


# Introduction into Neurology

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Department of Neurology  
Semmelweis University  
BUDAPEST



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## What is Neurology?

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**Neurology:** The medical science of the nervous system and its disorders.



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Sunday, April 08, 2007

- CONDITIONS
- [ADHD](#)
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- [Carpal Tunnel](#)
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- [Cerebral Palsy](#)
- [Charcot-Marie-Tooth Disease](#)
- [Chronic Pain](#)
- [Coma](#)
- [Creutzfeldt-Jakob Disease \(CJD\)](#)
- [Dementia](#)
- [Dizziness](#)
- [Encephalitis](#)
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## What is a Neurologist?

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A neurologist is a medical doctor or osteopath who has trained in the diagnosis and treatment of nervous system disorders, including diseases of the brain, spinal cord, nerves, and muscles.

Neurologists perform neurological examinations of the nerves of the head and neck; muscle strength and movement; balance, ambulation, and reflexes; and sensation, memory, speech, language, and other cognitive abilities.

They also perform diagnostic tests such as the following:

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- CAT (computed axial tomography) scan
- MRI/MRA (magnetic resonance imaging/magnetic resonance angiography)
- lumbar puncture (spinal tap)
- EEG (electroencephalography)
- EMG/NCV (electromyography/nerve conduction velocity)



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[Multiple Sclerosis](#)

[Multisystem Atrophy](#)

[Myasthenia Gravis](#)

[Myopathies](#)

[Nervous System](#)

[Tumors](#)

[Neurofibromatosis](#)

[Neuropathy](#)

[Normal Pressure](#)

[Hydrocephalus \(NPH\)](#)

[Parkinson's Disease](#)

[Periodic Limb](#)

[Movement Disorder](#)

[Restless Legs](#)

[Syndrome](#)

To become a board-certified neurologist several requirements must be met.

### **Education**

- Four years of premedical education in a college or university
- Four years of medical school resulting in an MD or DO degree (doctor of medicine or doctor of osteopathy degree)
- One year internship in either internal medicine or medicine/surgery
- At least 3 years of specialty training in an accredited neurology residency program

### **Residency**

Residency programs accredited by the [Accreditation Council for Graduate Medical Education \(ACGME\)](#) provide supervised experience in hospital and ambulatory care settings as well as educational conferences and research trainings.

After completing residency training, neurologists may enroll in a fellowship program to develop expertise in a subspecialty such as stroke, dementia, or movement disorders.

### **Board Certification**

After completing the educational requirements, medical doctors may seek certification from the [American Board of Psychiatry and Neurology \(ABPN\)](#), a member of the [American Board of Medical Specialties \(ABMS\)](#).

The ABPN offers additional certification in the following fields:

# ABOUT THE FOUNDATION

[Home](#) / [About the Foundation](#) /



Debi Brooks, President & Co-Founder  
and Michael J. Fox, Founder

The Michael J. Fox Foundation for Parkinson's Research is dedicated to ensuring the development of a cure for Parkinson's disease within this decade through an aggressively funded research agenda.

Enormous progress toward finding a cure has been made on many neurological fronts, and scientists' understanding of the brain and how disease affects it has increased dramatically. The Foundation seeks to hasten progress further by awarding grants that help guarantee that new and innovative research avenues are thoroughly funded and explored.

Actor Michael J. Fox established the Foundation in May 2000 shortly after announcing his retirement from the ABC television show *Spin City*. In 1998 he publicly disclosed that he had been diagnosed with young-onset Parkinson's disease seven years earlier.

## EMAIL UPDATES

To sign up for e-mail updates and join our mailing list, [click here](#).

## AUDITED FINANCIAL STATEMENT

To see our most recent audited financial statement, [click here](#). (pdf file, 811 KB)

## IRS 990 FORM

## IN THIS SECTION

### FAQS

Read commonly asked questions about the Foundation and how you can help us in our fight against Parkinson's disease.

[Click here for more information](#)

### BOARD OF DIRECTORS

MJFF's Board of Directors is made up of leaders in science, business and entertainment. Their expertise in such varied fields helps to guide the Foundation in its pursuit of raising money for the sole purpose of funding Parkinson's research.

[Click here for more information](#)

### SCIENTIFIC ADVISORS

MJFF's Scientific Advisory Board is composed of a multidisciplinary group of leading Parkinson's researchers and clinicians from across North America. Its members are actively involved with all the strategic meetings, grant review sessions, and other activities that guide the Foundation's scientific and research policies.

# OUTLINE

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- Learning requirements
  - What to study
  - Practicals
  - Exams
- Subject of neurology
- The neurological diagnosis
- Case presentations
- Patient presentation

# What to study?

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- Textbook: show what you have to the tutor of your group to see if it is OK, e.g.
  - Mumenthaler
  - Neurology Neurosurgery Illustrated,
  - Walton, Victor-Adams, Netter, etc
- What is presented at the lectures
- What you are taught at practical classes
- Practical textbook of the Department
- E-learning material of the Department

# E-learning

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- Individual study
- Interactive learning
- Self assessment at the end of chapters
- Use the same username and password as for other e-learning materials of Semmelweis University

# E-learning



Simmelweis Kiadó és  
Multimédia Stúdió Kft.



Könyvek E-könyvek Folyóiratok E-olvasók **E-learning** Szolgáltatások A kiadóról Letöltések

Gyors keresés:   E-könyv is  Csak Simmelweis Kiadó

**Újdonságok**

Zaletnyik Zita (szerk.), Repiszky Tamás (szerk.): **A gyógyító mozgás művésze - Madzsar Alice emlékének**

Dunay György, Keller Éva, Sótónyi Péter: **Rendkívüli halálozás Budapest 1940-2010**

sikerkőnyv album sikerkőnyv album sikerkőnyv album sikerkőnyv album

Tóth József és Podonyi Hedvig: **REJTŐZKÖDŐ BUDAPEST**

**Legkeresettebbek**

Barabás József (szerk.), Orosz Mihály (szerk.): **Szajsebészeti és fogászat - Általános orvosok és orvostanhallgatók számára**

Karczag Ákos, Szabó Tibor: **Erdély, Partium és a Bánság erődített helyei, 2., átdolgozott kiadás, számozott példányok**

**Előkészületben**

Szabó Lőrinc  
Shakespeare-drámafordításai

A csontanyagcsere betegségei

Szykzsian Wanda

**Bejelentkezés**

E-mail cím:

.....

Emlékezz rám

Regisztrálás  
Elfelejtett jelszó

**Új hír érkezett**

**Meghívó - A Madzsar Iskola megalakulásának 100 éves évfordulójára**

2012. szeptember 15. szombat 10 óra

Simmelweis Egyetem  
Egészségtudományi Kar  
1088 Budapest Vas utca 17., Szél Éva terem

**A Meghívó letölthető itt!**

2012-09-13

**Őszi könyvújdonságunk!**

Örömmel értesítjük, hogy megjelent **Dunay György, Keller Éva, Sótónyi Péter: Rendkívüli halálozás Budapest 1940-2010** című magyar nyelvű

# http://itc.semmelweis-univ.hu/moodle/

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Nincs bejelentkezve. (Belépés)

Magyar (hu)

### Támogatók

ÚJ SZÉCHENYI TERV

Felvehető kurzusok  
e - E.N.T.

Fül-orr-gégészet

NEUROLOGY

Neurológia

MEDICAL PSYCHOTHERAPY

Pszichoterápia

Onkológia

ORTHOPAEDICS

### Naptár

2012. szeptember

H	K	Sze	Cs	P	Szo	V
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

### Online felhasználók

(utolsó 5 perc)  
Nincs

### Plugin

Videók lejátszásához szükséges lejátszók a következő linkeken tölthetők le:  
Adobe Flash Player  
QuickTime

A Semmelweis Egyetem hallgatói és oktatói számára írt útmutató itt tölthető le.

Külső felhasználók számára a programba való belépés regisztrációköteles. E-mailben kérje regisztrációját: gyombercs@tf.hu

Here's a users' guide in English how to login (only for students of Semmelweis).

7:37  
2012.09.14.

### Bejelentkezés a Semmelweis Egyetem hallgatói és oktatói számára

#### Login for students of Semmelweis University



Kattintson ide a bejelentkezéshez! [Click here to login!](#)

További információ a Semmelweis Központi Azonosítórendszeréről

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Navigation: Fájli Szerkesztés Nézet Kedvencek Eszközök Súgó

Language: English (en)

Page Header: SEMMELWEIS EGYETEM E-LEARNING RENDSZERE

Page Header: SEMMELWEIS EGYETEM E-LEARNING RENDSZERE

Page Header: You are currently using guest access

Page Header: Home Login to the site

Section Header: **Bejelentkezés a Semmelweis Egyetem hallgatói és oktatói számára**

Section Header: **Login for students of Semmelweis University**

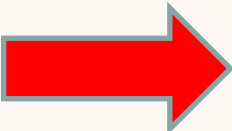

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Text: További információ a Semmelweis Központi Azonosítórendszeről

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- Kezdőoldal
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  - NEUROLOGY
    - Résztvevők
    - Jelentések
    - Általános
    - Téma 1
    - Téma 2
    - Téma 3
    - Téma 4
    - Téma 5
    - Téma 6

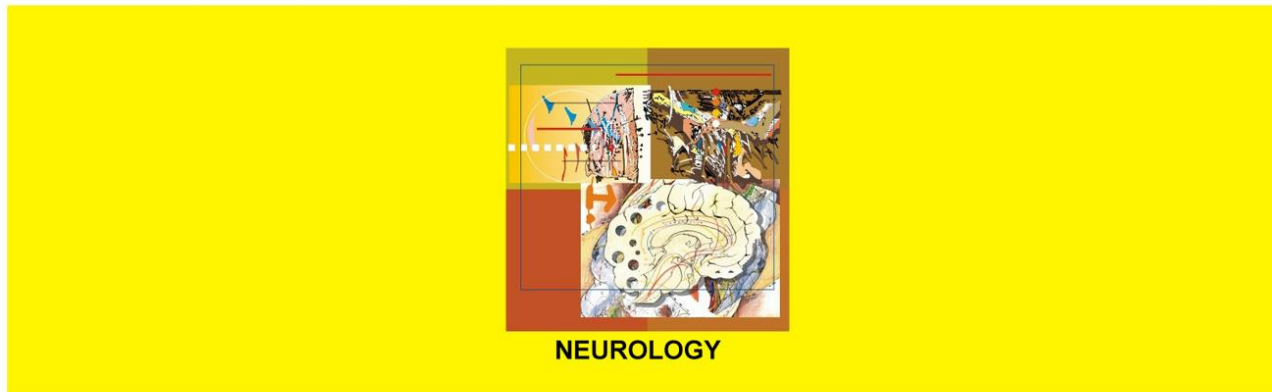
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A projekt az Európai Unió támogatásával, az Európai Szociális Alap finanszírozásával valósul meg.

TÁMOP-4.1.2-08/2/A/KMR-2009-0019



## NEUROLOGY

- Hírfórum
- I. Introduction – The subject of neurology

- Téma 1**
- II. Learning Unit: Neurological Patient Examination

**Keresés a fórumokban**

Mehet

Részletes keresés?

**Legfrissebb hírek**

Új téma hozzáadása...

(Nincs még hír)

**Elkövetkező események**

Nincs elkövetkező esemény

Áttérés a naptárhoz...

Új esemény...

**Legutóbbi tevékenység**

Tevékenység 2012. szeptember 12., szerda, 07:43 óta

Talicsa jelentés a legutóbbi

Lesion of cortical eye movement centers and of the descending fibers causes contralateral horizontal gaze palsy. Lesion of the pontine gaze center causes ipsilateral horizontal gaze palsy. For further details, refer to the recommended sources.

**Symptoms of oculomotor nerve lesion**

The nerve exits the brainstem between the superior cerebellar artery and the posterior cerebral artery; therefore an aneurysm on these vessels may lead to oculomotor nerve lesion. The *external (partial=without the involvement of parasympathetic pupillary function) oculomotor nerve lesion* seen in diabetic patients is caused by ischemia. On the affected side, ptosis is present, and the eye is deviated laterally and downward because the intact abducens and trochlear nerves pull the eye in this position. The patient complains of diplopia. If the parasympathetic fibers are also affected, the pupil is dilated, the direct pupillary light reflex and the accommodation reaction are lost. This is a *complete oculomotor nerve lesion* (Fig. 5).



Fig. 5

The consensual light reflex can be elicited from the abnormal, wide pupil, but no consensual light reflex is seen on the abnormal side when the intact eye is illuminated.

**Ptosis** may be unilateral or bilateral. *Unilateral ptosis* is caused by oculomotor nerve lesion. Causes of *bilateral ptosis* include 1) congenital ptosis; 2) chronic progressive ophthalmoplegia; 3) myasthenia gravis; 4) central lesion of the oculomotor nucleus.

In case of **circulatory insufficiency of the brainstem**, the axons of the oculomotor nerve may be damaged before exiting, at the base of the midbrain. If the ischemia affects the corticospinal pathway or the red nucleus, then contralateral hemiparesis or contralateral intentional tremor also develops in addition to the ipsilateral oculomotor nerve lesion (*Weber's and Benedict's syndromes*) ([go to the video](#)).

**Inflammation or cellular infiltration** on the basal part of the brain (bacterial meningitis, syphilis, tuberculosis, meningeal carcinomatosis) may also damage the nerve.

**Herniation of the temporal lobe** due to space occupying lesions causes dislocation of the cerebral peduncle, which damages the nerve as well (see below).

**Symptoms of trochlear nerve lesion**

When the trochlear nerve (4th cranial nerve) is damaged, the affected eye's movement is



In peripheral nystagmus, how is the direction of nystagmus determined?



Peripheral vestibular syndrome

**Examination of nystagmus:** the eyes are first observed in resting position, then during following eye movements in all four directions, in both sitting and supine positions. The direction, frequency, amplitude, and nature (rhythmic or non-rhythmic) of nystagmus, and the influence of gaze, change of head and body position is described. Nystagmus may be examined with *rotational and caloric stimulation*. With rotation, both labyrinths are stimulated, whereas with caloric stimulation the two labyrinths can be examined separately.

**With rotation,** the endolymph in the lateral (horizontal) semicircular canals flows in the direction opposite to the direction of rotation. The slow component of the nystagmus is opposite to the direction of rotation, therefore it is in the same direction as the flow of endolymph; the quick component beats in the direction of rotation. When rotation is stopped, the direction of post-rotational nystagmus is inverted, thus the quick component now beats opposite to the direction of rotation. The direction of deviation and past-pointing is the same as that of the slow component.

**With caloric stimulation,** warm water is injected into the ear, which causes an ampullopetal flow of the endolymph in the lateral semicircular canal and a nystagmus beating in the direction of the stimulus. With cold stimulation, the direction of nystagmus is towards the opposite side. Caloric stimulation is suitable for determining whether the nystagmus is caused by a lesion to the vestibular organ. Caloric stimulation on the side of lesion produces no nystagmus, and causes no change in any on-going nystagmus.

**The Romberg's test** is used to differentiate peripheral and central vertigo.

**Description of normal findings**

*Whispered words are well heard on both sides. Weber test is normal. Rinné test is positive on both sides. No nystagmus. No swaying in Romberg's test. No past-pointing in Bárány's test. No deviation when walking with eyes closed.*

**Nystagmus**

Nystagmus is an involuntary, rhythmic eye movement with a slow and a quick component, occurring in the presence of dysfunction of the vestibular, cerebellar and the eye movement control system. Based on the relation of the quick component and the direction of gaze, nystagmus of peripheral vestibular origin may be of *1st degree* if the nystagmus appears only when looking in the direction of the quick component, *2nd degree* if it appears already when looking straight ahead ([go to the video](#)), and *3rd degree* if the nystagmus is present in any direction of the gaze. The direction of the quick component of the nystagmus may be *horizontal, vertical (go to the video), oblique or rotatory*. Nystagmus of peripheral vestibular origin is *rhythmic*. The slow component results from the activity of the intact side, the quick component is a compensatory restoring saccade produced by the brainstem. *Undulating nystagmus* is irregular, no slow and quick components can be differentiated.

**Physiological nystagmus types**

**a.) Induced nystagmus of labyrinthine origin:** physiological nystagmus resulting from the stimulation of the semicircular canals. It can be elicited by rotation, and by cold/warm and galvanic stimulation of the peripheral vestibular system. In the lateral semicircular canal, ampullopetal flow of the endolymph (towards the ampulla) induces nystagmus beating in the opposite direction, whereas ampullofugal flow (from the ampulla) induces nystagmus beating in the same direction







# Exams

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- End of semester (first time in school year 2007/2008 due to the credit system)
  - Practical exam (1-5)
  - Requirements:
    - What you learned on the practical classes
    - What you heard on classroom lectures
    - Departmental textbook
- End of year exam
  - Practical exam
  - Written test in the e-learning system
  - Option to improve in oral exam

# Neurology

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- Central nervous system
  - Brain
  - Spinal cord
- Radices, plexus, nerves
- Neuromuscular junction
- Muscles

# Borderzones

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- Internal medicine
- Neurosurgery
- Psychiatry
- ENT
- Ophthalmology
- Urology
- Dermatology
- ETC

# Tasks

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- To have in mind the possibility of a neurological disease based on
  - Anamnesis (history)
  - Physical exam
- Diagnostic plan (decide on ancillary investigations)
- Come to a diagnosis
- Determine steps of treatment
- Plan follow-up

# Frequent neurological disorders

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- Cerebrovascular disorders
- Tumors
- Epilepsy
- Multiple sclerosis
- Parkinson syndrome
- Dementias
- Headache
- Trauma
- Metabolic disorders
- Developmental disorders
- Inflammatory diseases
- Neuropathies
- Chronic pain syndromes

# Tasks in general practice

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- Take the history and perform exam.
- Consider a neurological disease.
- Answer the 4 questions.
- Organize diagnostic procedures.
- Decide on treatment.
- Educate and help relatives of patient

# Taking the history

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- Not enough time.
- What exactly mean the patient and the relative on the complaint?
- Do you suspect a neurological disease?
- Is there an emergency?

# What to consider at history

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- Age
- Clarifying the symptoms
- Mode of onset and progression
- Chronological sequence of events
- Value of negative information
- Exclude irrelevancies
- Drugs
- Heteroanamnesis (interviewing relatives)

# Problems with history

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- Time
- Missing data
- Misunderstandings

„If a neurologist were in a group of people, stranded on a desert island, and if he were to be bereft of sight, arms and legs, but was still able to speak and hear, he would be able to take a history..... By the time the history is complete, the physician should be three-quarters of the way towards diagnosis, and, if he is not, then there is something wrong with the way in which it has been taken.”

# The neurological record of a patient

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- Personal data
- History (taken from and by)
- Internal exam
- Neurological exam
  - Meningeal signs and signs of injury
  - Cranial nerves
  - Motor system
  - Sensory system
  - Reflexes
  - Co-ordination
  - Vegetative functions
  - Psychiatric condition
- Summary
- Opinion (probable diagnoses)
- Diagnostic plan
- Followup

# The 4 questions to answer

---

1. Is there a neurological disease?
2. If yes, where is the lesion?
3. What pathological conditions may cause a lesion at this site?
4. In this patient which of these conditions is the most likely to be present?

# If you suspect a neurological disease

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- Think over what to do with the patient.
- Can you take the responsibility to treat this patient?
- Is it necessary to send the patient to a neurologist?
- How urgent it is?

# Organizing the diagnostic procedures

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- Is it an emergency?
- If yes, where to send the patient?
- If not, how far can I get in the diagnostic process?
- What ancillary investigations to ask for, and from whom?
- Where do they perform these investigations?
- If the appointment is at a distant time, is it safe to wait?

# Organizing the care of the patient

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- I reached the diagnosis myself or with a help of a specialist.
- Who determines the therapy?
- Is there a need for pharmacological or other treatments?
- Who may prescribe certain drugs?
- Shall I prescribe original or generic drugs?
- How frequently shall I check the patient?
- What to do during checkup exams?
- When shall I send back the patient to a neurologist?
- Shall I send to an outpatient service or to hospital?

# Education of relatives

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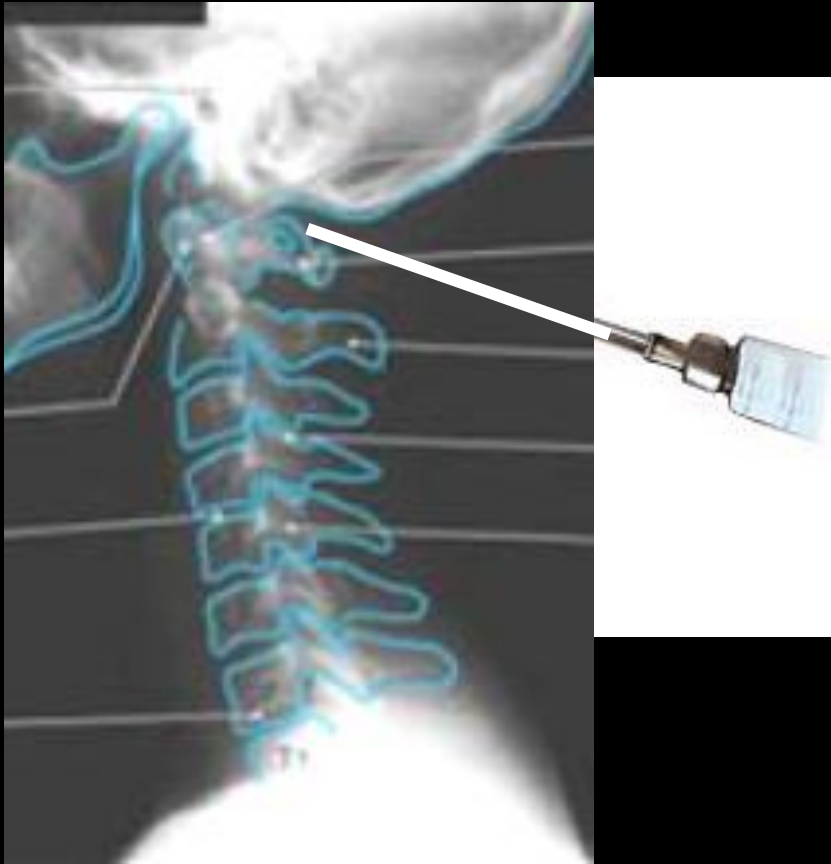
- Is it needed to involve relatives
  - When taking history?
  - When deciding on treatment options?
  - When organizing long term care?
- Pick the proper person from the relatives.
- Keeping contact with the relatives.

# Ancillary investigations to confirm or refute the suspected diagnosis

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- **Methods examining structure**
  - X-ray, CT, MRI, ultrasound
- **Imaging methods examining function**
  - fMRI, SPECT, PET, ultrasound
- **Electrophysiological methods**
  - EEG, ENG, EMG, evoked responses
- **Examination of the cerebrospinal fluid**
- **Immunological, genetic and molecular biological investigations**
- **Cytology and pathological investigations**
- **Consultations with other specialities**

# Old methods (until mid 80-ies)



**1. day: cisternali CSF sampling**



**2. day: percutaneous carotid angiography**



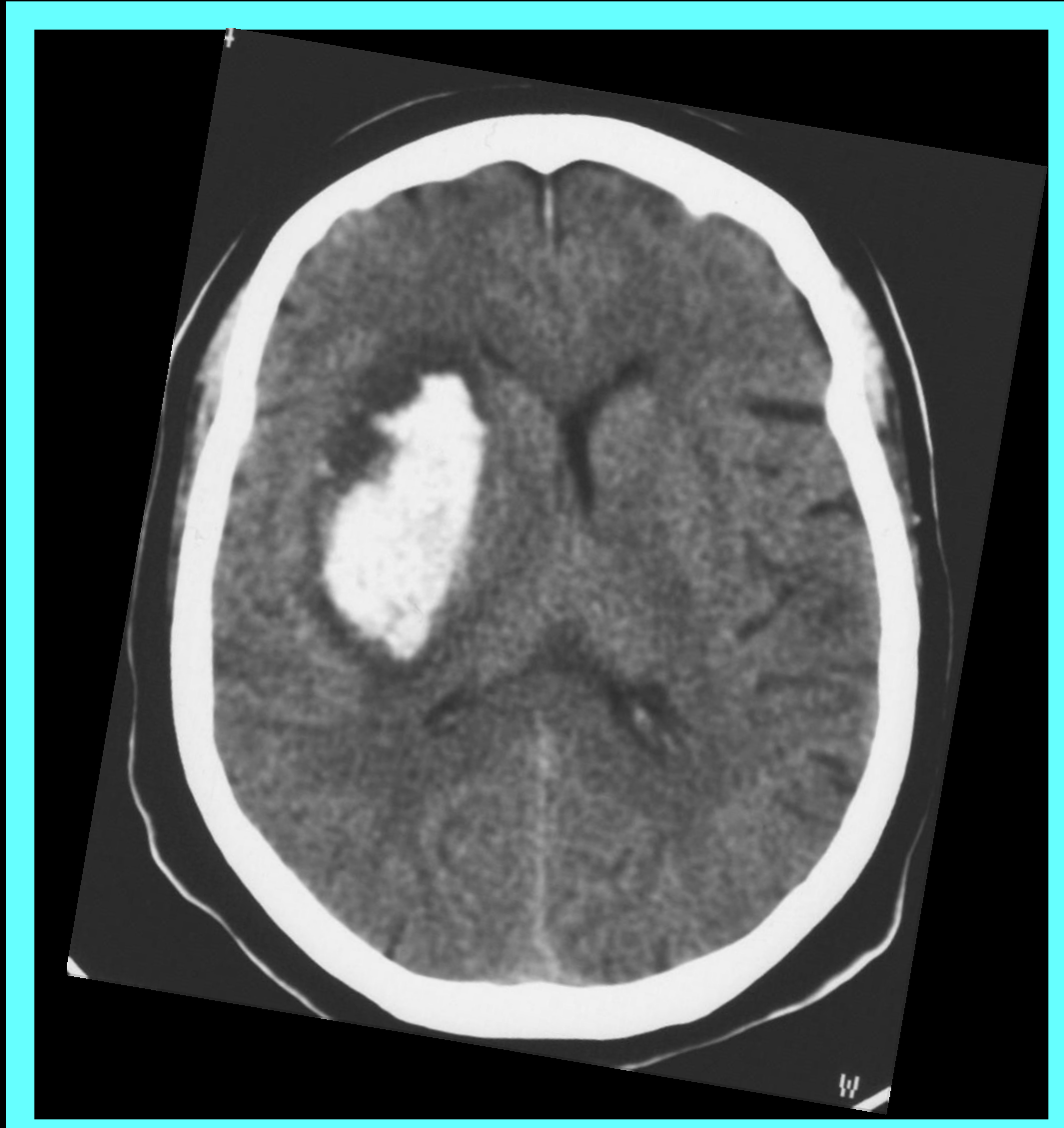
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247

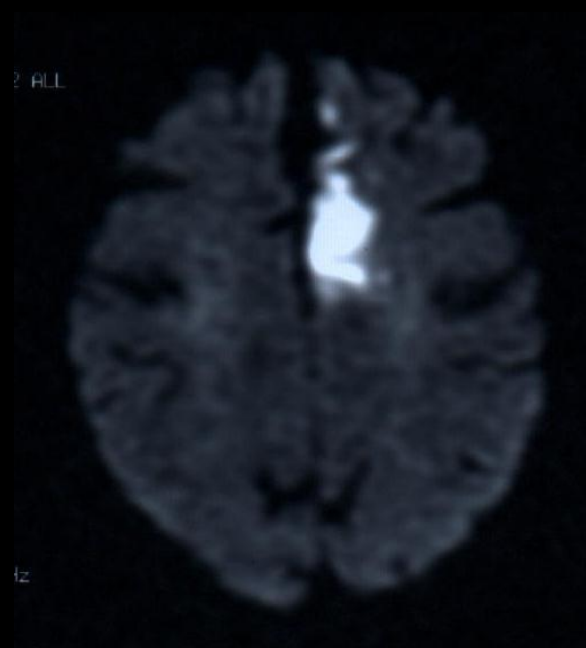
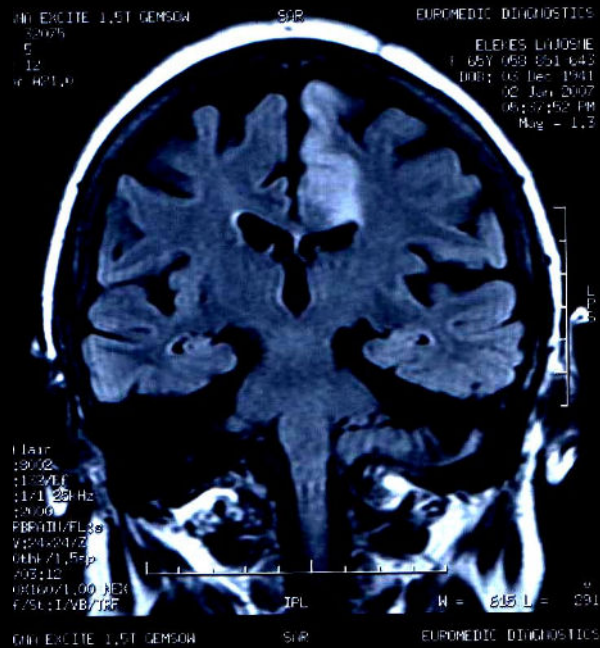


MR IMAGING

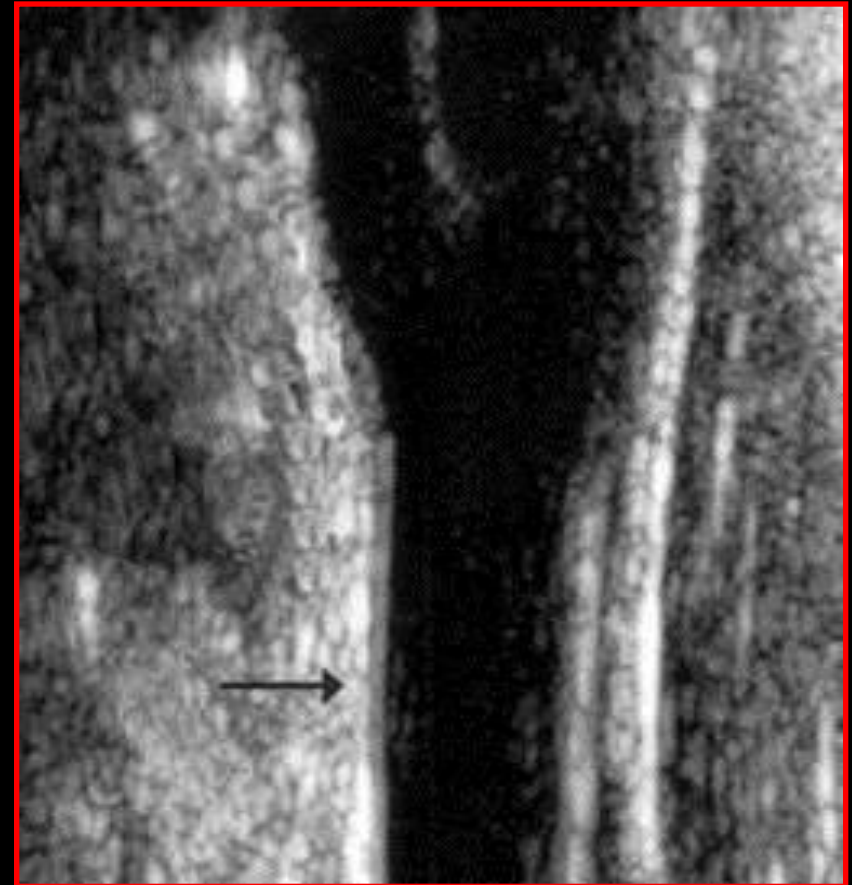
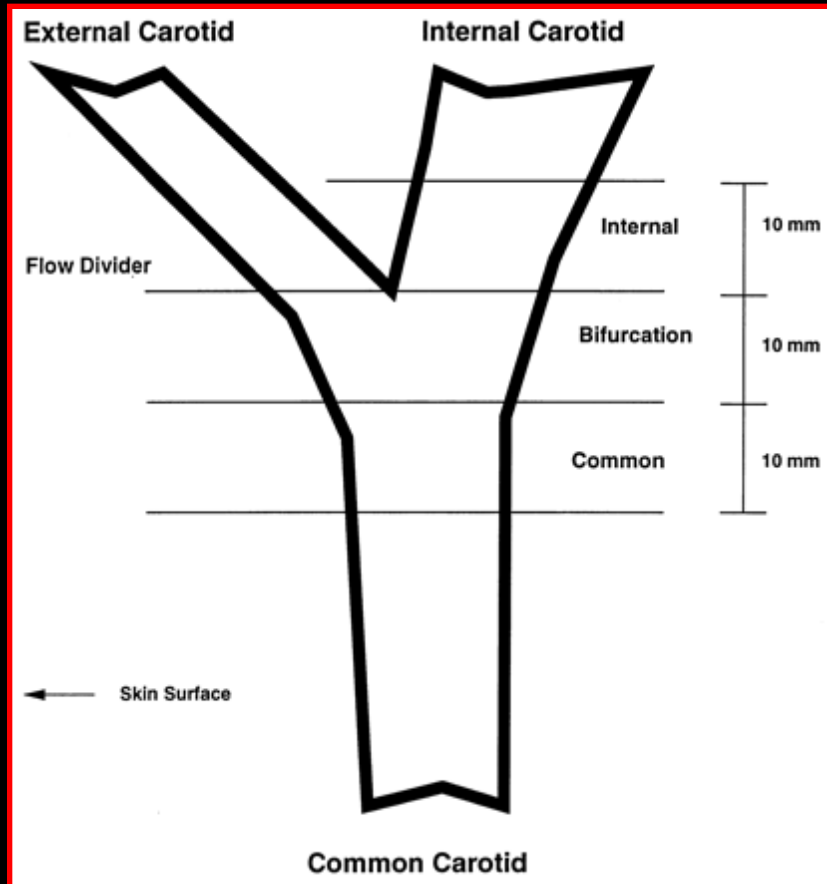
# Intracerebral hemorrhage



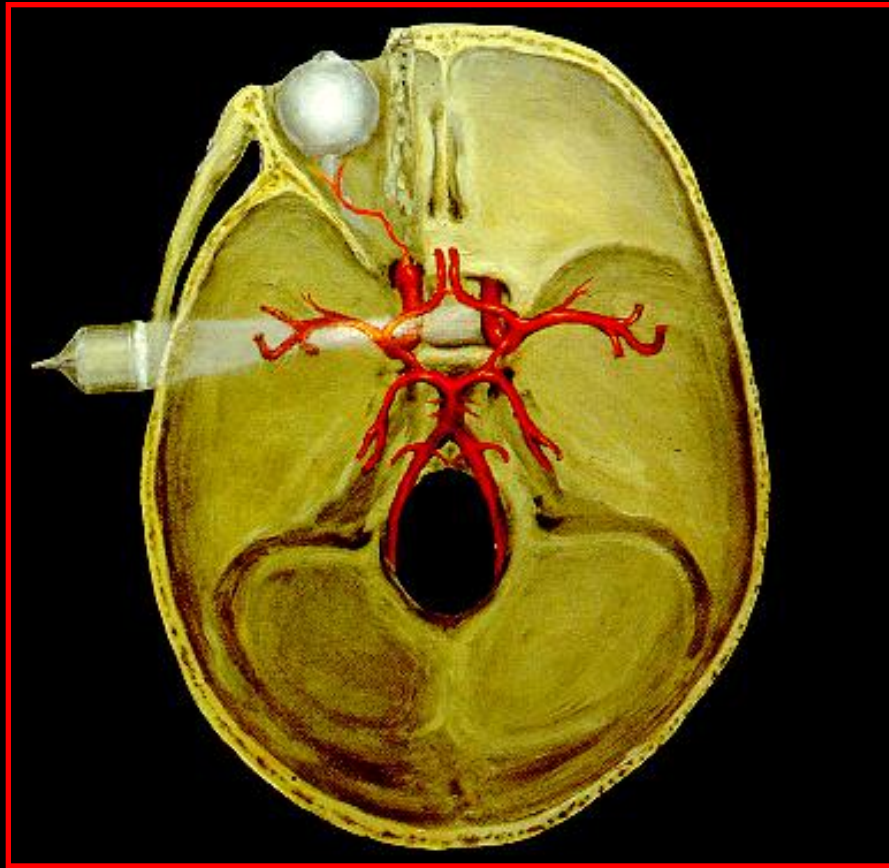
# Arteria cerebri anterior



# Carotid Ultrasound



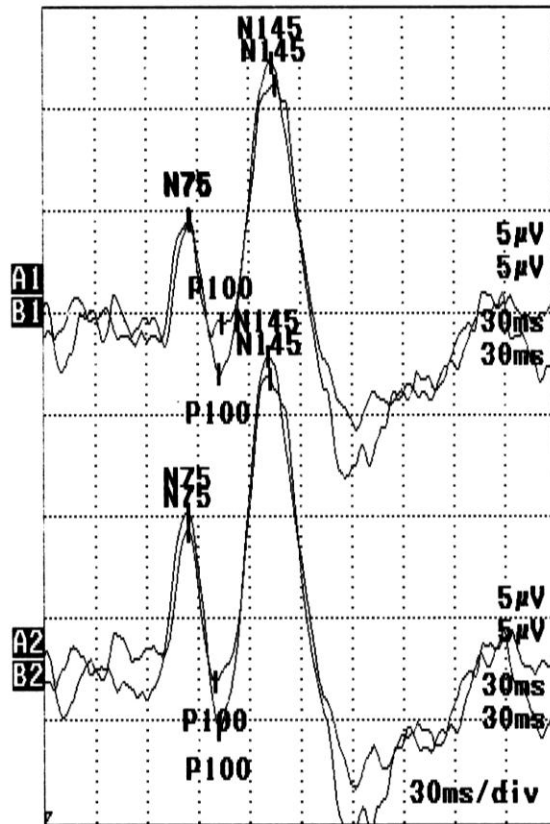
# Transcranial Doppler



# Visual evoked response

Birth Date: 50.09.02 Age: Height: Weight:  
 Doctor: Dr. Zemlenyi Gyongyi Examiner: bal  
 Note: A P100 lat.-ja norm. dr. Varannai

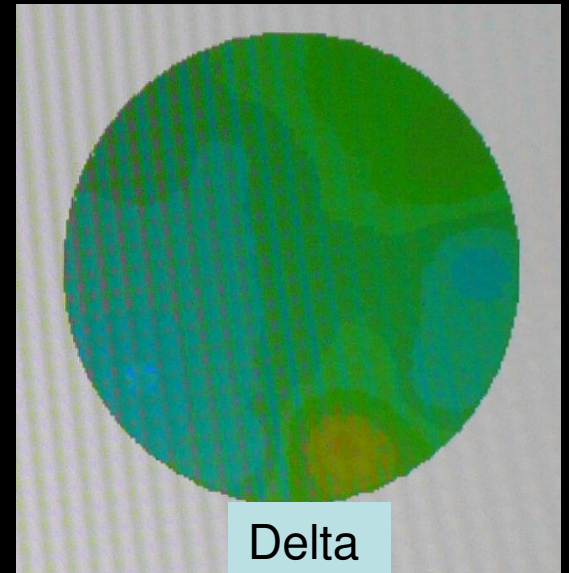
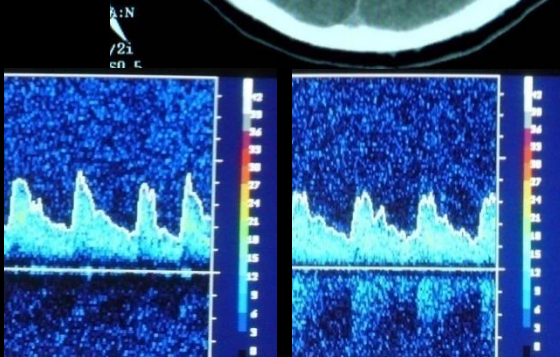
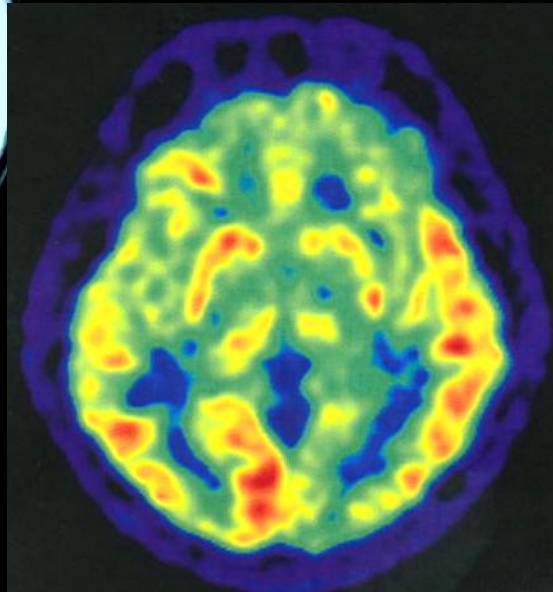
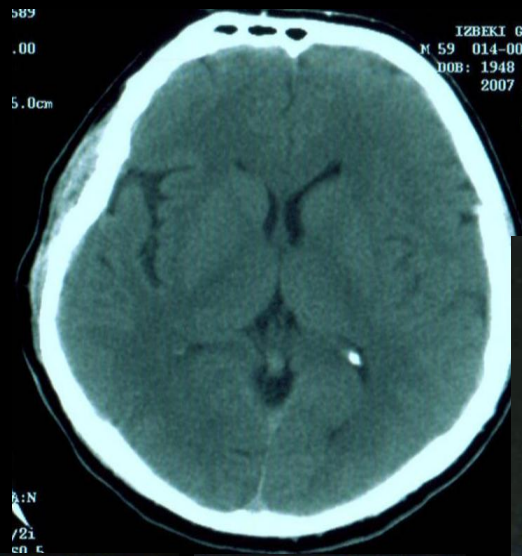
PR-VEP [ ] Measure Table 2, JAN'03 12:30:32



No.	Latency (ms)		
	N75	P100	N145
A1	85.8	102.6	133.8
A2	84.6	102.0	131.4
B1	85.2	104.4	135.6
B2	84.6	100.2	132.6

Interval	P100-P100	
A2-A1	0.6ms	
Amp.	N75 -P100	P100-N145
A1	7.5µV	15.4µV
Amp.	N75 -P100	P100-N145
A2	10.6µV	18.5µV
Amp.	N75 -P100	P100-N145
B1	5.1µV	11.8µV
Amp.	N75 -P100	P100-N145
B2	7.3µV	14.9µV

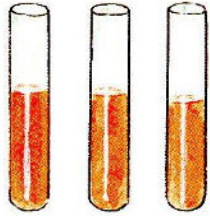
# Prolonged migraine aura



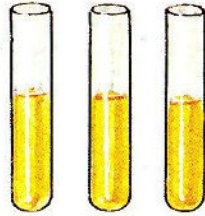
# CSF examination

## Cerebrospinal fluid

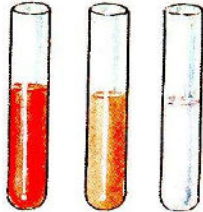
Three successive fluid samples collected. Shortly after or during bleeding, all 3 samples frankly bloody or orange



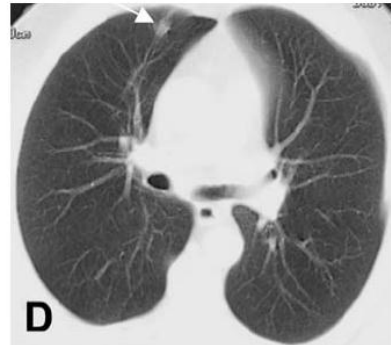
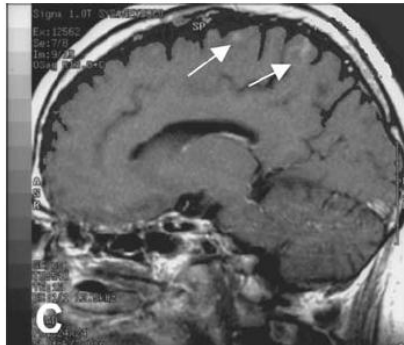
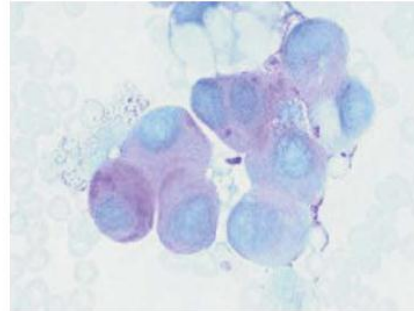
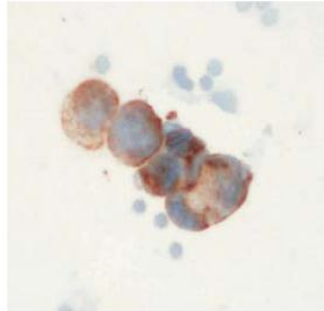
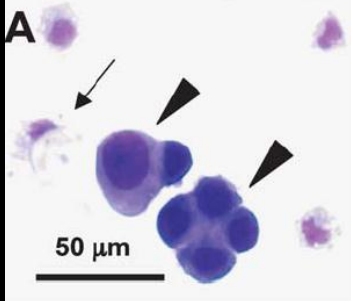
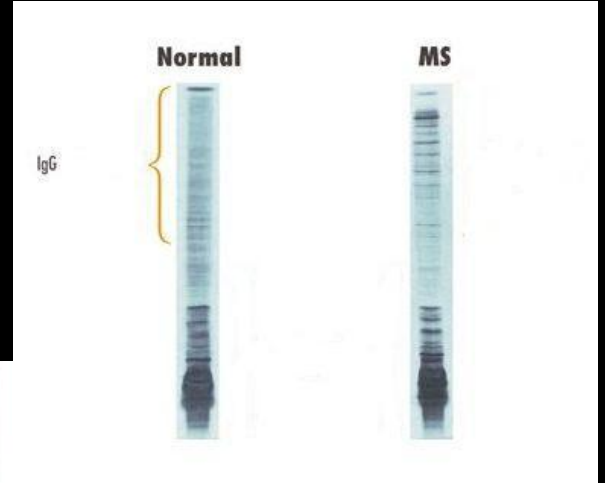
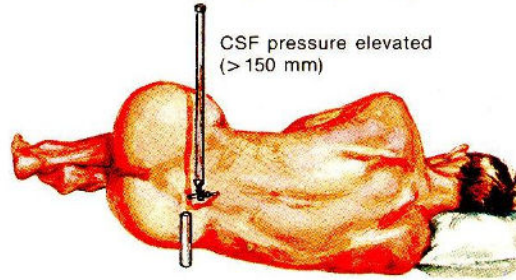
Later, on repeat tap, all 3 samples are xanthochromic (yellow) as a result of hemoglobin release or bilirubin formation



If blood is due to traumatic tap, fluid clears progressively in successive samples



CSF pressure elevated (>150 mm)



# Pathology



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