

Клиника лечения боли
зав. проф. Соков Е.Л.



Pain Management in Russia the Osteogenic Mechanisms of Pain and the Effectiveness of Intraosseous Blockades

EVGENY L. SOKOV

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Head of Pain Clinic

President of the Association of Pain Medicine Specialists

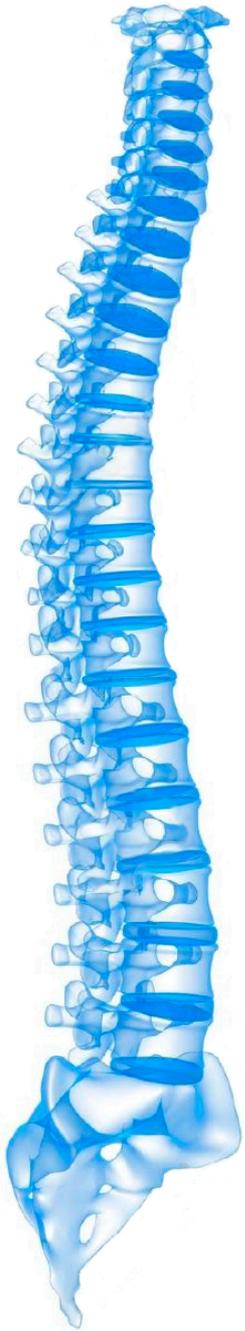
Member of IASP

Chronic pain is a pandemic of humanity

the high prevalence of chronic pain in the world

the number of pain syndromes in the world

is rapidly increasing



The US is the world leader in pain medicine.

In the US patients with chronic pain syndromes are registered,
pain mechanisms and methods of its treatment

are intensively studied,

a developed network of Pain Clinics is created,
systematic training and retraining of

pain medicine specialists is conducted,

pain treatment methods are available within

within the insurance,

direct and indirect costs of chronic pain in the

United States are about \$ 1 trillion,

many pain associations of doctors and patients

In Russia, there is no general statistical accounting of patients with chronic pain.

There is no unified training program for pain medicine specialists.

There are very few pain medicine courses in Russia

There are less than 40 pain clinics are registered in Russia.

Private clinics are engaged in the treatment of pain.

Certification of Pain Clinics is not carried out.

Only 10% of patients with lumbar pain undergo blockade before surgery.

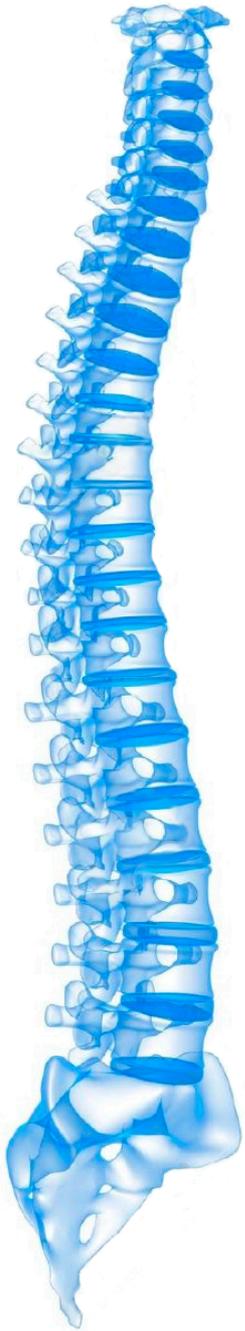
Our Department of Algology regularly trains doctors intraosseous and other blockades.

Pain medicine in Russia is just beginning to develop.

The most rapidly developing methods of pain treatment are interventional techniques and various blockades.

For 10 years, interventional methods of pain treatment have been used 3 times more often.

In US more than 20 million epidural and facet blockades are performed annually.



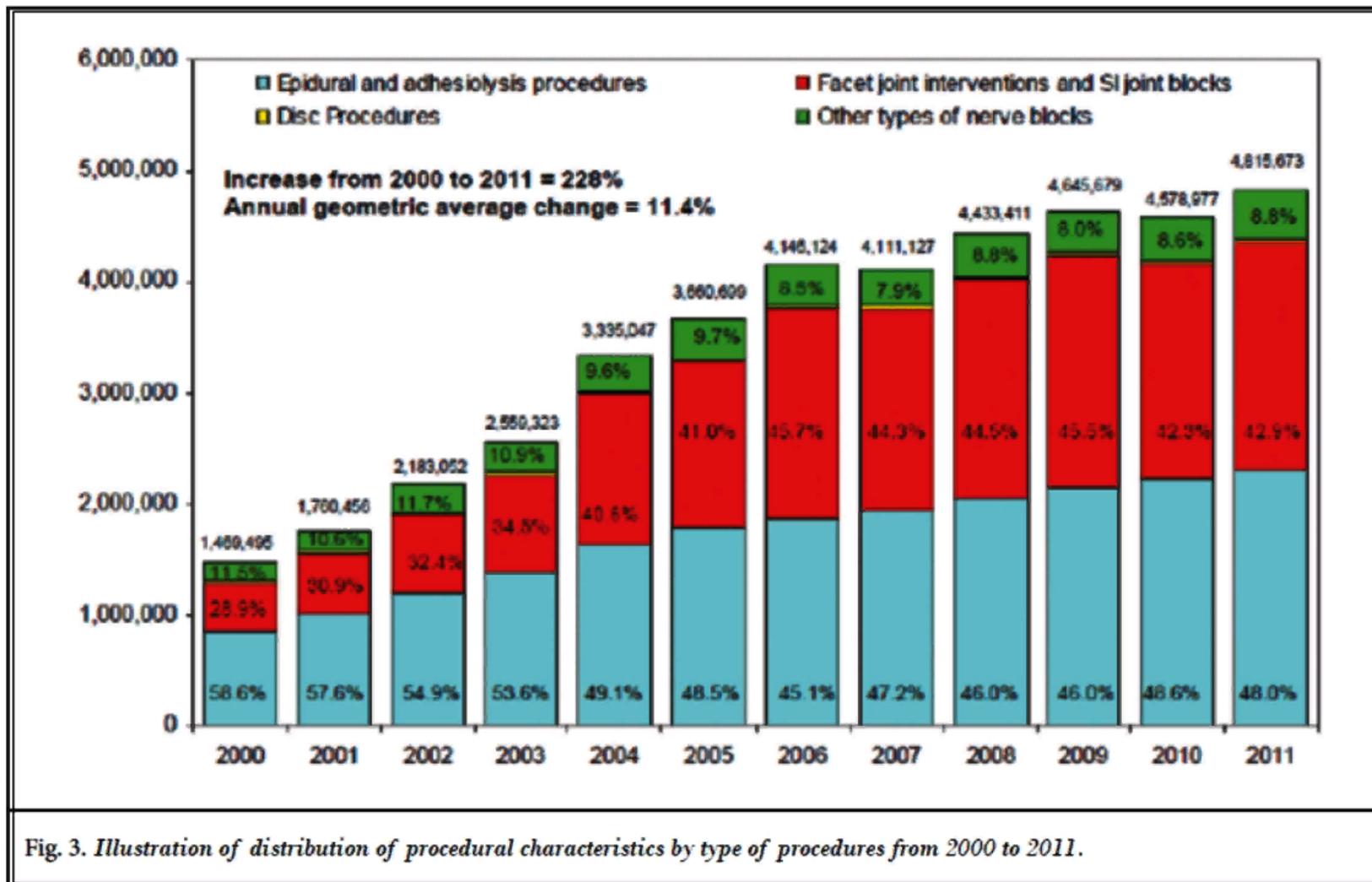
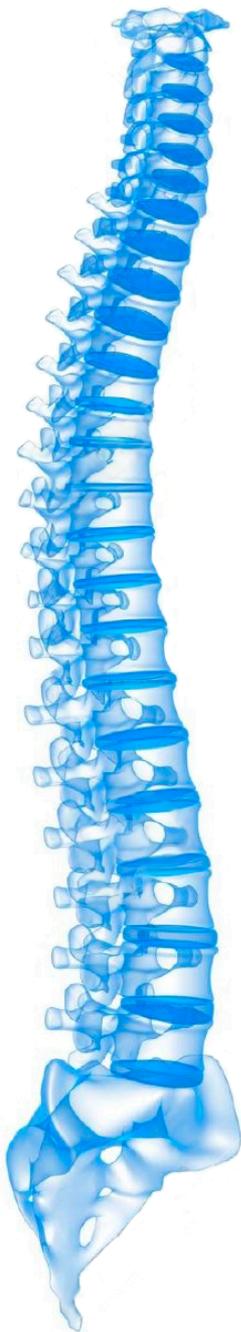


Fig. 3. Illustration of distribution of procedural characteristics by type of procedures from 2000 to 2011.

Usually blockades affect various tissues
other than bone

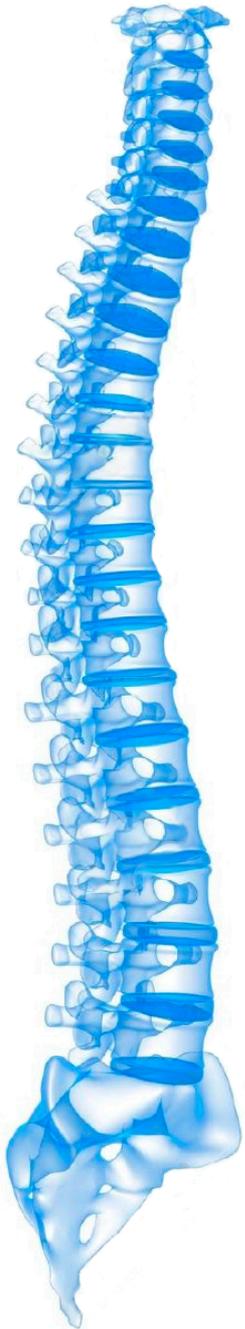
The role of bone tissue in the pathogenesis of pain syndrome is least studied.

Although the most severe pain is observed in
hematogenous osteomyelitis
sarcoma of the bone.

The introduction into the spongy bone
of saline under pressure causes severe pain.

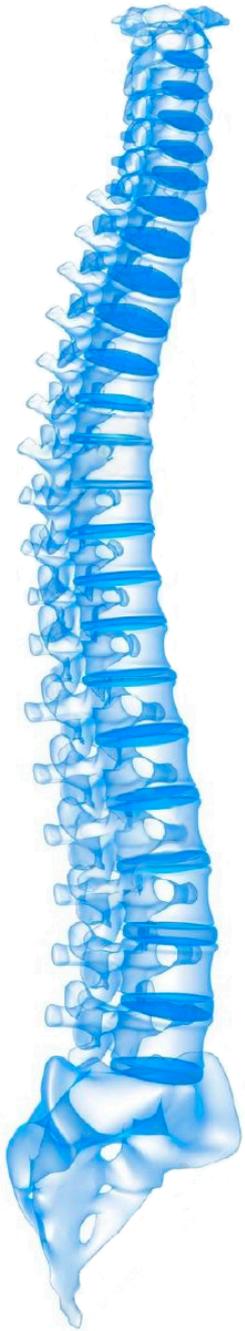
Bone puncture is carried out for:

1. Bone marrow biopsy
2. Venospondylography
3. Intraosseous administration of drug solutions
(analogue of intravenous administration)
4. Stimulation of reparative regeneration of a bone
5. Osteoreflexotherapy
6. Intraosseous blockades
7. Intraosseous infusion for pain treatment

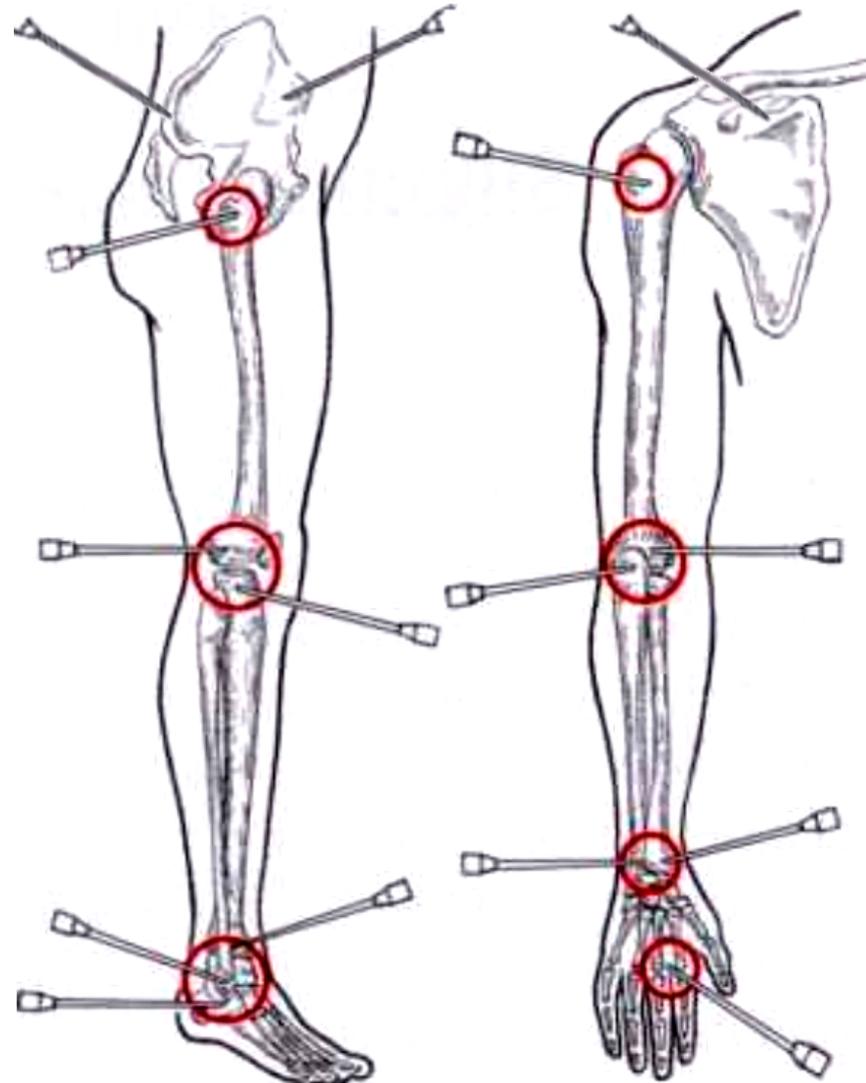
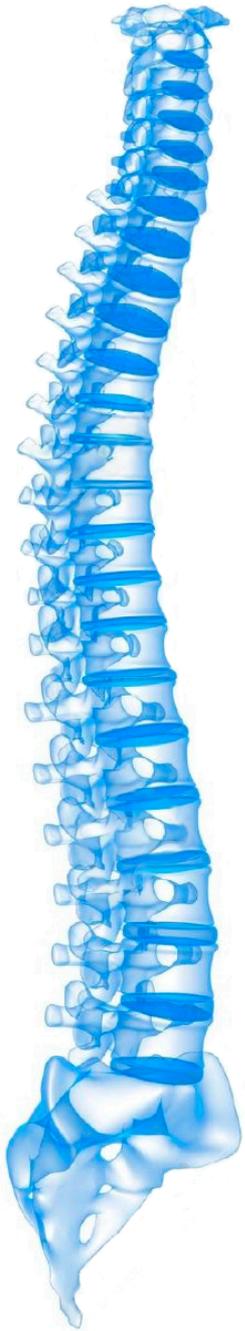


Intraosseous blockade and infusions are a type of intraosseous drug administration.

Intraosseous infusions are now widely used in emergency medicine for parenteral administration of drugs, as an analogue and substitute for intravenous administration.



Places for intraosseous infusions

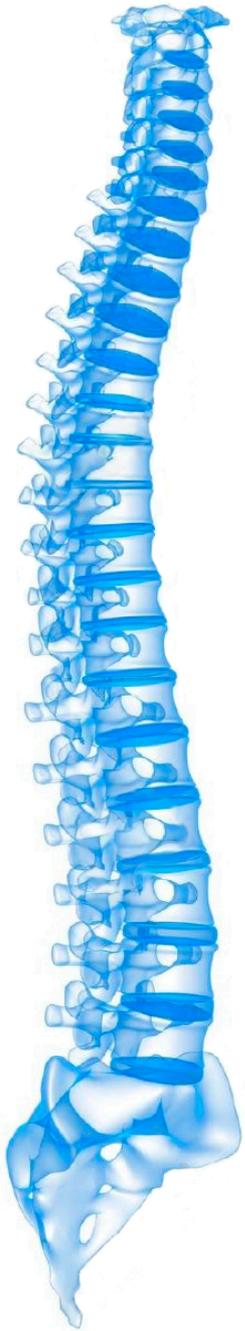


Bone injections and infusions in military



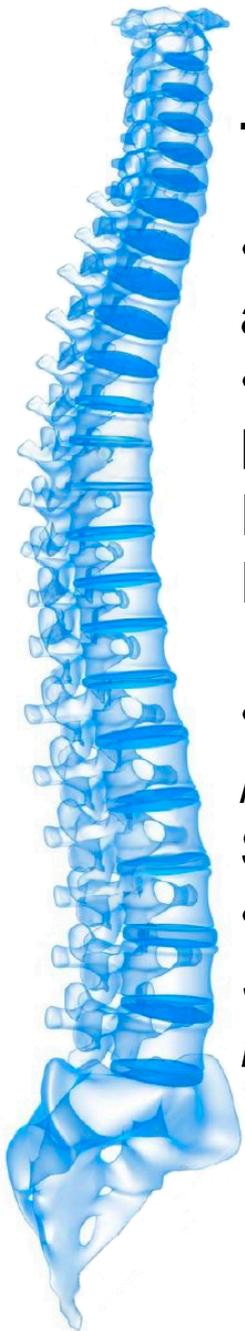
However, intraosseous blockades and infusions are rarely used for the purpose of treatment of pain syndromes.

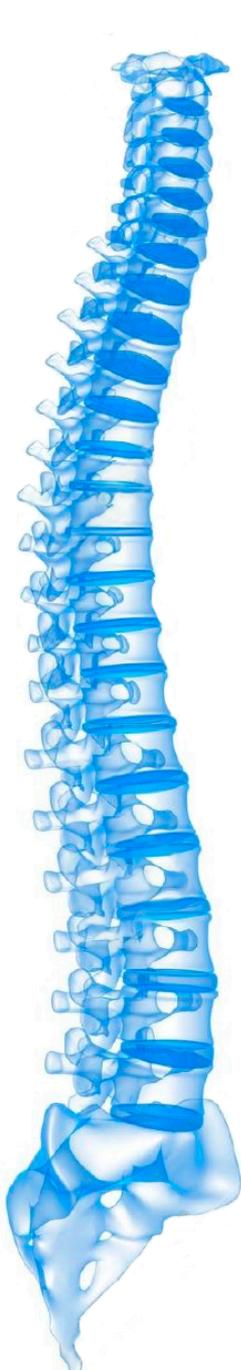
This is due to a lack of understanding of the important role of bone in pathogenesis of pain syndromes and other pathology.



The role of bone tissue in the pathogenesis of pain syndromes

- Arnoldi C. Intraosseous Hypertension // Clinical Orthopaedics and Related Research. 1976. № 115. C. 30-34.
- Moore M., Brown C., Brugman J., Donaldson D., Friedmood T., Kleiner J. and Odom J. (1991). Relationship Between Vertebral Intraosseous Pressure, pH, PO₂, pCO₂, and Magnetic Resonance Imaging Signal Inhomogeneity in Patients with Back Pain. Spine, 16(Supplement), pp.S239-S242.
- Simkin, P. A. Bone pain and pressure in osteoarthritic joints / P.A. Simkin // Osteoarthritic Joint Pain: Novartis Foundation Symposium. - [б.м.] : John Wiley & Sons, Ltd, 2004.
- *Takashi Ishida, Satoshi Tanaka, Takemi Sekiguchi, Daisuke Sugiyama and Mikito Kawamata «Spinal nociceptive transmission by mechanical stimulation of bone marrow» Molecular Pain. Volume 12: 1–15 2016*





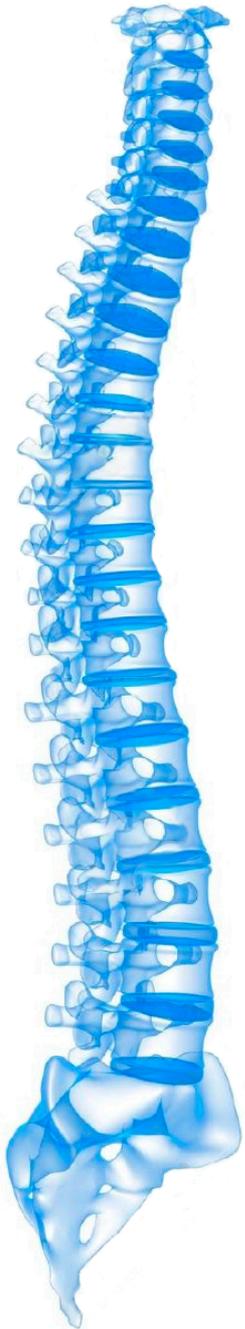
Takashi Ishida, Satoshi Tanaka, Takemi Sekiguchi, Daisuke Sugiyama and Mikito Kawamata «**Spinal nociceptive transmission by mechanical stimulation of bone marrow**»
Molecular Pain. Volume 12: 1–15 2016

«...**intraosseous nociceptors** are activated by various kinds of stimuli including an increase in intraosseous pressure...
...intraosseous pressure with bone marrow edema is closely related to back pain...
...our results suggest that intraosseous pressure is an important factor for skeletal pain.»

22. Shevelev OA, Sokov EL and Khodorovich NA. Role of intraosseous receptors in afferent and motor reaction modulation. Bull Exp Biol Med 1995; 120: 685–687.

Russian Literature:

- Varfolomeev A.K. Intraosseous infusions in the complex treatment of lumbar osteochondrosis (physiological reactions to intraosseous infusions): Tomsk, 1974.
- Polyakov V.A., Sakharov B.V. Prolonged intraosseous blockade in the treatment of injuries and diseases of the spine. Novosibirsk, 1976
- Sokov E.L. Intramuscular and intraosseous blockades in the complex treatment of neurological manifestations of lumbar osteochondrosis, Moscow, 1988.
- Esmembetov I.N. Pathogenetic features and treatment of lumbar osteochondrosis. Moscow, 1992.



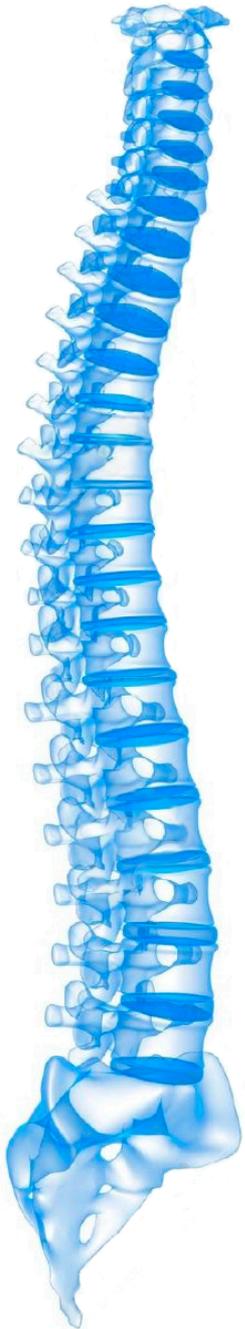
About 30 dissertations devoted to the study of bone tissue in the pathogenesis of pain and intraosseous infusions in various pain syndromes were defended in Russia. Of these, 14 theses defended in our clinic.

Shabanov V. V. Prolonged introduction of analgesics into spinous processes of vertebrae in pancreatitis. 1992.

Ivanova, T. A. Venospondyloinfusions in the complex treatment of neurological manifestations of osteochondrosis of the lumbar spine. 2003.

Utkin E. V. Proved the close connection of bone with lymphatic vessels. Administered antibiotics to the ilium in purulent adnexitis.

and others



Our study of intraosseous blockades (IOB) In various pain syndromes:

Ganzhula P. A. IOB and Vertebral-cardiac pain syndrome 2004.

Klepikov R. V. IOB and Trigeminal neuralgia 2004.

Purev D. IOB and Pain syndrome in multiple sclerosis. 2004.

Afanasyev D. S. IOB and Complex regional pain syndrome. 2004.

Pozdnyakova N. B. IOB and Headaches. 2008.

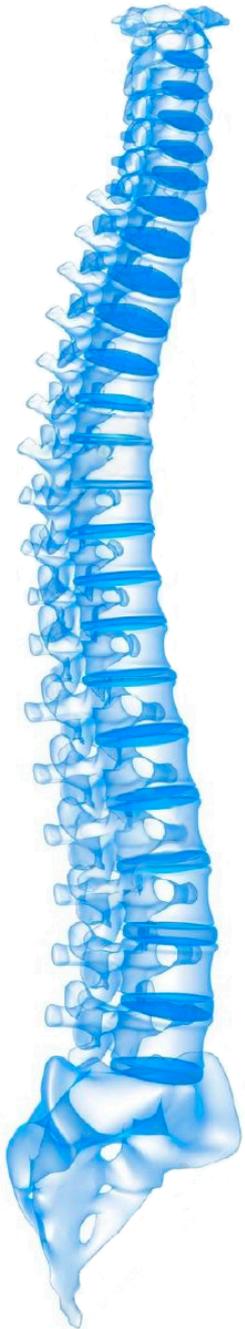
Garabova N. I. IOB and Failed back surgery syndrome. 2009.

Ibrokhimov S. I. IOB and Arthrosis of the shoulder joint. 2011.

Arsyukhin N. A. IOB and Painful diabetic polyneuropathy. 2012.

Nesterov A. I. IOB and Modic changes. 2019.

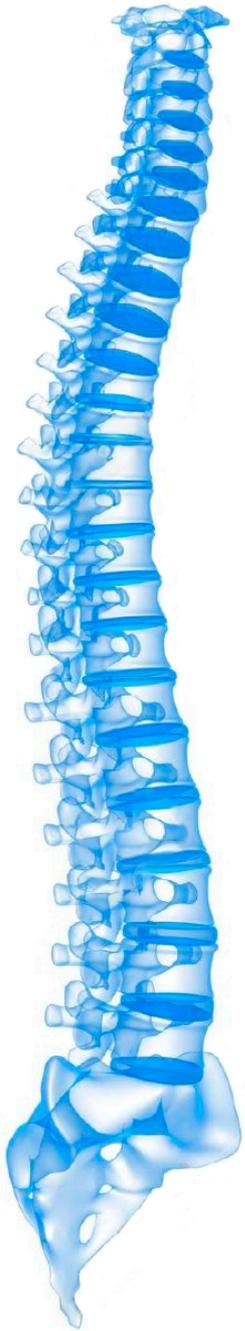
and others



Professor Georgy A. Yankovsky

Monograph - Osteoreception. - Riga, 1982

Method - Osteoreflexotherapy. 1957





LATVIJAS ZINĀTŅU AKADEMIJA · LATVIAN ACADEMY OF SCIENCES

To: Mrs. Ann-Marie Dumanski
The Nobel Assembly at Karolinska Institutet
Nobel Forum
Box 270, SE-171 77
Stockholm, Sweden
e-mail: nobelforum@nobel.se

Riga, June 6, 2016.

Dear Mrs. Ann-Marie Dumanski,

Latvian Academy of Sciences is the highest academic establishment in our country (founded 1946) devoted to elaboration of science policy and strategy, coordinating and administrating science, evaluating excellence in education and science in our country, granting prizes and academic titles. But first of all we are partners of the government and working in a team with Prime Minister and Ministry of Education and Science.

Delivering this letter to The Nobel Assembly at Karolinska Institutet including a supplement with an overview of the systematised method of tools in the field of life sciences, Physiology, Sensory system of bones, reflexotherapy, osteoreflexotherapy and regenerative medicine under the general title "Sensory system of bones and osteoreflexotherapy" I would request You and experts of the Nobel Assembly to study mentioned paper and to give a responding evaluation.

The importance of the paper insists in the essence of the discovery of osteosensory system by latvian professor, Dr. habil. med., Dr.h.c. Georgs Jankovskis and description of osteoreflexotherapy as a system of treatment based on studies of physiology of sensory systems. With his research professor G. Jankovskis and his colleagues founded internationally recognized and practised methods of osteoreflexotherapy for stimulating qualitative changes in bone stem cells giving reflexes on various physiologically functioning systems.

Latvian Academy of Sciences do assume that the importance of the discovery of the osteosensory system by professor G. Jankovskis and patented methods of treatment may earn Your interest and would be carefully studied to be evaluated and granted in a respectful mood.

If necessary information or additional materials are needed, do not hesitate to request us and we shall deliver them to You immediately. For any information according to the discovery of professor G. Jankovskis we shall be thankful.

On the name of Latvian Academy of Sciences - prof. dr. habil. art. Ojars Sparitis
President of Latvian Academy of Sciences.

Professor G.A. Yankovsky 98 years old



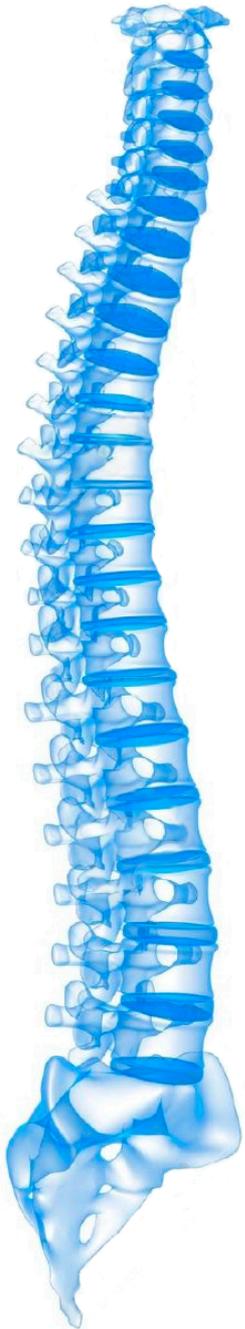
Features of bone tissue exchange

Bone provides bone marrow function, production of stem cells, osteocytes, erythrocytes, leukocytes.

The intensity of the biochemical metabolism of bone tissue is comparable to the brain, heart, liver

Bone – the most reparatively active tissue of the body

Bones are constantly in the process of osteoblastosis and osteoclastosis



Features of blood supply bone tissue

Rigidity of bone tissue

Relative closure of intraosseous space

The blood-bone barrier

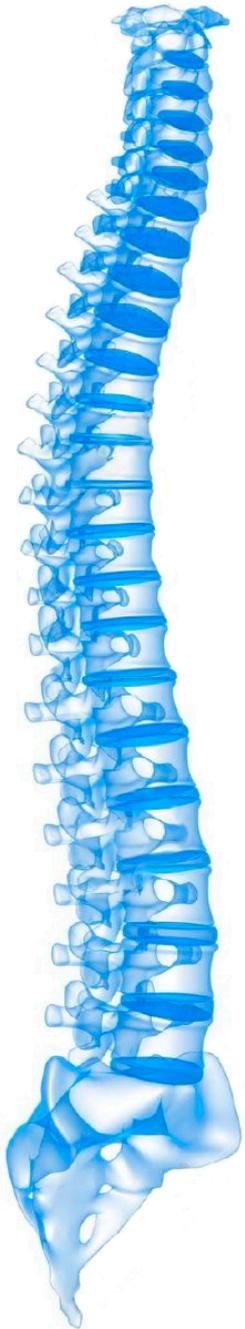
The ratio of the total diameter of bone arteries
and veins 1:10

Direct connection of

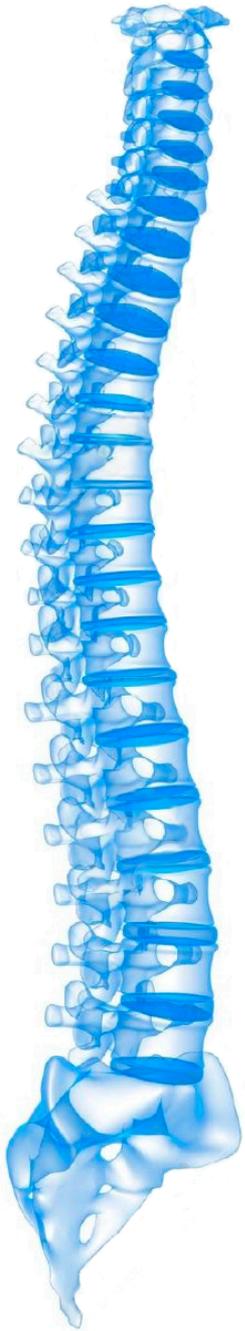
Bone and Veins,

Bone and Arteries,

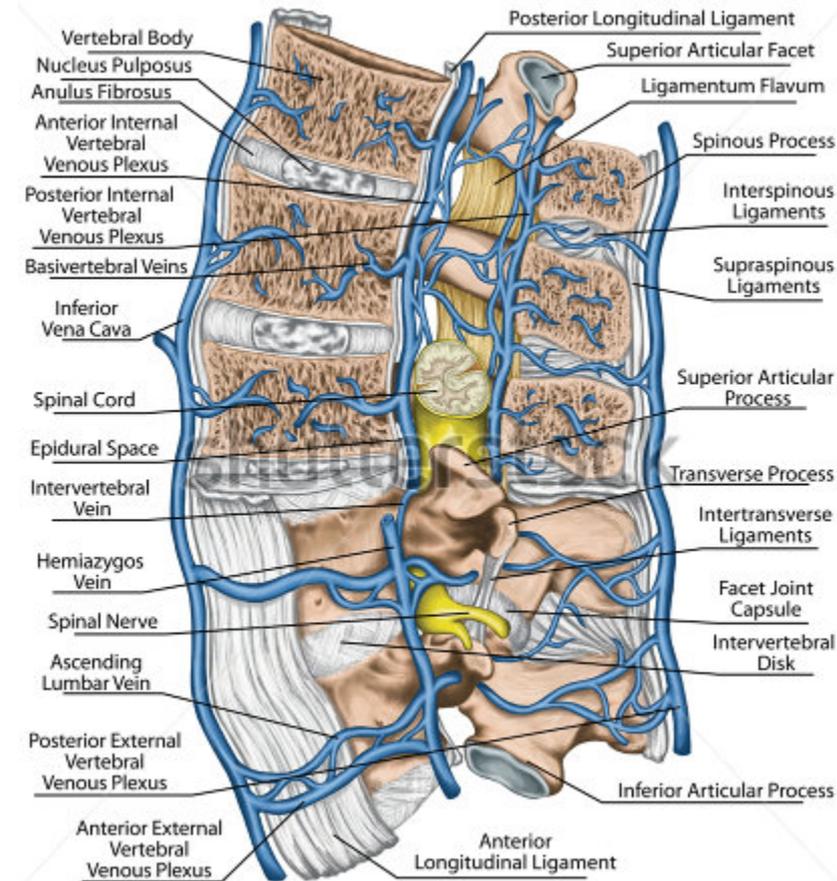
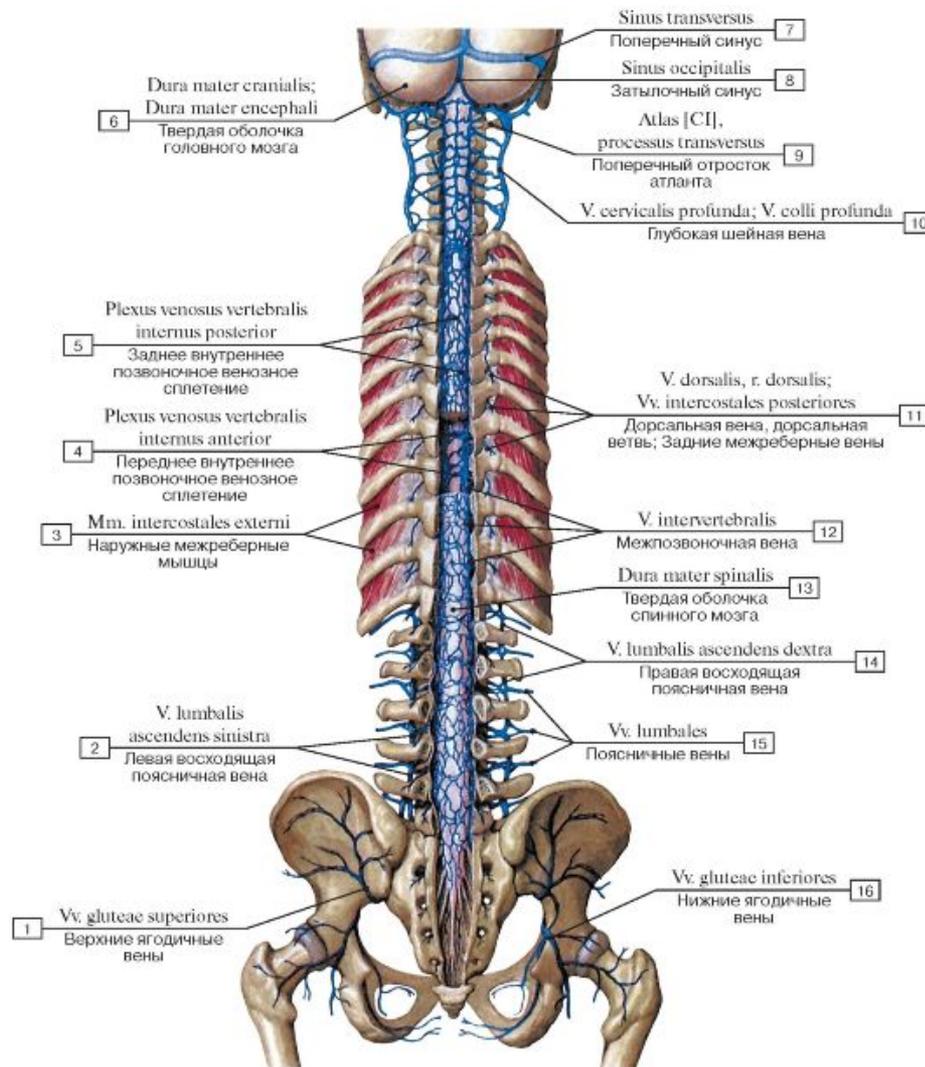
Bone and Lymphatics



Close connection of bones with lymphatic vessels



Close connection of bones with cerebrospinal venous system



Features of the innervation of the bone tissue

Baro-, chemo-, thermo- and other receptors

Participation of intraosseous receptors

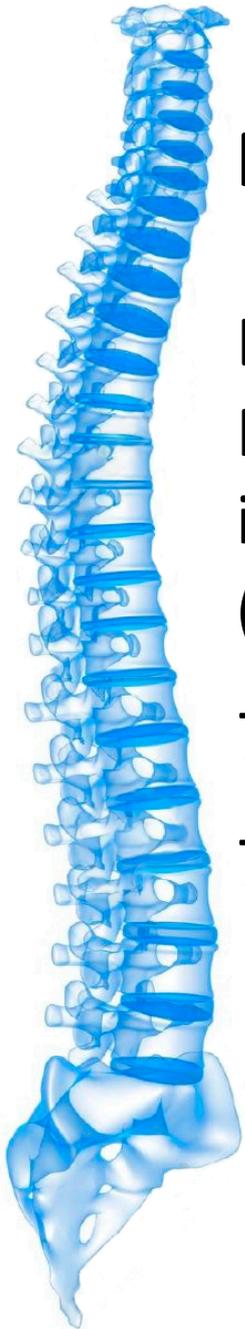
in local and general reactions of the body

(vascular and muscular tone, postural balance, t, PH)

70 % receptors - free, encapsulated.

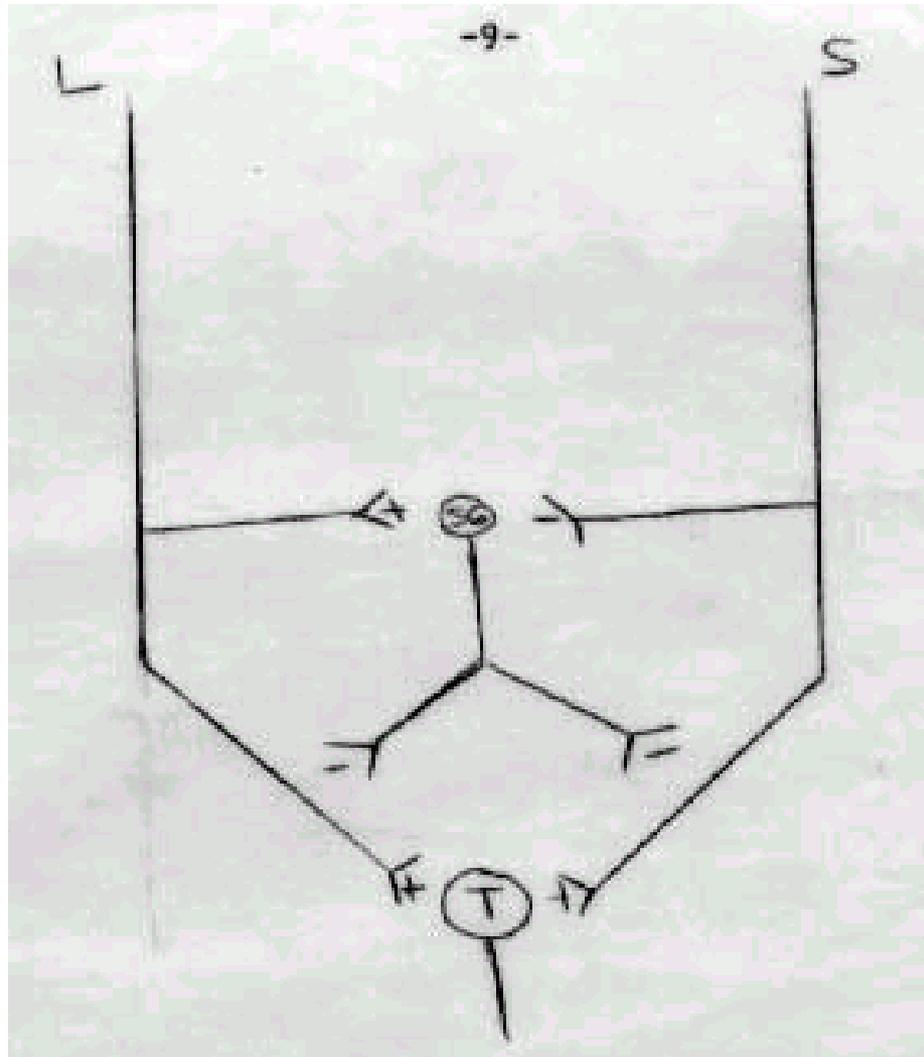
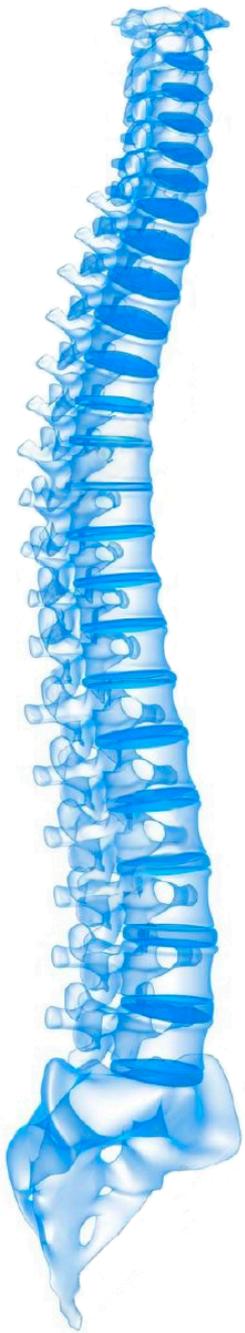
70% slow conductors

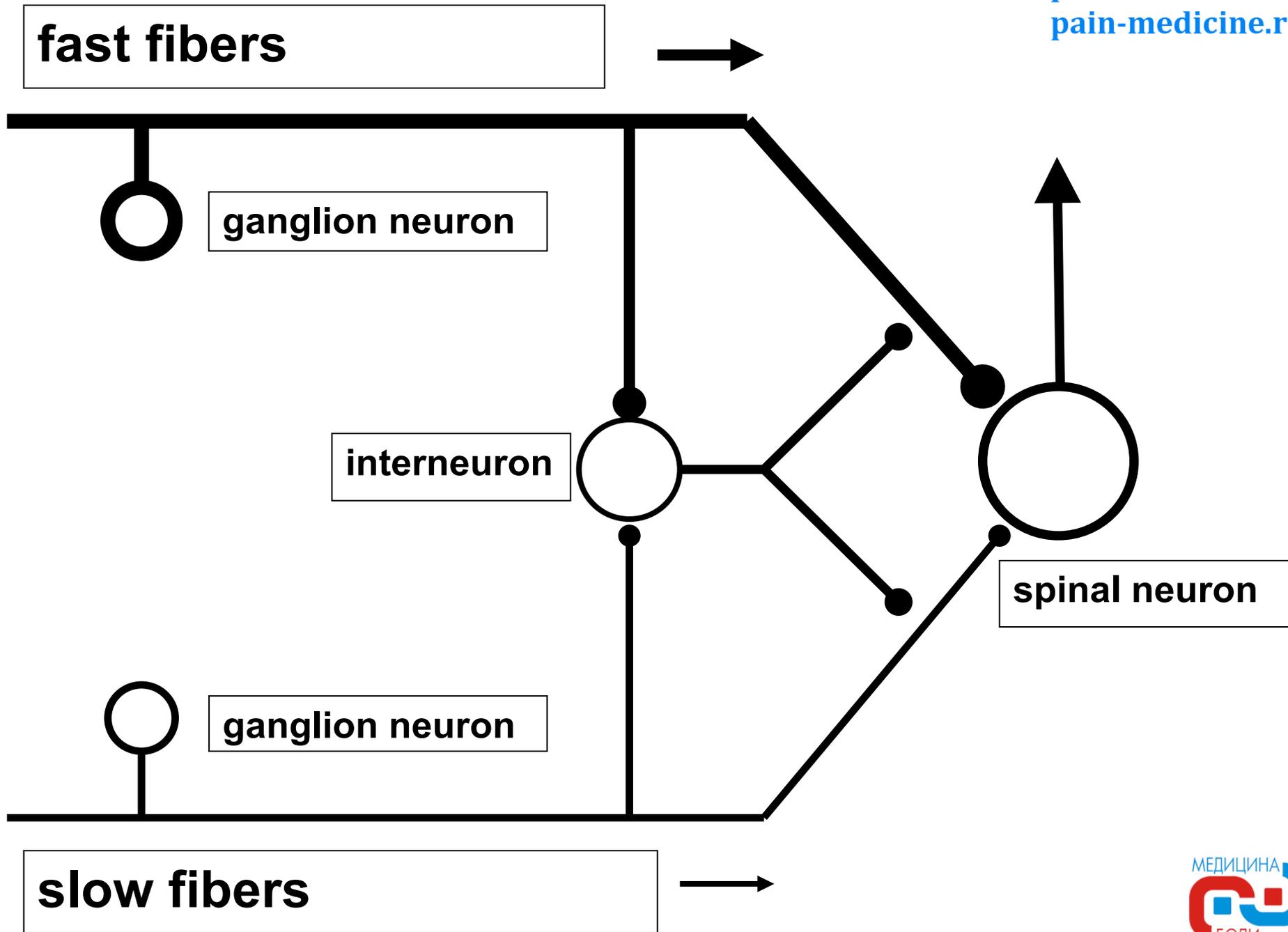
G.A. Yankovsky - Osteoreception. - Riga, 1982



The Gate control theory of pain

P.D. Wall, R. Melzack. 1965





fast fibers

ganglion neuron

interneuron

ganglion neuron

spinal neuron

slow fibers

fast fibers

ganglion neuron

interneuron

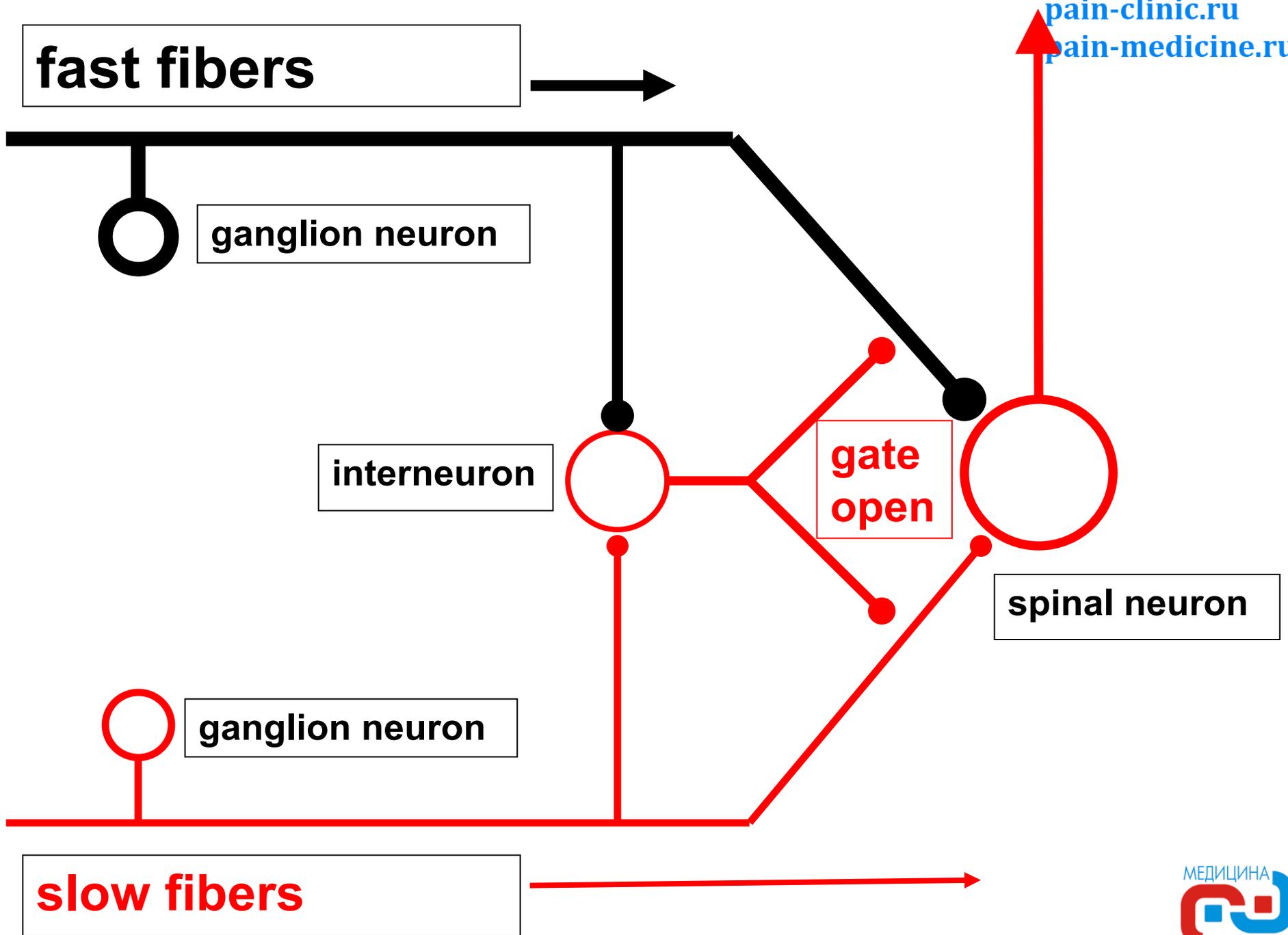
gate
open

spinal neuron

ganglion neuron

slow fibers

pain-clinic.ru
pain-medicine.ru



fast fibers

ganglion neuron

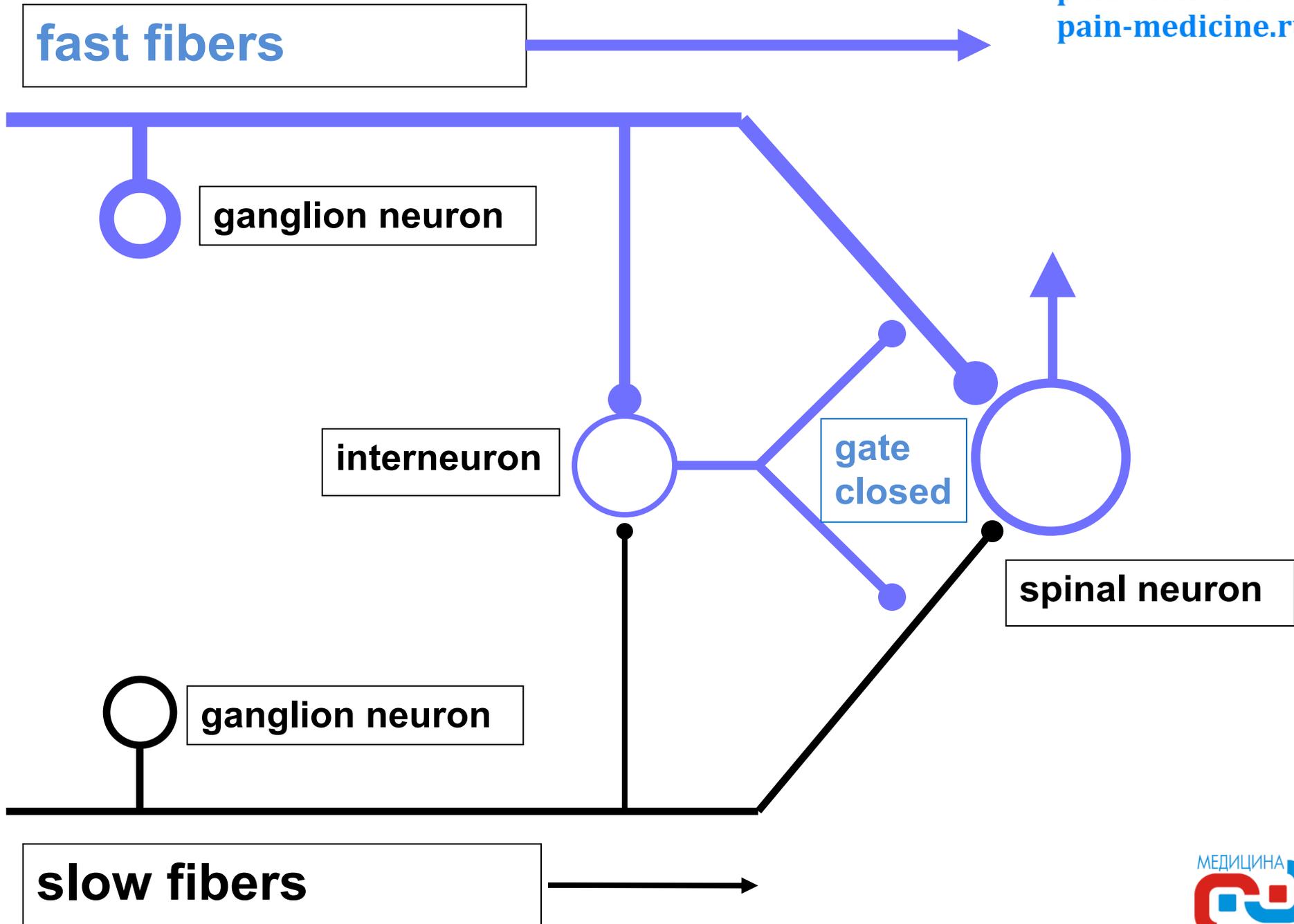
interneuron

gate closed

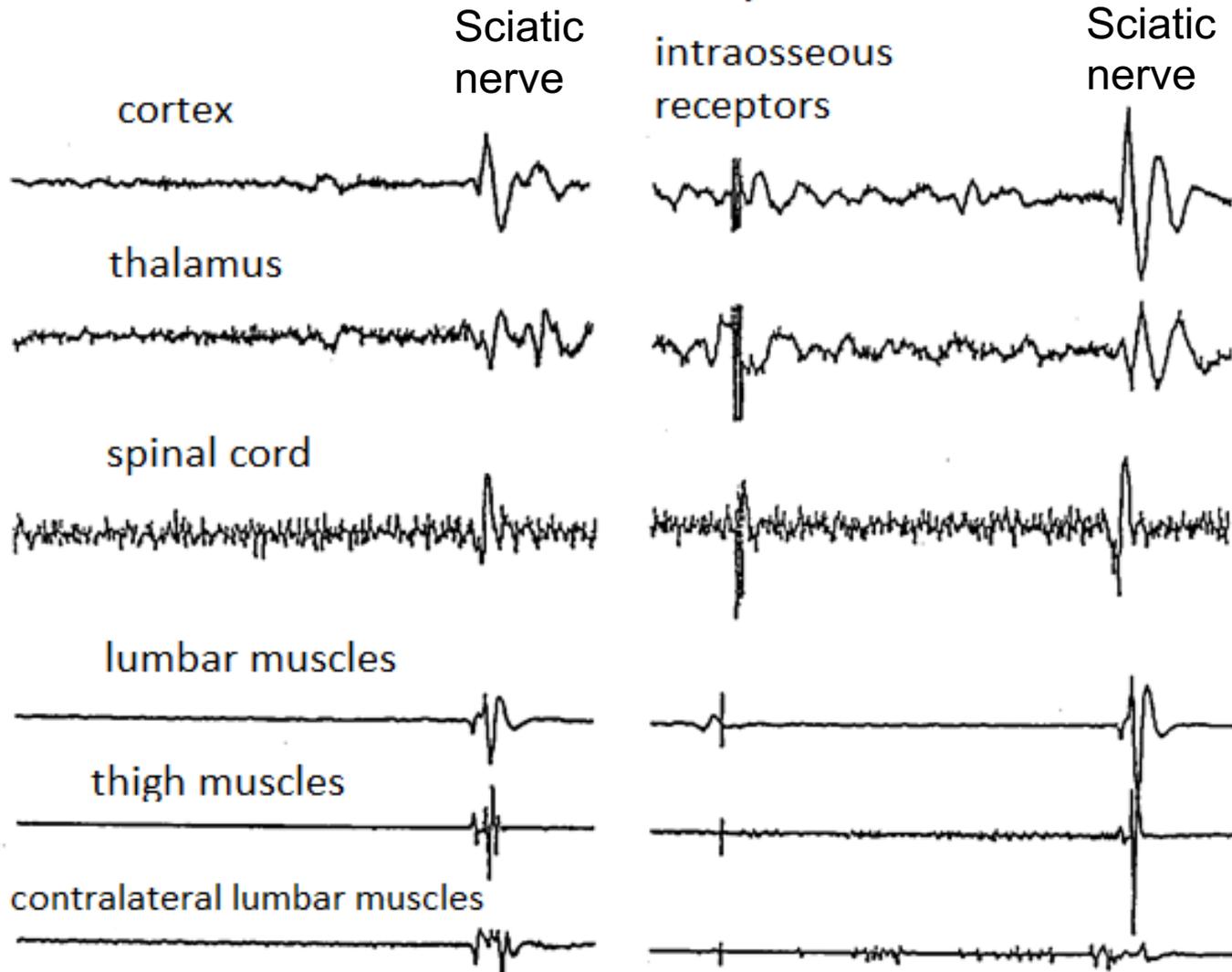
spinal neuron

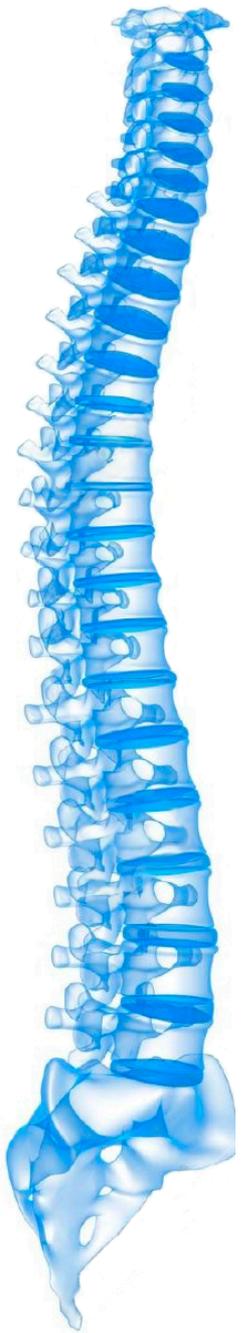
ganglion neuron

slow fibers



Evoked potentials and the EMG potentials in response to stimulation of the sciatic nerve in irritation of intraosseous receptors of the ilium.

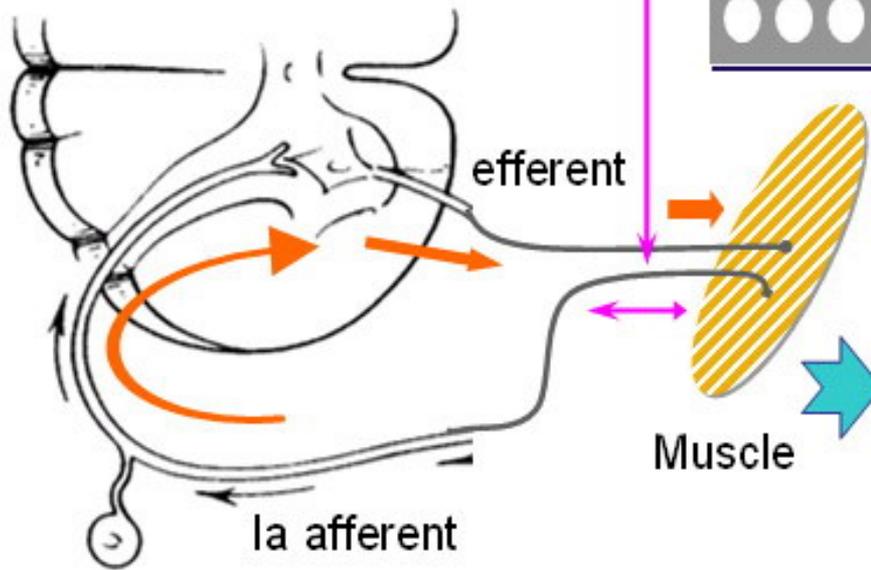




Stimulator



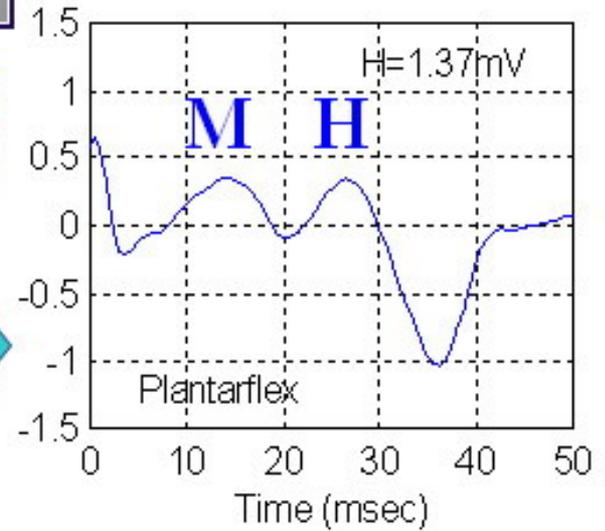
Spinal motor pool



EMG



Quadriceps H Reflex

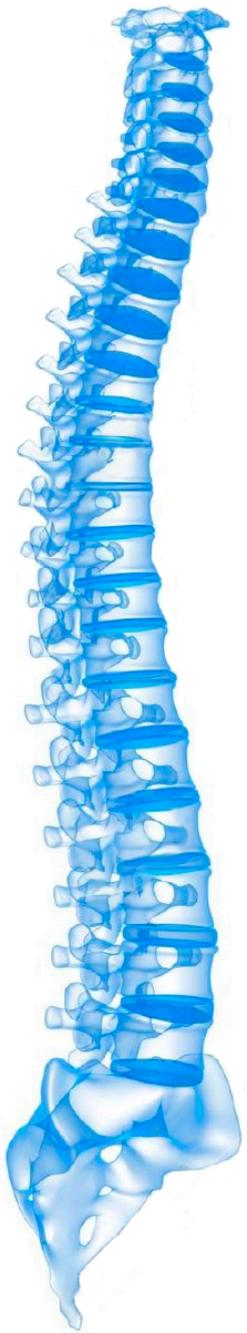


Change of H-reflex when injected into the iliac spine of saline solution

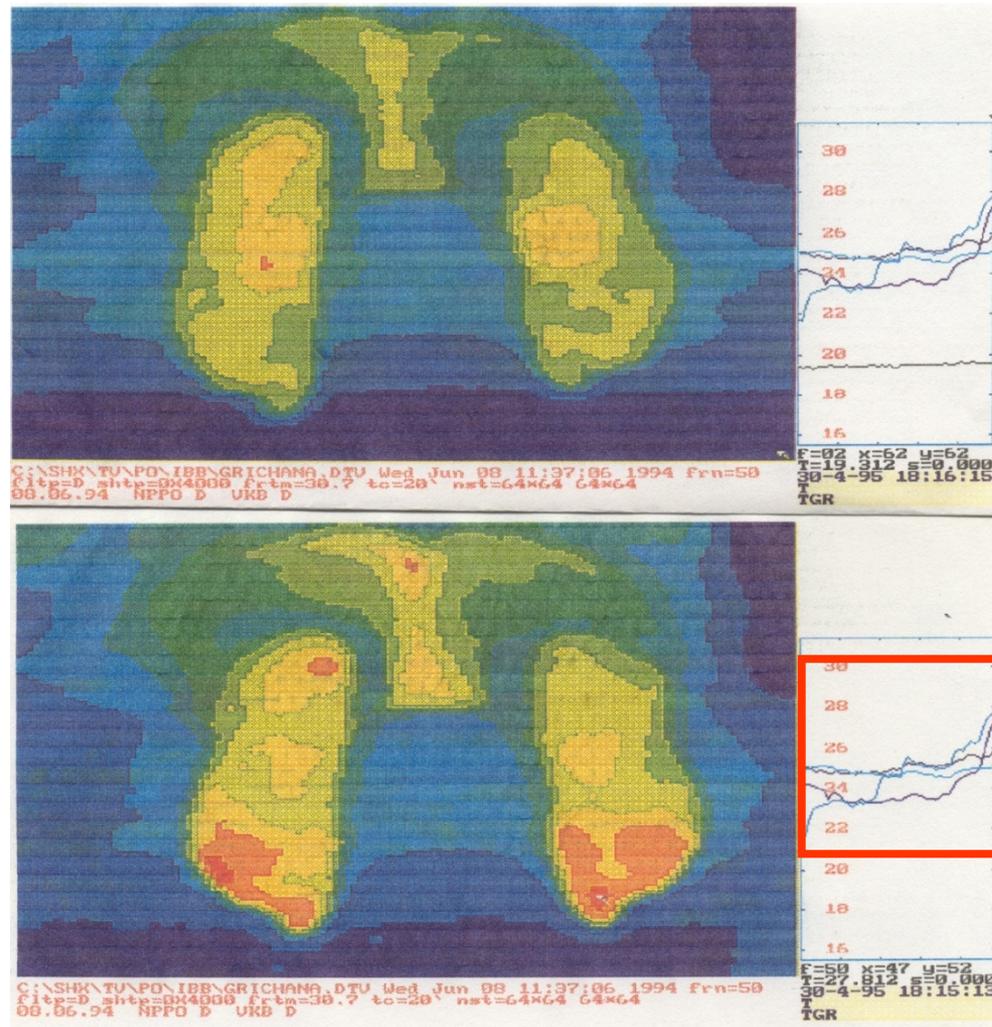


Introduction of the saline solution into the iliac spine provokes clonus of the foot in a patient with after stroke spasticity



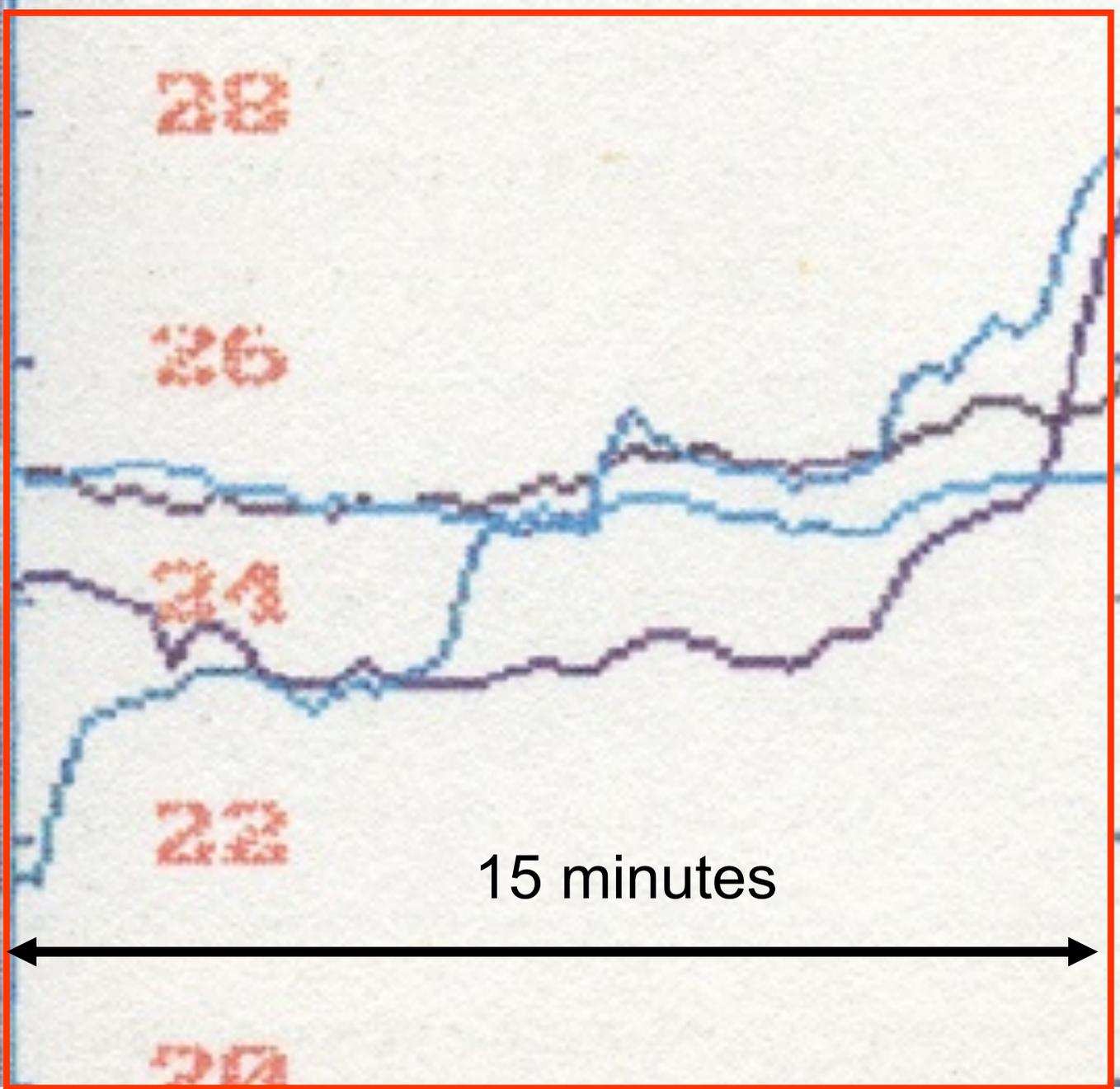


Feet thermography before and 15 minutes after lidocaine injection into the iliac spine



1 finger
Left
feet

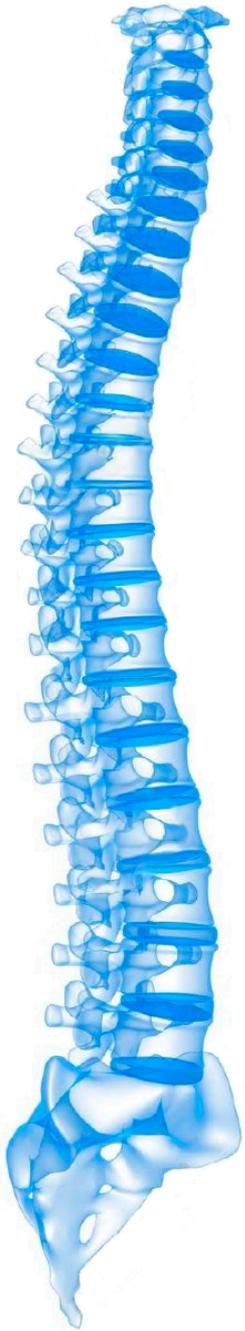
1 finger
Right
feet



Conclusions

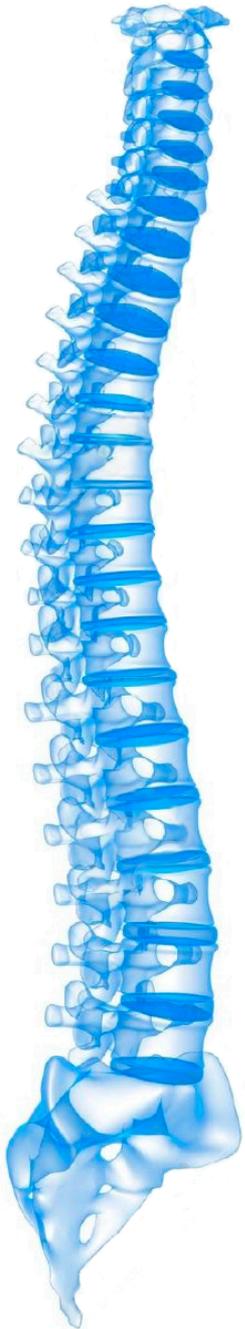
Irritation of intraosseous receptors enhances segmental afferent and efferent reactions

- “opens the gate of pain”,
- increases the tone of segmental muscles and blood vessels,
- reduce the cortical brake control.



Osteogenic mechanisms of pain

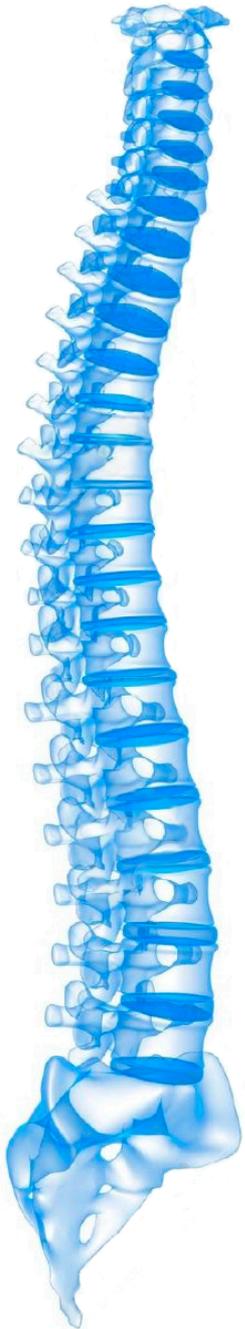
- degenerative changes of the bone
- sclerosis of venous openings of bone
- slowing the outflow of blood from the bones
- increased intraosseous pressure
- stimulation of intraosseous receptors
- facilitation of the segmental afferent and efferent reactions
- formation of pain, myotonic and angio-spastic syndromes
- combination of clinical symptoms depends on the segmental target tissue



Osteogenic mechanisms of pain

(continued)

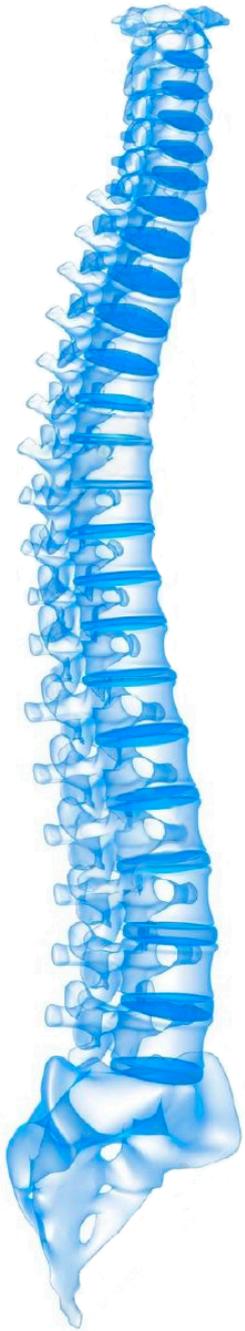
- lumbar level: pain, musculo-tonic and angio-spastic syndromes
- cervical level: the same syndromes + syndromes of irritation of the vertebral artery
- thoracic level: the same syndrome + vertebro-visceral syndromes
- facial bones: trigeminal pain
- cranial bones: vasospasm, headache
- clinical manifestations depend on pathological predisposition of target tissue.



Osteogenic mechanism of pain and discogenic factor

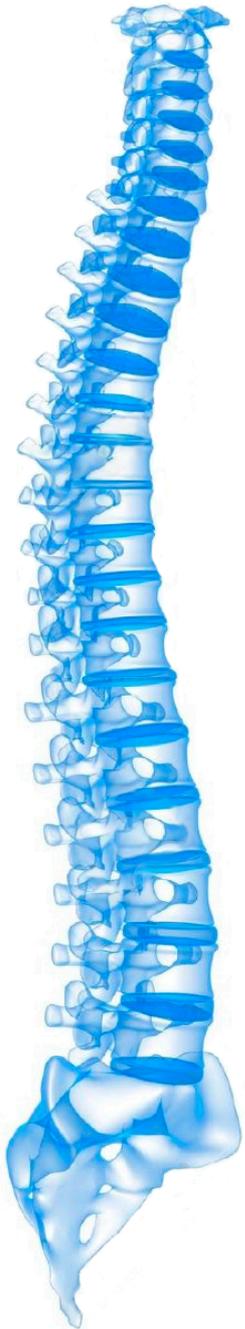
(continued)

The deterioration of microcirculation in the vertebrae leads to a violation of the osmotic mechanism of nutrition intervertebral disc, changing its physical properties, which contributes to the protrusion of the pulposus nucleus through the fibrous ring and the formation of a herniated disc.



Efficiency mechanisms of intraosseous blockades

1. Trepanation of the cortical layer
2. Normalization of intraosseous pressure
3. Anesthetic block of intraosseous receptors
4. Improving local microcirculation
5. Improving bone marrow nutrition
6. Filling the blood and lymph vessels
7. Effect on periosteal tissue
8. Anti-edematous and anti-inflammatory action
9. Normalization of bone drainage function
10. Activation of reparative regeneration of bone
11. Improving nutrition of the intervertebral disc



Advantages of intraosseous blockades (IOB)

1. With drug

IOB - targeted drug administration to the pathological focus

2. With physiotherapy

IOB - minimum contraindications

3. With electrostimulation

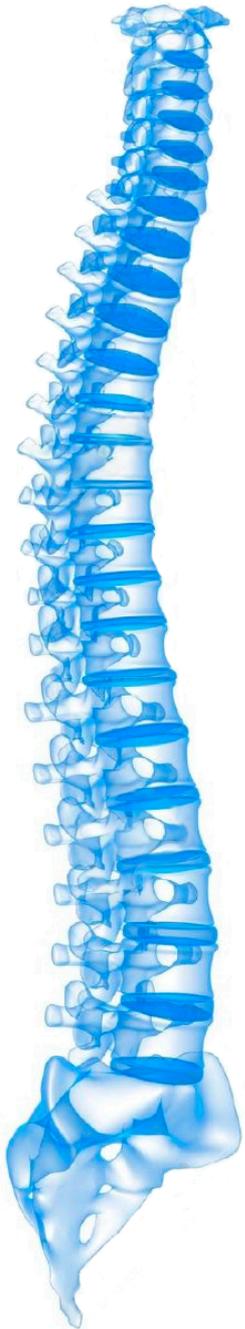
IOB - dosed hypoafferentation

4. With surgical methods

IOB - inexpensive, can be repeated with each exacerbation, no complications

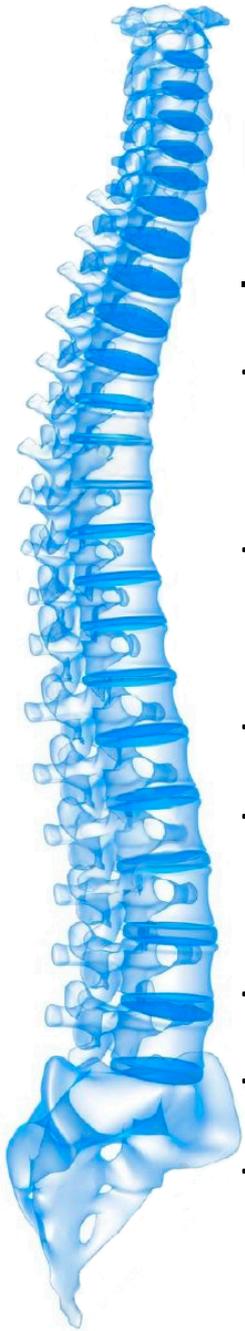
5. With epidural and facet blocks

IOB - no complications, no navigation equipment needed

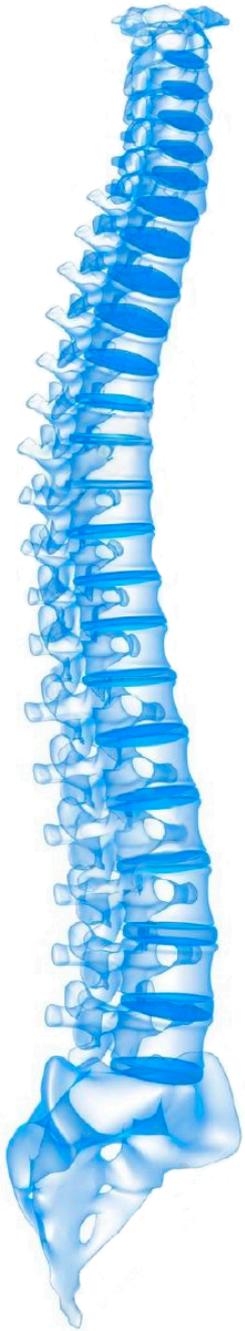


Intraosseous blockade - "Sniper injection"

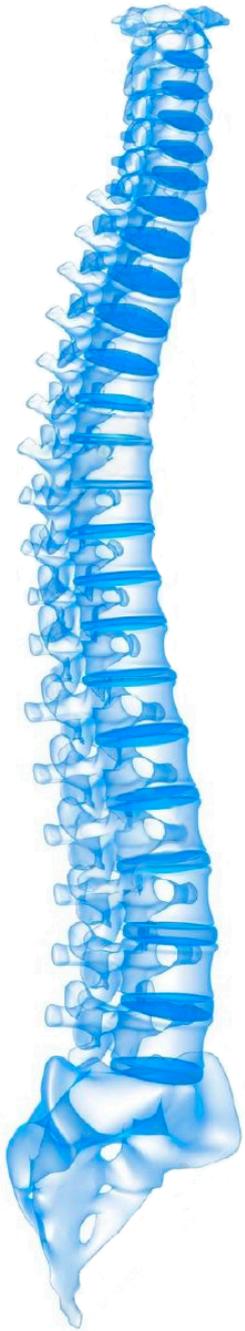
- Accurate determination of the injection site.
- Infiltration anesthesia of soft tissues to the periosteum.
- Introduction of a spinal needle with mandrin by method of "indentation-screwing".
- Extract mandrin from needle.
- Attach the syringe with medicinal solution to the needle.
- Aspiration blood from the bone marrow.
- Hemolysis of blood.
- Introduction of solution in the bone marrow.



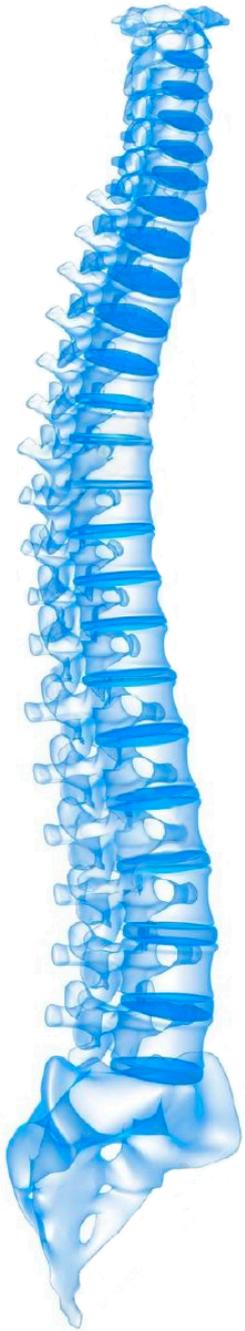
Intraosseous blockade in the iliac spine Infiltration anesthesia to the periosteum



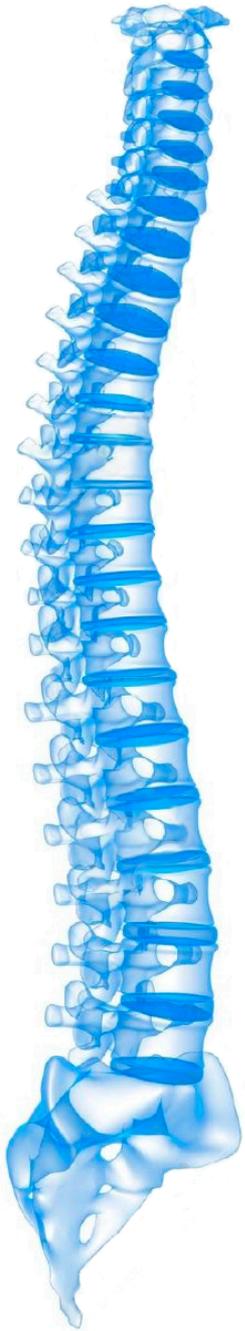
Introduction of the needle into the bone



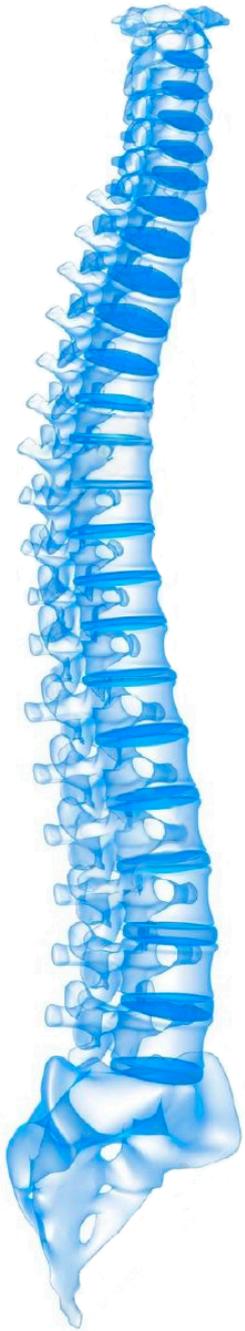
Intake of 2 ml of spongy blood



Blood hemolysis

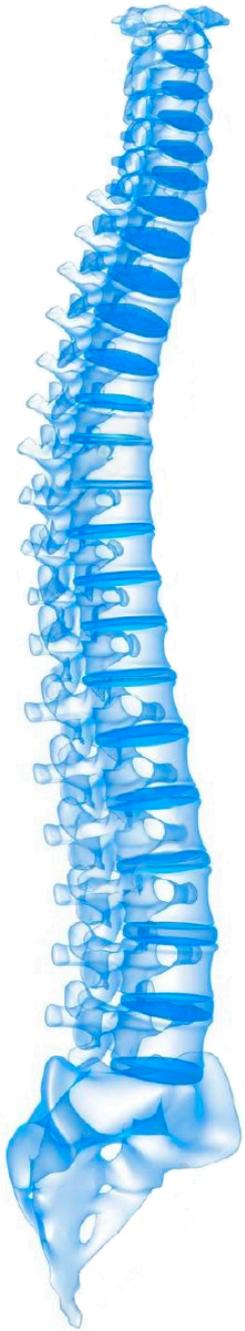


Administration of the solution into the spongy bone

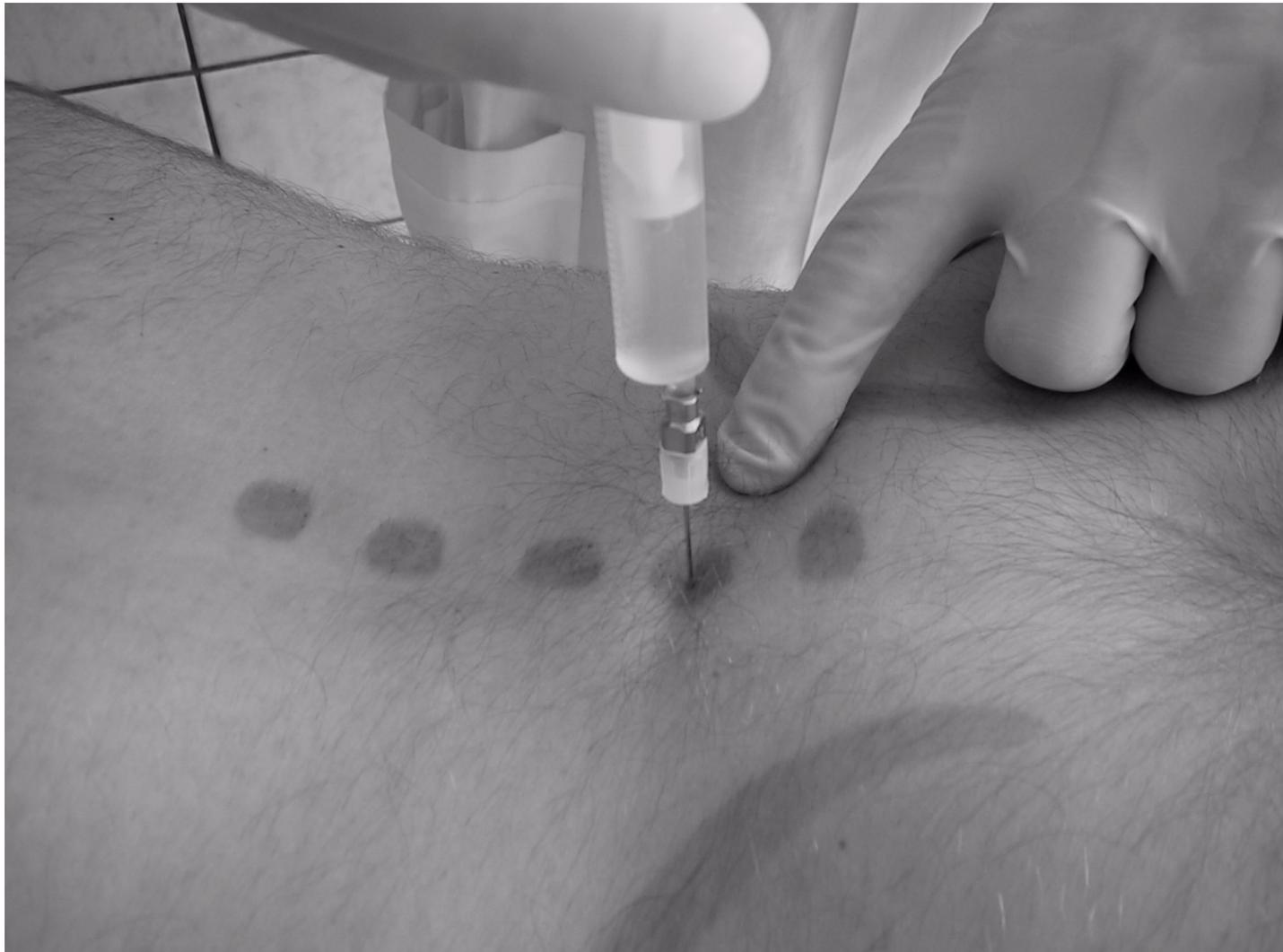


We perform intraosseous blockades in:

- spinous processes of the vertebrae
C2, C7, T1-T12, L1-L5, S1-S2
- zygomatic and mandibular bone
- pelvis bones, scapula, sternum
- epiphysis of limb bones
- some bones of hands and feet



Intraosseous blockade into the spinous process of the 4th lumbar vertebrae



Intraosseous blockade into the posterior iliac spine



Scheme of intraosseous blockade into the posterior iliac spine

**We use this
blockade in 90% of
patients with
low back pain**



Intraosseous blockade into the greater twist



Intraosseous blockade into the head of the fibula



Intraosseous blockade into the lateral malleolus



Scheme of intraosseous blockade into the spinous process of the C2 vertebra



Intraosseous blockade into the spinous process of the C2 vertebra



Intraosseous blockade into the zygomatic bone

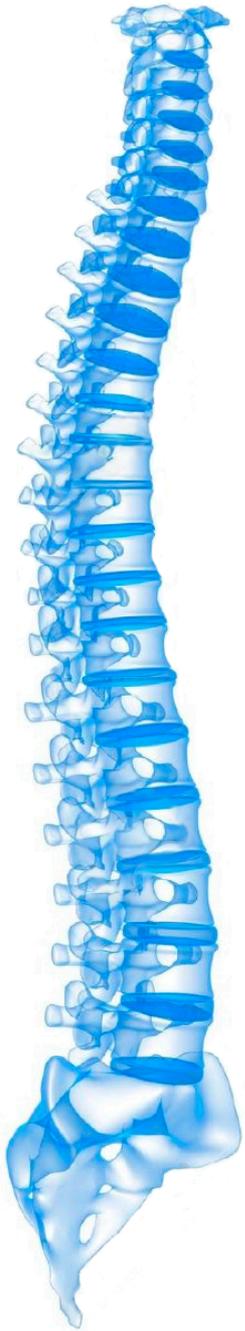


Intraosseous blockade into the mandibular bone



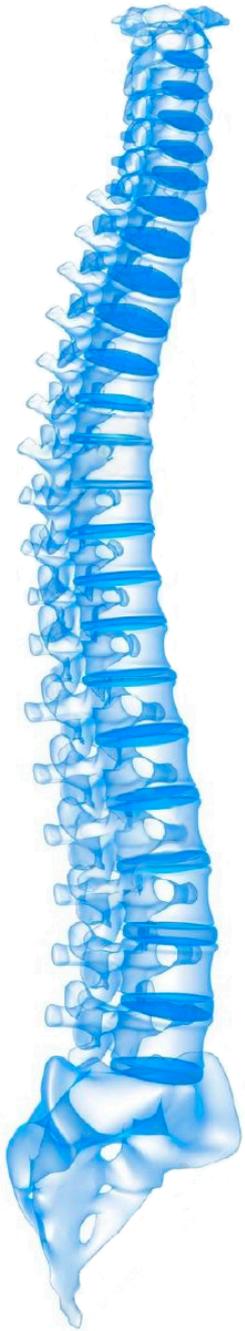
Instruments for intraosseous blockade:

1. Spinal needle with mandrin
2. Syringe



The composition of the solution for intraosseous blockade

1. Lidocaine 2% - 2 ml (40 mg)
2. Dexamethasone 2 mg
3. Water for injection 5 ml
4. Autoblood from spongy bone tissue – 2 ml



We use intraosseous blockade for the treatment of different pain syndromes

Pain in the lower back, back, neck.

Headache, migraine and facial pain.

Arthralgia and epicondylitis.

Vertebral cardialgia and vertebral-cerebral syndrome.

Complex regional pain syndrome.

Phantom and pelvic pains.

Failed back surgery syndrome.

Pain and spasticity in MS and after a stroke.

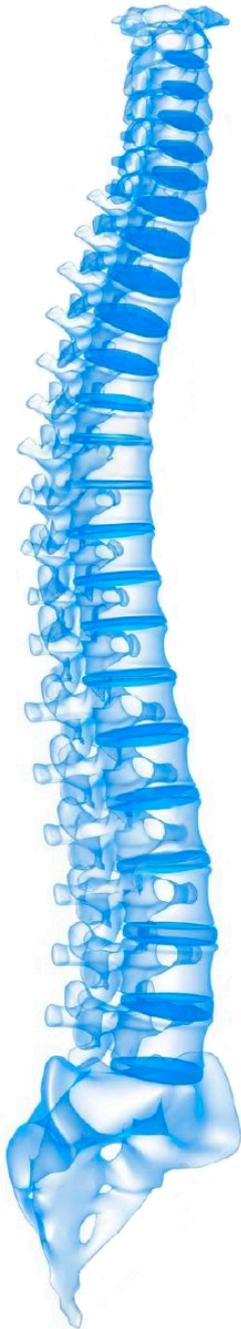
Pain and plastic muscle hypertonus in parkinsonism.

Pain and allodynia in diabetic polyneuropathy.

Modic chandes 1-2.

Erythromelalgia.

And etc.

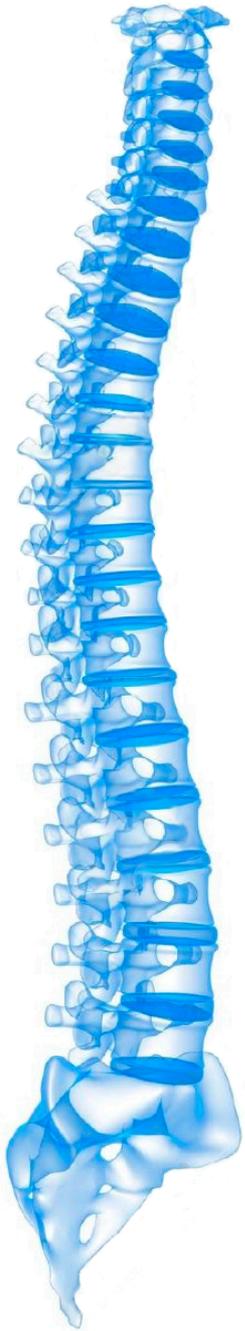


High safety of intraosseous blockade

About

40 years we use intraosseous blockades
8,000 patients received
30,000 intraosseous blockades

There was not a single complication !!!



Intraosseous blockades are effective in

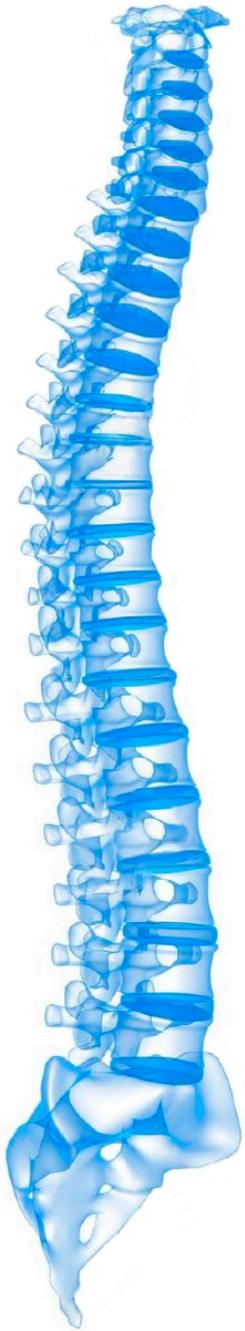
95% of patients with lumbar pain

80% of patients with FBSS

75% of patients with facial pain

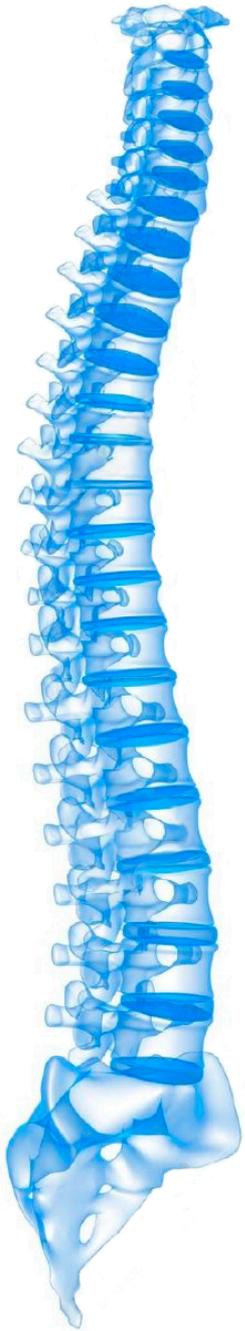
90% of patients with headaches

for most patients 1 IOB is enough
to relieve migraine status

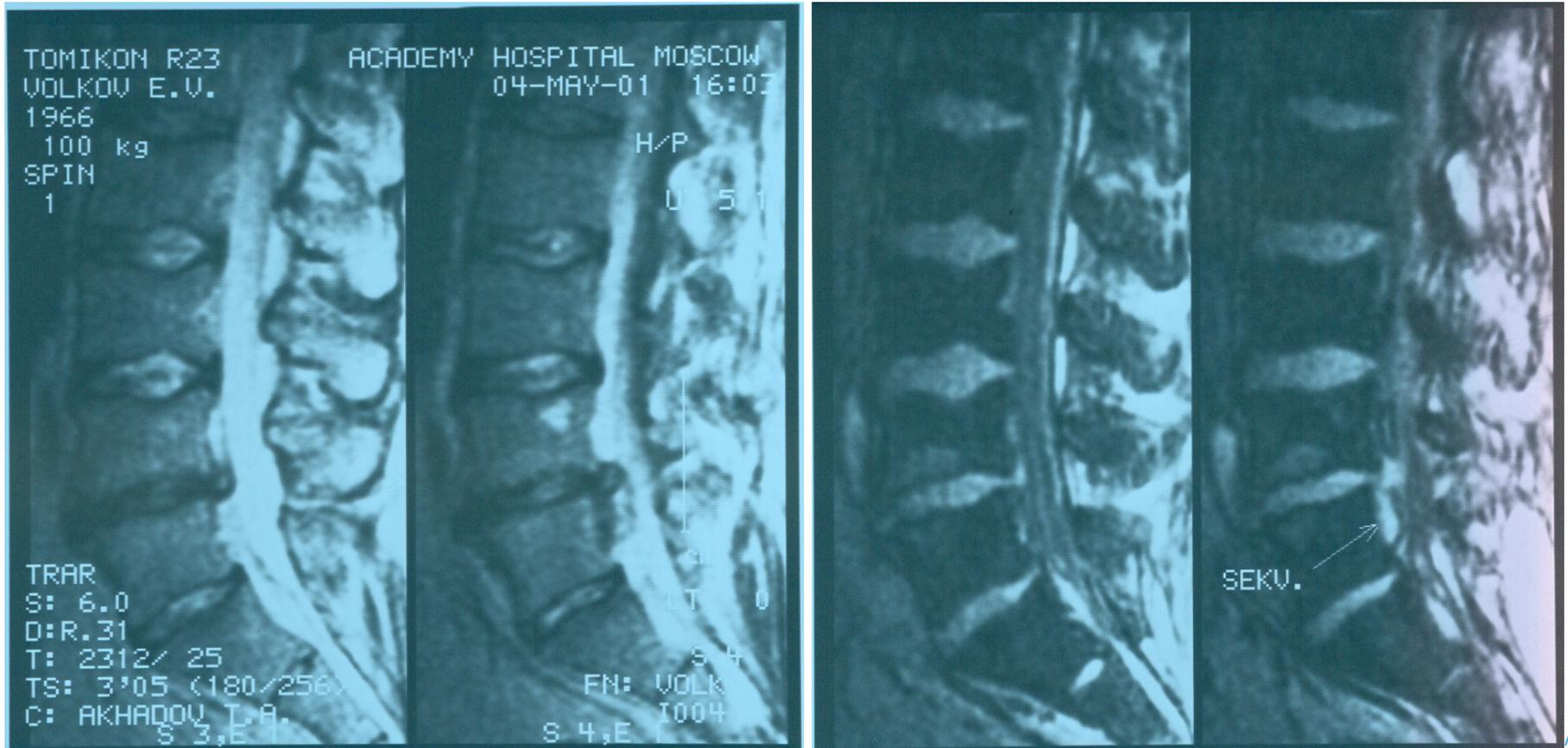


16 years working Pain Clinic
and the website www.pain-clinic.ru

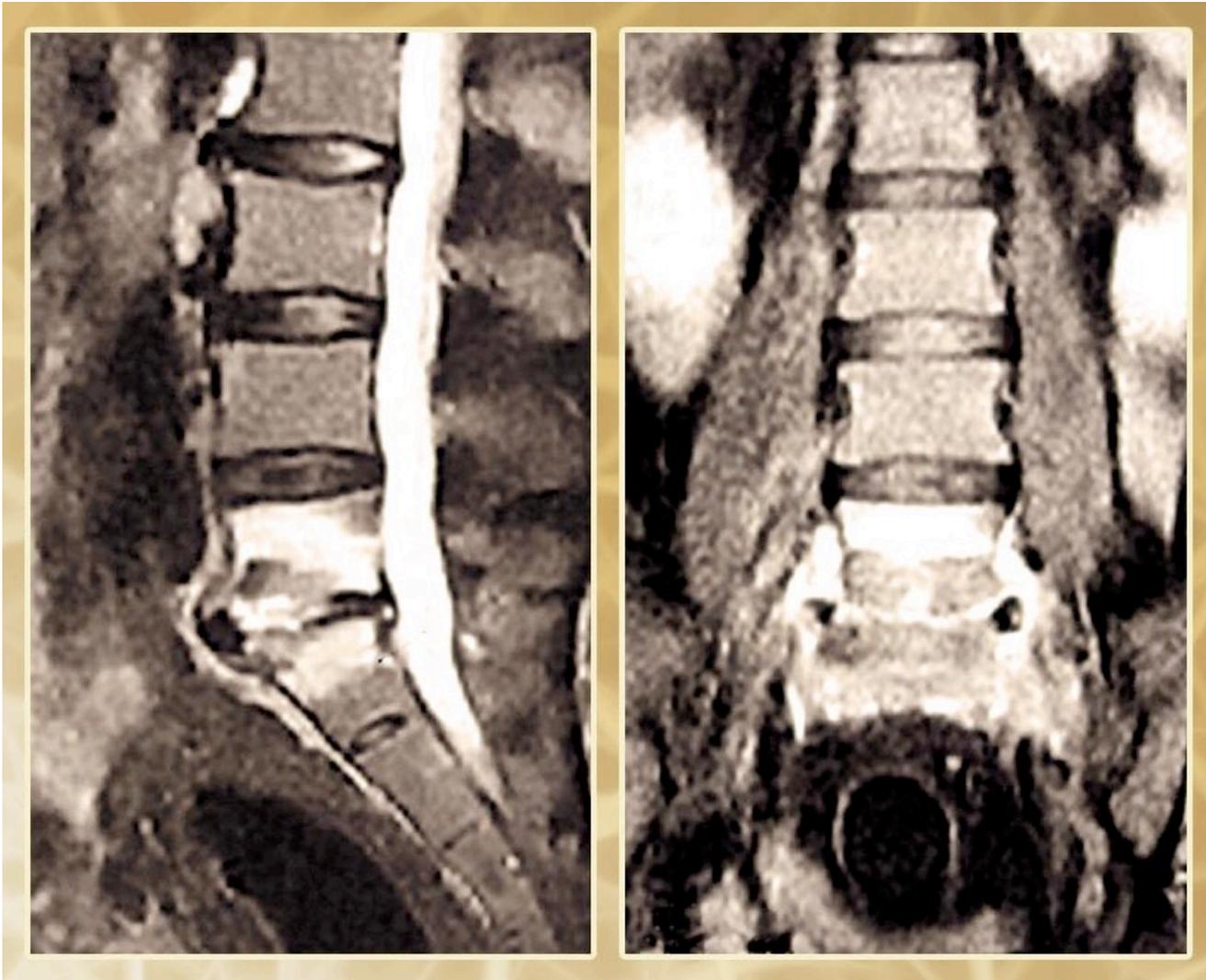
At the Department of Algology
for 4 years we have trained
40 doctors in the method of
intraosseous blockades



Efficiency of 3 intraosseous blockades in the case of a sequestered disc hernia 16 mm



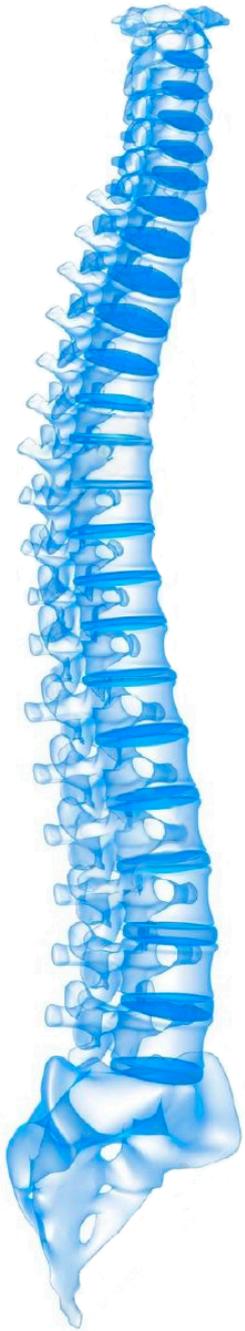
The effectiveness of intraosseous blockades in aseptic spondylodiscitis - Modic 1



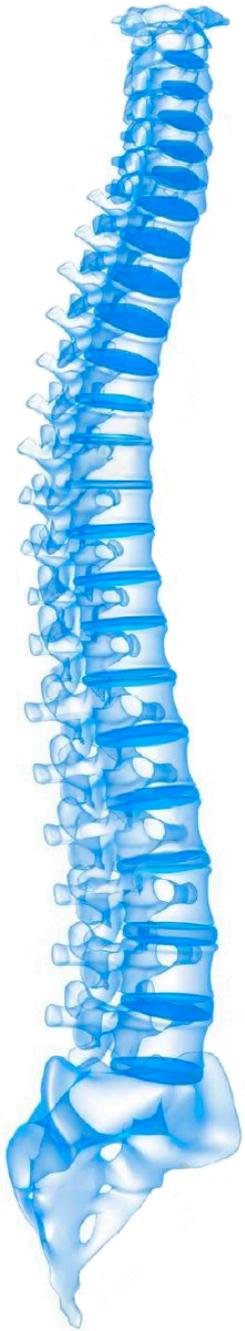
Reduction of edema in bones and soft tissues after intraosseous blockades



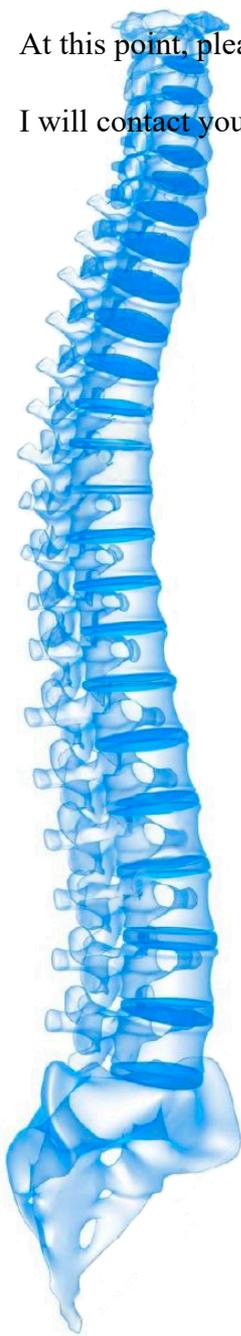
**Surgical treatment of
non-specific lumbar pain
should be carried out only
after the ineffectiveness of
intraosseous blockades**



Ankle sprains. 20 hours later an intraosseous blockade was made into the lateral malleolus



Consider developing new apparatus to hold the injection needle perpendicular to the bone surface, methods of quickly and easily piercing the bone



At this point, please provide information you already have. Please provide all descriptions, sketches, drawings, figures, notes, test descriptions, test

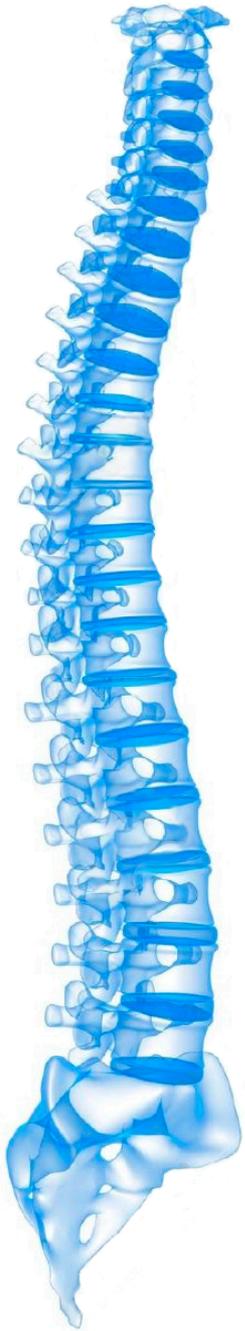
I will contact you after I have had a chance to review everything and request other information that we may need.

20 hours after intraosseous blockade

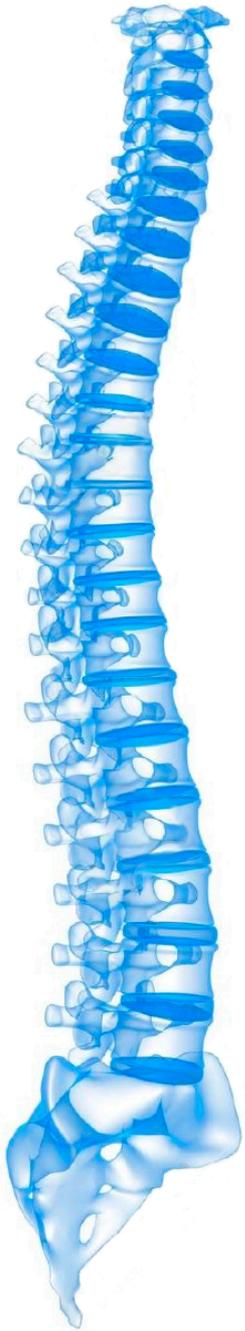




Conclusion.
**Osteogenic mechanisms and
intraosseous receptors play
a very important role in
the pathogenesis of pain.**



Conclusion.
Intraosseous blockades:
safe,
effective,
inexpensive,
universal,
pathogenetic
method for the treatment
of pain syndromes.



Thanks for attention

www.pain-clinic.ru

