Batten disease, epilepsy and movement disorders

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Aims:

To learn

• Basic anatomy & physiology of the brain
• Batten Disease
• Epilepsy
• Movement disorders
Anatomy and Physiology of the brain
The brain performs an incredible number of tasks including the following

- **Vital functions** of the body: it controls body temperature, blood pressure, heart rate and breathing.
- It accepts a flood of information about the world around you from your various **senses** (seeing, hearing, smelling, tasting and touching).
- It handles your physical **movement** when walking, talking, standing or sitting.
- **Cognitive functions**: It lets you think, dream, reason and experience emotions.
Lobes of the brain

- Frontal lobe: thinking, memory, behaviour and movement
- Temporal lobe: hearing, learning and feelings
- Parietal lobe: language and touch
- Occipital lobe: sight
- Cerebellum: balance and coordination
- Brain stem: breathing, heart rate and temperature
The nervous system

- **Building blocks: neurons**
  - Transmit information in the form of electrical signals which travel along the axon — nerve impulses
  - 100 billion nerve cells - about the same as the number of trees in the Amazon rainforest.
  - Each cell is connected to around 10,000 others. Total number of connections: about 1000 trillion (the same as the number of leaves in the rainforest)

- **Structural and maintenance cells: glial cells.**
Batten disease
What is Batten Disease?

– Batten’s disease: umbrella term for 14 subtypes.
– Also called: Neuronal ceroid lipofuscinoses (NCL or CLN) 1, 2, ...14. Lipo (greek, fat) Fuscus (Latin, dark).

– Accumulation of ceroid **lipofuscin** in the cells. More specifically in the organelle called: LYSOSOME----- Batten disease is one of the **lysosomal disease**.
– The accumulation happens because there is a **missing enzyme**.
Batten disease

- Very rare: prevalence of approximately 1.5 to nine per million population
- Cause: genetic. Every subtype has a responsible gene. All different, different genes involved
- No cure (???)
## Clinical presentation

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<th>Description</th>
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<td>Newborn with epilepsy and microcephaly</td>
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<td>Young child (&gt;6 months) with developmental standstill or regression and/or newly occurring severe epilepsy of unknown cause</td>
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<td>School child with visual loss and/or dementia and epilepsy</td>
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<td>Young adult with non-specific mental, motor, or behavioral abnormalities</td>
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What happens to the brain?

The lipofuscin builds up in all cells of the body but specifically damage certain parts of the brain (responsible for cognitive function, movements etc.) and the eyes.
They all have a mix of (symptoms):

- Loss of sight
- Epilepsy of different types
- Initially normal but later: cognitive decline - dementia
- Movement disorders of different types
- Behavioural problems
- Sleeping problems

- Age of death: depends of the type of Batten and on the person
- Cause of death: usually infection (respiratory) / cardiac arrest /
Epilepsy
What is an epileptic seizure?

- Sudden but transient event during which there is excessive electric brain activity causing different signs and/or symptoms.
- They are polymorphic but they are bespoke too.
- They can be very obvious (e.g. when they cause whole body jerks) or can be very subtle (e.g. when they only cause a short episode of staring and intellectual disconnection).
- They don’t always mean emergency.
- There usually no warning signs before.
- Majority of them are forgotten.
What is epilepsy and status?

- Epilepsy: the disease in which the patient has disposition of having epileptic seizures. Basically after two or more seizures epilepsy can be diagnosed.
- Status epilepticus: continuous seizure activity or repeated small seizures last 30 minutes or more without recovery to baseline consciousness. It is life threatening
Epilepsy in Batten

• Very frequent, can be the first sign (CLN2) or a later complication (CLN3)
• Most frequent types are:
  – Generalised tonic - clonic seizures (or as often called by the families: “big” seizures).
  – Absence seizures: unresponsiveness (staring)
  – Myoclonic seizures: short muscle contraction (in a shock like fashion) in a small or bigger group of muscles.
  – Focal seizures: they can manifest in different ways (e.g.: they can change muscle movements, or change how people think, feel, or experience things).
Myoclonic jerks and head drops
Absence seizure
A focal seizure
Tonic-clonic seizure and first aid
First Aid for Seizures
(Convulsions, generalized tonic-clonic, grand mal)

Cushion head, remove glasses
Loosen tight clothing
Turn on side

Time the seizure with a watch
Don’t put anything in mouth
Look for I.D.

Don’t hold down
As seizure ends...
...offer help
Epilepsy in Batten

• Become uncontrollable
• Different medications for different types of seizures, question of finding the right one and this can take time
• Side effects for some medication
Movement disorders
Dystonia

• a movement disorder characterised by sustained or intermittent muscle contractions causing abnormal, often repetitive, movements, postures, or both.
• Dystonic movements are typically patterned, twisting, and may be tremulous.
• Dystonia is often initiated or worsened by voluntary movements.
• May stay or come and go
• Brain functions such as intelligence, memory and language can remain unaffected.
• Can be focal or generalised
Dystonia
Ataxia and postural instability

- Unsteady, clumsy uncoordinated way of walking, getting around.
- Greek word: "a taxis": "without order or incoordination"
- Probably one of the most frequently seen movement problem in Batten disease.
- Can affect other movements/part of the body.
- Damage in the cerebellum
- Increased risk of falling.
Chorea

- Involuntary, irregular, random and flowing movements which can look purposeful but they are somewhat irregular.
- Greek: dancing.
- Generally the patients look fidgety, restless with more or less constant irregular movements
Other frequent movement problems in Batten

- **Tremor**: Is a rhythmic oscillating involuntary movement usually in the hands (shaky hands)
- **Hypotonia**: low muscle tone / floppiness
- **Spasticity**: increased muscle tone / stiffness or tightness. Opposite of hypotonia, but both can exist in the same patient
- **Tics**: Involuntary and irresistible purposeless repetitive movements of any muscles, can be vocal. Simple tics like wrinkling the nose or twitching with eyes.
- **Parkinsonism**: Slowness in the voluntary movements.
How do we diagnose movement disorders?

- It’s not always easy
- No specific tests--- video recording helps
- Rely on medical history
- Important for physiotherapy and occupational therapy to get involved
How do we treat movement disorders?

- Trihexyphenidyl: useful to treat dystonia.
- Baclofen: useful for spasticity and dystonia.
- Benzodiazepines: used not only to treat epilepsy but for myoclonus, dystonia and as a sedative drug for sleeping problems.
- Dantrolene: used in spasticity and dystonia.
- Antiepileptic drugs (like sodium valproate and levetiracetam) are used in dystonias and myoclonus.
- L-Dopa: can be tried in parkinsonism and tremor.
- Botox injections
What do I do if a child becomes dystonic?

- Don’t try and restrain them
- Can gently reposition the child
- Give appropriate medication if prescribed
- Speak to parents, they know them best!