The Floppy Baby

Clare Betteridge
The floppy baby

- Identification
- Evaluation
- Investigation
- Diagnosis
- Examples
What is a floppy baby?

- Elbows and knees loosely extended.
- Head control is usually poor or absent.
- Hypotonic infants tend to slip between the hands.
- Hypotonic children hang their arms and legs limply by their sides when resting.
Extreme hypotonia
Head Lag

• Pedineurologic exam
No anti gravity movements
Neurological exam

Causes

- Does the child have an associated encephalopathy?
- Is there generalised weakness?
Weakness and encephalopathy

- HIE
- Focal infarction
- Meningitis
- Neonatal abstinence syndrome
- Hypoglycaemia
- Inborn error of metabolism
- Intracranial haemorrhage
Hypotonia without significant weakness (neurological)

- Chromosomal abnormalities
- Prader Willi syndrome
- T21
Hypotonia without significant weakness (non neurological)

- Prematurity
- Severe illness
- Ligamentous laxity
- Metabolic conditions
  - Amino acidurias
  - Peroxisomal disorders
  - Organic acidurias
- Severe growth failure
- Endocrine
  - Hypercalcaemia
  - Hypothyroidism
Hypotonia with muscle weakness

- Cervical cord injury secondary to birth trauma
- Anterior horn cell problems
  - Polio
  - SMA
- Neuromuscular junction
  - Transient myasthenia
  - Congenital myasthenic syndrome
- Peripheral nerve
  - Peripheral neuropathies
- Muscle
  - Congenital muscular dystrophy
  - Congenital myopathy
  - Congenital myotonic dystrophy
HIE

Shows high signal in the basal ganglia
Assessment

• Any significant family history
  – Affected parents or siblings
  – Consanguinity, stillbirths, childhood deaths
• Maternal disease – diabetes, epilepsy, myotonic dystrophy (may not be recognised)
• Pregnancy and delivery history
  – Drug or teratogen exposure
Assessment

- Decreased foetal movements
- Abnormal presentation
- Polyhydramnios/ oligohydramnios
- Apgar scores
- Resuscitation requirements
Assessment

• Cord gases
• Respiratory effort
• Ability to feed
• Level of alertness
• Level of spontaneous activity
• Character of cry
Investigations

• Full examination

• Initial bloods
  – Chromosomes
  – FBC
  – CRP
  – LFT
  – Lactate
  – U and E
  – Blood gas
  – Ammonia
Additional clues

- Hepatosplenomegaly
  - storage disorders, congenital infections
- Zellweger’s syndrome
  - Renal cysts, high forehead, wide fontanelles –
- Neonatal adrenoleukodystrophy
  - Hepatomegaly, retinitis pigmentosa –
- Oculocerebrorenal (Lowe) syndrome
  - Congenital cataracts, glaucoma
- Abnormal odour – metabolic disorders
- Prader Willi
  - Hypopigmentation, undescended testes –
Prader Willi

- High prominent forehead
- Narrow bi-frontal diameter
- Telecanthus,
- Downslanted palpebral fissures
- Downturned corners of the mouth
- Micrognathia
- Dysplastic ears
Diagnosis

- **Central causes**
- **Neuroimaging**
  - Ultrasound scan in the first instance.
  - MRI may be indicated if a structural abnormality of brain development is suspected and to exclude other abnormalities (for example, evidence of HIE)
  - **EEG**
    - prognostic information as to brain function, useful clinically if seizures suspected
  - Genetics review and karyotype if any dysmorphic features present
  - TORCH screen
  - DNA methylation studies or FISH for Prader-Willi syndrome
  - Metabolic investigations
Diagnosis

• Peripheral causes
  – hypotonia and weak
  – Decreased reflexes

• Neurology review
• Molecular genetics –
  – CTG repeats (myotonic dystrophy)
  – deletions in SMN gene
• Creatinine kinase
• Nerve conduction studies and muscle biopsy
Muscular disorders

• **Congenital muscular dystrophy**
  – Group of disorders characterised by
    • Muscular weakness
    • Hypotonia
    • Joint contractures from birth
    • Spinal deformities
    • Respiratory compromise
Congenital muscular dystrophy

- Laminin alpha-2 (merosin) deficiency (MDC1A)
- Collagen VI-deficient CMD
- Dystroglycanopathies (caused by mutations in POMT1, POMT2, FKTN, FKRP, LARGE, POMGNT1, and ISPD)
- SEPN1-related CMD, previously known as rigid spine syndrome
- LMNA-related CMD
- Almost all are AR except Collagen VI deficient
Muscular dystrophies

• Merosin negative congenital muscular dystrophy
  – Merosin negative-absence of merosin on biopsy
  – Associated with learning difficulties
  – Usually cannot walk independently
  – AR
• Merosin positive less severe
• Fukuyama congenital muscular dystrophy
  – Autosomal recessive 9q31-q33
  – Associated with brain malformations
Slightly older children

- Duchenne’s muscular dystrophy
  - Caused by the absence of dystrophin, a protein involved in maintaining the integrity of muscle
  - Can be picked up by abnormal transaminases in intercurrent illness
  - Onset between 3 and 5
  - Early delay motor milestones
  - Faltering growth
  - Difficulty climbing stairs
  - Waddling gait
  - Diagnose with high CK (>5000), muscle biopsy and mutations in dystrophin gene
Congenital myopathies

- Group of disorders
- Hypotonia and weakness from birth
- Differentiated by clinical and histological features
• Nemaline myopathy
  – Common
  – Can get scoliosis
  – Doesn’t tend to worsen.
• Myotubular myopathy
  – Rare, only males
  – Can notice antenatally with reduced foetal movements
  – Significant respiratory and feeding difficulties
  – Most don’t survive
  – Also associated with osteopenia
• Centronuclear myopathy
  – Rare
  – Weakness of the arms and legs, droopy eyelids, and problems with eye movements
  – Weakness often gets worse with time
• Central core disease
  – Mild floppiness
  – Delayed milestones
  – Moderate limb weakness
  – Can have life threatening reactions to anaesthetics
  – Salbutamol significantly reduces weakness.
Congenital myotonic dystrophy

- Mother has to be affected by myotonic dystrophy
- Often unrecognised in mothers
- Polyhydramnios
- Unexpectedly flat at birth
- Facial weakness and hypotonia
- Often requires respiratory support
- Joint contractures especially talipes
- Tented upper lip
- Gene has been isolated
### Spinal muscular atrophy

<table>
<thead>
<tr>
<th>Severity</th>
<th>Synonyms</th>
<th>Functional abilities</th>
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<tbody>
<tr>
<td><strong>Severe</strong></td>
<td>Type I SMA</td>
<td>Unable to sit or walk</td>
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<tr>
<td>1:20000</td>
<td>Werdning-Hoffmann disease</td>
<td>Death in 18 months</td>
</tr>
<tr>
<td>Prenatal onset in 30%</td>
<td>Diagnose with SMA gene, EMG and biopsy</td>
<td></td>
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<td>Absent reflexes and tongue fasciculation</td>
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<tr>
<td><strong>Intermediate</strong></td>
<td>Type II SMA</td>
<td>Able to sit but not walk</td>
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<tr>
<td>Autosomal recessive</td>
<td>Early scoliosis</td>
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<tr>
<td>Onset after 3 months</td>
<td>Prognosis depends on respiratory muscle involvement</td>
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<tr>
<td><strong>Mild</strong></td>
<td>Type III Kugelberg-Welander disease</td>
<td>Able to walk but proximal weakness</td>
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<tr>
<td>Autosomal recessive</td>
<td>Tendon jerks may not be absent</td>
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Spinal muscular atrophy

- Diagnosed using the DNA mutation in the SMN1
- Motor neurons are vulnerable to a shortage of this protein
Case 1

- FTND
- Antenatal USS NAD
- Admitted on D5 with poor feeding
- Noted to be hypotonic, centrally and peripherally
- Treated with IV antibiotics for presumed sepsis
- Tone gradually improved but remained low
- MRI brain normal
Case 1

- Chromosomes and metabolic investigations sent
- Initial SALT review showed reasonable suck but difficult coordinating a swallow
- Myotonic dystrophy and Prader Willi genetics negative
- Re-presented at 7 weeks with weight decreased to 9th centile
Case 1

• Very hypotonic
• No anti-gravity movements
• SMN1 gene negative-SMA not excluded but less likely
• Referred to SGH
• Muscle biopsy performed
• Showed merosin positive congenital muscular dystrophy
Case 1

- Required portage, physiotherapy and SALT assessment
- Needed BiPAP at night from 6 months of age
- RIP at 1 year of respiratory failure
Conclusion

• Multiple pathologies
• Identification
• Assessment
• Investigation
• Ask for help