

# **Neurologic Complications of Cancer**

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  - **Other:**
    - **none**

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  - **none**

# Neurological Effects of Cancer

```
graph TD; A[Neurological Effects of Cancer] --> B[➤ Direct]; A --> C[➤ Indirect]; B --> D[✓ Primary]; B --> E[✓ Metastatic]; C --> F[✓ Paraneoplastic]; C --> G[✓ Treatment];
```

## ➤ Direct

- ✓ Primary
- ✓ Metastatic

## ➤ Indirect

- ✓ Paraneoplastic
- ✓ Treatment

# Primary Malignancy

- **BRAIN**

- **When in hemispheres usually present with seizures, personality or cognitive change, visual change or headache**
- **Cerebellar present with raised ICP, balance**
- **Brainstem multifocal**

- **SPINAL CORD**

- **Cord syndrome**
- **Acute/subacute**
- **Often bladder and bowel**
- **Often painless**
- **Usually multiple segments**

# Neurological Effects of Cancer

```
graph TD; A[Neurological Effects of Cancer] --> B[➤ Direct]; A --> C[➤ Indirect]; B --> B1[✓ Primary]; B --> B2[✓ Metastatic]; C --> C1[✓ Paraneoplastic]; C --> C2[✓ Treatment];
```

## ➤ Direct

- ✓ Primary
- ✓ Metastatic

## ➤ Indirect

- ✓ Paraneoplastic
- ✓ Treatment

# Direct Effects of Metastatic Cancer

## Localization

- **CNS**

- **Brain**
- **Spinal Cord**

- **PNS**

- **Root**
- **Plexus**
- **Nerve**



# CNS



- **Brain**
  - **Focal Symptoms/Deficit**
  - **Cognitive/Personality Change**
  - **Headache**
  - **Diagnosis**
    - **CT with contrast**
    - **MRI**
    - **CSF (meningeal involvement)**

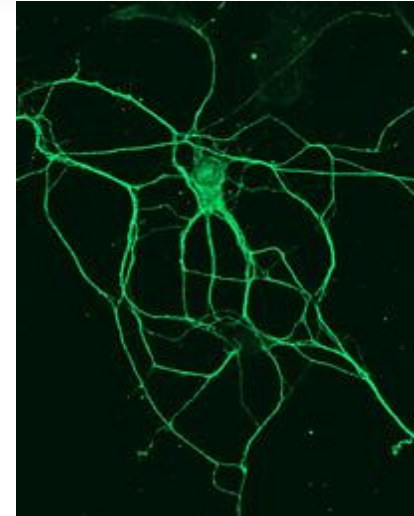
# CNS



- **Spinal Cord**
  - **Focal/cord deficit**
  - **Pain**
  - **Diagnosis**
    - **X-ray**
    - **MRI**

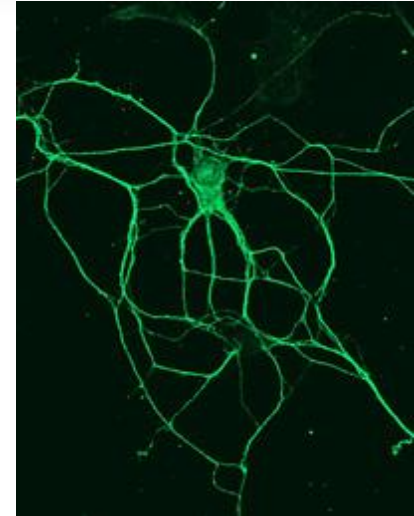
# PNS

- **Root**
  - **Radicular Symptoms**
  - **Often multiple**
  - **+/- Spinal cord**
  - **Pain**
  - **Diagnosis**
    - **MRI**
    - **EMG**
    - **CSF**



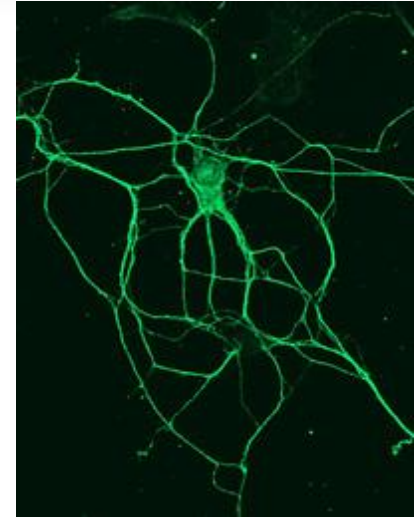
# PNS

- **Plexus**
  - **Multiple root/nerves**
  - **Pain**
  - **Diagnosis**
    - **MRI + gadolinium**
    - **EMG**
    - **CSF**



# PNS

- **Peripheral Nerve**
  - **Rare**
  - **Usually indirect**



# **Treatment of Secondary Cancer in the Nervous System**

- **Diagnosis**
- **Referral**
- **Pain**
  - **Narcotics/Opioids**
  - **Pregabalin (Lyrica)**
  - **Cannabinoids (Sativex, Cesamet/Nabilone, medical marijuana)**
- **Treatment of the Tumor**

# Neurological Effects of Cancer

```
graph TD; A[Neurological Effects of Cancer] --> B[➤ Direct]; A --> C[➤ Indirect]; B --> B1[✓ Primary]; B --> B2[✓ Metastatic]; C --> C1[✓ Paraneoplastic]; C --> C2[✓ Treatment];
```

## ➤ Direct

- ✓ Primary
- ✓ Metastatic

## ➤ Indirect

- ✓ Paraneoplastic
- ✓ Treatment

# Paraneoplastic Syndromes

- **Immune mediated/onconeuronal antigens**
- **Cytotoxic T-cell responses (CD8+/CD4+)**
- **Precede tumor diagnosis in 60%**
- **Check CSF + blood for antibody (Anti-Hu, Anti-Ri, Anti-Yo)**
- **Occult neoplasm presumed**



# Paraneoplastic Syndromes

- **Most common in:**
  - **SCLC**
  - **Breast**
  - **Ovary**
  - **Neuroblastoma**
  - **Plasma cell tumors**
- **Acute/subacute onset**
- **Blood/CSF/MRI/PET**

# Paraneoplastic Syndromes in CNS

- **Cerebellar degeneration**
  - **SCLC, Breast, Ovary, Lymphoma**
  - **Anti-Yo**
- **Encephalomyelitis (Limbic encephalitis)**
  - **Lung**
  - **Anti-Hu**
- **Opsoclonus – Myoclonus**
  - **Neuroblastoma, SCLC, Breast**
  - **Anti-Hu, Anti-Ri**

# **Paraneoplastic Syndromes in PNS**

- **Sensory neuronopathy (dorsal root ganglion)**
  - **Lung**
  - **Anti-Hu**
- **Subacute or chronic sensorimotor peripheral neuropathy**
  - **Plasma cell dyscrasias, B-cell lymphoma**

# **Paraneoplastic Syndromes of the Neuromuscular Junction**

- **Lambert-Eaton myasthenic syndrome**
  - **Fatigue, weakness, myalgia, paresthesias**
  - **Cholinergic dysautonomia – dry mouth**
  - **Characteristic EMG**
  - **SCLC**
  - **Anti – VGCC**
  - **Treat with 3,4-diaminopyridine**

# Paraneoplastic Syndromes of Muscle

- **Dermatomyositis**

- **Subacute muscle weakness, elevated CK**
- **dysphagia**
- **Skin changes**
- **Breast, lung, ovarian, gastric**
- **Anti-Jo**

- **Acute Necrotizing Myopathy**

- **Solid tumors**

# **Paraneoplastic Syndromes Treatment**

- **Steroids**
- **IVIg**
- **Plasma Exchange**
- **Treatment of underlying tumor**

**Indirect**

```
graph TD; A[Indirect] --> B[Paraneoplastic]; A --> C[Treatment]; C --> D[Chemo]; C --> E[Radiation]
```

**Paraneoplastic**

**Treatment**

**Chemo**

**Radiation**

# Chemotheraphy

- **Neuropathy**
- **Encephalopathy**
- **Acute cerebellar syndrome/ataxia**
- **Myelopathy**
- **Cerebral Vasculopathy**



# Radiation

- **Brain**
  - **Acute (hours to days)**
    - **↑ ICP**
    - **vasogenic edema**
  - **Early Delayed (weeks)**
    - **Diffuse (somnolence), or focal**
    - **demyelination**
  - **Delayed (months to years)**
    - **Diffuse (dementia), or focal**
    - **glial and vascular destruction**

# Radiation

- **Spinal Cord**
  - **Early delayed (weeks)**
    - **L'hermittes sign**
    - **demyelination**
  - **Delayed (months to years)**
    - **Necrosis**
    - **MND**
    - **Arachnoiditis**
    - **Glial and vascular destruction**

# Radiation

- **Cranial Nerves**
  - **Visual loss (retina, optic nerve, central artery occlusion)**
  - **Hearing loss ( radiation otitis)**
  - **12th nerve (hypoglossal)**

# Radiation

- **Plexopathy (brachial/lumbosacral)**
  - **Delayed**
  - **Fibrosis**
  - **No pain**

# Radiation

- **Radiogenic tumours**
- **Vascular abnormalities**
- **Endocrinopathies**

# Summary

- **Neurologic complications of cancer are common**
- **Think of them**
- **Refer**

**QUESTIONS?**