Brain Biopsy

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INDICATIONS

1. **Brain tumors** - definitive tissue diagnosis necessary for treatment planning. see p. Onc1 >>
2. Differentiating ***residual tumor*** from ***radiation necrosis*** (coagulative necrosis and vasculopathic changes).
3. Mass forms of **infection** (abscess, cerebritis, tuberculoma), incl. differentiation from CNS lymphoma in AIDS patients.
4. Rare **viral encephalitides** (esp. rabies, Creutzfeldt-Jakob disease). see p. Inf9 >>
5. **Vasculopathies** (e.g. granulomatous angiitis).

N.B. do not biopsy ***vascular lesions***!

METHOD

Tissue amount necessary - few cells may be sufficient in diagnosis of metastatic carcinoma or lymphoma, whereas even postmortem examination of entire brain may be inadequate to establish precise diagnosis in some degenerative or metabolic diseases.

Sampling area:

a) mass lesion / defined area on imaging studies
- possibility of tissue heterogeneity! - multiple biopsies along needle trajectory may provide more complete picture of pathological process.

  N.B. sampling of only central area (e.g. complete tissue necrosis in tumors or abscesses) may not yield diagnostic tissue!

b) diffuse pathology (no lesion on imaging) - noneloquent areas of cerebrum.

  N.B. random biopsies may be nondiagnostic
- type of tissue sampled (gray or white brain matter, leptomeninges) is guided by suspected diagnosis (tissue wedge consisting of cortex, overlying leptomeninges, and underlying white matter provides most useful tissue sample).
- tissue should be considered potentially infectious (precautions for Creutzfeldt-Jakob disease should be taken).

All brain regions may be approached by MR/CT-guided stereotactic biopsy! see p. Rx20 >>

- carried out under *general anesthesia* (in adults, *local anesthesia* is adequate).
- tissue aspiration through inserted needle.
- diagnostic yield ≈ 90%.

Indications for open biopsies:

1) *prominent blood vessels*
2) *hemorrhage within lesion*
3) contemplated resection (during same procedure)

TISSUE TECHNIQUES

Evaluation	Technique	Fixative	Staining
Cytological	Imprint/touch	Alcohol	Rapid H & E, Diff-Quik Papanicolaou
	Smear/squash		
Routine histological	Frozen section	Alcohol	Rapid H & E, metachrome B, special staining
	Paraffin section	Formalin, B5	
Special histological: histochemistry, immunohistochemistry	Frozen section	None	Enzymes, biochemical reactions
	Frozen or paraffin	Variable	Mono- or poly-clonal antibodies
Electron microscopy	Thick section	Glutaraldehyde/OsO_4	Toluidine blue
	Thin section		Lead citrate/uranyl acetate

Frozen sections:

– may provide ***specific diagnosis*** in some cases (but in many situations definitive diagnosis can be made only after evaluation of all tissue specimens and with adjunctive studies).
– sometimes used to ***guide resection*** of mass lesion.

Ancillary studies:

1) microbiology (e.g. bacterial, viral, fungal cultures)
2) cytogenetics (e.g. karyotype analysis)
3) molecular genetics (e.g. PCR)
4) biochemical analyses.

COMPLICATIONS

- all patients stay in hospital for 24-48 hours; avoid vigorous physical activity for 3 weeks.

  Removal of nonregenerating brain tissue is accompanied by risk of *permanent neurological deficit*!
- bleeding (2%)*, edema exacerbation, infection, development of seizure focus, increased neurologic deficit.

  *small hematoma at biopsy site is not unusual and is rarely clinically significant
- mortality < 0.2-1%.

FINDINGS

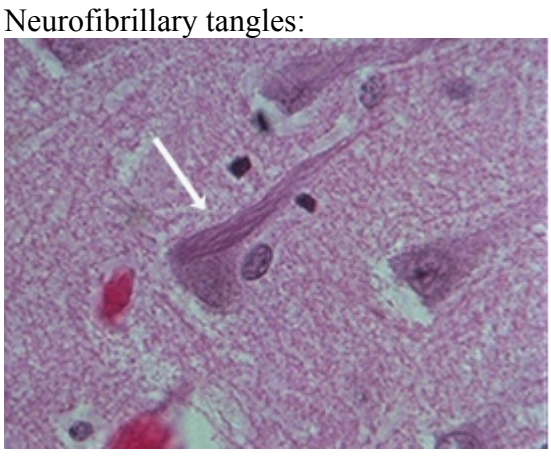
INCLUSIONS

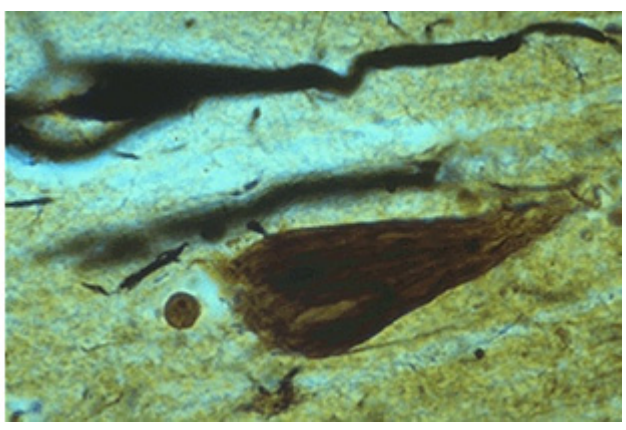
Disease	Inclusion name	Location (in cell)	Cells affected	Contents
HSV, VZV	COWDRY type A	nucleus	neurons and glia	
CMV	"owl-eyes"			
rabies	Negri bodies			
Parkinson disease	LEWY bodies	cytoplasm	neurons	***neurofilament***, ***tubulin***, ***α-synuclein*** and ***ubiquitin***
Alzheimer disease	neurofibrillary tangles	cytoplasm	neurons	**TAU protein**

eosinophilic

LEWY body:

Neurofibrillary tangles:





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