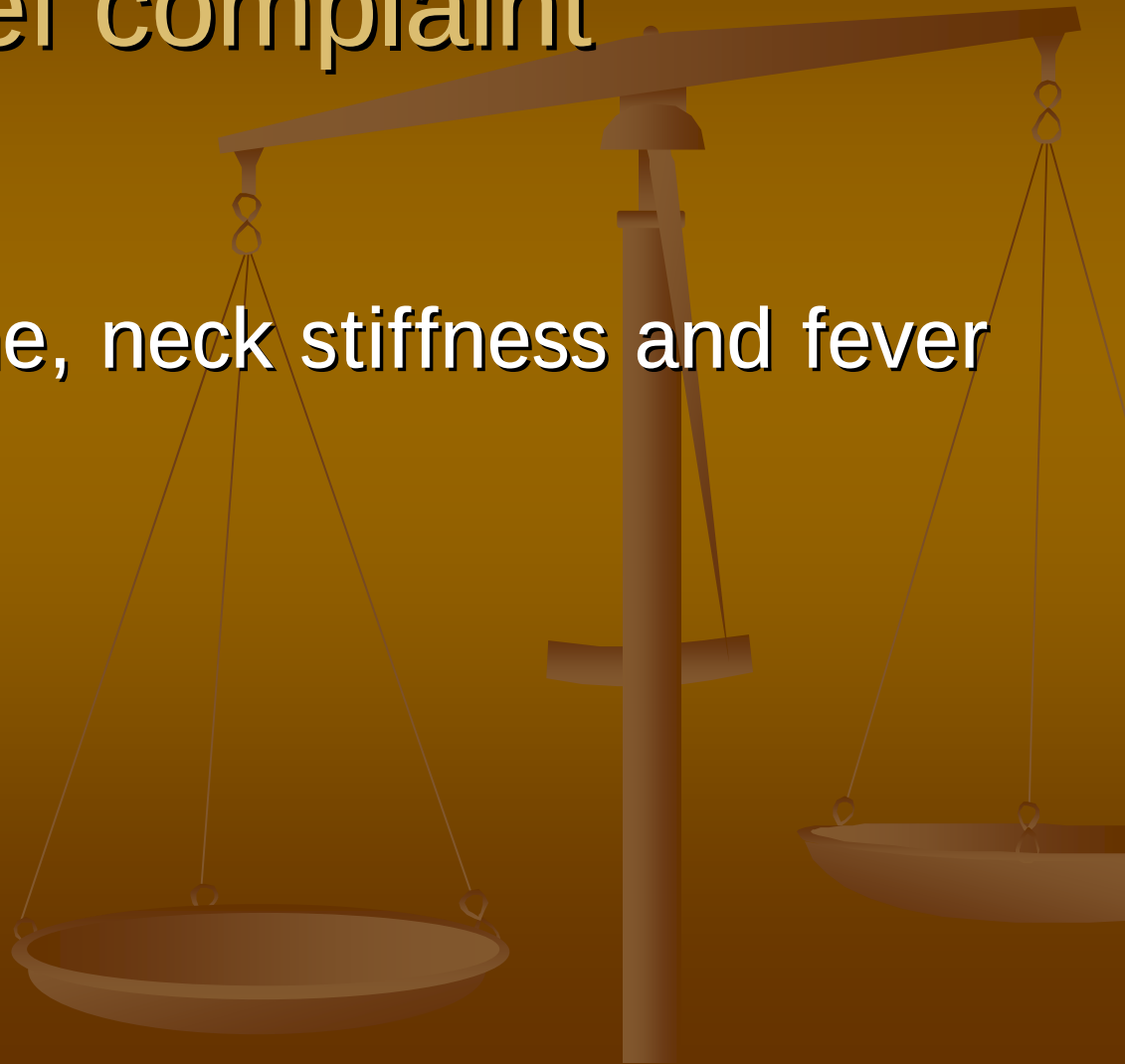
General Data

- Gender: female
- Age: 47
- Occupation:環保局

Chief complaint

- Severe headache, neck stiffness and fever for 10 days.



Present illness (Ⅰ)

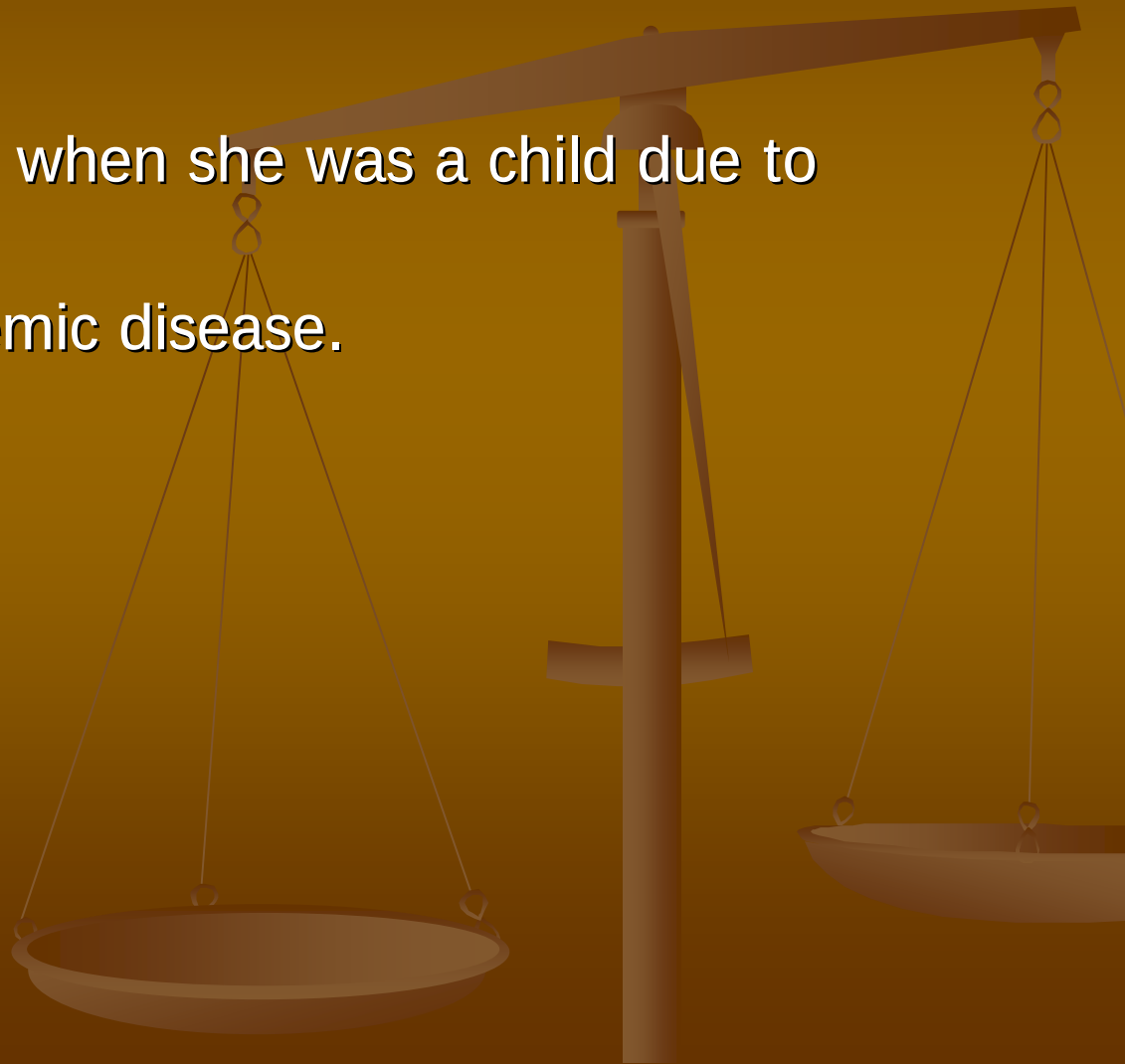
- This 47-year-old female patient was a case of asthma for years. She suffered from progressive headache with neck stiffness for 2 weeks. Fever and conscious disturbance were also noted. So she was admitted to 忠孝 H. on 2001-10-18.
- At 忠孝 H, GCS was E3V5M6, fever up to 38.5℃ and leukocytosis were noted.
- Brain CT showed a low density lesion at right frontal lobe with mild hydrocephalus. Right frontal tumor, infarction and brain abscess were suspected.

Present illness (Ⅱ)

- She was transferred to our hospital for MRI examination on 2001-10-19.
- Unfortunately, conscious disturbance occurred right before arrival at our ER.
- GCS was E1V1M1. Cardio-pulmonary resuscitation was performed and conscious recovered to E3VtM5 later.
- Emergent brain CT with contrast enhancement was done and she was admitted for further management.

Past history

- Medical history
  - Asthma for years.
  - Left lung resection when she was a child due to trauma.
  - Denied other systemic disease.
- Personal history
  - Smoking: denied
  - Alcohol: denied
  - Allergy: penicillin
- Family history
  - Not contributory

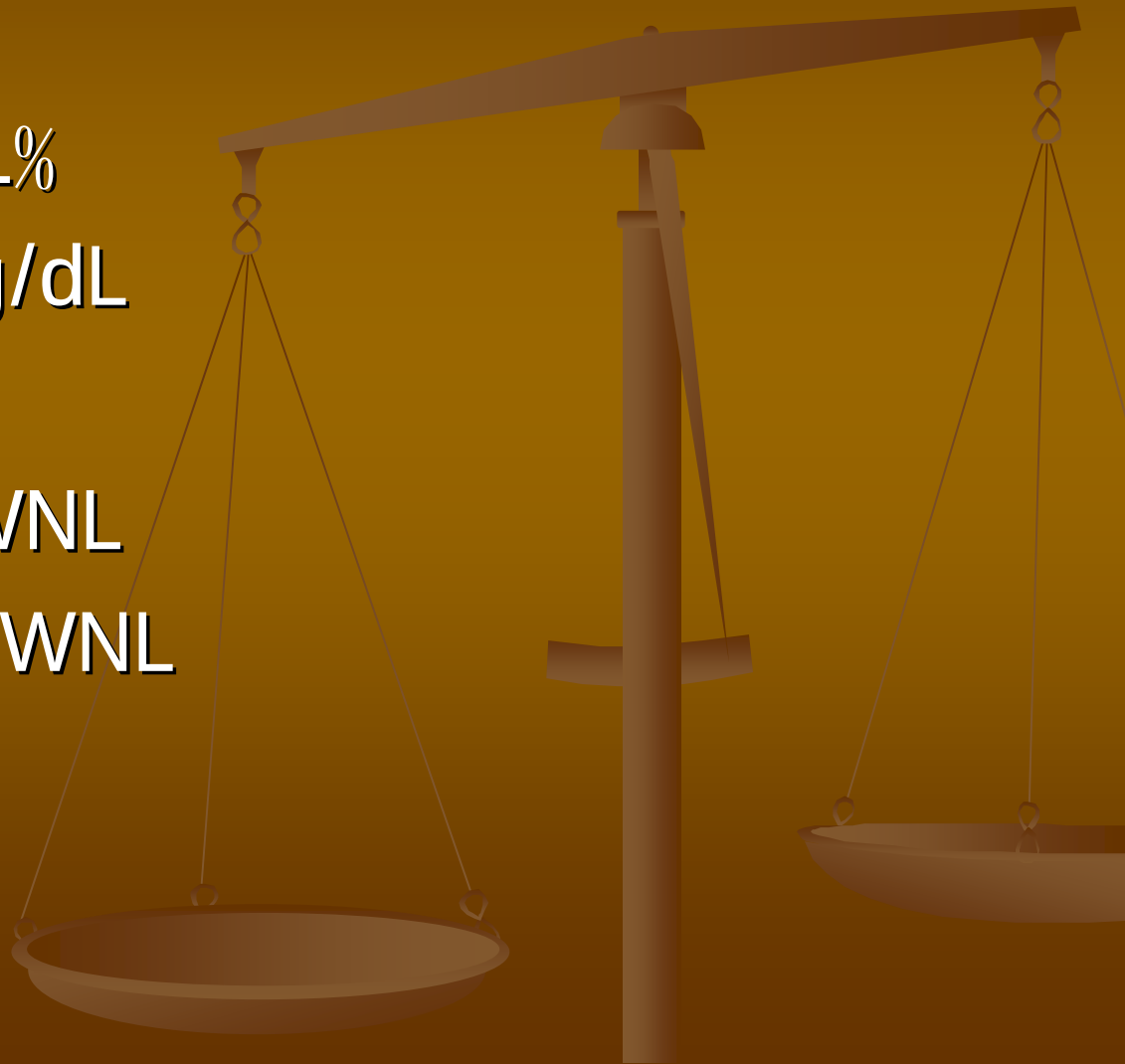


Physical examination

- Consciousness: E3VtM5
- Vital sign
  - BP 159/94 mmHg, PR 129/min
  - BT 37.6℃, RR 20/min
- Neck: stiffness
- Chest: asymmetric expansion, left chest immobilize, breathing sound clear
- Heart: tachycardia without murmur
- Neurological examination: NP

Lab. data

- WBC: 21460/uL
- Neutrophil: 90.1%
- Glucose 191 mg/dL
- K 3.3 mEq/L
- liver function: WNL
- Renal function: WNL



Cardiac sonography

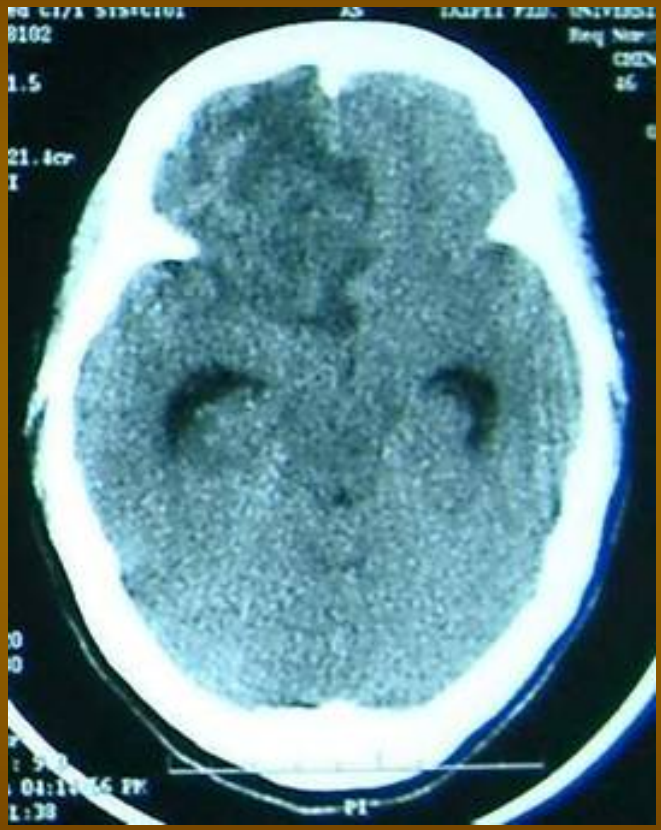
- For suspected infective endocarditis
- 2001-10-20
  - Mild LA dilation
  - Minimal amount of pericardial effusion
  - Regional wall motion abnormality suggests ischemic heart disease.
  - Mild MR
  - Estimated LV ejection fraction 52-58%
  - Sinus tachycardia with frequent APCs

X-ray

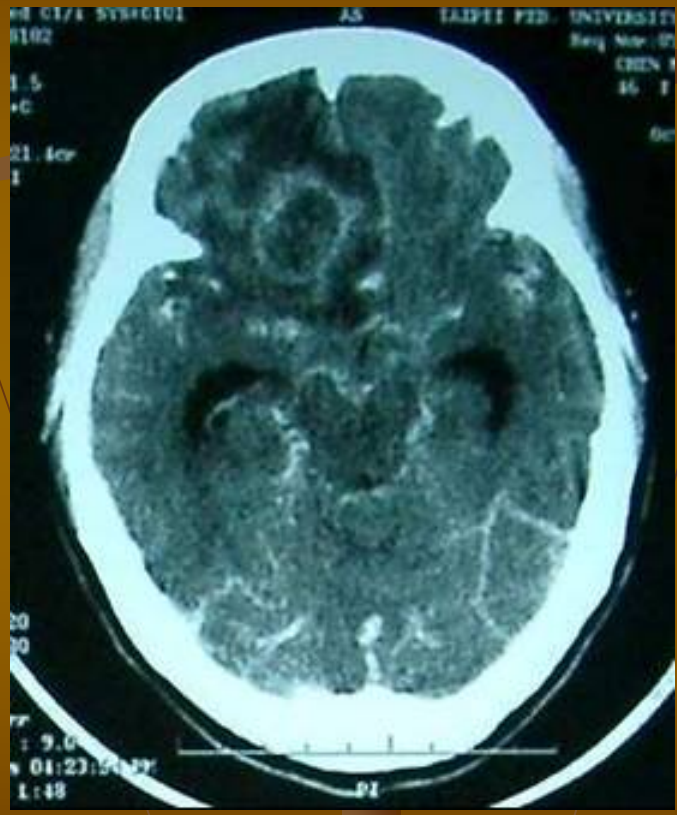
- 2001-10-20
- Total opacification of the left chest without mediastinal shifting.
- Amputation of left main bronchus.

Brain CT (1)

pre-enhanced



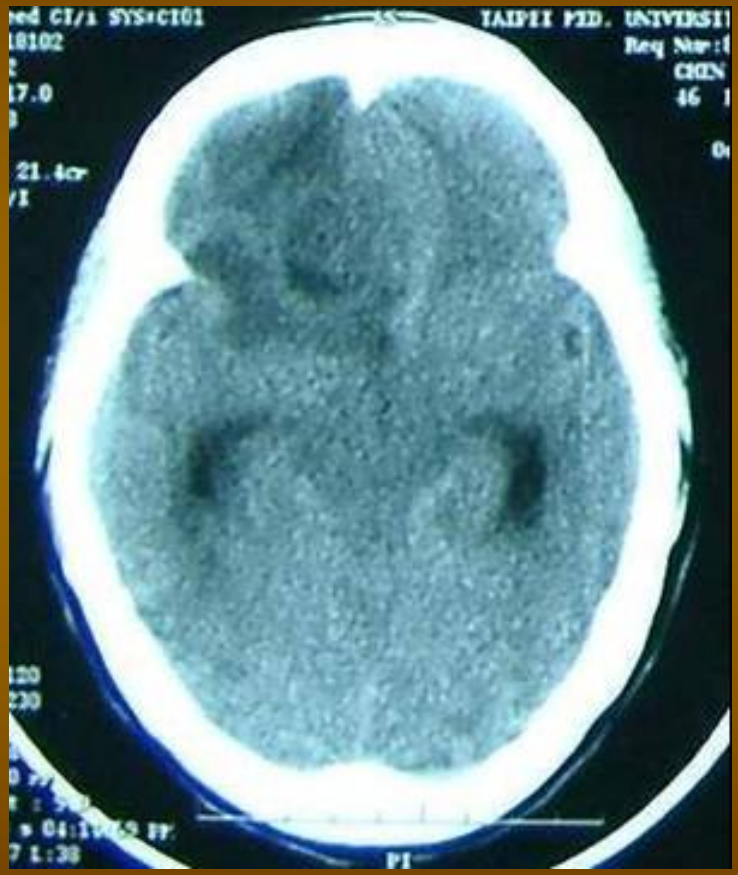
post-enhanced



A hypodensity lesion over R't frontal lobe

Brain CT (2)

pre-enhanced



post-enhanced

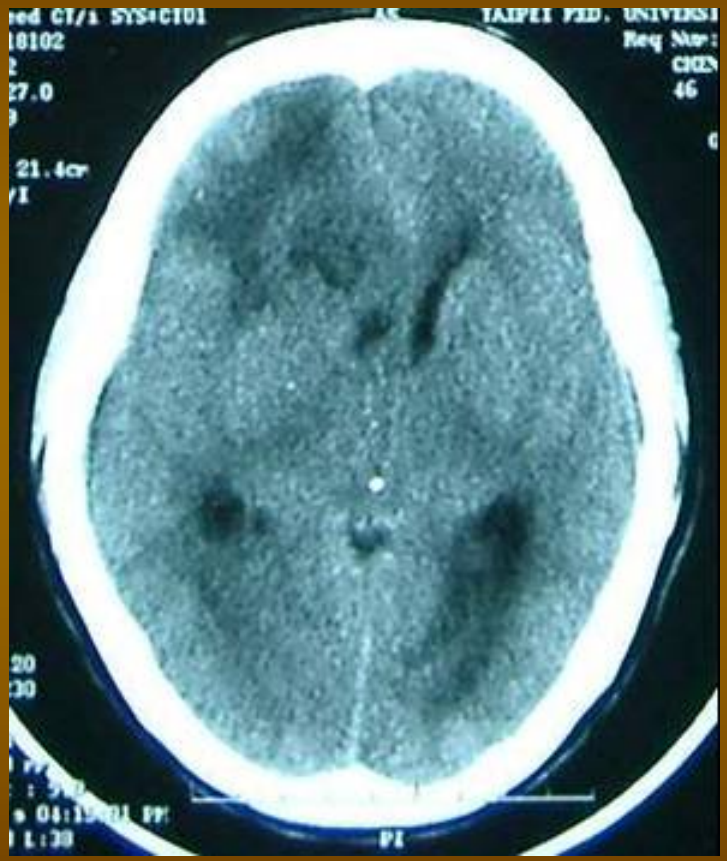
A thin ring-enhancing mass with extensive perifocal edema

Brain CT findings

- 2001-10-19
- A thin ring-enhancing mass (about 2x3x4 cm in size) with extensive perifocal edema is noted in right frontal lobe.
- The mass contains some non-enhancing low and iso-density materials.
- Brain abscess is more favored.

Brain CT (3)

pre-enhanced



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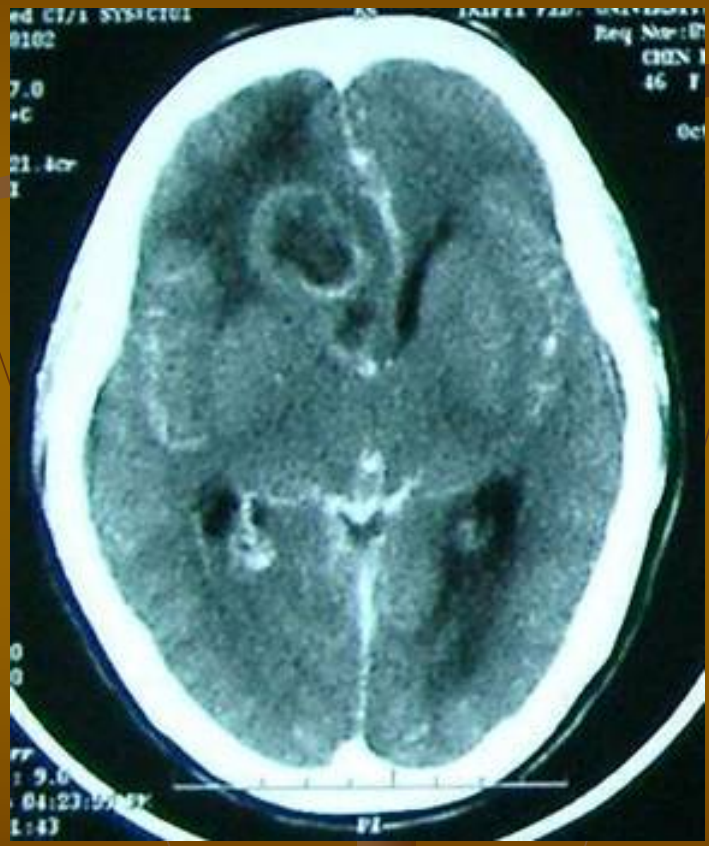


- Diffuse brain edema with midline shift
- Subfalcine herniation

Brain CT (4)

pre-enhanced

post-enhanced

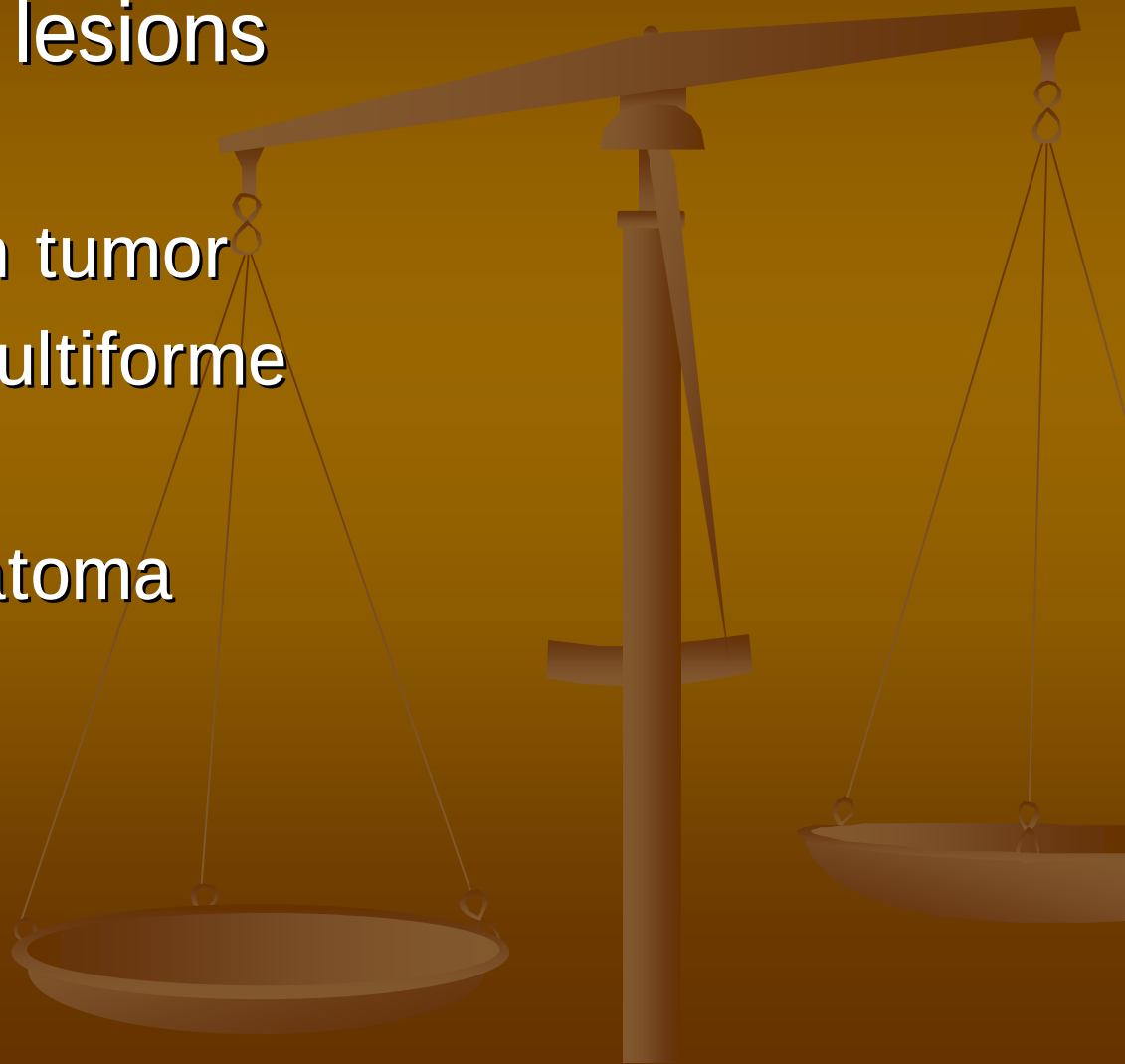
- There is ventricular wall enhancement in frontal horn of right lateral ventricle.
- Asymmetrical lateral ventricular dilatation.

Brain CT findings

- There is ventricular wall enhancement in frontal horn of right lateral ventricle.
- Abscess rupture into ventricle, resulting in ventriculitis are considered.
- Asymmetrical lateral ventricular dilatation is noted, obstructive hydrocephalus due to compression by the abscess is suspected.
- Diffuse brain edema with midline shift and subfalcine herniation are also seen.

Differential diagnosis

- Ring-enhancing lesions
  - Brain abscess
  - Metastatic brain tumor
  - Glioblastoma multiforme
  - Cerebral infarct
  - Resolving hematoma



Brain abscess

- A focal area of heterogeneous hypodensity surrounded by smooth-ring enhancement.
- Ring enhancement --- capsule of the abscess
- Nonenhancing abscess centre --- pus
- Extensive edema in the surrounding white matter.

Metastatic brain tumor

- Multiple
- Enhancing solid lesions --- irregular, ring pattern
- A thick or markedly irregular wall suggest a tumor rather than an infection lesion.
- Seen at the gray-white matter junction
- Extensive surrounding edema
- In a patient with known primary cancer

Glioblastoma multiforme

- Heterogeneous and lobulated on non-contrast CT.
- Central necrosis is the hallmark of GBM.
- Usually irregular, occasionally nodular, ring enhancement.
- Extensive surrounding white matter edema.
- Occasionally calcification
- Hemorrhage is common.

Cerebral infarct

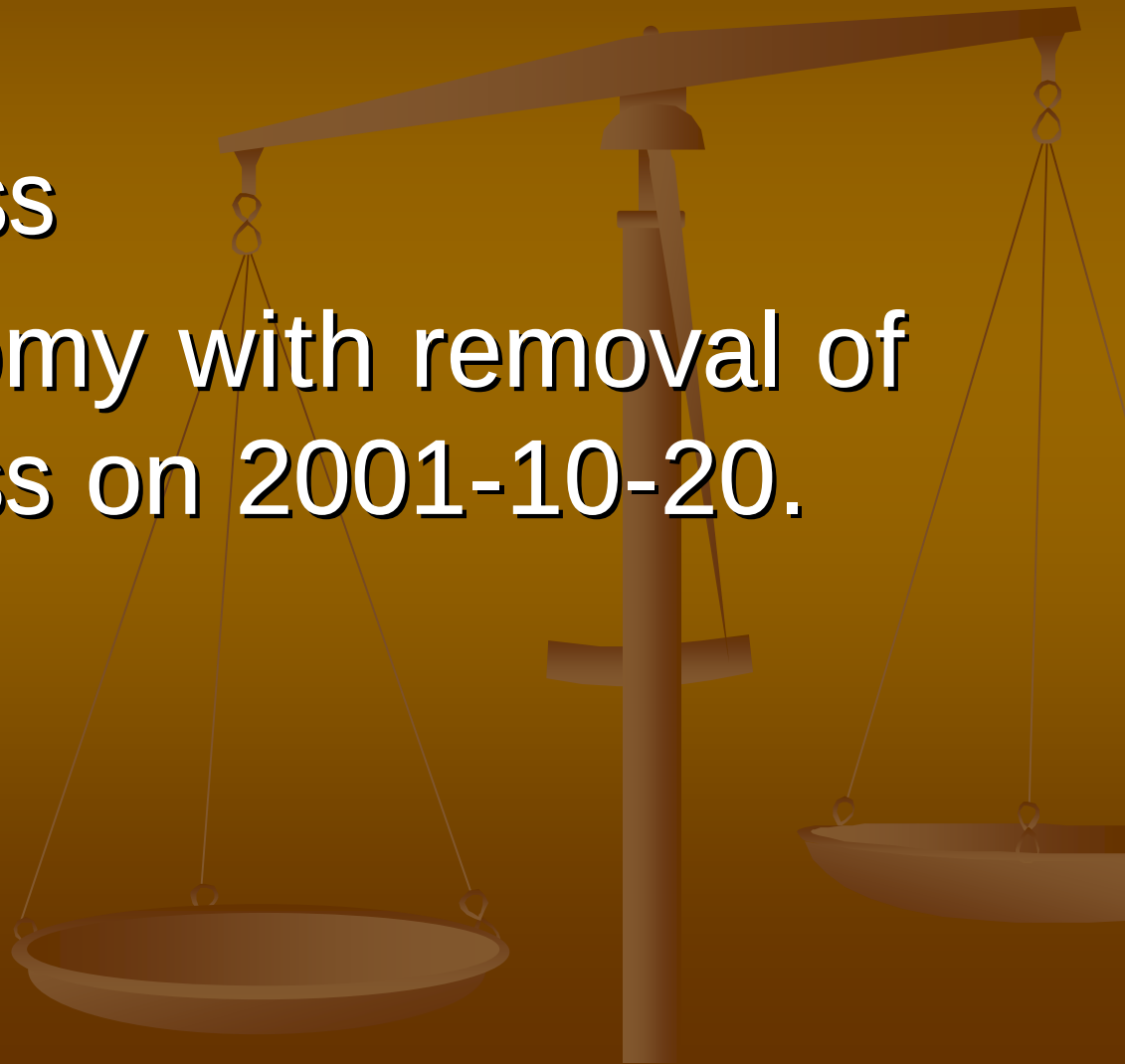
- CT showed hypodensity involving both gray and white matter.
- Cortical involvement is an important differential diagnostic criteria.
- On contrast-enhancement CT
  - Variable pattern: cortical, central, patchy and dense enhancement.

Resolving hematoma

- Intracranial hemorrhage can be identified on CT, depending on the age of the bleed.
- Acute stage (< 1 week): hyperdensity
- Subacute stage (1-6 weeks): ring-like enhancement can be seen, possibly related to hypervascularity at the periphery of a resolving hematoma
- Chonic stage (>6 weeks): hypodensity indicated cavity formation.
- Final stage: residual cavity

Final diagnosis

- Brain abscess
- OP: craniotomy with removal of brain abscess on 2001-10-20.

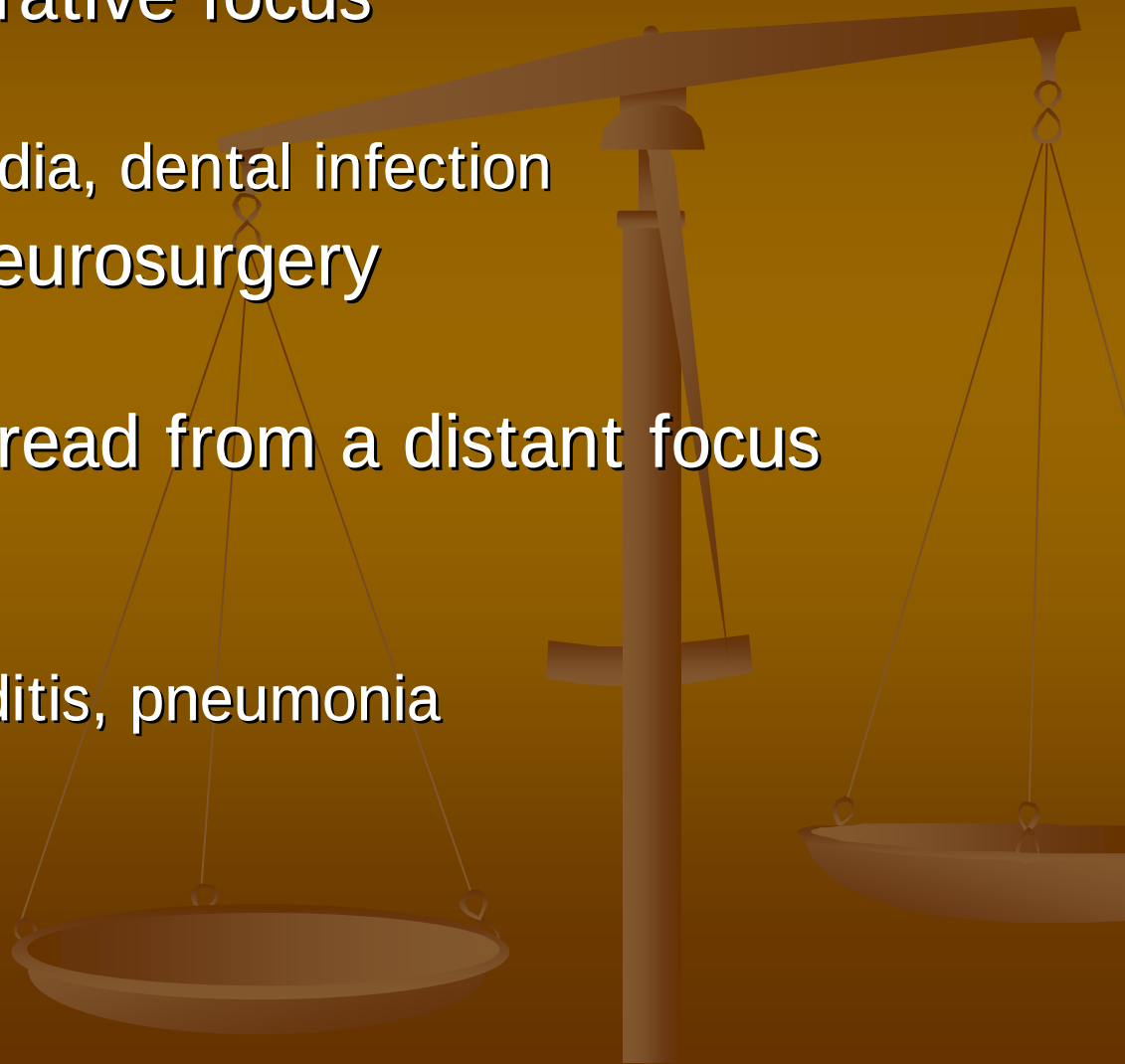


Discussion
Brain abscess

- Definition
  - A focal suppurative infection involving brain parenchyma with subsequent abscess formation .
- Common etiologic agents
  - Mixed flora
  - Staphylococcus aureus
  - Aerobic or microaerophilic Streptococci
  - Aerobic gram-negative bacilli
  - Other anaerobes

Etiology

- Contiguous suppurative focus
  - 45-50% of cases
  - Sinusitis, otitis media, dental infection
- Head trauma or neurosurgery
  - 10% of cases
- Hematogenous spread from a distant focus
  - 25% of cases
  - Multiple lesions
  - Infective endocarditis, pneumonia
- Cryptogenic
  - 15% of cases



Results of experimental models of brain abscess formation

- there must be preexisting or concomitant area of ischemia, necrosis, or hypoxia in brain tissue.
- Risk factor
  - Cyanotic heart disease
    - Tetralogy of Fallot, ASD, VSD
  - Pulmonary AV fistula
  - immunosupression

Clinical features

- Solitary abscess involve frontal > temporal > parietal > cerebellar > occipital lobes of the brain.
- hematogenous spread of infection to brain
  - Multiple abscesses

Symptom and sign

Triad	<50%
Headache	50-75%
Fever	40-50%
Focal neurologic deficit	~50%
Seizure	25-40%
Nausea and vomiting	22-50%
Neck stiffness	~25%
papilledema	~25%

Radiological examination

- Skull films
  - For diagnosis of sinusitis or the presence of free gas in the abscess cavity.
- Chest X-ray film
  - For detection of underlying cardiac or pulmonary abnormality.

CT

- On contrast enhanced CT
  - An uniformly ring or doughnut representing the spherical wall or capsule of the abscess.
    - Breakdown of the blood-brain barrier
    - Hypervascularity of the granlation tissue.
  - The nonenhancing hypodensity abscess centre is pus.
  - There is commonly extensive hypodense-appearing edema in the surrounding white matter.

CT

- On non-contrast enhanced CT
  - usually not contain high density material.
- Delayed scanning after IV contrast medium
  - For differentiation between the pseudo-capsule of the late stage of cerebritis and a true capsule.

MRI
cerebritis

- MRI is better than CT for abscess
  - In the early stage --- cerebritis
  - In the posterior fossa
- Cerebritis appears on MRI
  - An area of low-signal intensity on T1WI with irregular post-gadolinium enhancement.
  - An area of increased signal intensity on T2WI
- Cerebritis is often not visualized by CT

MRI
mature brain abscess

- On T1 weighted image
  - The hypointense central area surrounded by a thin hyperintense signal wall
  - hypointense signal edema.
  - Marked ring-enhancement after gadolinium administration
- On T2 weighted image
  - Hyperintense central area of pus surrounded by a well-defined hypointense capsule.
  - Hyperintense area of edema.

Treatment

- Surgical drainage
  - For encapsulated abscess
- Empirical antibiotic therapy
  - based on abscess culture
  - At least 6-8 weeks
- Prophylactic anticonvulsant therapy
  - At least 3 months
- Short-term steroid therapy
  - Used only in patients with proven or suspected elevation in ICP