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**HISTORY OF
NEUROSURGERY,
ANATOMY and PHYSIOLOGY
of NERVOUS SYSTEM,
INVESTIGATION METHODS**

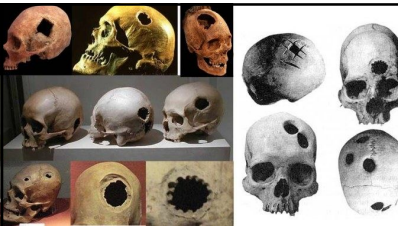
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Craniotomy, was practiced in Africa 12,000 years, and in Europe, 6,000 years ago. However, these cuts were made in the skulls, mostly dead, and this was done, probably because of superstition, for example, to drive out evil spirits. Already in the 1877 French anthropologist Paul Broca made the classification of the ancient transactions on the vault of the skull of man, which even today retains its value. He suggested that craniotomy was performed on living people sometimes - to heal them from certain diseases such as hysteria, epilepsy, convulsions, nervous disease, the cause of which takes the existing in the head and was attributed to the special spirit resides there. An artificial opening done in the skull, was intended to give vent to the spirit and so contribute to the liberation of the subject from the disease



More recent studies of other trepan skulls have led to the discovery of a whole set of different methods of surgical technique and pointed out the striking fact is that half of these patients after craniotomy completely cured. This can be seen at the edges of the bone around the hole in the skull, they are completely covered with new bone tissue, smooth and round. Scientists estimate that hundreds of trepan skulls found at present in Peru, exceed the amount of all known prehistoric trepan skulls in the world at large. For many centuries before the arrival of modern medicine in Peru, was born here neurosurgery...



The Incas performed trepanation of the skull operations in approximately every third inhabitant of Cuzco. Of the 420 skulls found, there were 145 holes from prior operations. One skull has seven holes, which means that the patient was subjected to craniotomy seven times



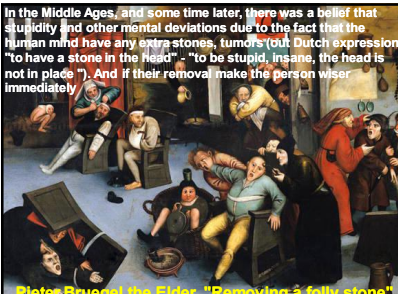
As a result of examination of the bones, found out that infectious diseases after operations have been extremely rare. Moreover, instead of antibiotics and pain medication, the Incas used a variety of herbs that act is no worse than modern drugs



The word «trepan» (trypanon) - Greek in origin, it meant a special drill bit that were used to perforate the skull. Scalpel blade served as a strong scraper. In ancient times a wide variety of techniques were used - sawed square or right-angled plates, which are then taken out, drilled holes in a circle outlined by, or just the bone was cut

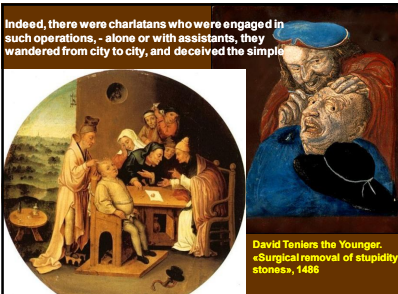


Trepanation was considered a promising treatment for migraines, epilepsy and mental disorders since the Neolithic



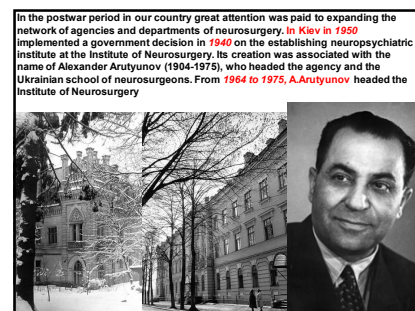
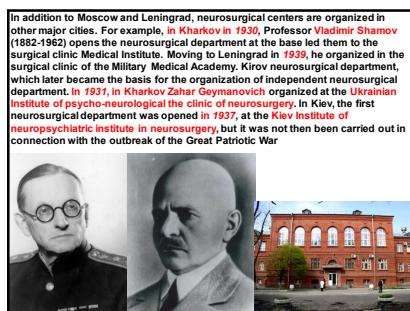
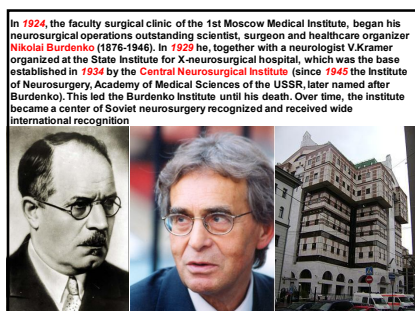
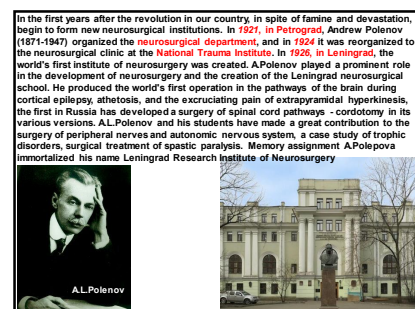
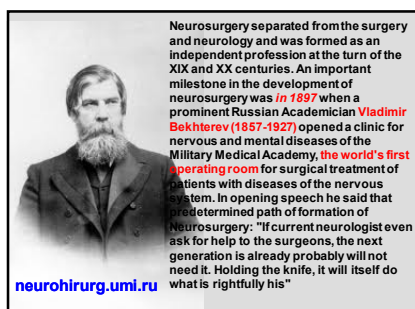
In the Middle Ages, and some time later, there was a belief that stupidity and other mental deviations due to the fact that the human mind have any extra stones, tumors (out Dutch expression "to have a stone in the head" - "to be stupid, insane, the head is not in place"). And if their removal make the person wiser immediately

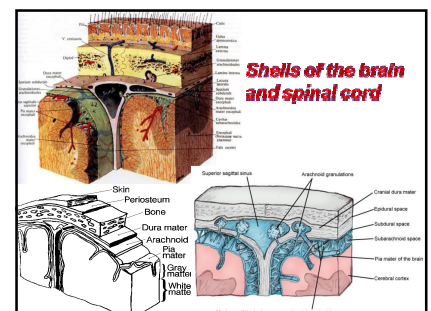
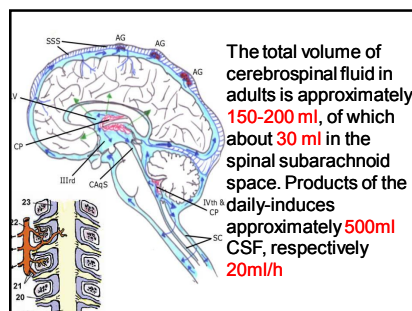
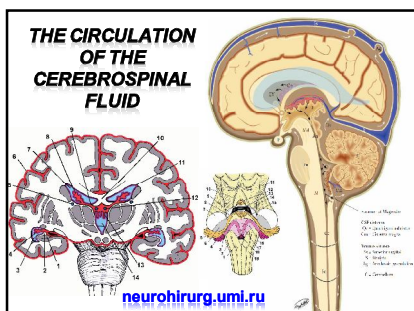
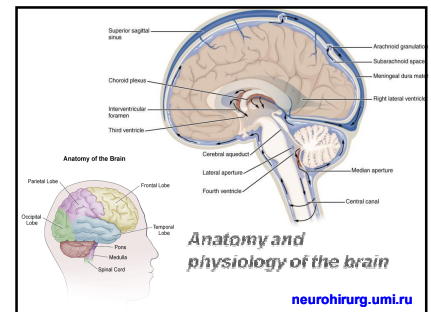
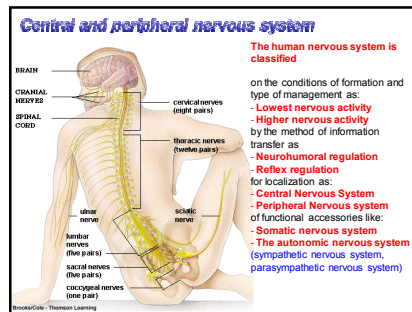
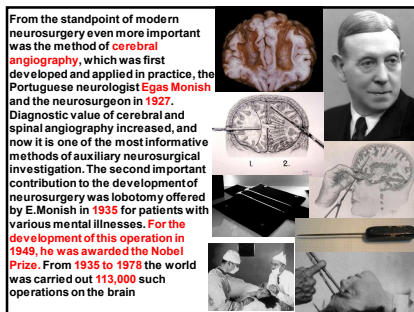
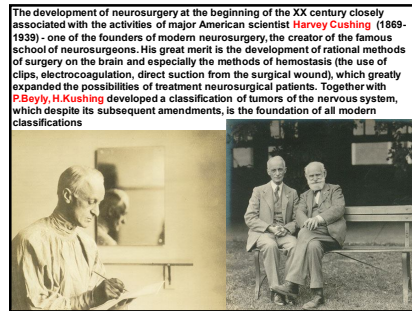
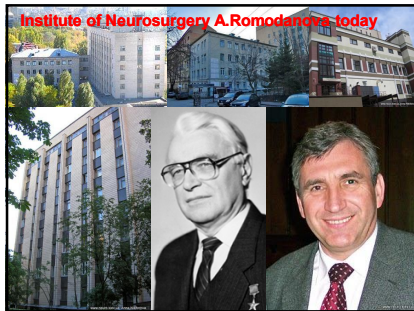
Pieter Bruegel the Elder, "Removing a folly stone"

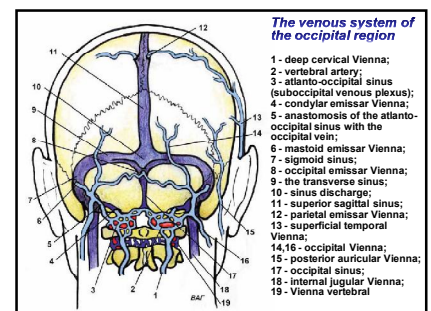
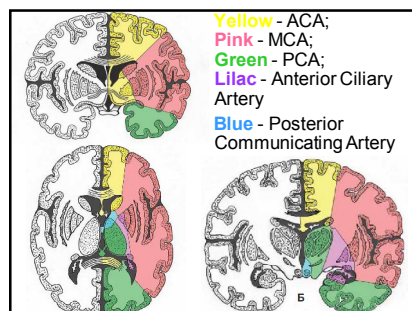
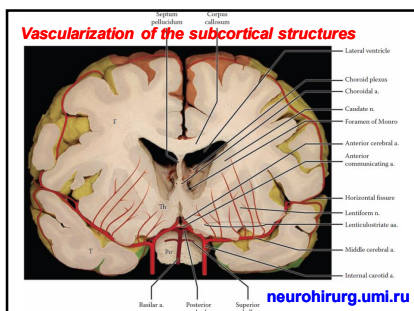
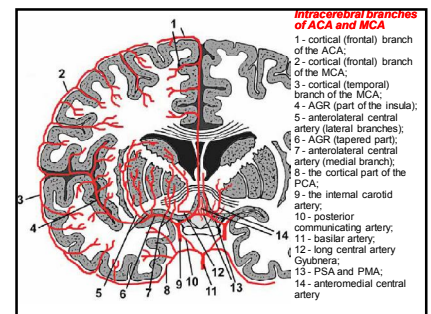
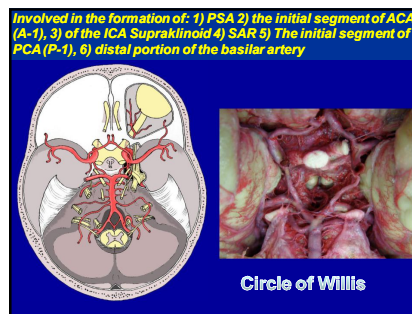
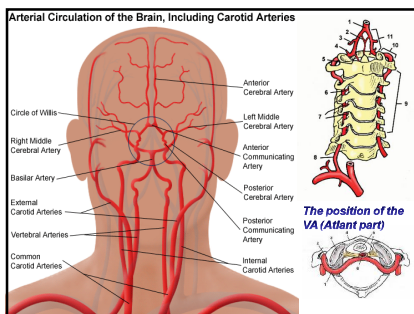
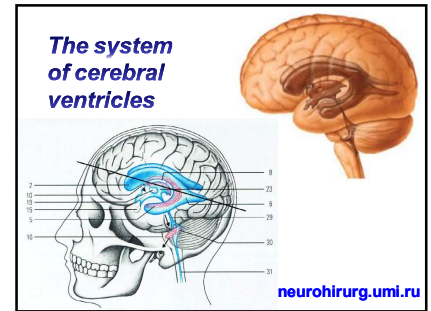
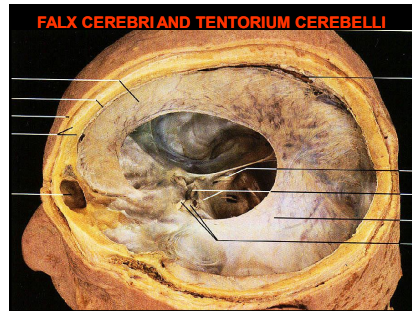
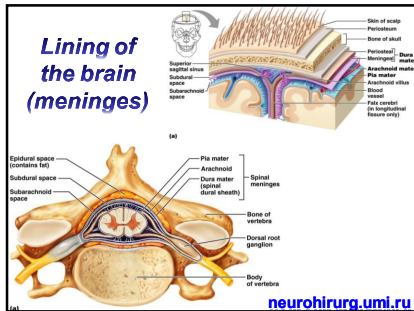


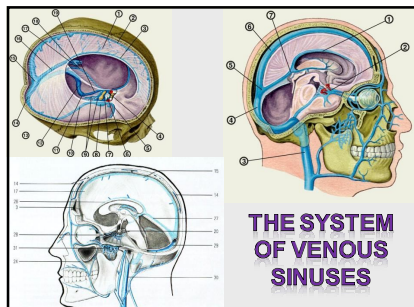
Indeed, there were charlatans who were engaged in such operations, - alone or with assistants, they wandered from city to city, and deceived the simple

David Teniers the Younger, «Surgical removal of stupidity stones», 1486









Methods of investigation in neurosurgery

NONINVASIVE

- Echoencephalography;
- Radiography of the skull and spine;
- Transcranial Doppler sonography;
- Electroencephalography;
- Electroneuromyography (surface and needle);
- Computed tomography of the brain and spine (with contrast);
- Magnetic resonance imaging of the brain and spinal cord (with contrast);

INVASIVE

- Lumbar puncture (liquorodynamic samples);
- Suboccipital puncture;
- Ventriculopuncture;
- Cerebral and spinal angiography;
- Myelography (ascending and descending);
- Ventriculography (contrast fluid or pneumatic);
- Electrocorricography;

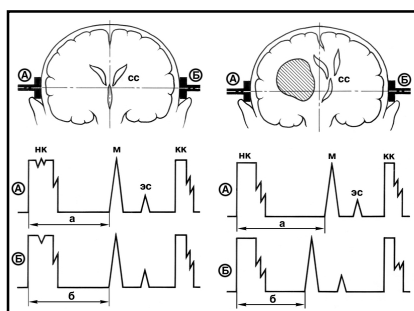
AUXILIARY

- Ophthalmologic examination;
- Otoneurologic survey

Echoencephalography

Echoencephalography was introduced into clinical practice in 1956 by a Swedish neurosurgeon pioneering research L.Leksella, who used a modified apparatus for industrial radiography, well-known in the art as a method of "nondestructive testing", and based on the ability of ultrasound reflected from the boundaries of media with different acoustic impedance

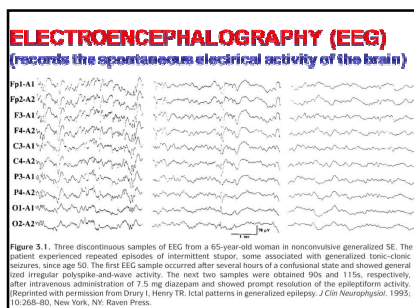
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Electroencephalography - a method for studying brain activity, which is based on recording the total activity of the cells (neurons). EEG is a recording of the difference between the oscillations of bioelectric potentials of the living brain

The major indications for EEG recordings in neurological practice are:

- suspicion of epilepsy in a new patient
- assessment of epilepsy in a patient with recurrent seizures
- assessment of the risk of epilepsy in a patient who has undergone intracranial surgery or following a severe head injury
- as an aid in the diagnosis of herpes simplex encephalitis and Creutzfeldt-Jakob disease



ELECTRONEUROMYOGRAPHY (EMG) - a hardware method of research, which is determined by the degree of electrical activity in muscles and nerve conduction

EMG CAN HELP DIAGNOSE MANY MUSCLE AND NERVE DISORDERS, INCLUDING:

- muscular dystrophy
- congenital myopathies
- mitochondrial myopathies
- metabolic myopathies
- myotonias
- peripheral neuropathies
- radiculopathies
- nerve lesions
- amyotrophic lateral sclerosis
- polio
- spinal muscular atrophy
- Guillain-Barre syndrome
- ataxias
- myasthenias
- inflammatory myopathies

Electromyography

EMMG 2002

EVOKED POTENTIALS

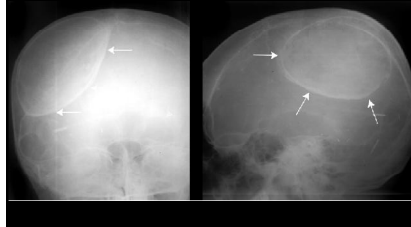
Stimulation of the sensory receptor will evoke a signal in the appropriate region of the cerebral cortex

- Visual evoked potential
- Brainstem auditory evoked potential
- Somatosensory evoked potential

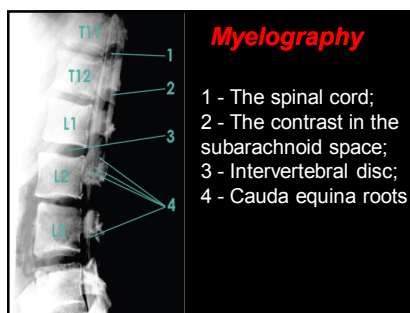
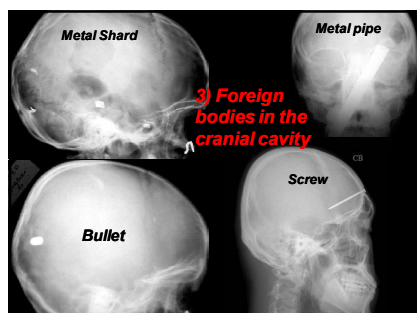
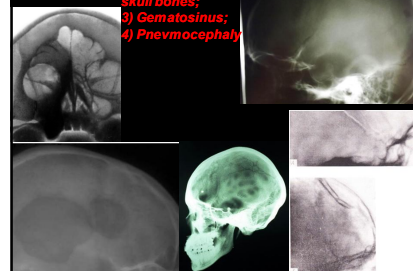
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Craniography to diagnose:

1) Ossified intracranial hematoma

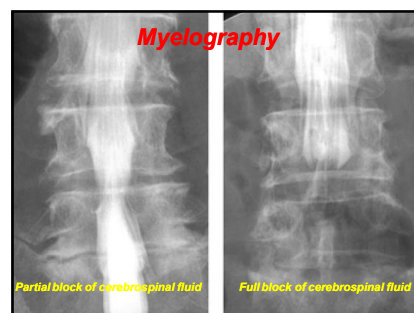


2) Fractures and defects of the skull bones; 3) Gamatosinus; 4) Pnevmocephaly



Myelography

- 1 - The spinal cord;
- 2 - The contrast in the subarachnoid space;
- 3 - Intervertebral disc;
- 4 - Cauda equina roots



CT of the brain allows you to visualize: 1) linear and depressed fractures of the bones of the skull



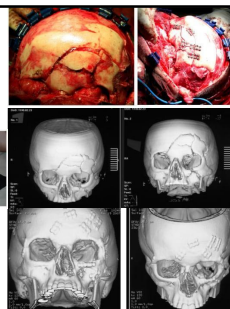
2) 3D CT Skull

Etched many fragmented fracture of the frontal bone with the transition to the roof of the left orbit

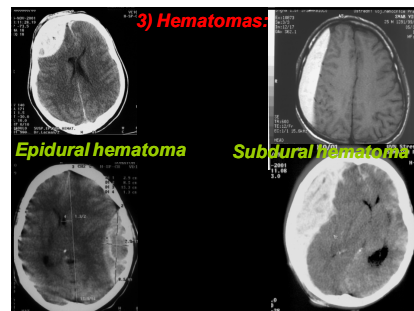


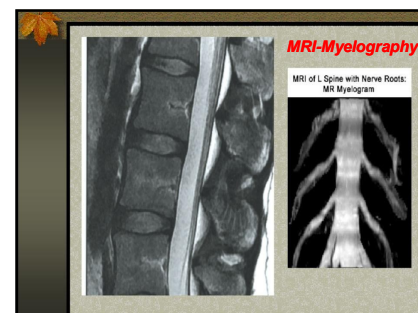
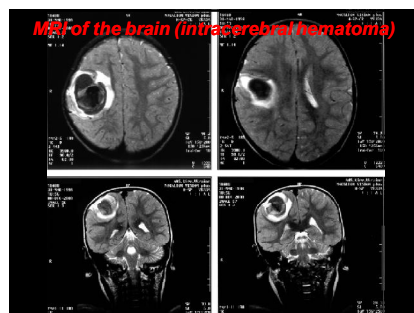
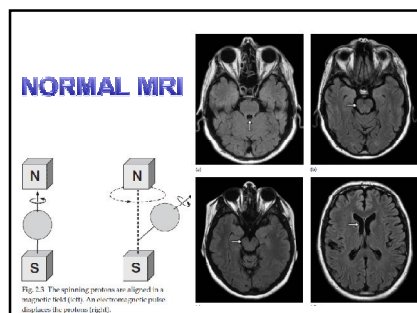
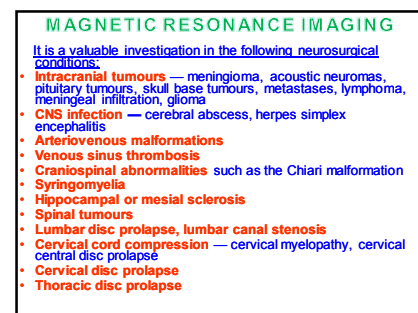
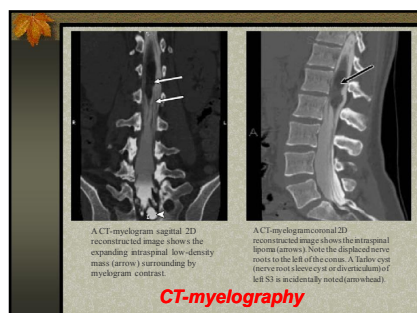
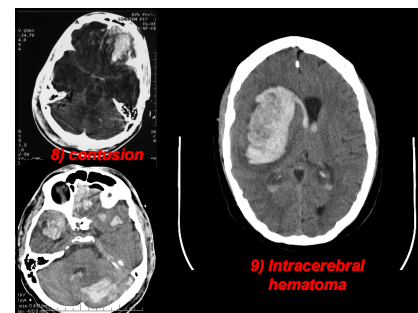
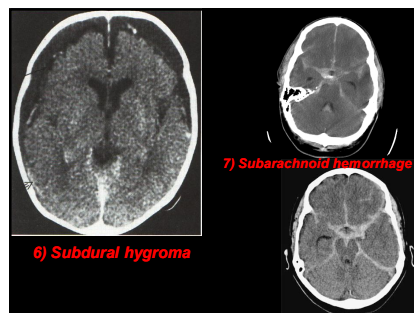
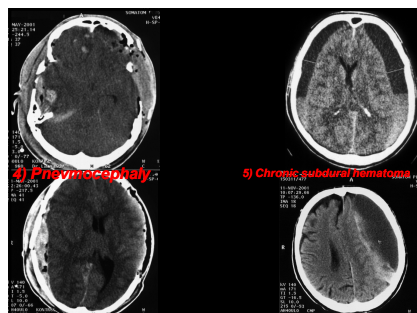
Condition after fracture repositioning of bone fragments

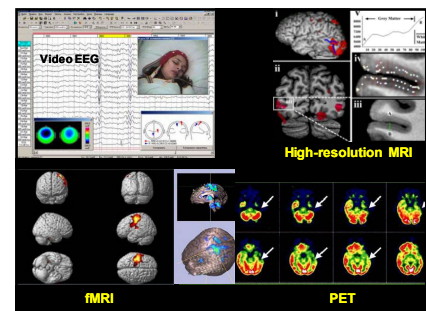
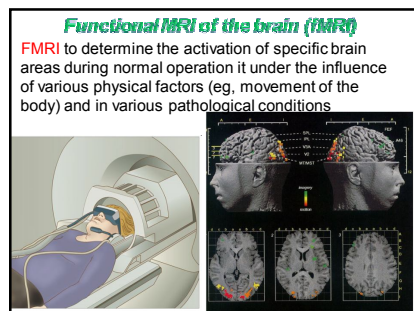
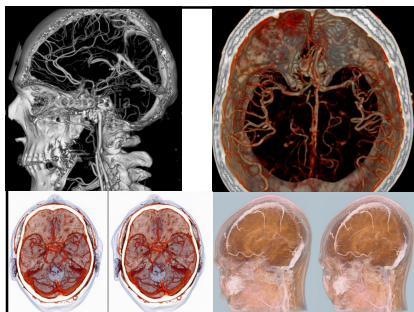
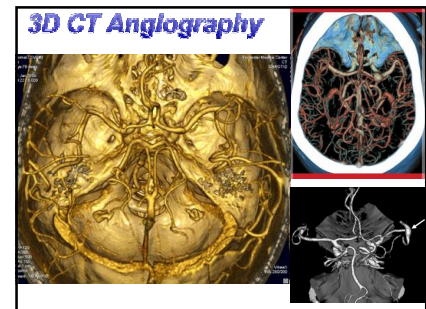
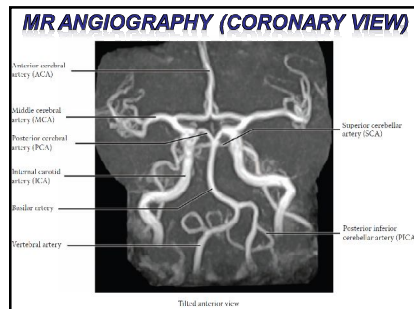
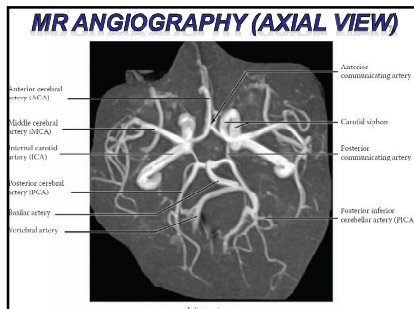
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3) Hematomas:







CSF can be obtained by:

- Lumbar puncture
- Cisternal puncture
- Cannulation of the lateral ventricle

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Lumbar puncture

The most common indications for CSF examination by lumbar puncture are:

- Subarachnoid hemorrhage, meningitis
- Neurological diseases such as multiple sclerosis
- Spinal anesthesia
- Intrathecal administration of antibiotics, chemotherapy
- Cytological examination for neoplastic disease
- Injection of contrast media for myelography or for cisternography
- Measurement of intracranial pressure

CONTRAINDICATIONS

Absolute contraindications for lumbar puncture are the presence of infected skin over the needle entry site and the presence of unequal pressures between the supratentorial and infratentorial compartments. The latter is usually inferred from the following characteristic findings on computed tomography (CT) of the brain:

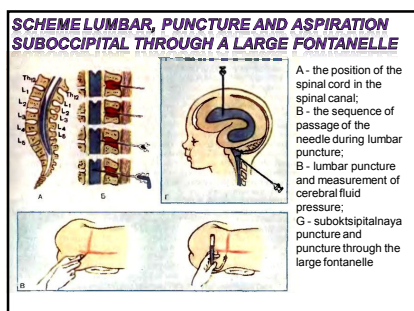
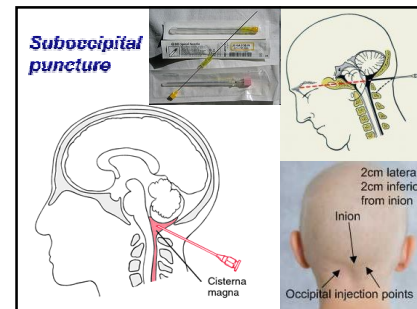
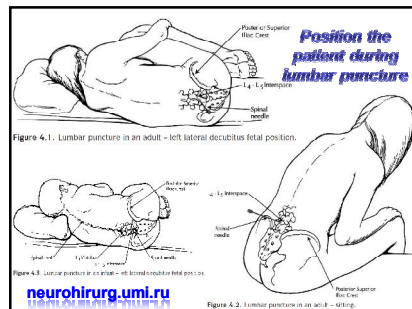
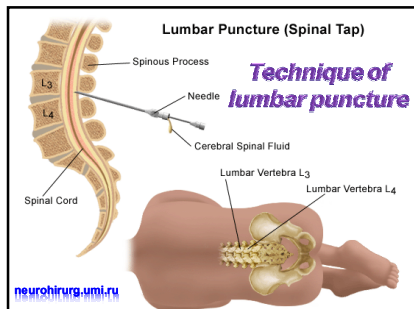
- Midline shift
- Loss of suprachiasmatic and basilar cisterns
- Posterior fossa mass
- Loss of the superior cerebellar cistern
- Loss of the quadrigeminal plate cistern

Relative contraindications for lumbar puncture include the following:

- Increased intracranial pressure (ICP)
- Coagulopathy
- Brain abscess

Indications for performing brain CT scanning before lumbar puncture in patients with suspected meningitis include the following[9]:

- Patients who are older than 60 years
- Patients who are immunocompromised
- Patients with known CNS lesions
- Patients who have had a seizure within 1 week of presentation
- Patients with an abnormal level of consciousness
- Patients with focal findings on neurologic examination
- Patients with papilledema seen on physical examination, with clinical suspicion of an elevated ICP



COMPLICATIONS— LP is a relatively safe procedure, but minor and major complications can occur even when standard infection control measures and good technique are used. These complications include:

- Cerebral herniation
- Post-LP headache
- Infection
- Bleeding
- Minor neurologic symptoms such as radicular pain or numbness
- Late onset of epidermoid tumors of the thecal sac
- Back pain

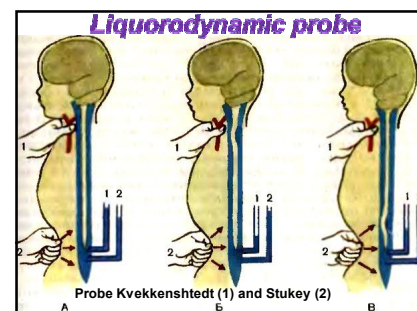
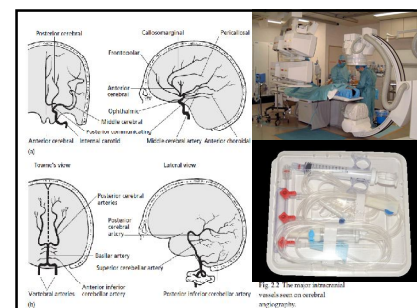


Table 2.1 CSF statistics (lumbar).	
Volume	140 ml
Rate of production	0.4 ml/min
Pressure (recumbent)	10–15 cm of CSF
Cells	Less than 3–4 white cells/mm ³
Protein	0.15–0.45 g/l (15–45 mg/100 ml)
Glucose	2.8–4.2 mmol/l (50–75 mg/100 ml)
IgG	10–12% of total protein
Chloride	120–130 mmol/l

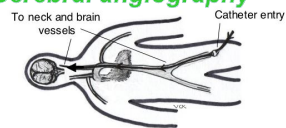
The values are expressed in SI (Système Internationale) units and the corresponding traditional units are in parentheses.

CSF along the cerebrospinal axis			
Table 2.2 CSF gradients along the cerebrospinal axis.			
	Ventricle	Cisternal	Lumbar
Protein (g/l)	0.1	0.2	0.4
Glucose (mmol/l)	4.5	4.0	3.4

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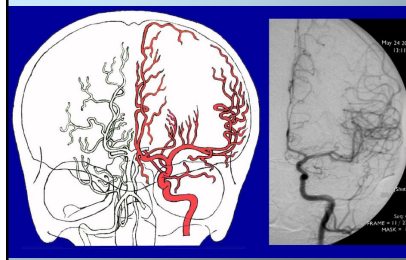
Cerebral angiography



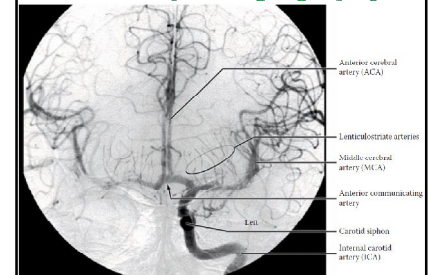
The major indications for angiography are:

- investigation of cerebral ischaemia due to carotid artery disease and intracranial atheroma
- investigation of subarachnoid haemorrhage, e.g. cerebral aneurysm, arteriovenous malformation
- investigation of venous sinus thrombosis
- preoperative embolization of meningioma

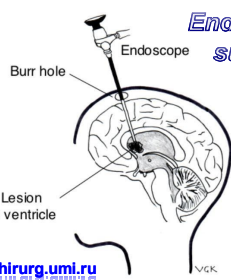
Cerebral carotid angiography



Cerebral panangiography



Endoscopic surgery



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THANK YOU!