Neurocutaneous Syndromes

- Neurofibromatosis
- Tuberous Sclerosis
- Sturge Weber
Neurocutaneous Syndromes

Neurofibromatosis

Tuberous Sclerosis

Sturge Weber
Neurofibromatosis

- Autosomal dominant
- NF 1
  - 1:3500 incidence
  - Mutation on chromosome 17
- NF 2
  - 1:40,000 incidence
  - Deafness (bilateral)
  - CNS tumors
  - Mutation on chromosome 22
Neurofibromatosis

- NF 1 criteria (need 2 of the following 9):
  - + FHx (but ~ ½ cases sporadic mutation)
  - Skin criteria:
    - CAL (need 6+, > 0.5 cm prepubertal, > 1.5 cm post-pubertal)
    - Neurofibromas
    - Inguinal / axillary freckling
  - Bone criteria:
    - Pseudarthrosis (angulation deformity of long bone)
    - Scoliosis
    - Hypoplasia of sphenoid bone in base of skull
  - Eye criteria:
    - Lisch nodules (hamartomas in the iris)
    - Optic pallor (optic glioma)
Neurofibromatosis

- Autosomal dominant
- Two types:
  - NF 1 (1:3500 incidence) NF 2 (1:40,000 incidence)
    - chromosome 17 chromosome 22 (CNS tumors, deafness)
    - mutation in Neurofibromin mutation in Merlin
- NF 1 criteria:
  - + Family History (but ~ ½ cases sporadic mutation)
  - Skin
    - CAL (need 6+, > 0.5 cm prepubertal, > 1.5 cm post-pubertal)
    - neurofibromas
  - Bone
    - Pseudarthrosis (angulation deformity of long bone)
    - Scoliosis
    - Absence of sphenoid bone in base of skull
  - Eye
    - Lisch nodules (hamartomas in the iris)
    - Optic pallor (optic glioma)
Neurofibroma

Axillary Freckling
Pseudarthrosis

Scoliosis

Sphenoid Bone Hypoplasia
Lisch Nodules

Optic Glioma
Tuberous Sclerosis

- Autosomal dominant
- Chromosomes 9 and 16
- Skin hypopigmentations ("Ash leaf" spots)
- Benign hamartomas:
  - skin
    - adenoma sebaceum on face
    - shagreen patch (brown leathery) on forehead or lower back
  - brain, retina, heart, kidney
- Seizures in 80-90 %
Tuberous Sclerosis

- Autosomal dominant
- Chromosomes 9 (hamartin) and 16 (tuberin)
- Skin hypopigmentations (“Ash leaf” spots)
- Benign hamartomas:
  - skin
    - adenoma sebaceum on face
    - shagreen patch (brown leathery) on forehead or lower back
  - brain, retina, heart, kidney
- Seizures in 80-90 %
“Ash Leaf” Spot

Shagreen Patch

Adenoma Sebaceum
Tuberous sclerosis

Adenoma sebaceum

Shagreen patch

Ungual fibromas
Sturge Weber

- Unilateral port wine stain over upper face
- Buphthalmos (infantile glaucoma) - enlargement of globe, corneal clouding
- Intracranial leptomeningeal vascular anomaly and calcifications in 90%
- Seizures (partial / focal onset)
Port Wine Stain

Buphthalmos with enlarged globe, corneal clouding

Leptomeningeal Vascular Anomaly
The ‘floppy infant’

- picking up the infant, who tends to slip through the fingers
- hang like a rag doll when suspended prone.
- There will be marked head lag when the head is lifted by the arms from supine.
INFANTILE HYPOTONIA

- Central hypotonia is associated with poor truncal tone but preserved limb tone.
- Dysmorphic features suggest a genetic cause.
- Lower motor neurone lesions are suggested by a frog-like posture.
### Box 27.3 Causes of the floppy (hypotonic) infant

**Central**

**Cortical**
- Hypoxic-ischaemic encephalopathy
- Cortical malformations

**Genetic**
- Down syndrome
- Prader–Willi syndrome

**Metabolic**
- Hypothyroidism
- Hypocalcaemia

**Peripheral**

**Neuromuscular**
- Spinal muscular atrophy
- Myopathy
- Myotonia
- Congenital myasthenia.
Neural tube defects and hydrocephalus
Neural tube defects

- failure of normal fusion of the neural plate to form the neural tube during the first 28 days following conception.
- Mothers of a fetus with a neural tube defect have a 10-fold increase in risk of having a second affected fetus.
Folic acid supplementation

- reduces this risk. High doses are now recommended periconceptually for women with a previously affected infant planning a further pregnancy.

- Low-dose periconceptual folic acid supplementation is recommended for all pregnancies. In some countries e.g. United States, folic acid is added to flour for bread.
Anencephaly

- This is failure of development of most of the cranium and brain. Affected infants are stillborn or die shortly afterbirth.
Encephalocele

- There is extrusion of brain and meninges through a midline skull defect, which can be corrected surgically. However, there are often underlying associated cerebral malformations
Spina bifida occulta

- This failure of fusion of the vertebral arch incidental finding on X-ray,
- +/-overlying skin lesion such as a tuft of hair, lipoma, birth mark or small dermal sinus. usually in the lumbar region.
- There may be underlying tethering of the cord (diastematomyelia).
- Neurosurgical relief of tethering is usually indicated.
Meningocele

- Meningoceles usually have a good prognosis following surgical repair.
Myelomeningocele:

- Variable paralysis of the legs
- Sensory loss
- Bladder denervation (neuropathic bladder)
- Bowel denervation (neuropathic bowel)
- Scoliosis
- Hydrocephalus from the Chiari malformation (herniation of the cerebellar tonsils and brainstem tissue through the foramen magnum), leading to disruption of CSF flow.
Figure 27.14. Neural tube defects: (a) spina bifida occulta; (b) meningocele; (c) myelomeningocele.
**Neural tube defects**

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<thead>
<tr>
<th>Year</th>
<th>Anencephaly</th>
<th>Spina bifida</th>
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<tbody>
<tr>
<td>1965</td>
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<tr>
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<td>1990</td>
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<td>1.0</td>
</tr>
<tr>
<td>1995</td>
<td>1.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**Figure 27.13** The decline in the number of babies born with neural tube defects. This has resulted from a natural decrease together with antenatal diagnosis and termination of pregnancy.

**Figure 27.15** Myelomeningocele showing the exposed neural tissue and the patulous anus from neuropathic bowel.
Management –

- The back lesion is usually closed soon after birth.
- Physiotherapy helps prevent joint contractures.
- For sensory loss – skin care is required to avoid the development of skin damage and ulcers.
- Neuropathic bladder – an indwelling or intermittent catheter may be required for a neurogenic bladder.
Hydrocephalus

- In hydrocephalus, there is obstruction to the flow of cerebrospinal fluid, leading to dilatation of the ventricular system proximal to the site of obstruction.
- The obstruction may be within the ventricular system or aqueduct (non-communicating or obstructive hydrocephalus), or at the arachnoid villi, the site of absorption of CSF (communicating hydrocephalus)
clinical

Hydrocephalus In infants,
- increase in head circumference,
- separation of skull sutures,
- bulging of the anterior fontanelle,
- distension of scalp veins and
- sun setting of the eyes •

Older children present with raised intracranial pressure •
Box 27.4 Causes of hydrocephalus

Non-communicating (obstruction in the ventricular system)
Congenital malformation
- Aqueduct stenosis
- Atresia of the outflow foramina of the fourth ventricle (Dandy–Walker malformation)
- Chiari malformation
Posterior fossa neoplasm or vascular malformation
Intraventricular haemorrhage in preterm infant

Communicating (failure to reabsorb CSF)
Subarachnoid haemorrhage
Meningitis, e.g. pneumococcal, tuberculous
Some can cause both non-communicating and communicating hydrocephalus.
“Sunsetting Eyes: clinical sign of increased intracranial pressure
**Figure 27.16** Grossly enlarged head and downward deviation of the eyes (setting-sun sign) from untreated hydrocephalus.

**Figure 27.17** Ventriculoperitoneal shunt for drainage of symptomatic hydrocephalus. A sufficient length of shunt tubing is left in the peritoneal cavity to allow for the child's growth. Right atrial catheters require revision with growth.
• Ventricular endoscopy
• Ventriculoperitoneal Shunt