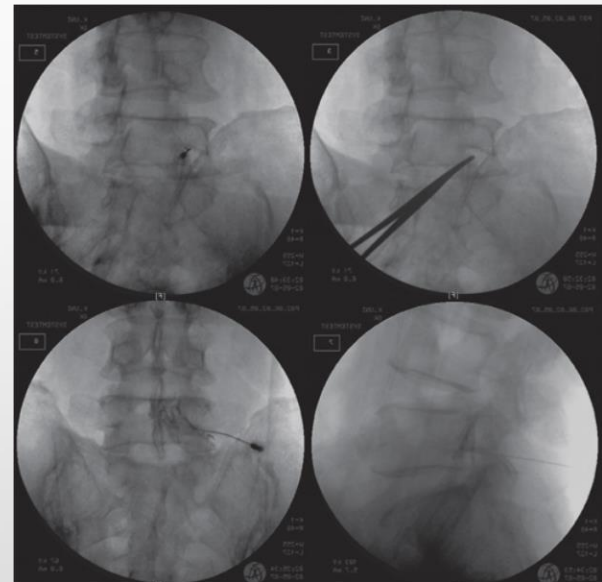
# IDET (operation theater)



# RADICULAR PAIN. X-RAY ANATOMY / TUNNEL VISION

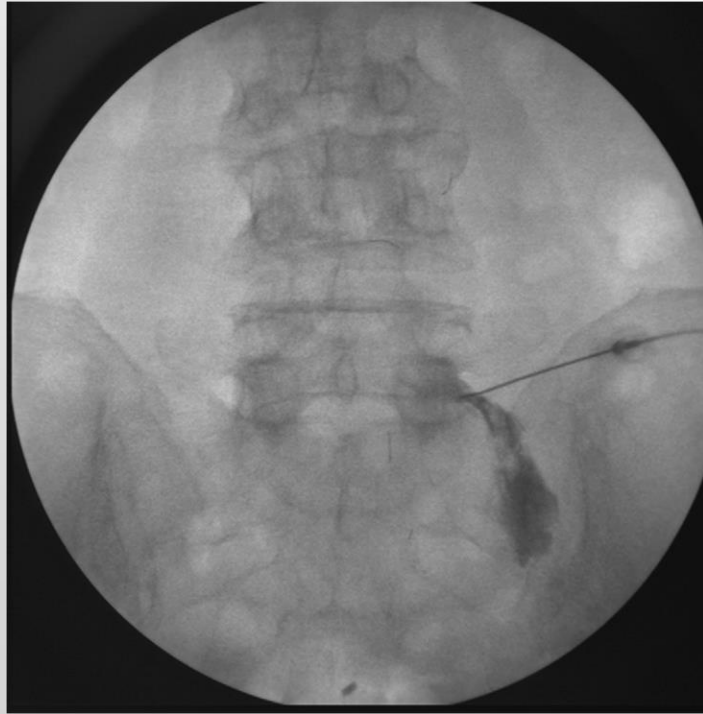


- SAP- superior articular process
- IAP- inferior articular process
- P- pedicle
- TP- transversus process



Michael B. Furman, *Atlas Of Image-Guided Spinal Procedures*. 2018

## PRF DRG (operation theater)



- The spine root is contrasted.
- $t = 42^{\circ}\text{C}$
- Two series of 120 s

## OPERATION THEATER



- Manipulations are performed on an outpatient basis, in an operating room, under fluoroscopic (C-arm) control. Monitoring of indicators of vital functions is carried out.



## PROBLEM...

- PRF - pulsed radiofrequency of the dorsal root ganglion leads to a fairly long-term effect, but does not eliminate the mechanical cause of pain - a degenerative altered intervertebral disc.
- IDET - intradiscal electrothermal therapy directly affects the intervertebral disc, changing its structure and reducing intradiscal pressure. However, the pain manifestations of radiculopathy itself regress later, which cannot but worsen the patient's quality of life.





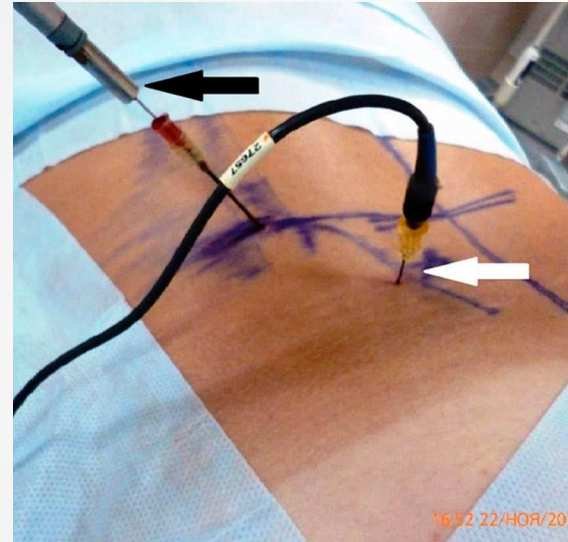
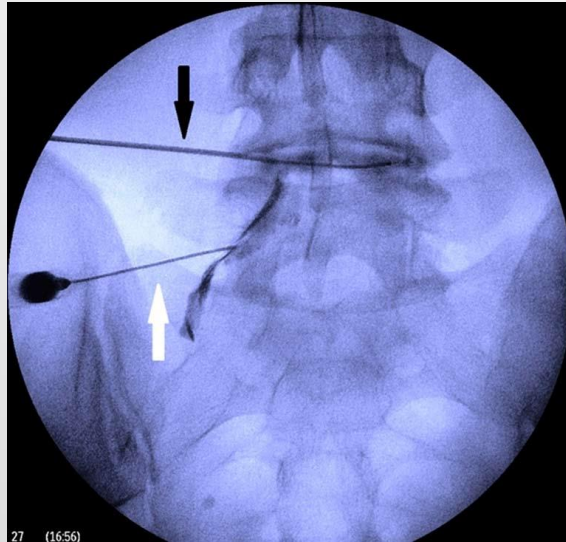
## COMBINED RF-ACTION (protocol)

The combined action protocol consists of two parts, which are performed simultaneously. The first part is to perform thermocoagulation (IDET). High-frequency current (500 kHz) is supplied to the intradiscally installed electrode-catheter in a constant mode. In this case, the working part of the catheter is heated stepwise: 50°C for 120 s, 55°C for 120 s, 60°C for 120 s, and 65°C for 240 s. Thus, thermal modification of collagen fibers and deactivation of nociceptors are achieved. The second part (PRF DRG) was performed in a pulse mode, which, due to its influence primarily on nerve C-fibers, reduces the conduction of a pain impulse. Two series were performed, lasting 120 s each, during which the temperature of the electrode tip should not exceed 42°C. Pulses with a frequency of 500 kHz, the duration of each is 2 ms.

*Pavlov B. Combined radiofrequency treatment of lumbar discogenic radiculopathies. Ukrainian Neurosurgical Journal. 2018;(3).*

*Pavlov B, Romanenko V. Interventional combined radiofrequency method in the treatment of chronic lumbosacral radicular pain associated with moderate disc herniation. Georgian Medical News. 2022. No 2 (323).*

# COMBINED RF-ACTION (X-ray film, operation theater)



IDET L<sub>4</sub>-L<sub>5</sub> and left PRF DRG L<sub>4</sub> on the. Photo of the intraoperative fluorogram in AP and the appearance of the surgical field (black arrows indicate the intradiscal catheter for thermodiscoplasty, white arrows indicate the electrode for radiofrequency pulsed ablation of the posterior spinal root ganglion). Traces of radiopaque solution for provocative discography are visualized in the intervertebral space. The spinal root L<sub>4</sub> is also contrasted.

*Pavlov B. Combined radiofrequency treatment of lumbar discogenic radiculopathies. Ukrainian Neurosurgical Journal. 2018;(3).  
Pavlov B, Romanenko V. Interventional combined radiofrequency method in the treatment of chronic lumbosacral radicular pain associated with moderate disc herniation. Georgian Medical News. 2022. No 2 (323).*



МІНІСТЕРСТВО  
ЕКОНОМІЧНОГО  
РОЗВИТКУ І ТОРГІВЛІ  
УКРАЇНИ

УКРАЇНА

(19) UA (11) 128574 (13) U  
(51) МПК  
A61B 17/56 (2006.01)

(12) ОПИС ДО ПАТЕНТУ НА КОРИСНУ МОДЕЛЬ

(21) Номер заявки:	u 2018 03366	(72) Винахідник(и):	Смоланка Володимир Іванович (UA), Федурця Василь Матвійович (UA), Павлов Борис Борисович (UA)
(22) Дата подання заявки:	30.03.2018	(73) Власник(и):	ДЕРЖАВНИЙ ВИЩИЙ НАВЧАЛЬНИЙ ЗАКЛАД "УЖГОРОДСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ", вул. Підгірна, 46, м. Ужгород, 85000 (UA)
(24) Дата, з якої є чинним права на корисну модель:	25.09.2018		
(46) Публікація відомостей про видачу патенту:	25.09.2018, Бюл.№ 18		

(54) СПОСІБ ЛІКУВАННЯ ДИСКОВЕНОЇ РАДИКУЛОПАТІЇ В ПОПЕРЕКОВОМУ ВІДДІЛІ ХРЕБТА РАДІОЧАСТОТНИМ ІНТЕРВЕНЦІЙНИМ МЕТОДОМ

(57) Реферат:

Спосіб лікування дискової радикулопатії в поперековому відділі хребта радіочастотним інтервенційним методом включає проведення пацієнту пункційної внутрішньо-дискової електротермальної терапії та пульсової радіочастотної абляції ганглія заднього спінального корінця. Використовують радіочастотний вплив на корінець і одночасно виконують термальну інтервенційну радіочастотну обробку безпосередньо міжребцевого диска.

UA 128574 U

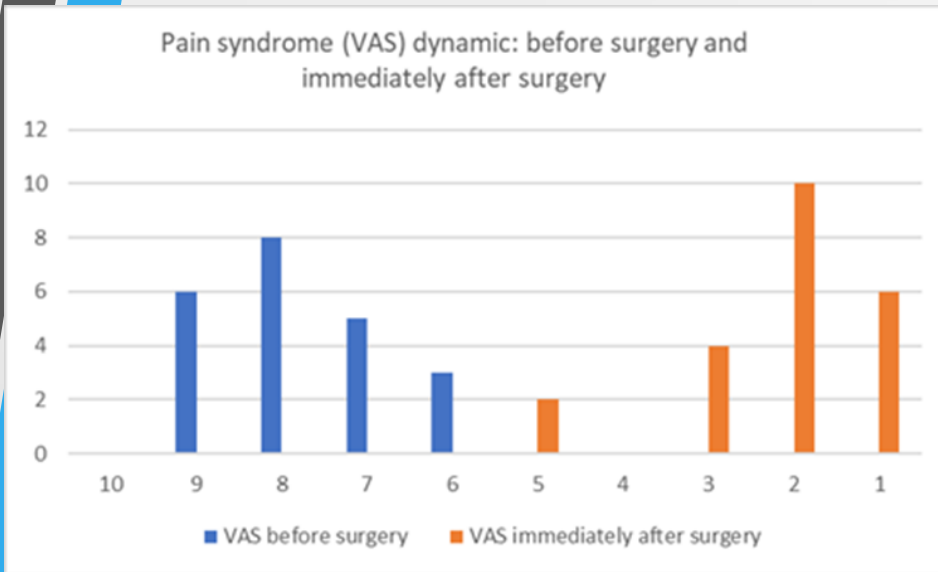
UA 128574 U

5. S Erdine, A Bilir, ER Cosman Sr, ER Cosman Jr. Ultrastructural changes in axons following exposure to pulsed radiofrequency fields. Pain Practice. Volume 9, Issue 6, 2009.

ФОРМУЛА КОРИСНОЇ МОДЕЛІ

- 5 Спосіб лікування дискової радикулопатії в поперековому відділі хребта радіочастотним інтервенційним методом, що включає проведення пацієнту пункційної внутрішньо-дискової електротермальної терапії та пульсової радіочастотної абляції ганглія заднього спінального корінця, який відрізняється тим, що використовують радіочастотний вплив на корінець і одночасно виконують термальну інтервенційну радіочастотну обробку безпосередньо міжребцевого диска.

# RESULTS

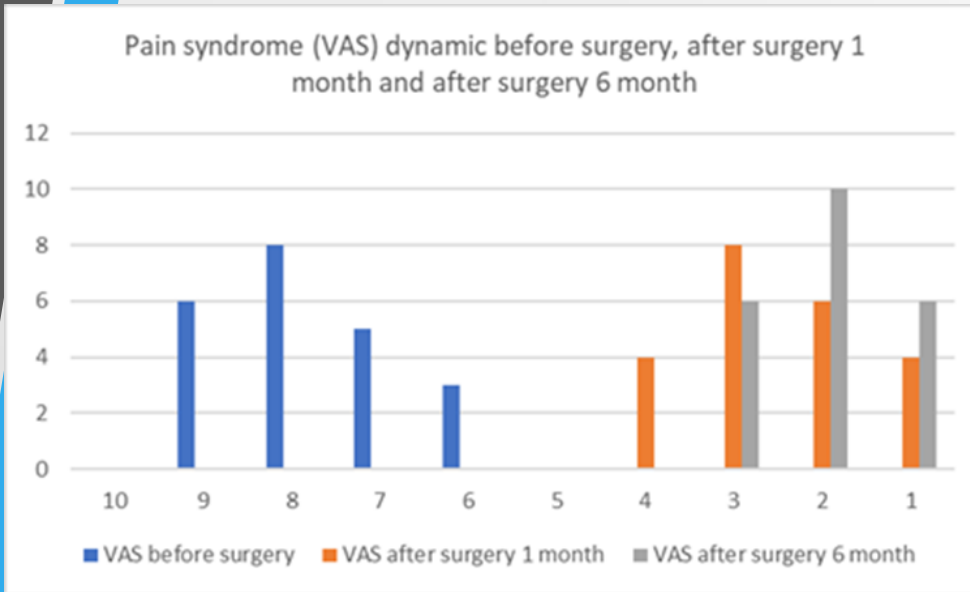


The severity of the pain syndrome before and immediately after the operation (visual analog scale, 1987)

The results of treatment were evaluated by pain visual analog scale (VAS) and disability index Oswestry (ODI). The main criteria evaluations of treatment results were pain intensity and dynamics of social adaptation. An assessment has been made indicators before treatment, directly after the manipulation, after 1 month and after 6 months.

Complications during operations and after them were not observed. Significant analgesic effect observed immediately after intervention. Most patients in preoperative period were characterized their pain as "terrible, leading to distress," rating them from 6 to 9 VAS ( $Me = 7.77 \pm 1.02$ ). And already on the first day after surgery maximum number of patients described the pain as "weak, but troubling", which corresponds from 1 to 5 VAS ( $Me = 2.54 \pm 1.01$ ). Often these had uncomfortable feelings myogenic character, caused inevitable soft tissue injury during access.

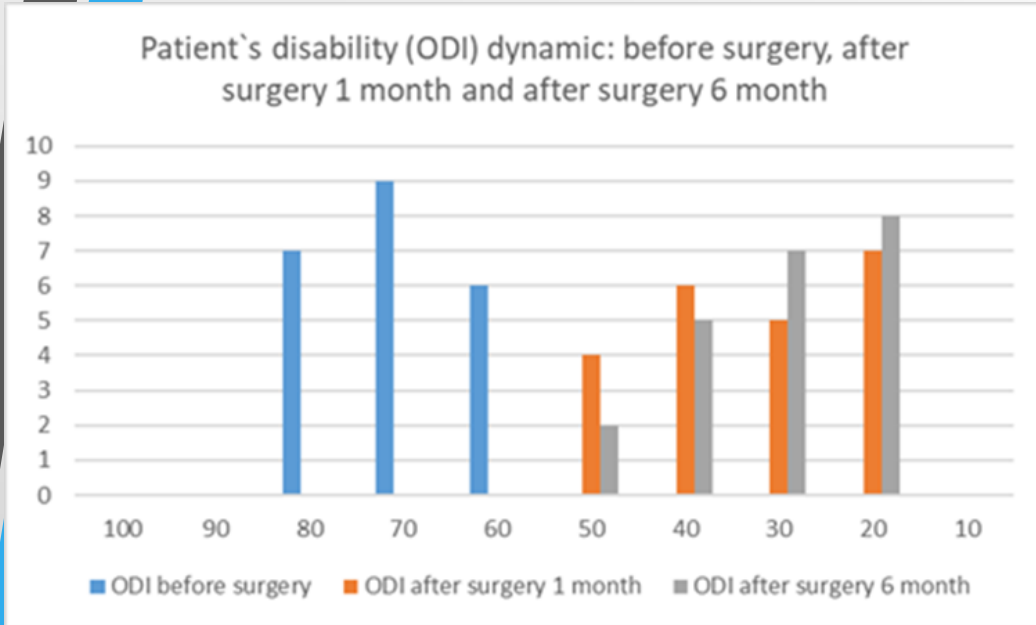
# RESULTS



Severity of pain syndrome before surgery and 1 and 6 months after surgery (visual analogue scale, 1987)

Treatment's results in 1 month after the operation testified about maintaining a downward trend pain syndrome: more than 60% operated were celebrated almost complete absence of disturbing sensations, and about a third of patients characterized the pain as "weak" (**VAS Me = 2.18 ± 1.01**). Similar result was kept for 6 months when patients evaluated their own pain according to VAS from 1 to 3 (**Me = 2.0 ± 0.75**).

# RESULTS



Data dynamics before surgery and 1 and 6 months after surgery according to Oswestry Low Back Pain Disability Questionnaire (1980)

Worthy of attention, in our opinion, data obtained using Oswestry Low Back Pain Disability. So, before treatment disability was determined in patients range from 60 to 80 points on the **ODI (Me = 70.45 ± 7.85)**, which is sufficient low vital energy. And already in 1 month after surgery most patients could stay much longer in vertical position, which allowed them to participate in public life, and also make long trips. Many of the patients could care without using analgesics. A significant part of the researched noted the normalization of sleep (**Me ODI = 33.18 ± 11.29**). This trend continued after 6 months: until the end of our period observation of patients characterized the degree of social adaptability by **ODI** in the range of 20 up to 50 points (**Me = 30.45 ± 9.98**)

# CONCLUSION

- Combined use of IDET and PRF DRG is effective and safe method for treatment of chronic (therapeutic resistant) lumbar radicular pain associated with protrusions intervertebral discs.



# COLLEAGUES ARE INTERESTED IN:

★ James Parker | Neurology 2020 — **RE:Combined radiofrequency for the treatment of lumbar discogenic radiculopathy**

Dear **Borys B. Pavlov**

We cordially invite you to attend a Speaker for ICNN 2020

Well in search of some renowned people, we found your interesting work online. So I would like to invite you to present your latest research article at CPD **Neurology & Neuroscience (ICNN 2020)**.

**Dates:** June 08-10, 2020  
**Venue Hotel:** Barcelona, Spain.

For detailed info: [Neurology\\_Conference](#)

I hope you will comeback with positive works.

Sincerely,  
James Parker  
Conference Coordinator | ICNN 2020  
Phone no: [+44 2034554929](tel:+442034554929)  
Whatsapp: [+44 7418344198](tel:+447418344198)

★ Spine Meeting — **Borys B. Pavlov - Combined radiofrequency for the treatment of lumbar discogenic radiculopathy** 2 DISCUSS

Dear Dr. Borys B. Pavlov,

Glad to reach out to you.

It is my great pleasure to announce you about the "6<sup>th</sup> World Congress on Spine and Spinal Disorders" slated on **April 23-24, 2021 at Dubai, UAE**.

Based on your expertise and publication relevancy of the research paper entitled **Combined radiofrequency for the treatment of lumbar discogenic radiculopathy**, we suggest you to join this global platform as a Speaker.

I do very much hope that you will be able to join this congress in Dubai.

For further information on Spine 2021 kindly go through the website [spine.cmesoci](#)

Please let us know at your convenience if you would be interested in giving a talk and with no hesitation kindly contact me if you have important questions.

We appreciate your time and awaiting for an affirmative response.

Warm Regards,

Ms. Luciana Alice  
General Chair | Spine 2021  
E: [spine\[at\]pulsusgathering\[dot\]com](mailto:spine[at]pulsusgathering[dot]com) | [spine\[at\]pulsusseries\[dot\]com](mailto:spine[at]pulsusseries[dot]com)  
P: [+44-203-769-1778](tel:+442037691778) | WhatsApp: [+44 3455280361](tel:+443455280361)  
[Twitter](#) | [Facebook](#) | [LinkedIn](#)

★ Neurology 2020 — **Combined radiofrequency for the treatment of lumbar discogenic radiculopathy** 3 DISCUSS

8 января 2020, 12:29:34

[Подробнее](#)

Dear Dr. Borys,

It is with great pleasure that we invite you to participate in the "9<sup>th</sup> International Conference on Neurological Disorders and Stroke" scheduled in the month of **February 28-29, 2020 at Rome, Italy**.

The overall theme of the conference is "**Innovations in Diagnosis, Therapeutics, and Rehabilitation of Neurological Disorders and Stroke**"

The conference will be a platform for Professors, Researchers to discuss the current situations, challenges, and advancements relating to Neurological Disorders and Stroke.

Knowing your research of "**Combined radiofrequency for the treatment of lumbar discogenic radiculopathy**", it is our privilege to invite you to be a part of our Global Gathering.

**Below are few of the benefits for being a Speaker in our Congress:**

1. Promotion of your Institute/Organization and research works at our event
2. Networking opportunities with eminent researchers and industrial contacts
3. We will include inserts (provided by you) in the conference delegate bags
4. We will include your University/Institution logo on the conference banners and books and in the conference website
5. Your Biography will be displayed in our conference website
6. Certificate of recognition during the conference for your contributions presented by our eminent Organizing Committee
7. Your Biography will be displayed in our conference website
8. Publication of your submitted Abstract in one of the International Journals with DOI number

ENDOSCOPIC SPINE FOUNDATION INDIA  
IN COLLABORATION WITH  
EGYPTIAN & WORLD NEUROSURGEONS  
COMMUNITY

JUBE  
Sana Foundation Inc

Transforaminal Endoscopic  
Spine Foundation India

PSLD

Date: 01/06/2022

**INVITATION LETTER**

Prof. Dr. Borys Pavlov  
Respected Sir

On behalf of the Organizing Committee of Endoscopic Spine Foundation India and Egyptian World Neurosurgeons Community, I take the pleasure to extend an invitation to participate in our Third World Congress on Endoscopic Spine Surgery.

For the past two years we have been conducting the conference on a virtual platform with participation of more than 40 eminent faculties from all across the globe and across 27 countries each year.

We now look forward to conducting this upcoming **THIRD WORLD CONGRESS** at Holy Spirit Hospital Mumbai.

The conference will be in a physical format and will be held at Mumbai tentatively on the 22/23/24 and 25th of September 2022 and an early response from your kind self will be highly appreciated.

Venue: Holy Spirit Hospital  
Mahaball Andheri Mumbai

Dates: Tentative 22/23/24/25 Sept 2022

- Pick up & Drop
- Stay at Four Star Hotels
- Food arrangements for participants will be provided by the congress.

**ENDOSCOPIC SPINE**  
FOUNDATION INDIA

We request your participation in our virtual session  
Your talk will be for 10 mins you will be addressing them in hall of the congress via zoom.

We will be proud to display your participation on our upcoming website in all our program schedulers and advertising materials.

So, Two topics of interest may please be decided by you to be shared with our scientific committee for final selection.

Looking forward to your participation in the congress

Regards,  
Prof. Dr. Malcom Pestoji  
Endoscopic spine foundation India  
Honorary Endoscopic Spine Surgeon Holy Spirit Hospital Mahaball Andheri (East) Mumbai.  
Orthopedic Endoscopic Spine Surgeon Golden Park Hospital Vashi  
Honorary Professor of Endoscopic Spine Surgery at Bharati International University & Kishidand Medical College Hospital.

Please do not hesitate to contact the Secretariat's Office  
Shirley Priyanka  
+91-9821018953 +91-7820948791

Please Visit Our Website For More Information:  
[www.endospinespine.com](http://www.endospinespine.com) | [www.endospinespine.com](http://www.endospinespine.com) | [www.endospinespine.com](http://www.endospinespine.com) | [www.endospinespine.com](http://www.endospinespine.com)



**SINCERELY AND EXTREMELY GRATEFUL!  
I APPRECIATE YOUR TIME AND ATTENTION!**



+380953740440

+380684740440

+380635740440



NEUROSPINE.UA



WWW.NEUROSPINE.CLINIC

