

Gomel State Medical University
Department of Neurology and neurosurgery

Lecture

THEME 8. THE BRAIN TUMORS

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Neurosurgery,
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Classification

The classification is based on two principles:

- 1) topographic anatomy;
- 2) pathomorphological that takes into account the nature of the histogenetic, histology and biological properties of the tumor.

In 2007, WHO adopted a new fourth histological classification CNS tumors.

I. Tumors of neuroepithelial tissue

- *A. Astrocytic tumors*
 - 1. Astrocytoma: fibrillar, protoplasmic, mixed
 - 2. Anaplastic (malignant) astrocytoma
 - 3. Glioblastoma: giant cell glioblastoma, gliosarcoma
- *B. Oligodendroglial tumor*
 - 1. Oligodendroglioma
 - 2. Malignant oligodendrogliomas

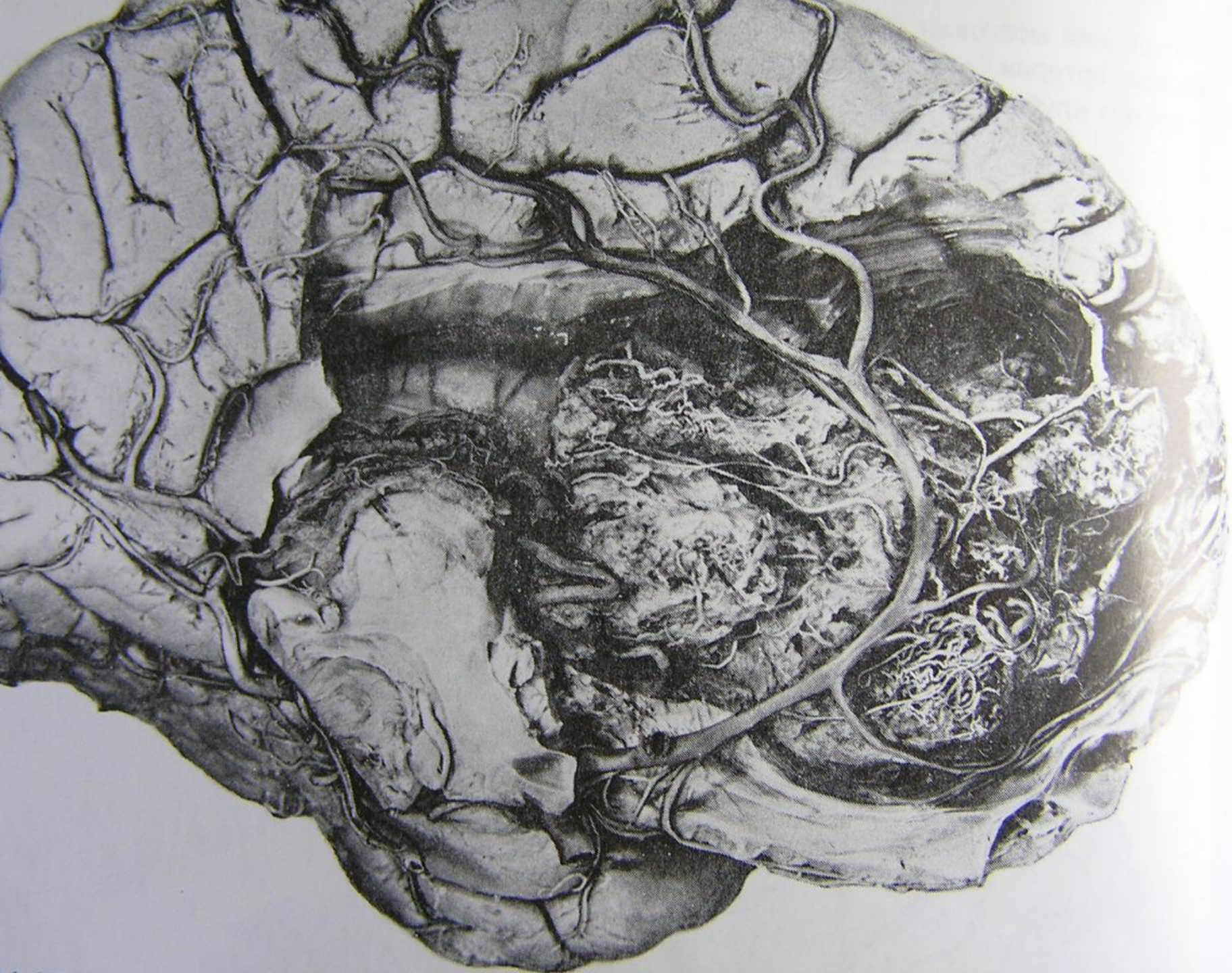
- *C. Ependymal tumors*

- 1. Ependymoma: papillary, epithelial, clear cell, mixed
- 2. Anaplastic (malignant) ependymoma

- *D. Mixed gliomas*

- 1. mixed oligoastrocytoma
- 2. Anaplastic (malignant) oligoastrocytoma









50.5. МЕДИАЛЬНАЯ ПОВЕРХНОСТЬ ПРАВОГО ПОЛУШАРЬЯ ЧЕЛОВЕЧЕСКОГО МОЗГА



1.3. СМЕЩЕНИЕ И ДЕФОРМАЦИЯ ОБОИХ ЗУБЧАТЫХ ЯДЕР.

б-го вещества мозжечка со стор

- *E. Horioid plexus tumors*
 - 1. Plexus papilloma horioid
 - 2. Plexus carcinoma horioid
- *F. Other neuroepithelial tumors*
 - 1. Astroblastoma
 - 2. polar spongioblastoma
- *G. Neuronal and mixed neuronal-glial tumors*
 - 1. Gangliocitoma
 - 2. Ganglioglioma
 - 3. Anaplastic (malignant) ganglioglioma

H. pineal tumors

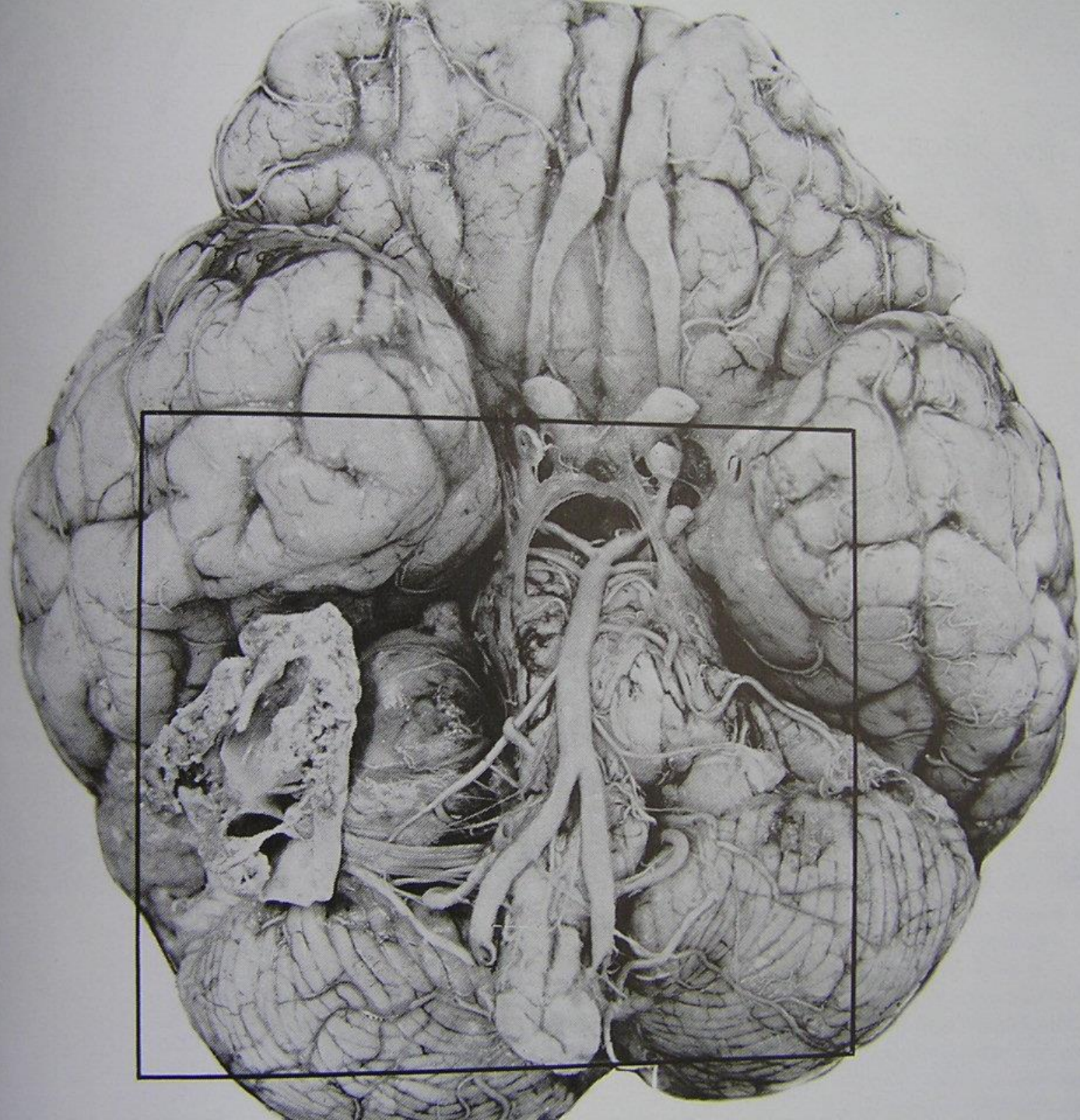
1. Pineocitoma
2. Pineoblastoma

Embryonic tumors

1. ependymoblastoma
2. retinoblastoma
3. Primitive neuroectodermal tumors
(PNETs)

II. Tumors of cranial and spinal nerves

- 1. Schwannoma (neurinoma)
- 2. Neurofibroma
- 3. Malignant tumor membranes of peripheral nerves ("malignant schwannoma")

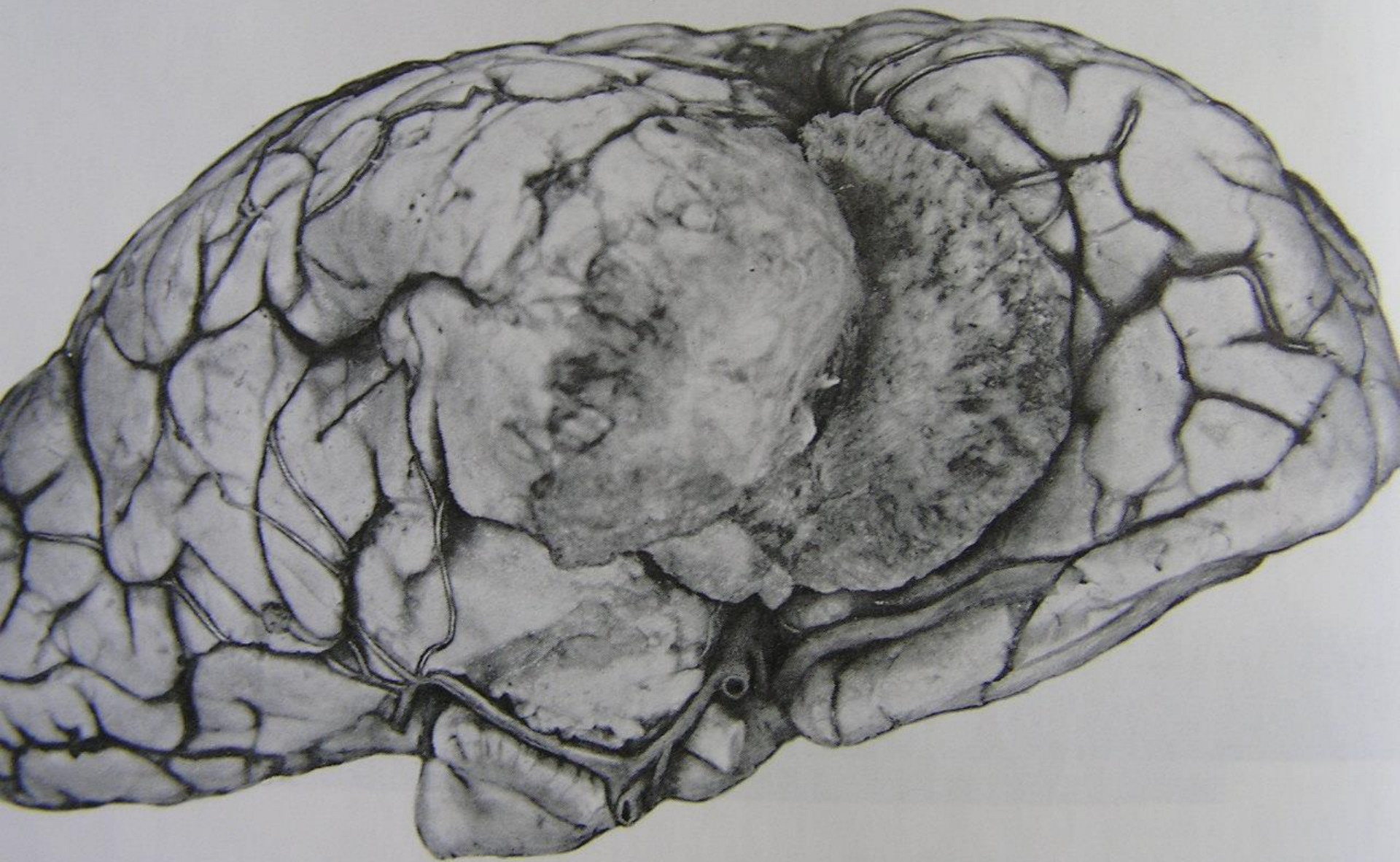


III. Tumor of the meninges

A tumor originating from the meningotelial cells of the brain shell.

- 1. meningioma
- 2. atypical meningioma
- 3. anaplastic (malignant) meningioma

3. ВЕТВИ СРЕДНЕЙ И ПЕРЕДНЕЙ МОЗГОВЫХ АРТЕРИЙ НА ЛАТЕРАЛЬНОЙ ПОВЕРХНОСТИ.
4. ОТВЕТВЛЕНИЕ ВИСОЧНЫХ АРТЕРИЙ ПРОИСХОДИТ В ТОЛЩЕ ОПУХОЛЕВОГО УЗЛА.



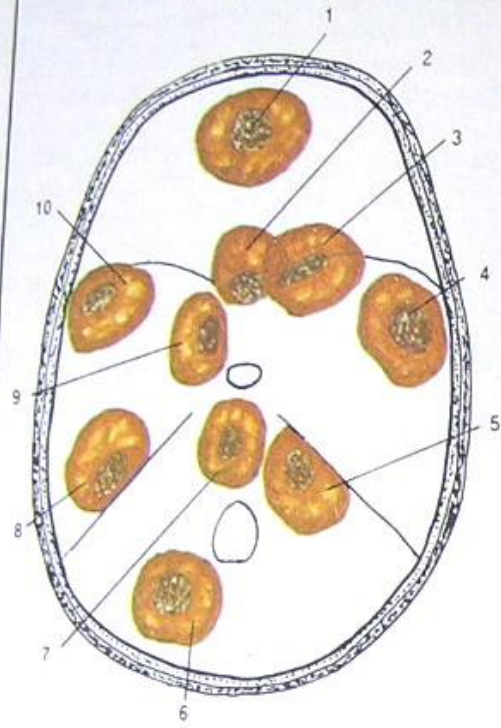


Рис. 83. Локализация менингиом на основании черепа:
 1 — ольфакторная; 2 — бугорка турецкого седла; 3 — малого крыла основной кости; 4 — основания средней черепной ямки; 5 — мосто-мозжечкового угла; 6 — основания задней черепной ямки; 7 — блюменбахова ската; 8 — верхней поверхности пирамидки височной кости; 9 — параселлярная; 10 — большого крыла основной кости.

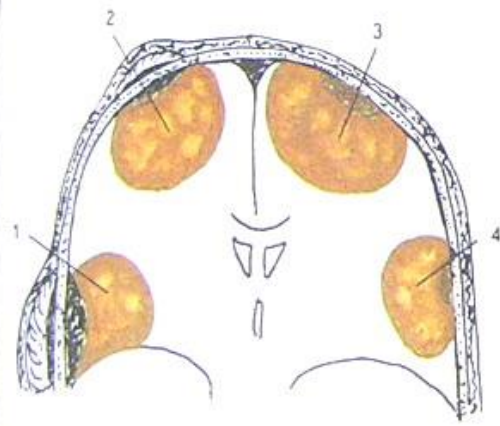
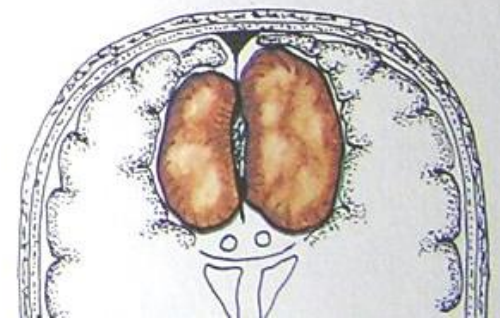
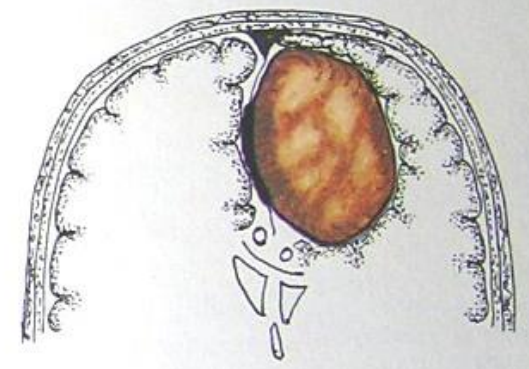
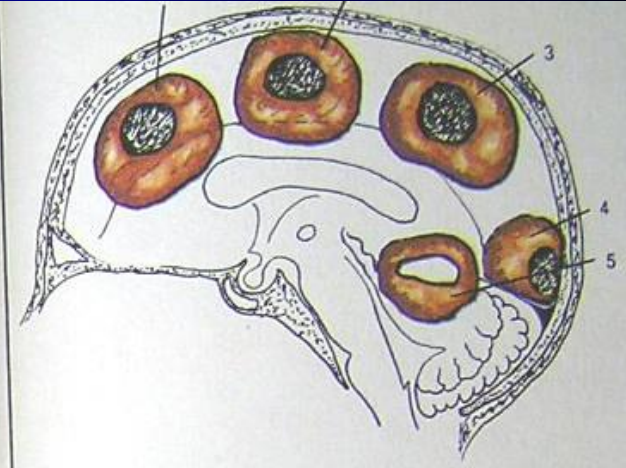


Рис. 84. Локализация менингиом различных областей свода черепа: 1 — височная с переходом на основание; 2 — теменная с экзо- и эндостозом; 3 — теменная парасагиттальная; 4 — височная.



- B. Nonmeningeal tumor of the meninges
- I. mesenchymal tumors
- 1) benign tumors
- a) bone and cartilage tumors
- b) lipoma
- 2) *cancers*
- a) hemangiopericytoma
- b) chondrosarcoma
- c) mesenchymal chondrosarcoma
- 2. Other tumors related to shells
- a) hemangioblastoma

IV. Lymphoma and tumors of hematopoietic tissue

- 1. Primary malignant lymphoma
- 2. Plasmacytoma

V. Germ cell tumors

- 1. Germinomas
- 2. Yolk sac tumor (tumor epidermal sinus)
- 3. Choriocarcinoma
- 4. Teratoma: mature, immature, malignant

VI. Tumors of the sella turcica

- 1. hypophyseal adenoma
- 2. pituitary carcinoma
- 3. craniopharyngioma

VII. Metastatic tumors

Cyst and tumor processes

- 1. Rathke's cleft cyst
- 2. Epidermoid cyst (cholesteatoma)
- 3. Dermoid cyst
- 4. III ventricle colloid cyst

The frequency of tumors

The most common are:

astrocytoma, glioblastoma and meningioma-to 15%

oligodendrogliomas - 8%;

pituitary adenoma -7-10%;

neuroma-7-8%

medulloblastoma - 4%;

ependymoma - 3%;

congenital tumor, 2%;

horoidpapiloma plexus - 0.7%:

metastases -8%.

Symptoms and syndromes brain tumors

- The clinical picture of brain tumors is determined by progressive development of the disease and steadily increasing focal, cerebral and somatic symptoms.

- Severity of cerebral symptoms depends mainly on the location of the tumor and the associated dislocation and discirculatory disorders hemo- and liquorodynamics with increasing venous congestion, hypoxia, edema - swelling of the brain and hydrocephalus.

Group of symptoms

- Cerebral

Focal:

- Primary focal (characterize localize tumors);
- Symptoms in the neighborhood (associated with swelling in the dissemination of on adjacent parts of the brain);
- Symptoms in the distance (associated with developing or herniation hydrocephalus).

Headache

- For benign tumors characterized by diffuse hypertension - hydrocephalic headache.
- For malignant neuroectodermal tumors of the brain characterized by hypertensive and intoxication, as well as vascular headaches.
- Hypertensive pain is a very typical situation - it is bursting from the inside, paroxysmal character, diffusely covers the entire head, comes on suddenly at night or in the morning, accompanied by nausea and vomiting.

Vomiting

- Vomiting is a common symptom of brain tumors, acting in some cases, as a cerebral, in others - as a local symptom.
- As a focal symptom vomiting is less common and is observed at subtentorial tumor, mainly in tumors IV ventricle.

Dizziness

- Is the result of irritation vestibular system at any of its levels - from the vestibular system in the inner ear to the vestibular cortical areas in the temporal lobe.
- As cerebral symptom occurs under the influence of an acute increase in intracranial CSF pressure and the development of stagnation in the maze and booster endolymph in the semicircular canals.
- As a focal symptom observed in tumors of the cerebellopontine angle, posterior fossa tumors of the cerebellum and the bridge.

Edema of the optic nerve

- Most often found in intracerebral gliomas (80%), rarely with benign extracerebral
- Gliomas and metastatic brain tumors differ by early beginnings, severity and frequency of bleeding events in the fundus.

Atrophy of the optic nerve.

- Atrophy can be primary or secondary
- Primary due to vascular, mechanical or infectious-toxic factor.
- Secondary occurs after edema of the optic nerve

Mental disorders.

- In benign tumors - in the late stage of tumor development
- Malignant primary (glioblastoma), and especially metastatic tumors of the cerebral hemispheres mental disorders occur relatively early and is more consistently and severity.

- The most common mental disorders: lethargy and stupor patients, resulting in the weakening of attention, perception, and blunting of memory decline.

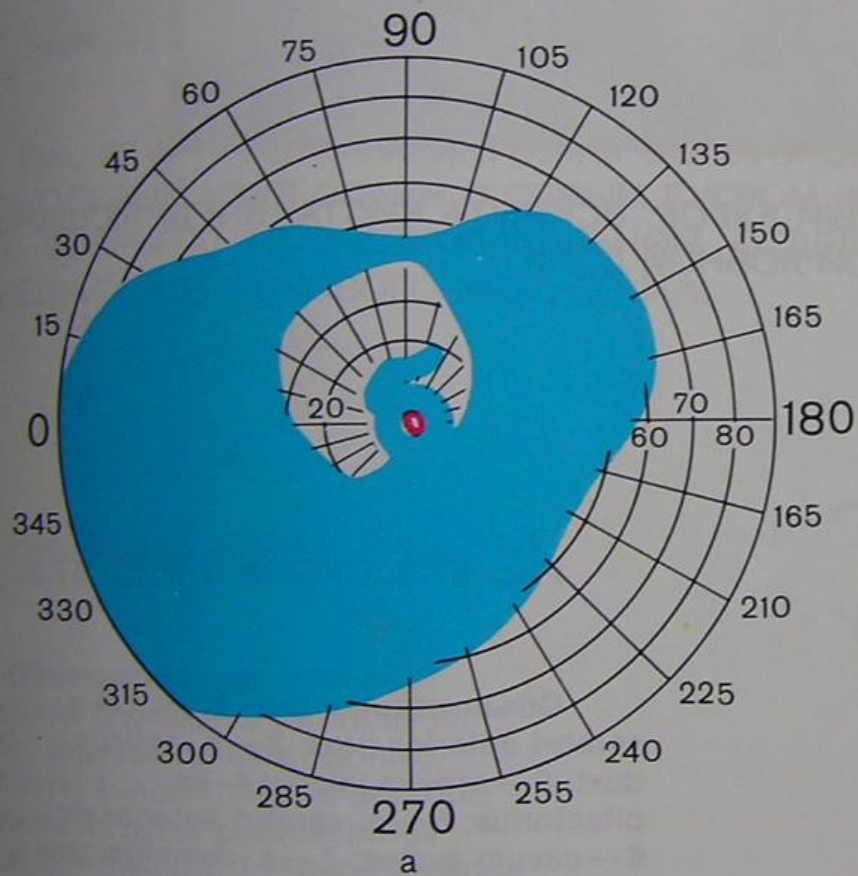
Epileptic syndrome

- The most common seizures occur in supratentorial tumor and rarely at subtentorial.
- Diagnostic value of seizures in is that they appear in the early stages of the disease, before the appearance of intracranial hypertension (in 36% of cases seen in the first place).

Clinic and diagnosis of tumors chiasmo-sellar area

- Complaints: headache, drowsiness, blurred vision, impairment of sexual function.
- Neurological status: different types of visual disturbances and visual fields, impaired function of the oculomotor nerve.
- Somatic status: Cushing's syndrome, acromegaly, hyperthyroidism, galactorrhea-amenorrhea syndrome.

Левый глаз
Острота зрения: 0,6



Правый глаз
Острота зрения: 0,2

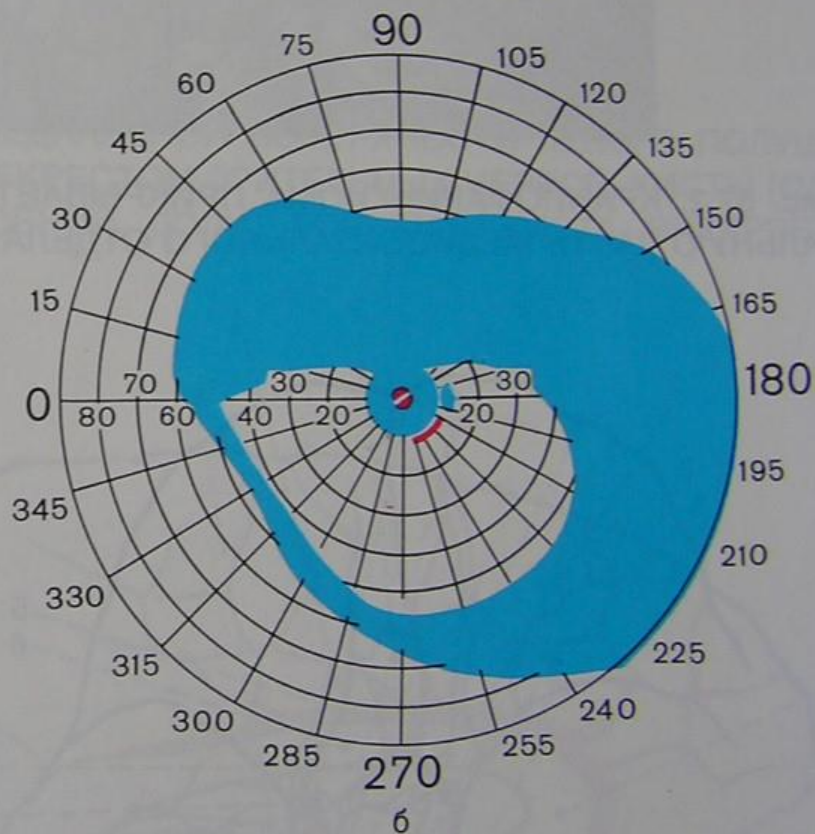


Рис. 57.1. а и б. ПОЛЕ ЗРЕНИЯ БОЛЬНОЙ В.

Features of metastatic brain lesions

- The presence of diagnosed primary tumor (80%).
- The rapid growth and rapid progression of symptoms, respectively.
- Can be located in any part of the brain.

- There are often multiple.
- Characterized by edema surrounding brain regions.
- Tendency to hemorrhage, not only in the tumor tissue, but also to the formation of intracerebral hematomas larger than himself metastasis.

Features of children's tumors

- Mainly developed in the posterior cranial fossa (60%).
- Among supratentorial tumors more common is craniopharyngioma.
- More often than adults diagnosed medulloblastoma.

Edema of brain

- Edema of the brain understand as excessive accumulation of extracellular fluid in his tissues.
- The increase in intracellular fluid called brain swelling.
- Distinguish vasogenic, cytotoxic, osmotic and hydrostatic brain edema.
- Cerebral edema may be limited or diffuse.

Intracranial hypertension.

- Intracranial pressure is normal, when the lumbar puncture in lying position equal 150-180 mm water column (11-13 mm Hg).
- It consists of three components: the pressure of cerebrospinal, interstitial and intracellular fluids.
- Increased intracranial pressure with brain tumors develop due to:
 - 1) increasing the mass of the tumor;

- 2) occlusion of liquor in violation of the outflow tract cerebrospinal liquid;
- 3) swelling of the brain;
- 4) imbalance "products – suction cerebrospinal fluid (usually aresorptive type);
- 5) violation of the venous outflow.

The clinical symptoms of intracranial hypertension

- In slow its rise appears uncertain, often "morning" headaches, often at the height of headache marked vomiting.
- In the fundus vein engorgement, the initial swelling of the optic nerve.

Dislocations and herniation of the brain

- The most common are temporal- tentorial and axial wedging.
- Other clinically relevant types: subfalks and cerebellar-tentorial.
- Starting wedging is characterized by pain in the back of the head and neck, stiff neck, forced position of the head. The growth of herniation leads to disturbances of consciousness and vital bulbar disorders ending apnea, if not received emergency assistance.

Non-invasive diagnosis of brain tumors

- - Neurological research
- - Patopsihology study
- - Ophthalmology study: visual acuity, visual fields, fundus
- - Study: evaluation of smell, taste, hearing, vestibular function.
- -Craniography two main projections.
- -Magnetic resonance imaging
- - Computed tomography:
- - Electroencephalography (EEG);
- - Immunochemical diagnosis

Invasive methods

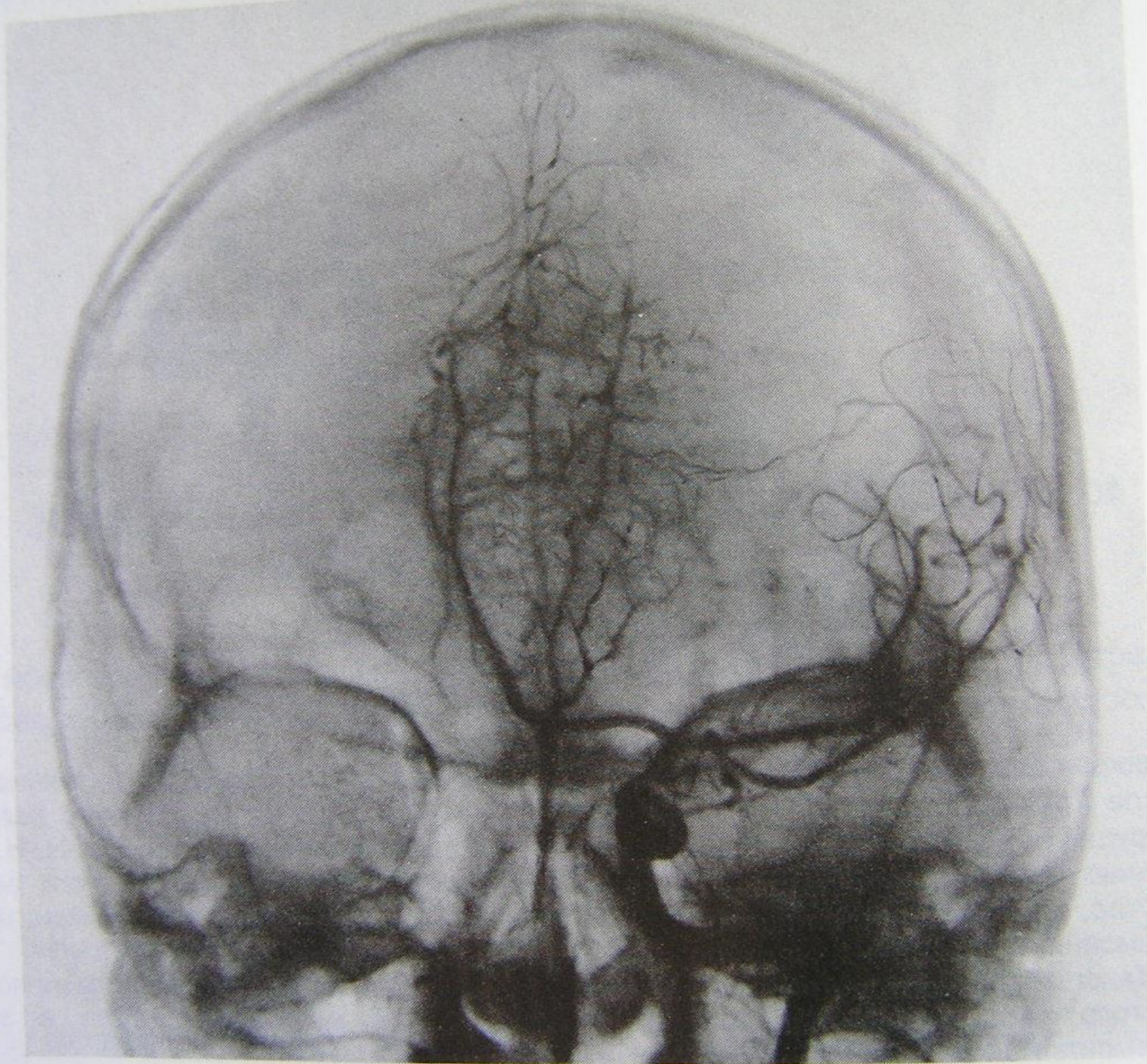
- Study of the cerebrospinal fluid:
- evaluate:
 - a) the pressure of the cerebrospinal fluid
 - b) protein - normal 0.35 g / L at lumbar puncture, 0.2 g / l for ventricular;
 - c) cytology (normally not more than 4 cells in 1 ml or 10/3)
 - d) syndrome protein-cell dissociation (a significant increase in the amount of protein with a slight increase in cell number);
 - e) tsitoskopiya CSF (detection of abnormal cells, study their composition);
 - f) A study of the CSF for activity of B-glucuronidase isozyme study of cerebrospinal fluid (specific globulin and the brain, and - fetaprotein).

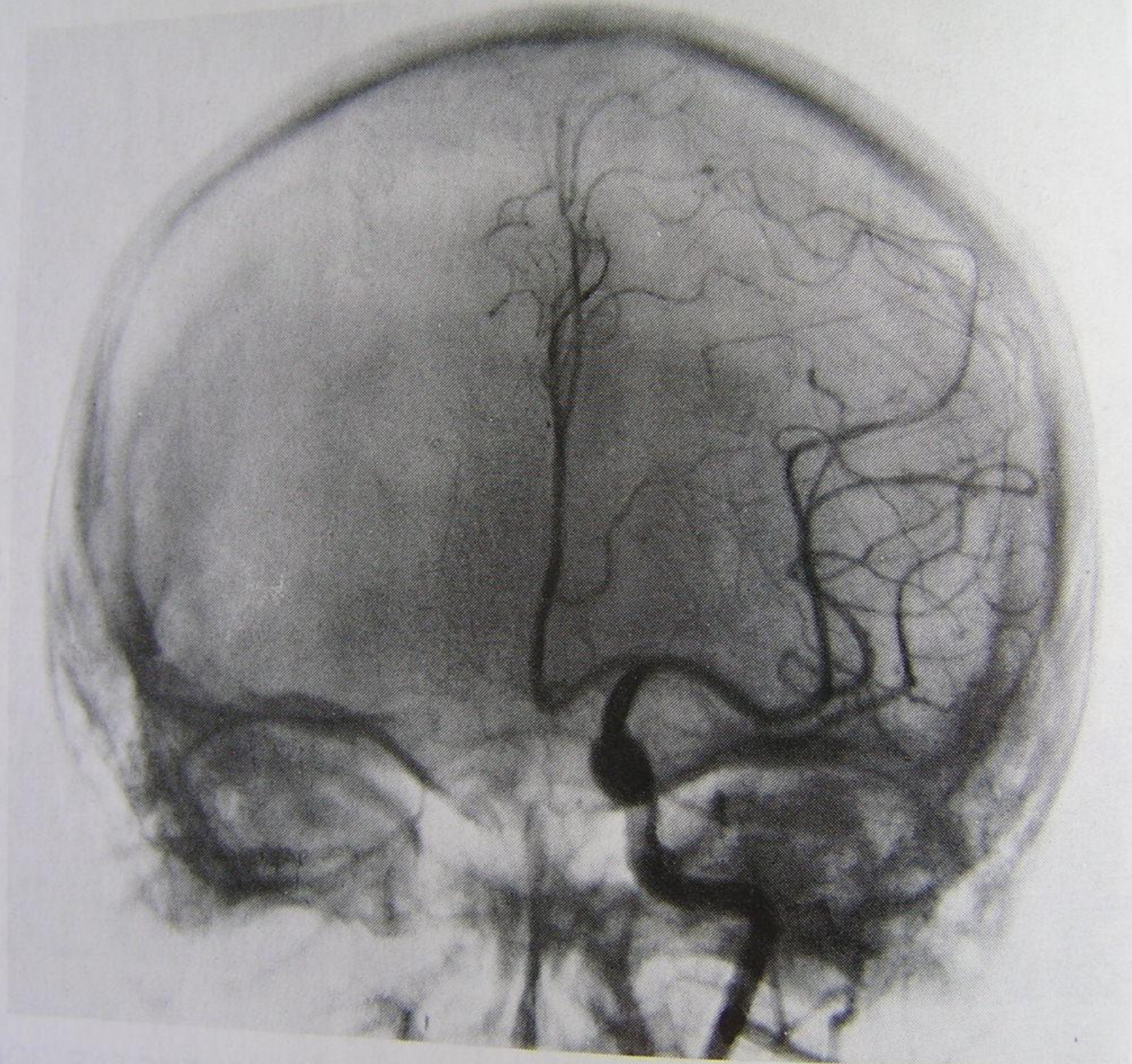
Radiopaque methods

- Cerebral angiography is based on the X-ray imaging contrast brain vessels.
- When supratentorial tumors using carotid, and at subtentorial - vertebral angiography. The presence of tumors judged by dislocation of vessels, revealing its vasculature.

- Modern safe method is **magnetic resonance angiography**, which does not require the administration of drugs directly into the artery.









Surgical diagnosis

- Endoscopic examination (ventriclescope + surgery)
- Biopsy immediately before surgery for final diagnosis.
- Stereotactic biopsy and tumor surgery
- Ventriclescopia using miniature fiberscope

Treatments for brain tumors

- Surgical
- Radiation
- Chemotherapeutic
- Hormone therapy
- Immunological
- Symptomatic

Surgical treatment

- The indication for surgery is the tumor itself.
- The solution about the surgery is not always clear, because the tumor can be placed in functionally important areas or patient may have severe somatic pathology.
- The indications for emergency surgery is growing hypertensive syndrome with signs of herniation and dislocation of the brain.

Requirements for surgical access

- 1) must be provided with sufficient vision for efficient operation;
- 2) access should be as gentle to the functionally important regions of the brain. The most common access, requiring craniotomy.

- There are two types of trepanation - and osteoplastic resection. In the first version in the skull bones form the window; bone after surgery fit into place, with the second - resected bone by forceps.
- Trepanation resection is less common, such as in tumors affecting the bones of the cranial vault.
- Resection of bone is also used in surgery on the posterior fossa, where the brain is protected by a thick muscle layer.

Technology to remove the tumor

- Virtually all extracerebral tumor removed without cutting the brain tissue.
- Inevitable cuts brain needed to remove intracerebral and intraventricular tumors is desirable to produce a "silent" areas of the brain.
- Modern microsurgical technique allows the removal of even large and spread of tumors through small incisions cortex.

Palliative surgery

They are taken when direct intervention on tumors is impossible.

An example of such an operation are:

Decompressive craniotomy

Various operations on the liquor system

Perforated bottom III ventricular stucco,

Septal perforation

Draining operations:

Ventriculoperitoneal shunting





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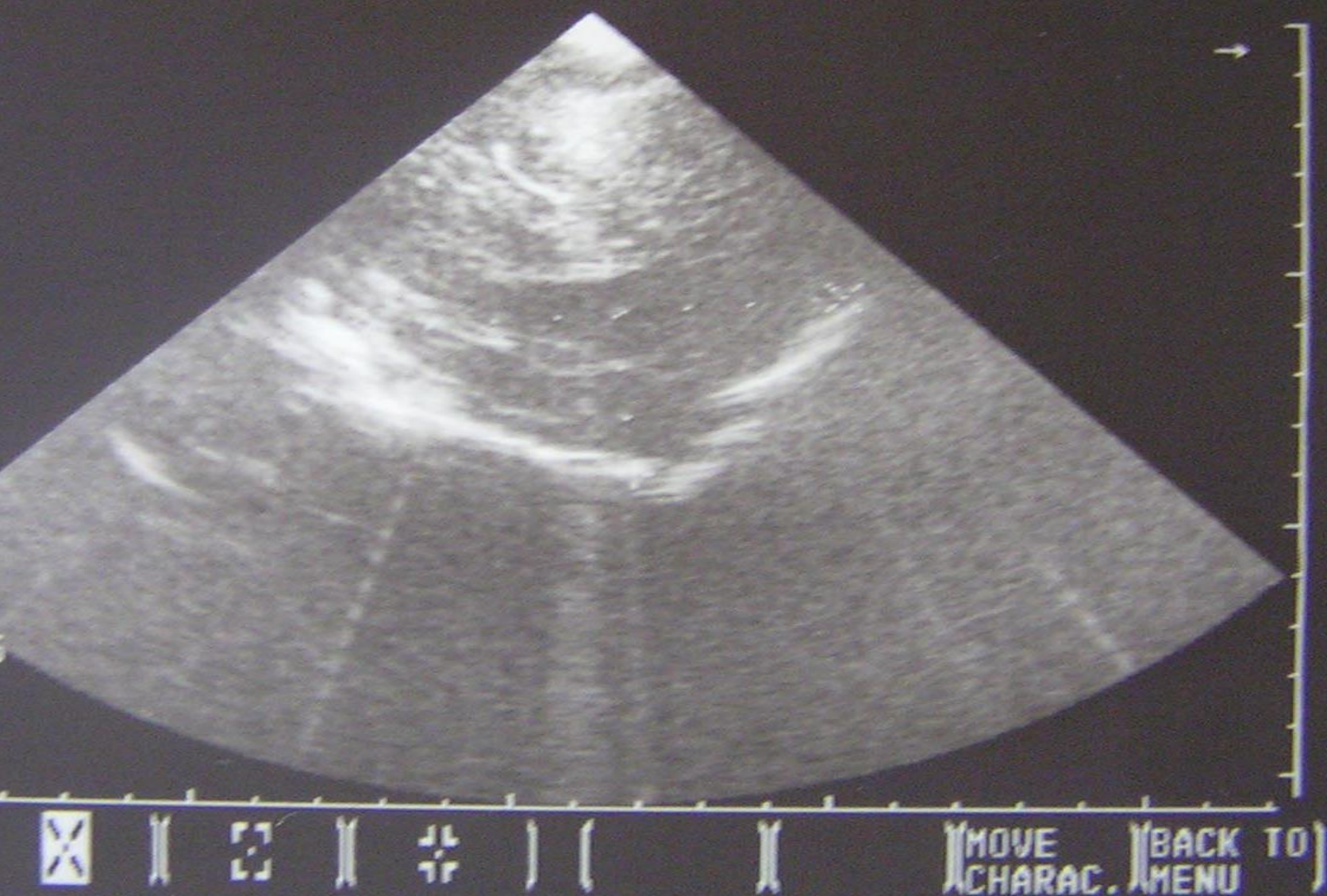
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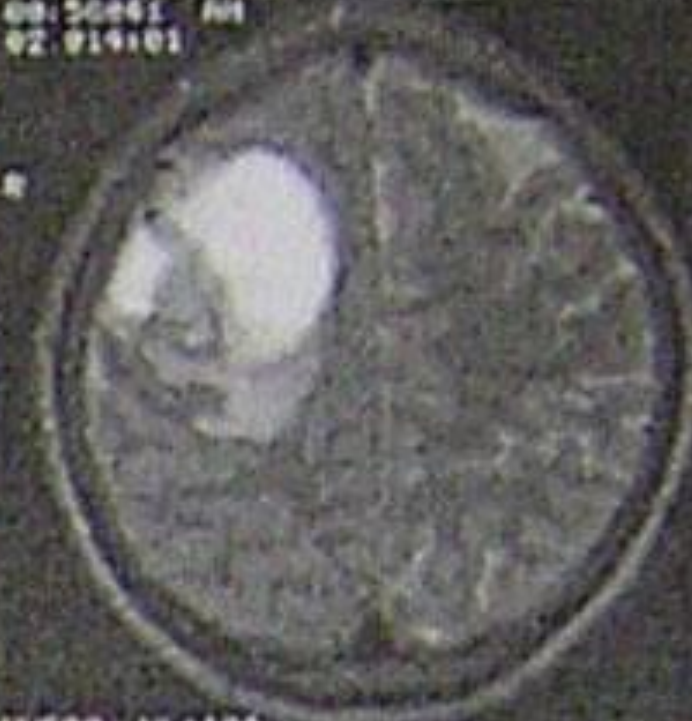
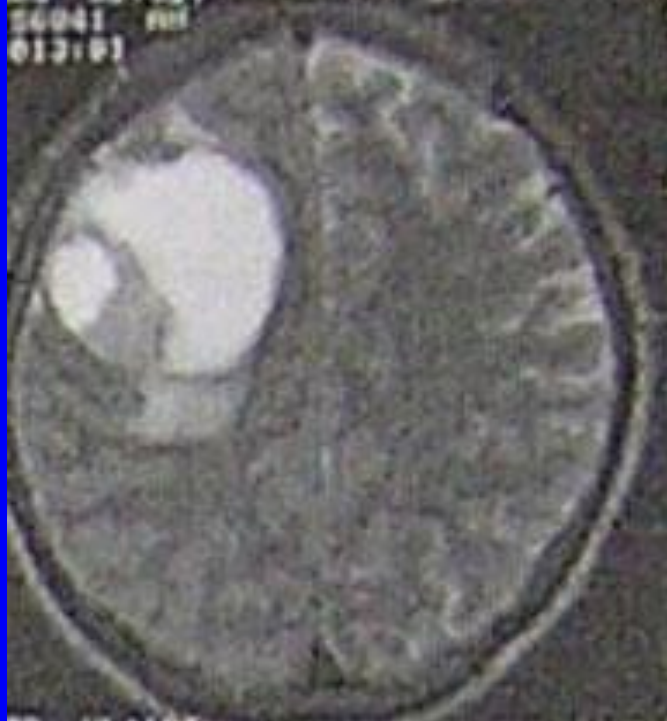
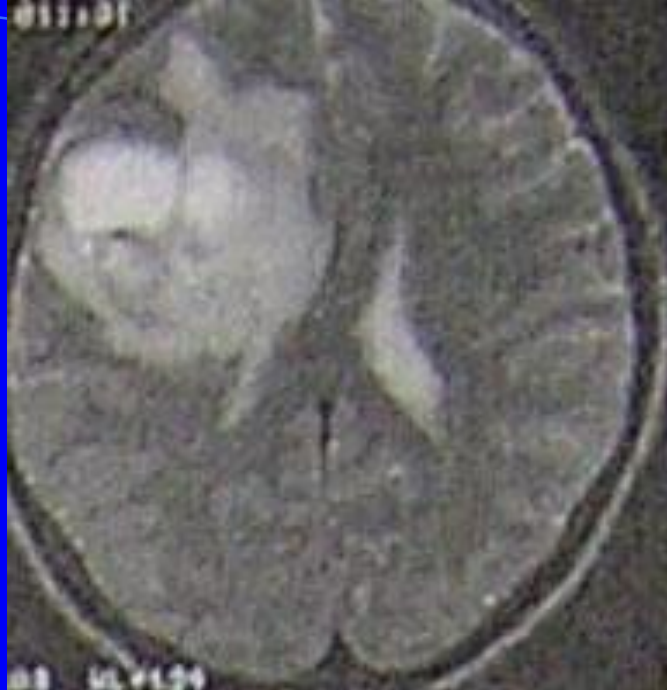
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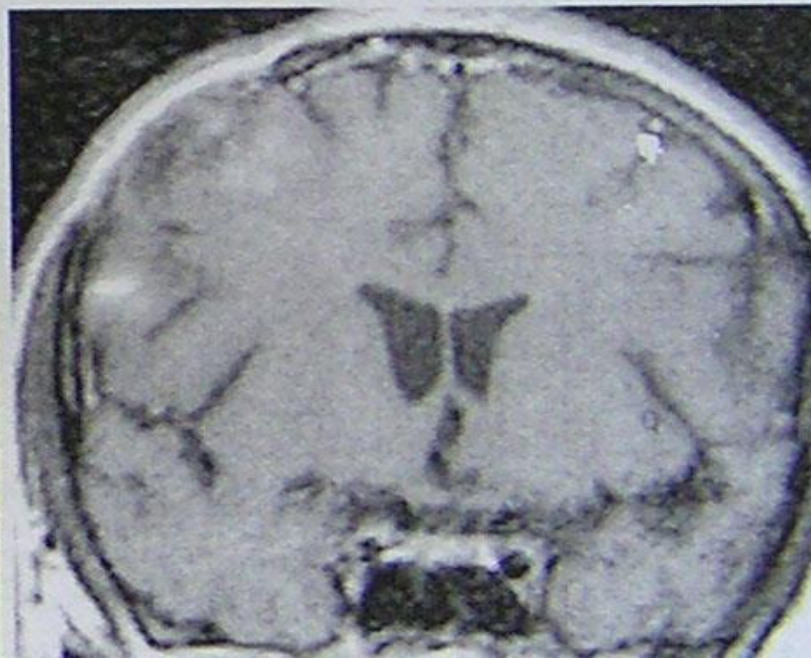
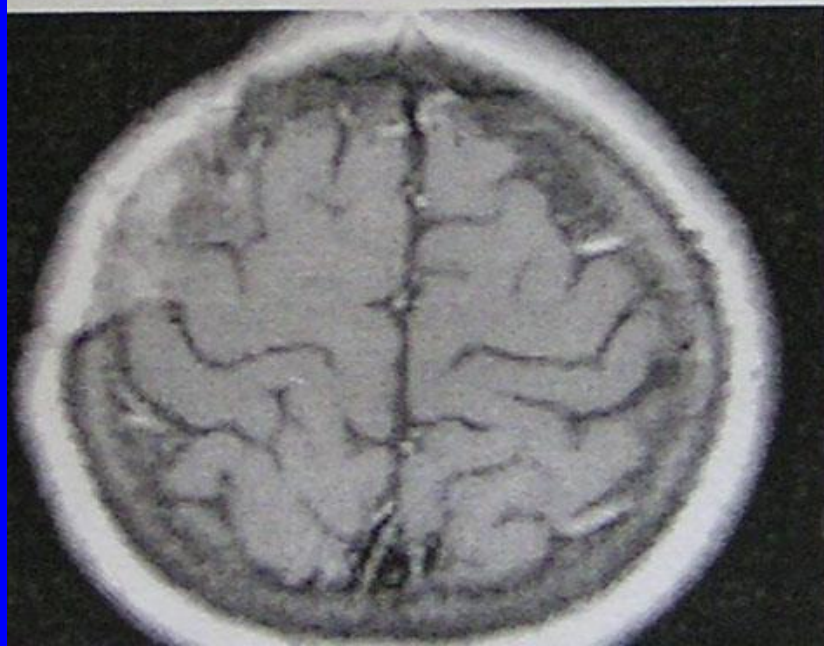
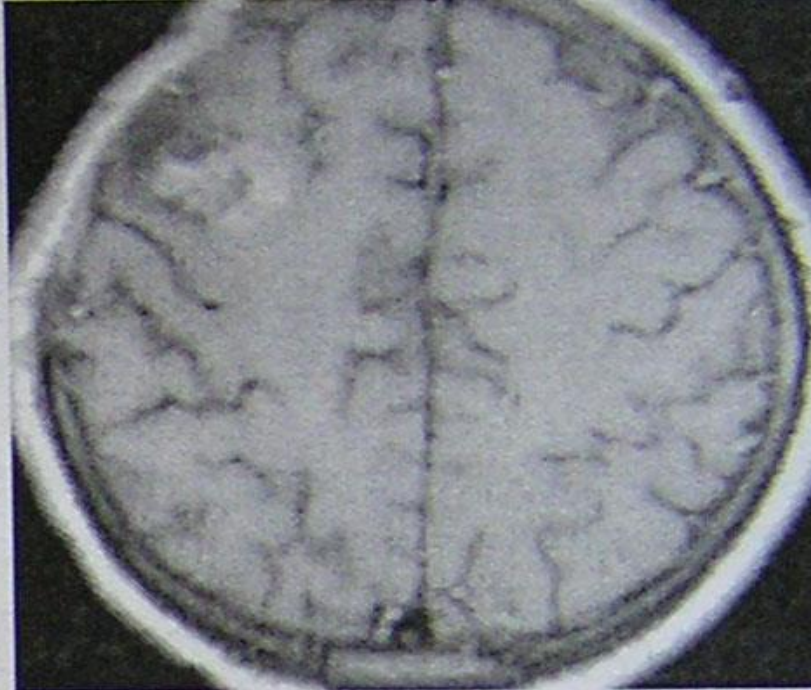
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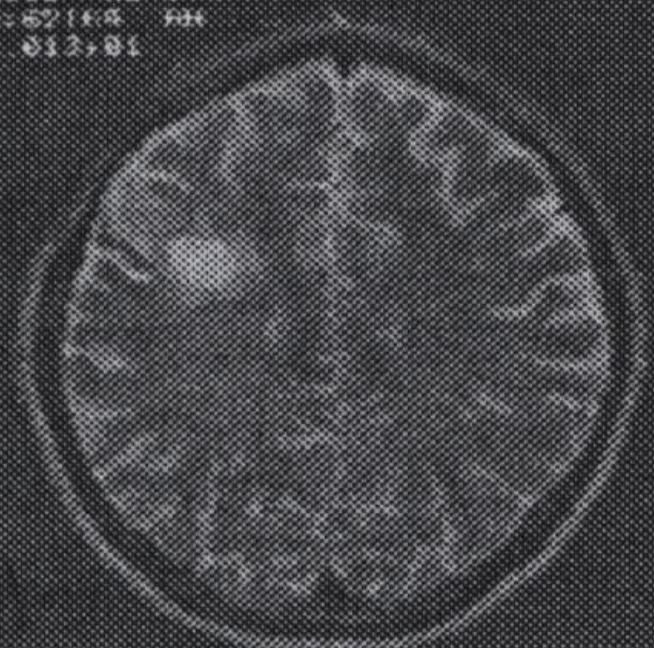




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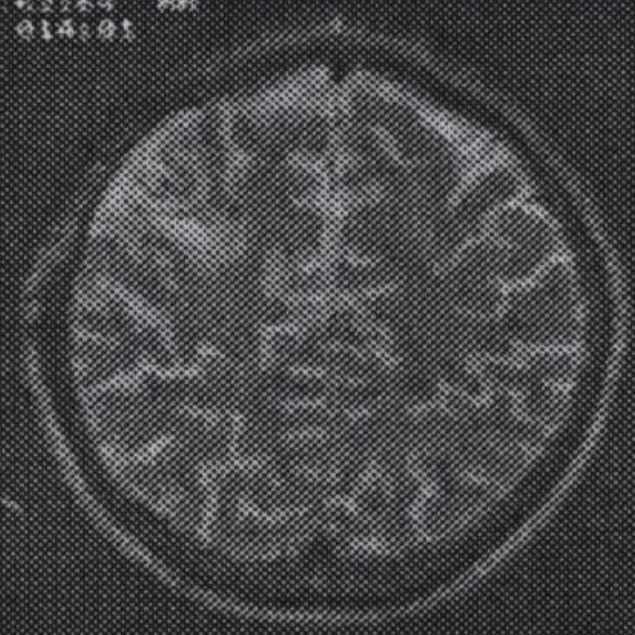


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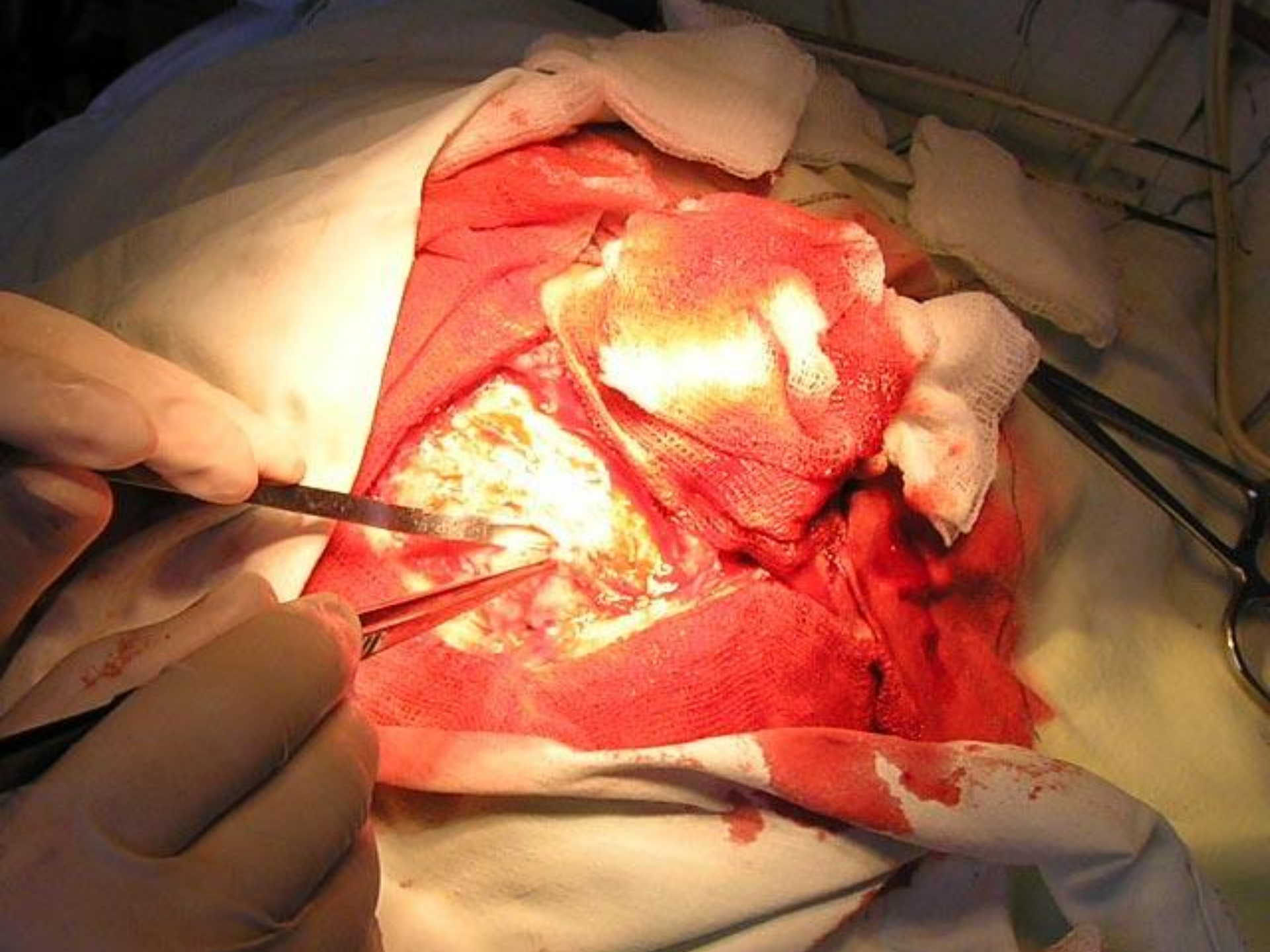
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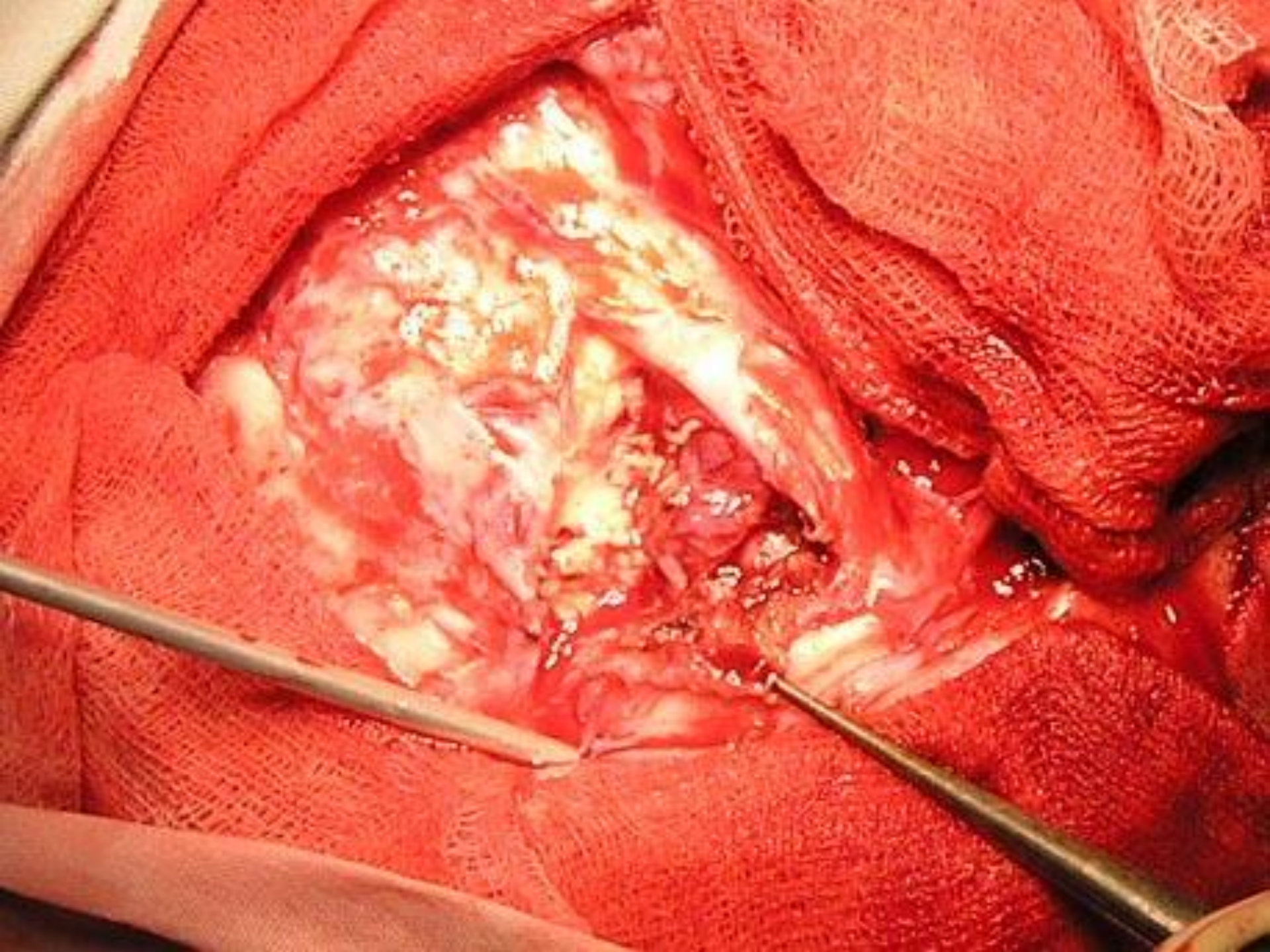


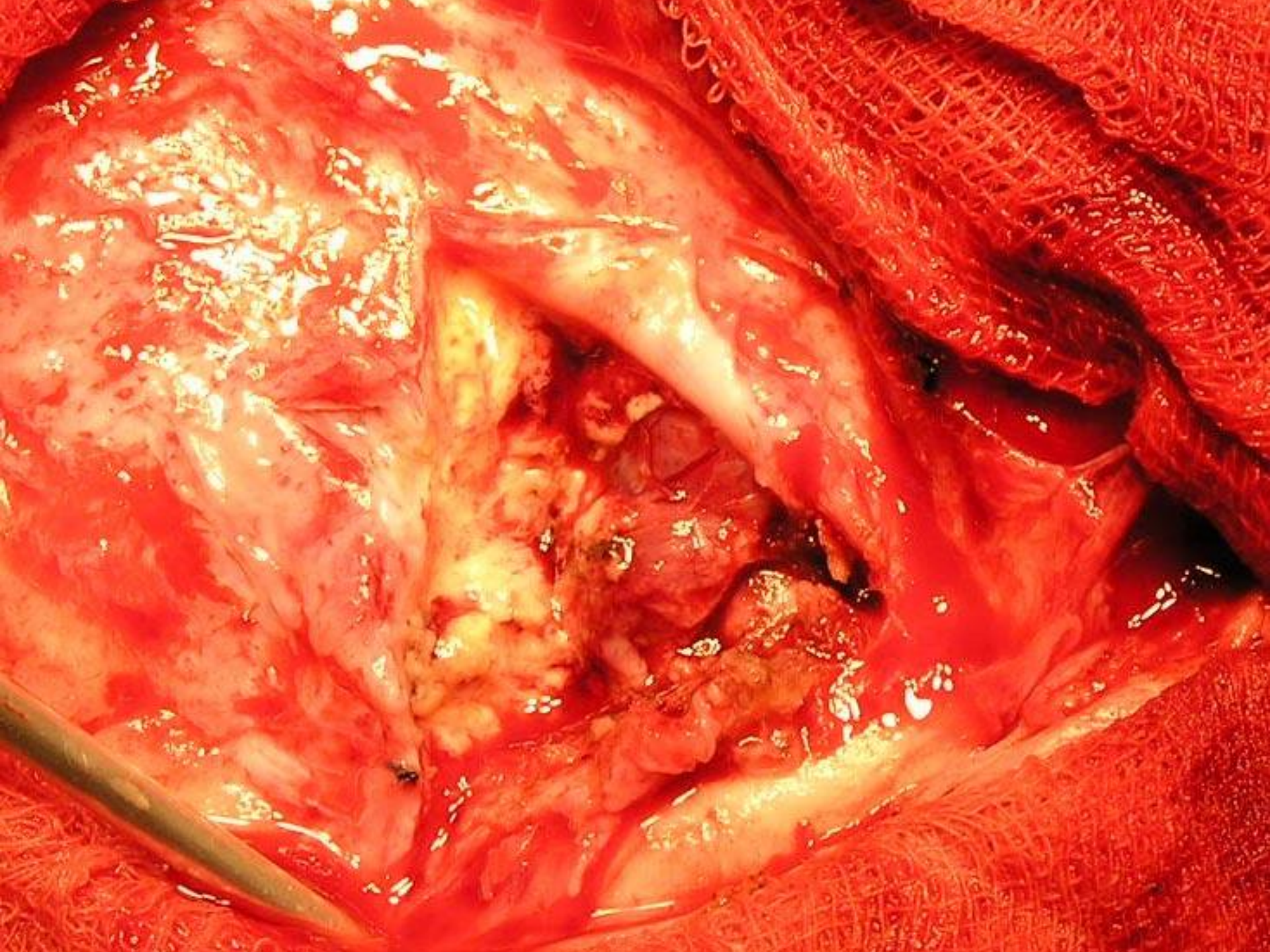
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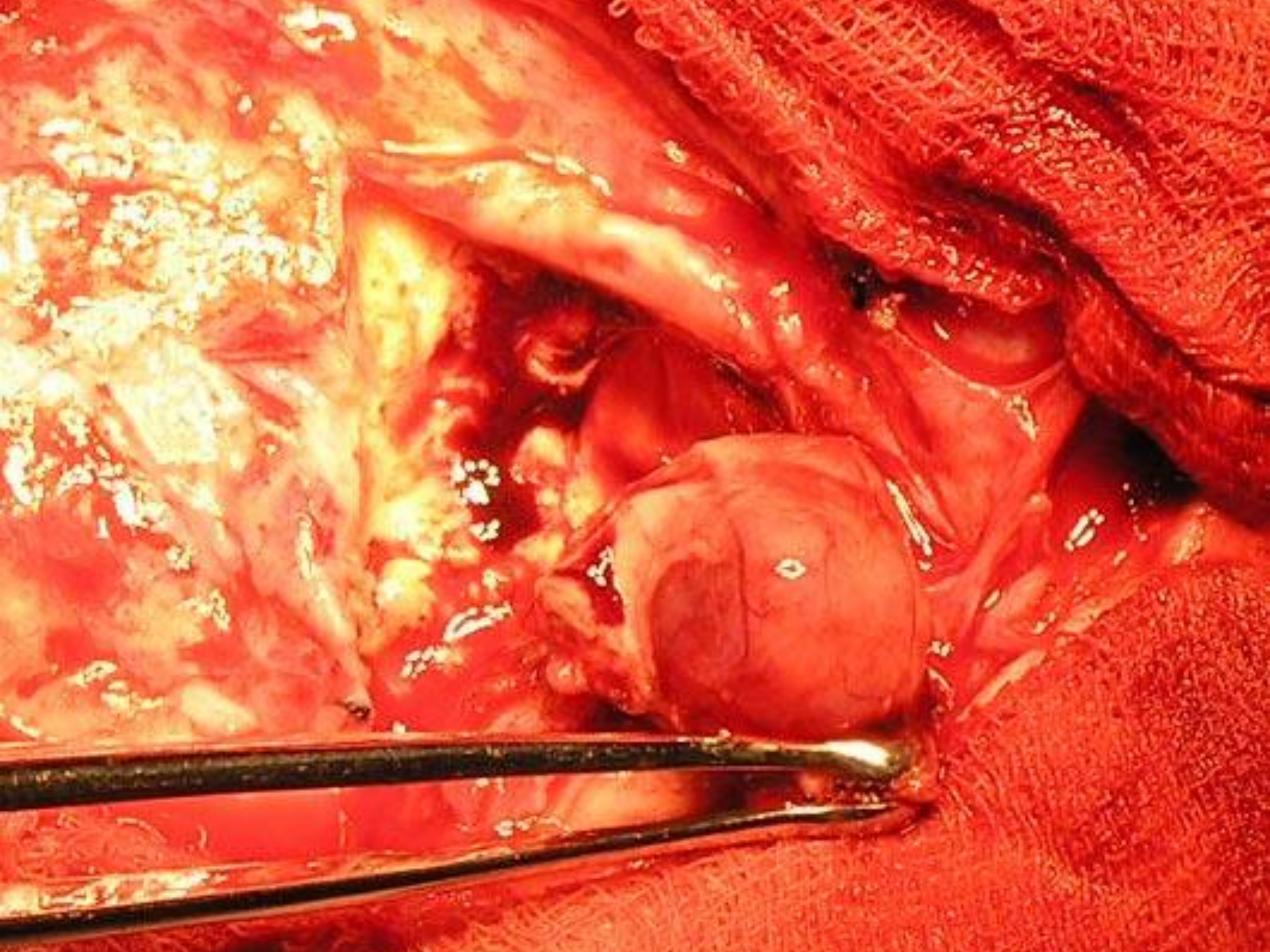


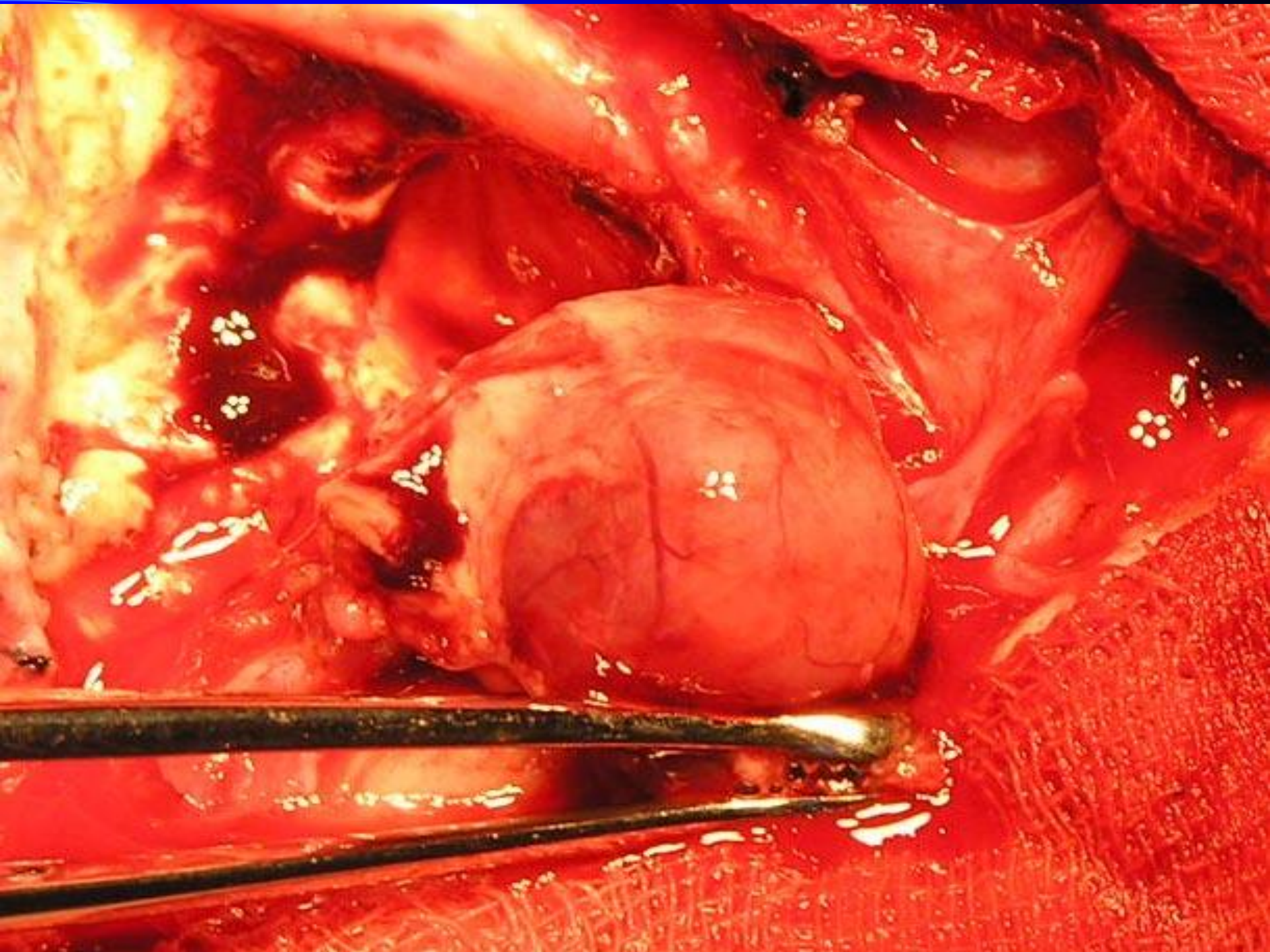
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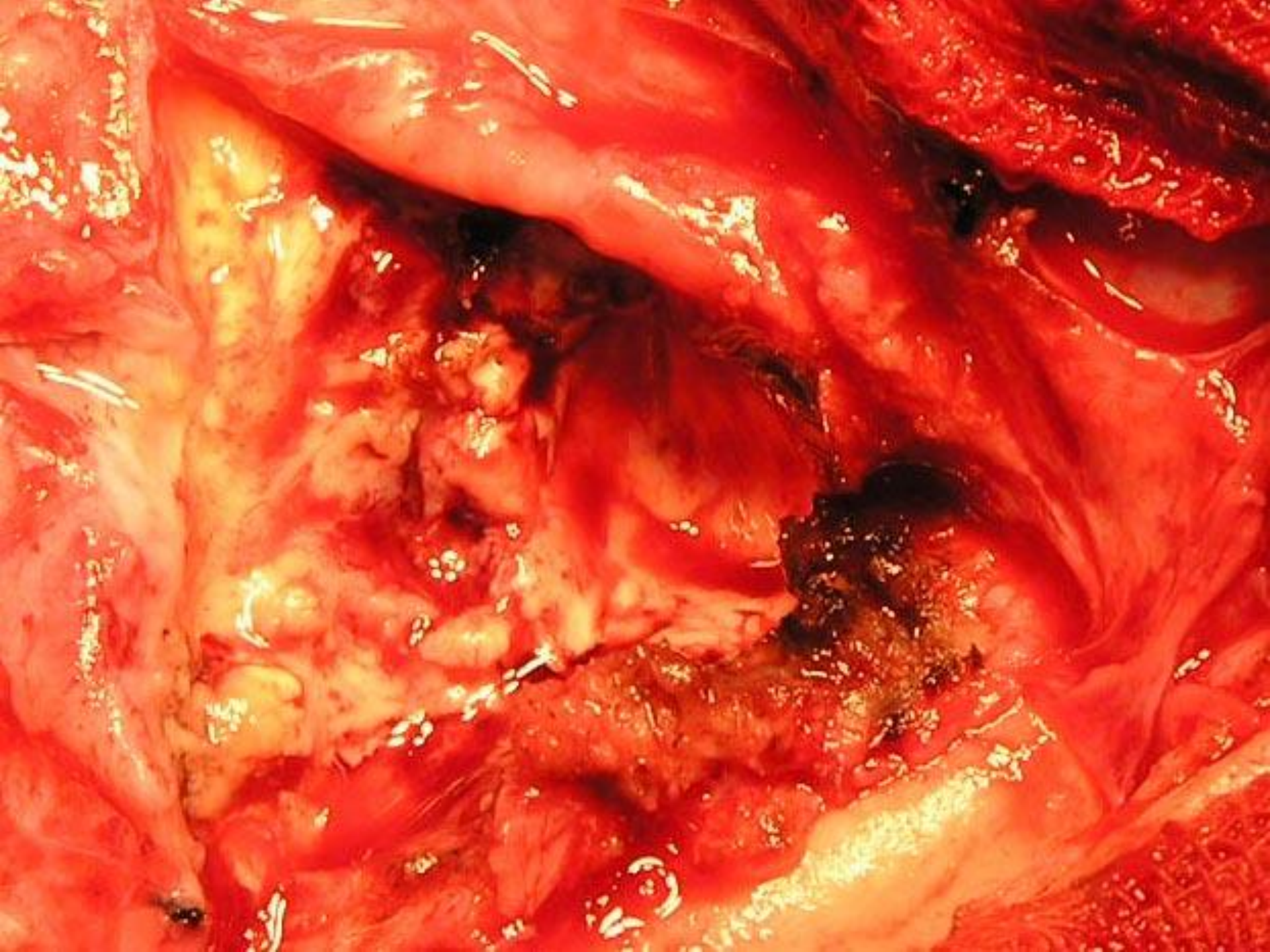






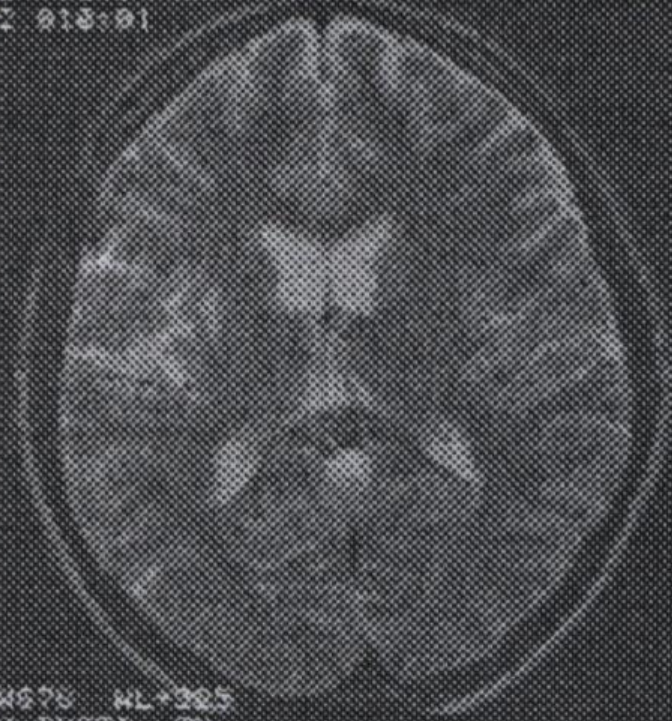








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Radiation therapy

- Methods of exposure to radiation can be divided into radiosurgery and radiotherapy.
- **By radiosurgery include:**
- 1) implantation of solid pharmaceuticals (ittrium-90, Intrastat) in tumor tissue;
- 2) the introduction of liquid radiopharmaceuticals (ittrium, gold) into the cyst or tumor bed of the resected tumor.

Radiotherapeutic techniques

External beam radiation therapy:

- Gamma-ray therapy;
- Proton beam irradiation;
- Conformal (3-D) radiation
- Gamma Knife

Chemotherapy

Chemotherapy, depending on the degree of penetration of the blood brain barrier may enter:

- Systemically intramuscularly or intravenously (effective to lomustine, ftorafur, vincristine);
- In the cerebrospinal fluid spaces (methotrexate, reumitsin);
- Direct injection of drugs in the resected tumor bed;
- Intraarterial with balloon catheter.

Hormone therapy

- The main area of application - a pituitary tumor.

Used in three ways:

for **the morphological** tumor regression use the Parlodel (bromocriptine) - this drug is a dopamine agonist for and adenomas secreting growth hormone (acromegaly). In the treatment prolactinomas by Parlodel can stop tumor growth and restore fertility.

for **substitution** lack of hormon in case of adenomas and after tumor surgery). Use prednisone and growth hormone.

to **reduce** the effects of excessive hormone hypersecretion. For the treatment of Cushing's syndrome use cyproheptadine and hloditon, that inhibit the secretion of cortisol).

Symptomatic treatment

Used in those cases when other methods are ineffective and need to alleviate the suffering patient.

Apply:

- Narcotic and non-narcotic analgetics.
- Dehydrating agents (saluretic and osmodiuretic).
- Sedatives and hypnotics.
- Medicine for the relief of associated systemic diseases.