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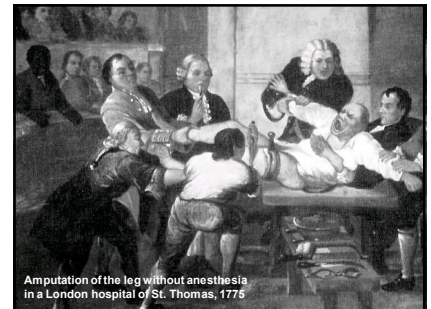
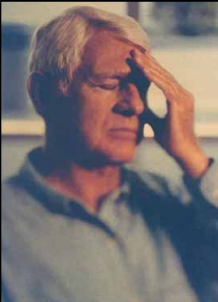
FUNCTIONAL NEUROSURGERY, LOW BACK PAIN

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There are a number of diseases of the nervous system, which are traditionally considered "neurological" or "therapeutic." This is a fairly large group of diseases such as **chronic pain syndromes, Parkinson's disease, essential tremor, torsion dystonia, some forms of multiple sclerosis, epilepsy, phantom limb pain, syringomyelia, cerebral palsy, multiple impact injuries of the brain and spinal cord, etc.**

For a long time, all these diseases have been treated only by conservative methods. Patients with impaired movement, severe pain, sometimes leading to suicidal attempts of patients, gross violations of pelvic functions, practically, throughout later life, taking many different medications, which often had a pronounced side effects, or even lead to irreversible changes in a relaxed and without of the body, even more aggravating for a chronic disease. At present, the whole spectrum of pathology is an area of application of **functional neurosurgery**





Trigeminal neuralgia

Paroxysmal trigeminal neuralgia was first described in the XVIII century

N. Abdre (1756), J. Fothergill (1776)

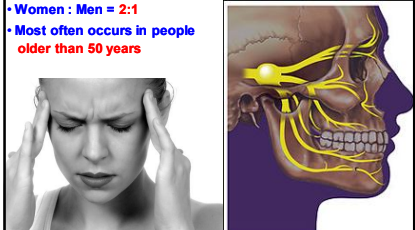
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- Paroxysmal attacks, lasting from several seconds to several minutes
- Nature of pain (at least 4 criteria):
 - spread over the course of one or more branches of the trigeminal nerve;
 - sudden, intense, sharp, superficial, and burning;
 - severe in intensity;
 - begins with stimulation of certain areas or during eating, talking, washing face, brushing your teeth;
 - complete lack of complaints between attacks
- Absence neurological deficit
- Attacks stereotyped for each patient
- Exception other causes of pain in the collection of medical history survey

Trigeminal neuralgia

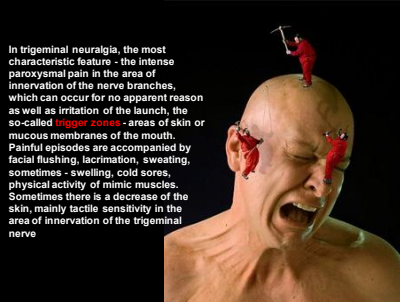
- Incidence: **4-5 cases per 100,000 population per year**
- The prevalence of **30-50 cases per 100,000 population**
- Women : Men = **2:1**
- Most often occurs in people **older than 50 years**



Classification of TN (J.Eller, A.Roslan, 2005)

| | |
|--|--|
| <u>Allocated symptoms</u> | <u>Diagnostic classification</u> |
| IDIOPATHIC TN (acute, short-term type of electrical discharge episodic pain) | TN type I |
| (Pain, throbbing, burning pain, more than 50% of the time a character constant) | TN type II |
| TRIGEMINAL DAMAGE | |
| Indirect (facial skull trauma, ENT surgery, surgery on the skull base and the PCF, stroke) | Trigeminal neuropathic pain |
| Immediate (neurotomy, gangliolysis, rhizotomy, nucleotomy, tractotomy, or other denervating procedures) | Deafferentation trigeminal pain |
| Associated with multiple sclerosis | Symptomatic TN |
| The resulting myocardial herpes zoster | Postherpetic TN |
| Somatiform pain disorder (functional or psychotic) | Atypical pain in the face |

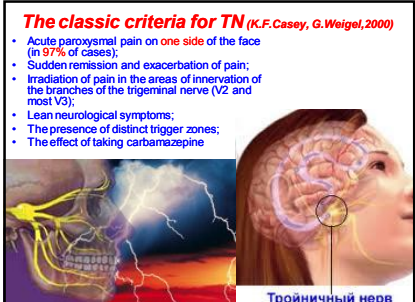
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In trigeminal neuralgia, the most characteristic feature - the intense paroxysmal pain in the area of innervation of the nerve branches, which can occur for no apparent reason as well as irritation of the launch, the so-called **trigger zones** - areas of skin or mucous membranes of the mouth. Painful episodes are accompanied by facial flushing, lacrimation, sweating, sometimes - swelling, cold sores, physical activity of mimic muscles. Sometimes there is a decrease of the skin mainly tactile sensitivity in the area of innervation of the trigeminal nerve

The classic criteria for TN (K.F. Casey, G. Weigel, 2000)

- Acute paroxysmal pain on one side of the face (in 97% of cases);
- Sudden remission and exacerbation of pain;
- Irradiation of pain in the areas of innervation of the branches of the trigeminal nerve (V2 and most V3);
- Lean neurological symptoms;
- The presence of distinct trigger zones;
- The effect of taking carbamazepine



Тройничный нерв

Seizures and acute pain triggered by:

- Shaving;
- Washing;
- Brushing teeth;
- A gust of wind;
- Cosmetics;
- Smile;
- Touching the person, even a light;
- Articulation during speech



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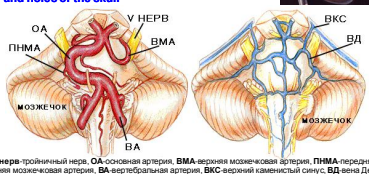


THEORIES OF TN

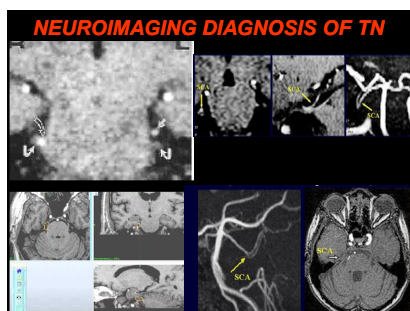
- **Peripheral theory** - defect is localized in the root-zone a few millimeters at the entrance to the root bridge due to damage (thinning), myelin layer. This leads to chronic irritation of the nerve as a result of the depletion of segmental inhibition in the trigeminal nucleus and increased activity in the trigeminal nerve, causing ectopic action potentials;
- **Central theory** - Irritation of the trigeminal nerve nuclei in the roots due to the unchanged susceptibility of nuclear forces the posterior horns of the spinal cord, the diencephalon, the thalamus and the cerebral cortex to maintain pathological pain stimuli;
 - Notes the role of genetically susceptible weak analgesic system;
 - Attack of pain is considered as an analogue of nuclear seizure

THE ETIOLOGY OF TN

- Vascular compression (86-97%);
 - Arteries (80-87%);
 - Veins;
- Tumors of the PCF;
- MA basilar and cerebellar arteries;
- AVM vessels of the trunk;
- Congenital or acquired narrowing of channels and holes of the skull



У нерва тройничный нерв, ОА-основная артерия, ВМА-вертебральная мозжечковая артерия, ПМА-передняя мозжечковая артерия, ВА-вертебральная артерия, ВКС-верхний каменистый синус, ВД-вена Дарвина



PHARMACOTHERAPY TN

- Carbamazepine (Tegretol, Finlepsin) 600-1200 mg / day;
- Baclofen 50-60 mg / day;
- Phenytoin (most supplements 1 and 2) 300-400mg/den;
- Gabapentin (Neyralgin) 900-1800 mg / day;
- Lamictal (Lamotrigine) 300-500 mg / day



Treatment of posttherpetic TN

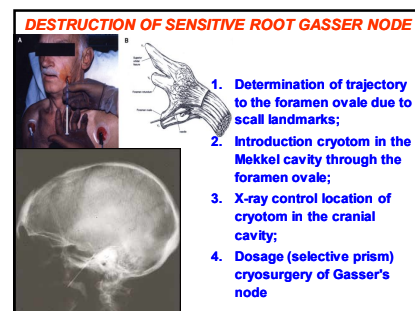
- Antiviral therapy (Cycloferon, Zovirax);
- Epidural steroids in the Mekkelevu cavity (diprospan) and bupivacaine (Merkaïn);
- Amitriptillin and / or Gabapentin (Neyralgin);
- Vaccination;
- ? Intrathecal methylprednisolone



Surgical treatment of TN

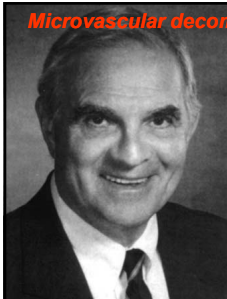
1. Alcoholisation and the blockade of the peripheral branches of TN;
2. Blockade of Gasser's node;
3. Neurectomy peripheral branches of TN;
4. Decompression of peripheral branches of TN;
5. Thermal destruction (cryo-, HF) Gasser's node;
6. Balloon microcompression of Gasser's node;
7. Microvascular decompression (surgery Jannetta);
8. Stereotactic surgery in the basal ganglia;
9. Stereotactic radiosurgery (Gamma Knife);
10. Electrical stimulation of the cerebral cortex

DESTRUCTION OF SENSITIVE ROOT GASSER NODE



1. Determination of trajectory to the foramen ovale due to scall landmarks;
2. Introduction cryotom in the Mekkel cavity through the foramen ovale;
3. X-ray control location of cryotom in the cranial cavity;
4. Dosage (selective prism) cryosurgery of Gasser's node

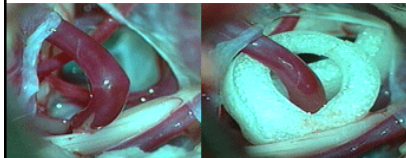
Microvascular decompression (MVD)



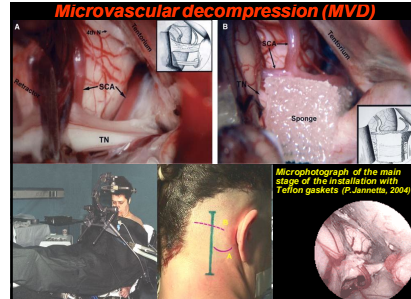
PETER JEANNETTE - American neurosurgeon. In 1967 he developed and implemented the technology to the operation of the MVD. The operation of MVD named after him (the operation Jannetta). Produced more than 4400 operations MVD

THE ADVANTAGES OF MVD (P.JANNETTA, 2004)

- Complete pain relief at once;
- The absence of loss of function of cranial nerves;
- The absence of mortality;
- Resistant result;
- Patogenetic intervention;
- Availability

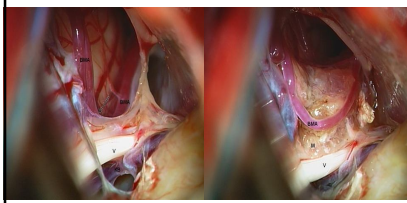


Microvascular decompression (MVD)



Microphotograph of the main stage of the installation with Teflon gaskets (P.Jannetta, 2004)

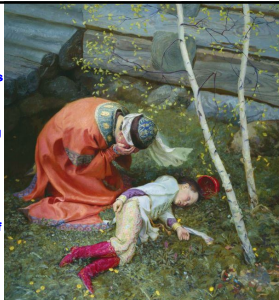
Microvascular decompression (MVD)



Neurovascular conflict After decompression

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Epilepsy - In Greek - "a sudden fall." The people are called - "epilepsy." Sometimes accompanied by a fall in screaming, convulsions, loss of consciousness, biting tongue, involuntary urination. Attack lasts 3-4 minutes, then the patient falls into a deep sleep. This is a severe form of disease. Frequency of attacks varies - from 1-2 times per year to 10-15 per day



In developed countries the number of seizures ranged from 24 to 53 cases per one thousand people. In addition, these figures do not include one-time provoked seizures and febrile seizures in children. Each year, the recorded incidence of epilepsy, an average of 70 per 100 thousand people (in children 4.5-5 times higher than in the population). The number of patients with epilepsy on the planet is more than 40-50 million people in Ukraine - about 500 thousand people

Looking at epilepsy as an incurable disease has been refuted by modern epidemiological studies that suggest that:

- 70% of patients after 5 years of adequate therapy did not have seizures in;
- 20% of patients coming long-term remission (2-5 years);
- 20-30% of patients suffering from epilepsy all his life


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SIGNS OF EPILEPSY

- Convulsive seizures and nonconvulsive;
- Epileptic personality changes

All epileptic seizures are common symptoms:

- short period;
- sudden onset and termination of the attack;
- the frequency of attacks and their similarity



Fase tónica Fase clónica

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Methods of investigation in epilepsy

MRI of the brain - The study is absolutely necessary in all patients with epilepsy, regardless of whether surgery is planned or not. Allows you to diagnose the condition, leading to epilepsy (tumors, AVMs).

fMRI (functional Magnetic Resonance Imaging) - Patient is placed in a high-resolution MRI (magnet is not less than 3 Tesla). During the study, patients are asked to perform various tasks: squeezing a fist, saying, look at pictures, and other studies based on the principle that the blood flow to various parts of the brain unevenly, with the active work of the functional areas of the brain blood flow in them is increasing.

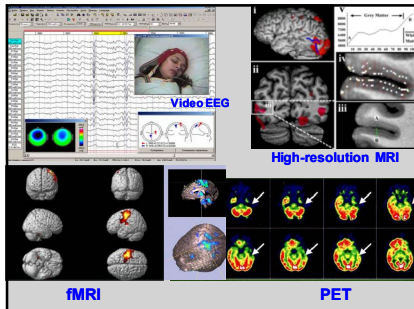
MEG (magnetoencephalography) - This study allows to accurately determine what part of the brain is epileptogenic focus.

Video-EEG monitoring - The study - the most important part of the preoperative patient, as it gives the surgeon information about the localization of epileptogenic focus.

PET (Positron Emission Tomography) and **SPECT (Single photon emission tomography)** study with 18-fluorodeoxyglucose can detect epileptogenic foci, especially in focal epilepsy, and assess the metabolic abnormalities in these centers.

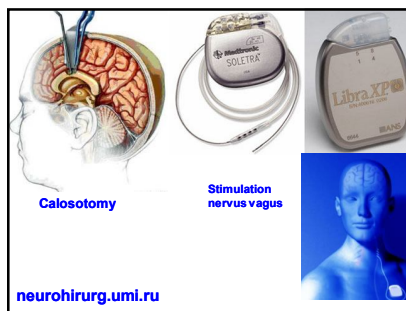
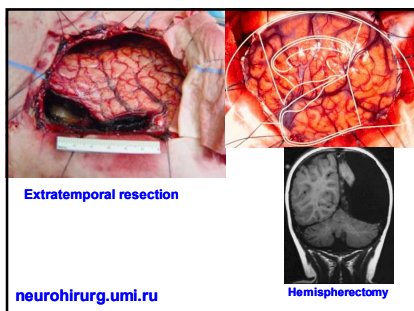
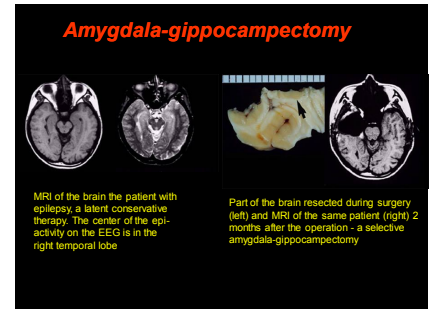
Neuropsychological testing results of neuropsychological testing can assess the risks of the planned operation.

Invasive EEG monitoring is sometimes these video-EEG, PET, MEG is insufficient to determine the exact location of the epileptogenic focus. In such cases, invasive video-EEG monitoring. The patient underwent the surgery to the imposition of the EEG electrodes directly on the cerebral cortex. The operation is performed under general anesthesia



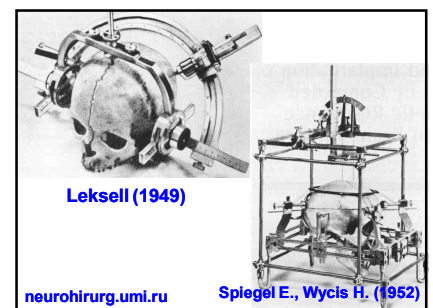
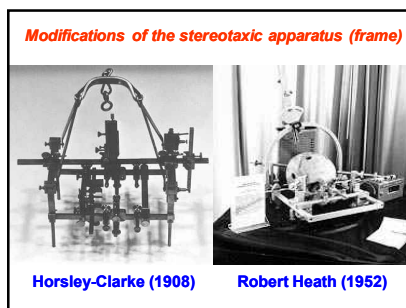
THE MAIN SURGICAL METHODS OF TREATMENT OF EPILEPSY

- **Focal cortical resection**; efficiency techniques for isolated use - 40-50%, when combined with resection of the medial structures - up to 80%;
- **Temporal lobe resection**, when the dominant hemisphere resection borders constitute 4.5-5 cm in the non-dominant hemisphere resection border - 7-8 cm, (upgraded appliances selective amygdala-gippocampectomy transiliev transcortical microsurgical approach is effective in 75-80% of cases);
- **Extratemporal resection**; effectiveness of techniques - 64% - clinical improvement of the disease, 36% - the liberation of the attacks. Favorable prognostic factor in the success of surgery is to record epileptic activity that is restricted to a fraction of the brain;
- **Hemispherectomy**;
- **Callosotomy**, best results are observed in the attacks "drop attack" (improvement occurs in 75-100% of cases);
- Multiple subpial notches;
- Stereotactic techniques;
- Stimulation of the cerebellum;
- Stimulation of the nervus vagus

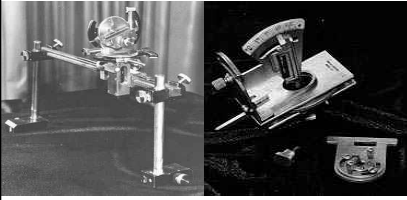


Determination of stereotaxy is a set of methods and calculations that allow using special instruments and methods of X-ray and functional control with high precision type electrode (cannula) into a predetermined depth of the structure of the brain or spinal cord to influence her with a diagnostic or therapeutic purposes

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Modifications of the stereotaxic apparatus (frameless)

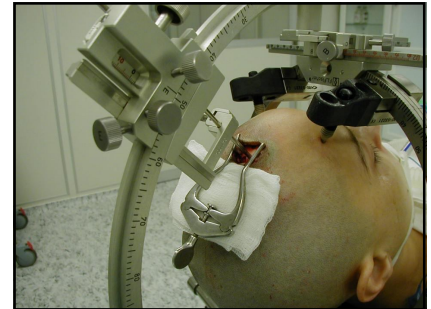


Dr. Irving Cooper (1955) David Fairman (1976)

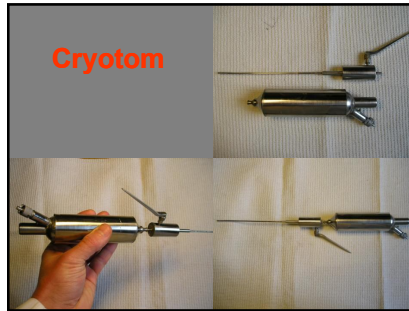


Cosman-Roberts-Wells (Radionics)

*Cosman-Roberts-Wells Stereotaxic System



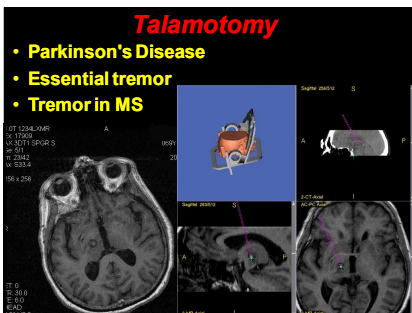
Equipped with modern stereotaxic operating



Cryotom

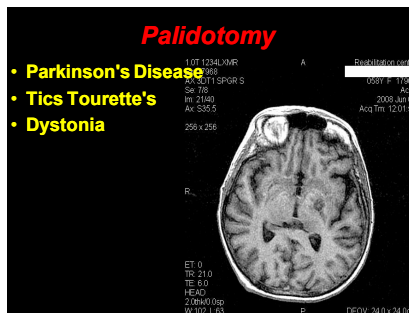


Stereotaxic surgery using the standalone cryoprobe controlled computed tomography intraoperative electrophysiological monitoring



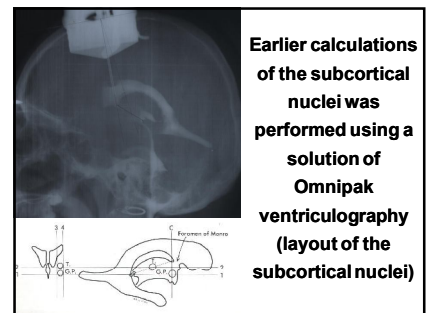
Talamotomy

- Parkinson's Disease
- Essential tremor
- Tremor in MS

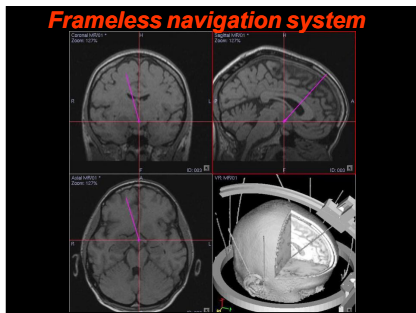


Palidotomy

- Parkinson's Disease
- Tics Tourette's
- Dystonia



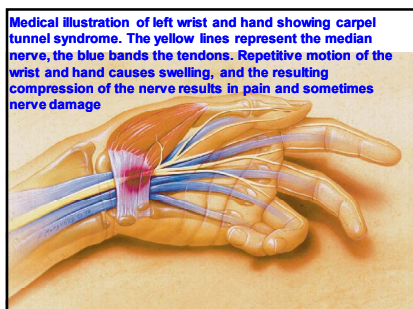
Earlier calculations of the subcortical nuclei was performed using a solution of Omnipak ventriculography (layout of the subcortical nuclei)



What is electrostimulation?

- The impact of electricity on slaboimpulsnogo structure of the peripheral and central nervous system
- Fundamental mechanisms of action of neurostimulation is still unknown

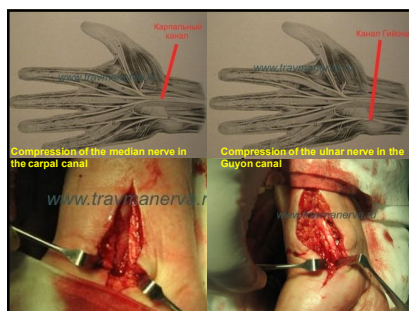
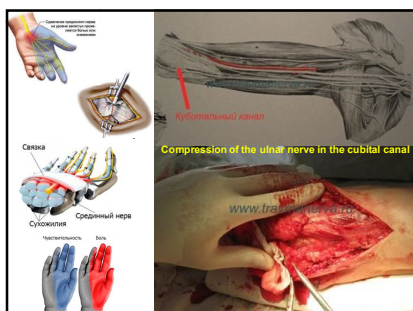
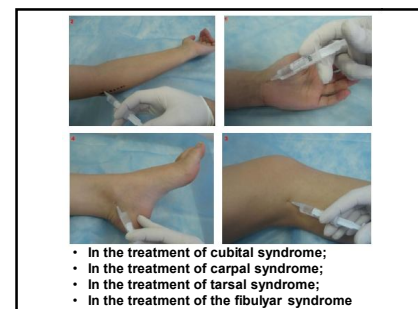
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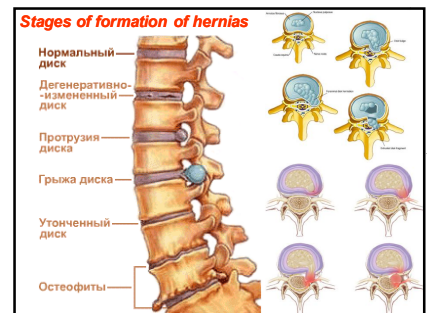
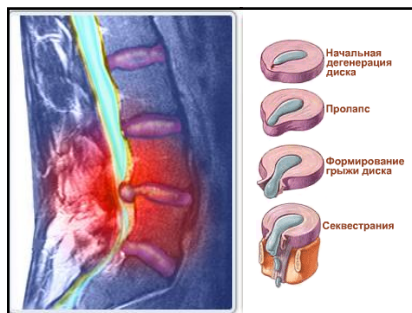
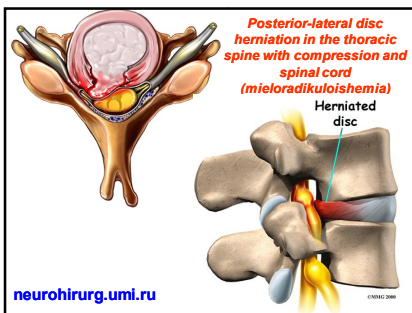
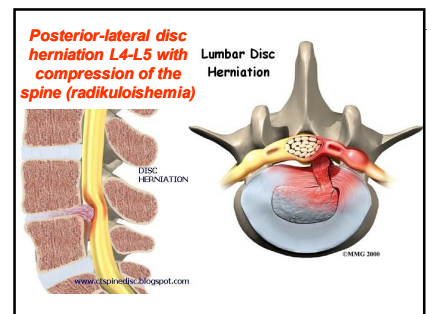
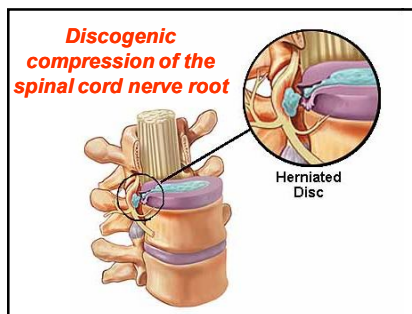
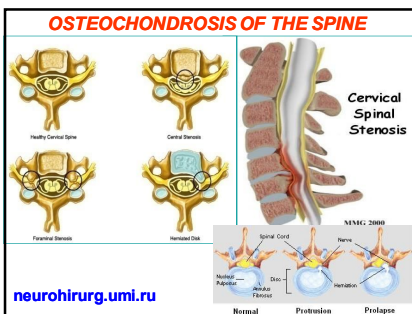
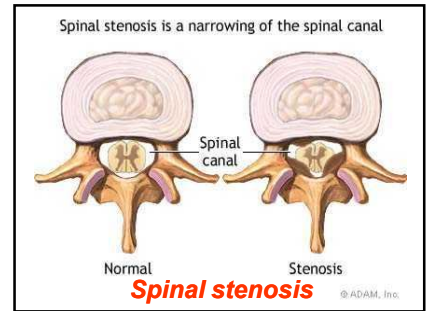
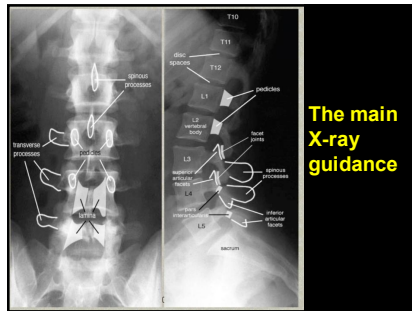
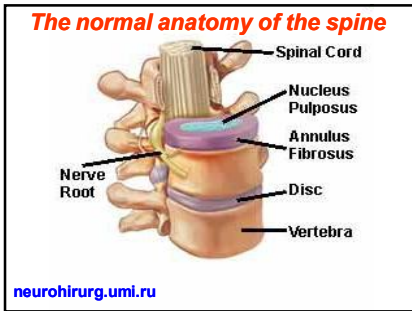


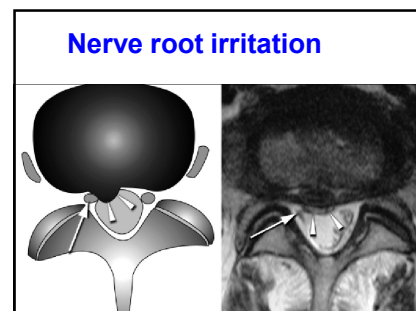
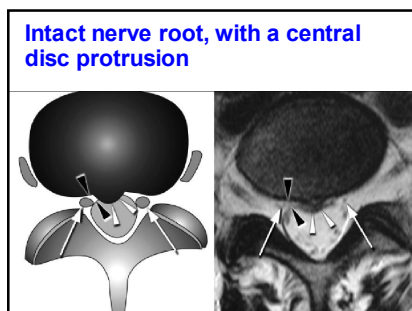
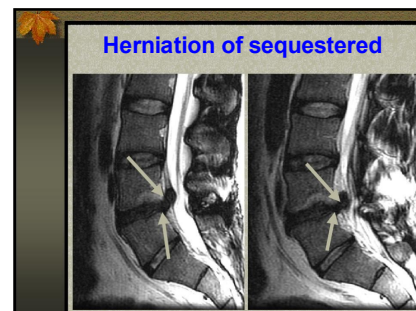
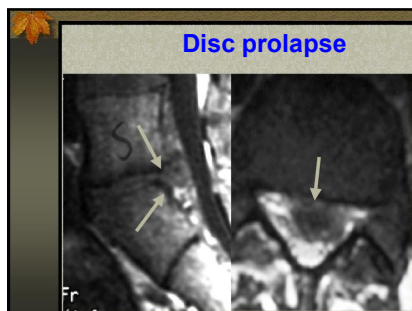
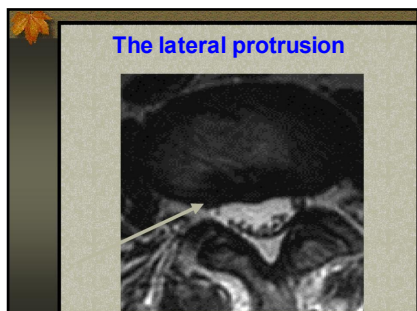
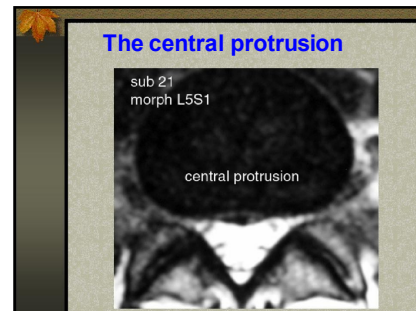
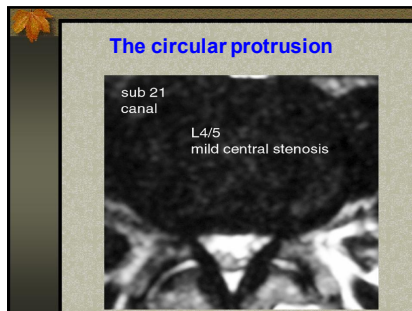
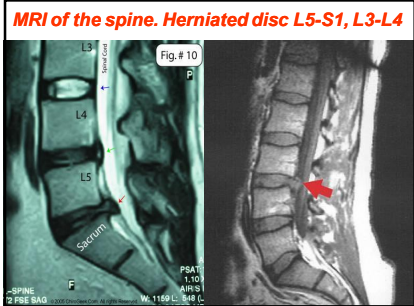
Problems with the nerves
 The nerve; compression; Fire damage to the nerves; Tumors of the nerves; Damage to the brachial plexus; The defeat of the facial nerve

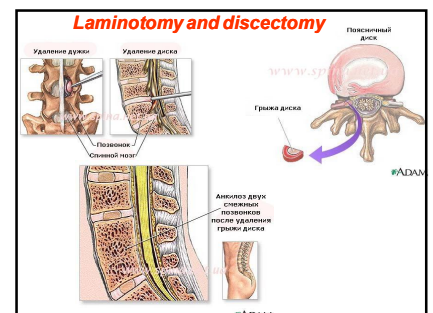
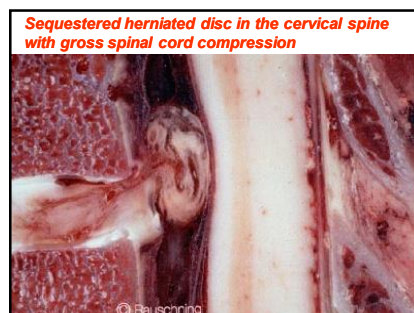
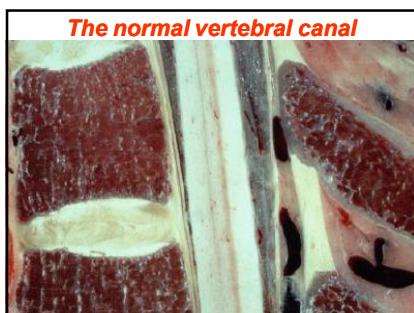
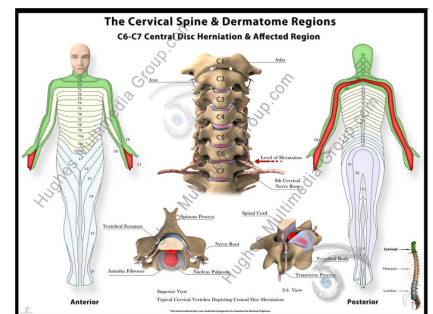
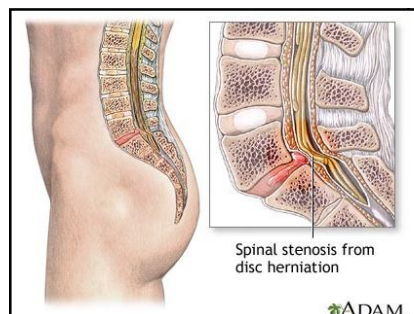
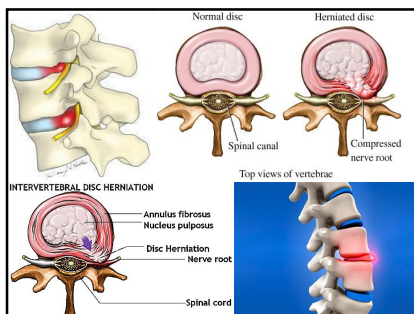
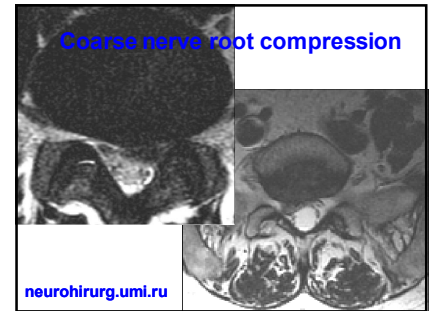
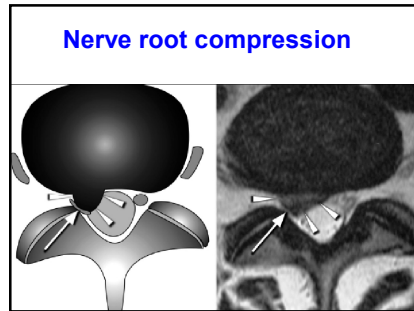
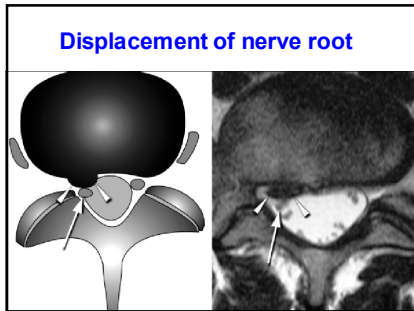
Methods of diagnosis
 Clinical examination; Electromyography; Magnetic resonance imaging; X-rays

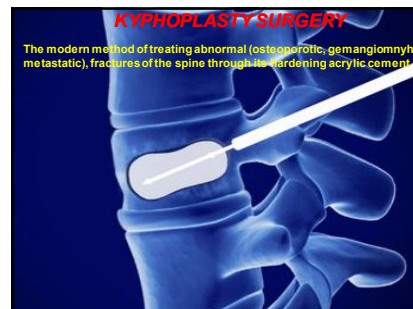
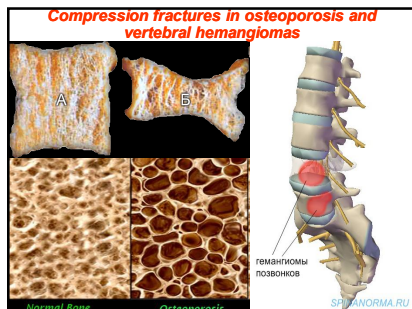
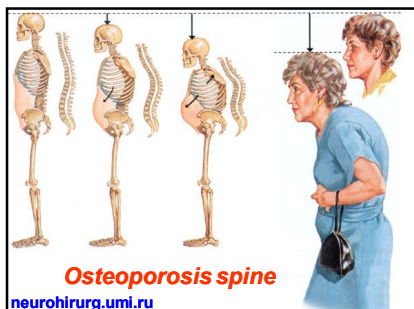
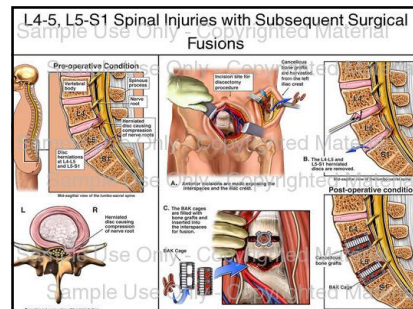
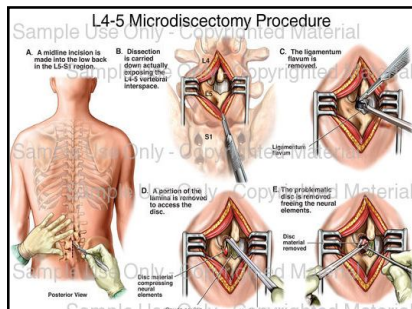
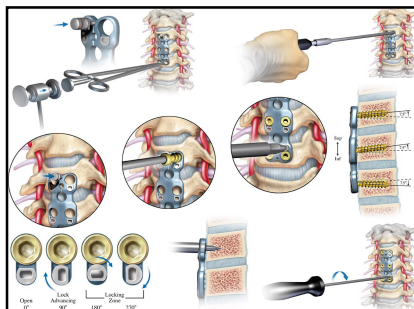
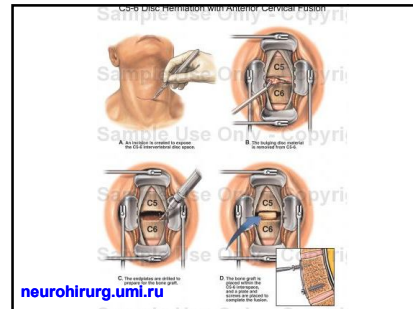
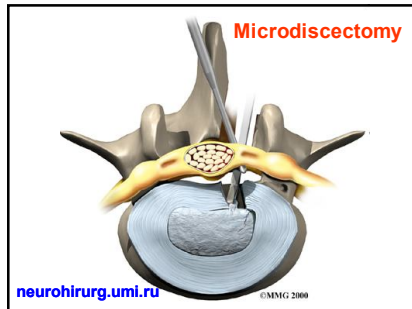
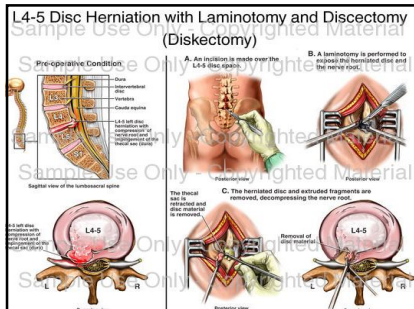
Methods of treating injuries and diseases of the nerves
 Suture of nerve; Suture of nerve damage after a fire; neurolysis; Decompression, moving into a new bed; reinnervation; Orthopedic surgery in irreparable damage to the nerves; removal of the tumor

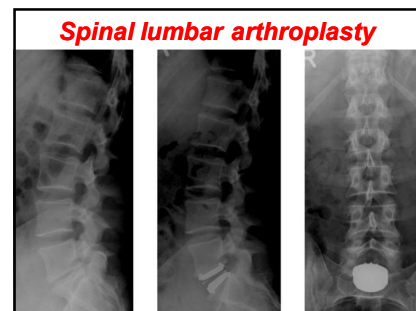
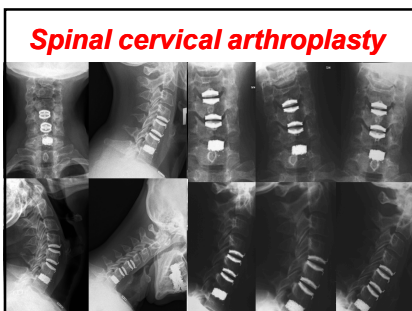
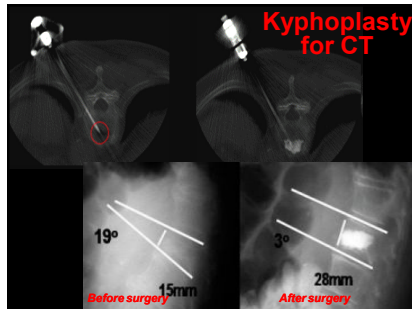
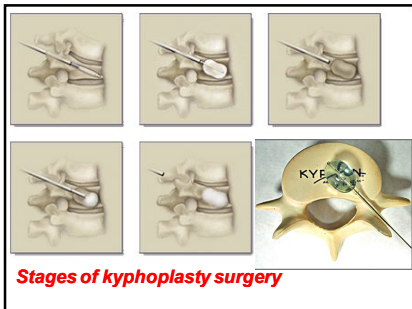












Methods of external fixation of thoracic and lumbar spine



Alternative semi-rigid lumbosacral corset in the treatment of herniated disc and protrusion at the level of the lumbar spine

Wearing the extensor (ecsterion) corset in the treatment of vertebral compression fractures

