

Nervous System 4

- 1) HIV and the nervous system
- 2) Tumours of the nervous system

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NS infection in immunosuppressed

- infections common and often fatal in immunosuppressed, esp.
 - atypical mycobacteria
 - CMV
 - papovaviruses
 - *Candida albicans*
 - *Aspergillus fumigatus*
 - *Cryptococcus neoformans*
 - *Toxoplasma gondii*
 - *Entamoeba histolytica*
- diagnosis often difficult before death
- multiple infections common, particularly in HIV

HIV and nervous system

- NS commonly involved in both AIDS and pre-AIDS stages
- route of infection uncertain
 - ? carried across blood brain barrier in macrophage-type cells (“Trojan horse” theory)
 - ? actual direct infection of nerve cells and other glial cells

HIV and the nervous system

- NS presentations common in HIV/AIDS
- at death at least 80% of AIDS patients have CNS pathology resulting from -
 1. multiple opportunistic infections (e.g. toxoplasma, fungi)
 2. viral infections (e.g. CMV, papovavirus)
 3. primary cerebral lymphoma
 4. cerebral HIV infection (subacute encephalitis causing cerebral atrophy with progressive dementia)
 - sometimes preAIDS
 - diagnosis by blood serology or PCR on CSF
- also peripheral neuropathy (incl. after antiretroviral therapy)

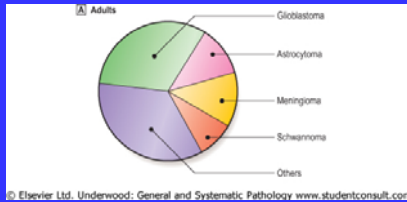
NS tumours

- gliomas
- nerve cell tumours
- germ cell tumours
- lymphomas
- meningionas
- metastases
- tumours of nerves

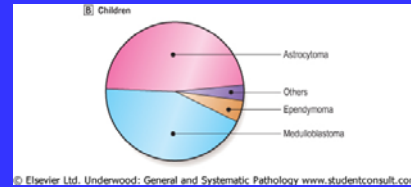
NS tumours

- quite common -
 - intracranial* ~ 10 - 20 per 100,000
 - intraspinal* ~ 1 - 2 per 100,000
- around two thirds primary and one third metastatic
- in adults, two thirds in cerebral hemispheres
- in children, where CNS tumours = 20% all tumours, two thirds in posterior fossa

Pie chart of CNS tumour frequency in adults



Pie chart of CNS tumour frequency in children



NS tumours are “different”

- benign/malignant distinction often blurred
 - mostly because even benign tumours can expand enormously in soft brain, so having major effects
 - so tumour site may be more important than behaviour for prognosis
- soft brain tissue makes tumours (espec glial ones) difficult to remove
- pattern of spread differs tumours elsewhere
 - rarely metastasise outside the NS
 - other than direct spread, only path for spread is subarachnoid space, so seeding along brain and cord can occur in tumours getting into CSF

Brain tumours

- most important primary brain tumours are gliomas
- can arise from any glial cell
 - astrocytomas, oligodendrogliomas and ependymomas

Astrocytomas

- various types, each usually with its own histology, age range and clinical effect, e.g.
 - fibrillary astrocytoma
 - pilocytic astrocytoma
 - glioblastoma
- **only** important differences to remember
 - glioblastomas are malignant, others usually more benign
 - likely behaviour of more benign ones can be predicted by “grading”, if biopsy representative
 - genetic analysis of tumour also correlates with likely behaviour

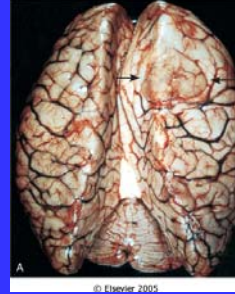
Astrocytomas

- around 80% of adult primaries
- usually found in hemispheres, but can occur anywhere in brain or cord
- age range 40s – 60s
- most common presenting signs/symptoms
 - seizures, headaches and focal neurological signs depending on tumour site

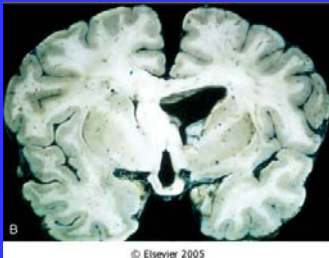
Appearance of astrocytomas

- more benign ones
 - poorly defined, infiltration expanding/distorting and distort brain (edge between tumour and normal can be difficult see even histologically)
 - range in size few cms to lesions filling a hemisphere
 - usually homogenous, but may be cystic
- more malignant ones – glioblastoma (essentially = anaplastic astrocytomas)
 - often well-demarcated (speed of growth)
 - variable cut surface with areas of necrosis, haemorrhage and cystic degeneration
 - often surrounding oedema, because of abnormal vessels – can be seen on imaging

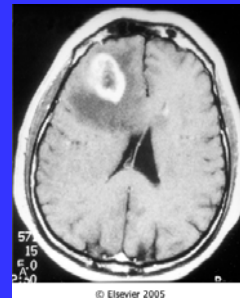
Well-differentiated astrocytoma



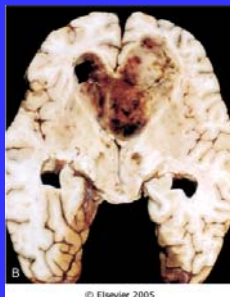
Well-differentiated astrocytoma



NMR of glioma



Glioblastoma multiforme



Gliomatosis cerebri

- *unusual condition*
- *multiple regions, occasionally whole brain, infiltrated by neoplastic astrocytes*

Astrocytomas – clinical effects

- depend partly on location and growth rate
- tendency to increase with time
- if “more benign”, symptoms/signs may not change or only slowly over years, but eventual faster deterioration as dedifferentiation occurs
 - mean survival around 5 yrs
- prognosis for glioblastoma poor
 - <10% of patients alive after 2 yrs

Pilocytic astrocytoma (a more benign type) – cystic tumour with nodule



Oligodendrogliomas

- ~ 10% all gliomas
- most common in 30s-40s
- often prolonged history before diagnosis
 - neurological problems, often with fits
- mostly affect cerebral hemispheres, particularly white matter
- usually better prognosis than astrocytomas
- with treatment, average survival of 5 to 10 years

Ependymomas

- most often arise beside ventricles or central canal of cord
- in children and adolescents, usually near the fourth ventricle
- in adults, usually in spinal cord, especially in neurofibromatosis

Ependymomas

- often block 4th ventricle, causing hydrocephalus
- poor prognosis and CSF dissemination because of site
- average survival of about 4 years after treatment
 - better for supratentorial and spinal sites, since often resectable

Ependymoma in roof of 4th ventricle



Ependymoma in 4th ventricle



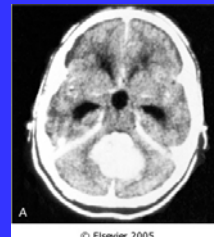
Nerve cell tumours

- ganglion cell tumours
 - gangliocytomas or gangliogliomas (mixed with glial cells)
 - usually slow growing, but glial component can become anaplastic
- neuroblastomas
 - highly aggressive tumours of cerebral hemispheres in children

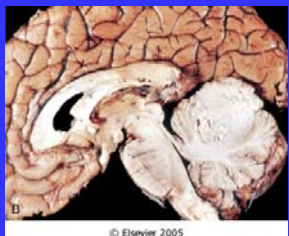
Medulloblastoma

- neuroectodermal origin
- usually undifferentiated, but sometimes neuronal and/or glial markers
- 20% of brain tumours in children
- always cerebellum
- highly malignant, but very radiosensitive
- with treatment 5 year survival can be up to 75%

Medulloblastoma on CT



Medulloblastoma in cerebellum



NS lymphoma

- primary NS lymphoma (PCNSL) ~ 2% of extranodal lymphomas
- 1% of intracranial tumours overall
- commonest NS neoplasm in immunosuppressed
- in non-immunosuppressed incidence increasing, especially in old people

Primary NS lymphoma

- often multiple tumour sites in brain
- nodal, marrow or extranodal involvement outside NS rare and late
- (NHL arising elsewhere rarely involves NS
 - can produce malignant cells in CSF and round nerve roots and occasionally infiltrate superficial cortex or cord)

Primary NS lymphoma

- mostly B-cell tumours
- in immunosuppressed, tumours contain EBV genomes in transformed B cells
- always aggressive disease
 - poor response to chemotherapy, cf. peripheral lymphomas

Primary NS lymphoma

- lesions frequently multiple, involving cortex, white matter and central nuclei
- periventricular spread common.
- relatively well defined compared to gliomas, but less so than metastases
- almost always high-grade lymphomas

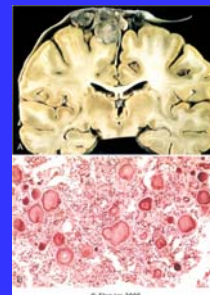
Germ cell tumours

- (can be same types as in testis/ovary)
- occur in midline, most commonly in the pineal (strong male predominance) and suprasellar regions
- rare in most countries, though up to 10% brain tumours in Japan
- 90% occur in first two decades

Meningiomas

- predominantly benign adult tumours
- slow growing
- usually attached to dura
- arise from stromal cells
- may be found on any external brain surface or in ventricles

Meningioma – and histology showing psammoma bodies



Meningiomas

- usually rounded masses with well-defined base
- compress brain, but easily separated from it
- rarely involve overlying bone
- usually encapsulated and often lobulated
 - other pattern is en plaque variant - tumour spreads in sheets along dura, commonly with overlying reactive new bone
- usually firm, even gritty and may be heavily calcified (“psammoma bodies”)

Meningiomas

- behaviour can be predicted by grading
- most are “benign”
- different histological patterns of NO significance
 - e.g. syncytial, fibroblastic, psammomatous

Meningiomas

- only a few infiltrate brain - broad pushing edges or as single cells
- brain invasion means increased risk of recurrence, but does **not** alter histological grade and so clinical behaviour

Meningiomas

- usually slow-growing and solitary
- present either with vague symptoms or focal findings due to pressure on underlying brain
- commoner in women, espec. in cord
 - often express progesterone receptors
 - rapid growth reported in pregnancy

Metastases

- mostly carcinomas
- around 25% brain tumours
 - most commonly lung, breast, melanoma of skin, kidney and GIT
 - some tumours (e.g. prostate) almost never do, though can affect nearby bone and dura.
- meninges are also frequent site for metastases
- present clinically as SOLs
 - occasionally as first sign of cancer

Pontine metastases from CA lung



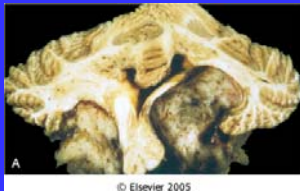
Tumours of nerves

- Schwann cell tumours (= Schwannomas = neurilemmomas)
- neurofibromas

Schwann cell tumours

- well-circumscribed, encapsulated masses
- attached to nerve, but can be separated from it
- in cranium only common site is in cerebellopontine angle attached to the vestibular branch of the eighth nerve
 - “acoustic neuromas”
 - present with tinnitus and deafness
- elsewhere schwannomas most common in association with large nerve trunks

Schwannoma



Neurofibromas – 2 types

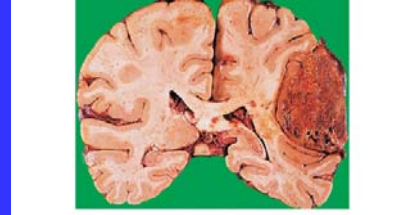
- common form in skin or peripheral nerve
 - sporadically or in neurofibromatosis
 - sometimes hyperpigmentation over skin lesions
 - may be large and pedunculated
 - malignant transformation rare
- rare one is plexiform neurofibroma
 - diffusely permeating tumours
 - probably only in neurofibromatosis
 - difficult to remove
 - significant potential for malignant transformation

Spinal cord tumours

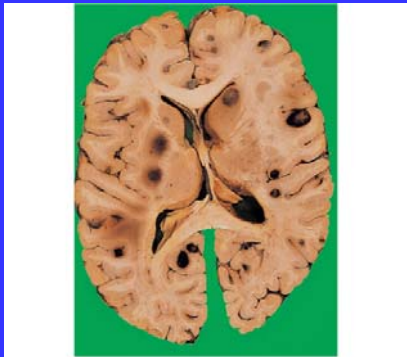
- more or less any tumour affecting brain can also arise in cord
- similar mass effects from lesions in bones or discs

Fetal NS infections

- rubella (deafness, blindness, microcephaly)
- CMV (microcephaly)
- toxoplasma (microcephaly)
- syphilis (tertiary forms include GPI, tabes dorsalis and meningovascular syphilis)
- (HIV)



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