Guideline for the investigation and treatment of acute ataxia in children

NHS Birmingham Women's and Children's NHS Foundation Trust

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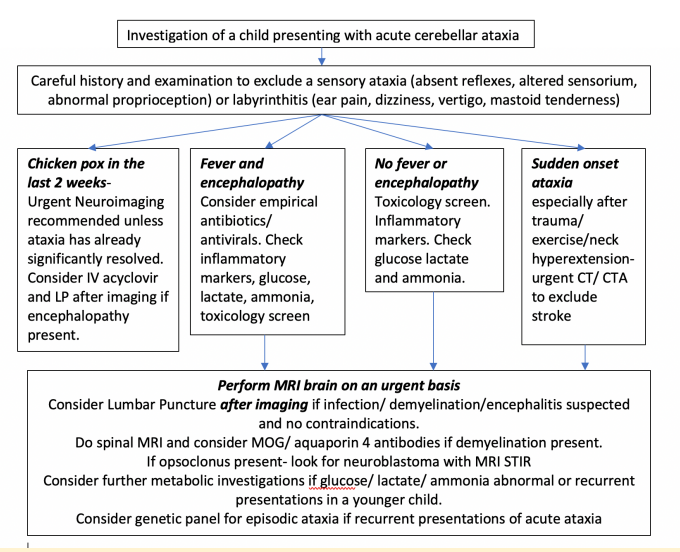
1. Introduction and scope of the guideline

- Ataxia may be defined as abnormal coordination of muscle movements due to neurological dysfunction (Pavone et al., 2017) .
- Ataxia may result in inaccurate and coarse movements.
- In clinical practice, you may see a child who is wobbly, jerky or who has slurred speech. An unsteady broad-based gait is classical. There may be nystagmus.
- This guideline is intended for use a cognitive framework for Paediatricians working in the West Midlands regional Neurology network. It sets out the most common differential diagnoses which should be considered
- ***It is not intended to replace detailed clinical discussion of individual cases where appropriate.***

2. Important practice points

- The majority of children presenting with an acute ataxia have a benign underlying cause. There are a number of serious disorders that need to be excluded. Most children will need Neuroimaging.
- ***A careful clinical history and examination are crucial to guiding investigation and management***
- Ataxia is often, but not always due to pathology in the cerebellum.
- Ataxia may also result from pathology in brainstem, spinal cord or peripheral nerves (such as Guillain Barre Syndrome)
- Nystagmus, dysarthria and intention tremor would point towards a cerebellar cause. The presence of depressed reflexes, ascending sensory symptoms, constipation, urinary incontinence, abnormal proprioception and a positive Romberg sign suggests an acute inflammatory neuropathy (classically Guillain Barre Syndrome) or a spinal cord pathology (transverse myelitis or spinal cord compression).
- Children with other pathologies may appear to have clinical features similar to ataxia but are not truly ataxic. Examples include a myopathy causing a waddling gait, vestibular neuronitis resulting in an unsteady gait and joint synovitis resulting in a cautious/ antalgic gait.
- Infants learning to walk may present with ataxic gait and then loss of ambulation/ axial hypotonia as result of a cerebellar ataxia that results in an apparent developmental regression

3. Framework for investigation and management



4. Infectious and parainfectious causes

- The most common cause of an acute ataxia in childhood is post-varicella ataxia.
- It typically occurs 5-14 days after the onset of vesicles on the skin (Bozzola et al., 2014). In most cases the ataxia is mild and there is no evidence of encephalopathy.
- In cases where ataxia is severe and/or there are features of encephalopathy then Neuroimaging (ideally MRI brain) should be considered which may be normal or show abnormalities such cerebellar swelling, demyelination or even stroke.
- Treatment with intravenous acyclovir and/or steroids can be considered although there is lack of evidence base and expert consensus in this area (Lancella et al., 2017). ***Please consider discussing these cases with the on-call Paediatric Neurology***
- In the absence of a clinical history of chicken pox other infectious/ parainfectious causes should be thought of in a febrile child with ataxia. The presence of encephalopathy may point towards bacterial/ viral meningoencephalitis or ADEM (acute disseminated encephalomyelitis).
- Empirical treatment with third generation cephalosporin and acyclovir may be reasonable until further diagnostics are available.
- MRI brain is the recommended investigation to look for features of demyelination and meningoencephalitis in particular.
- ***Lumbar puncture should only be undertaken after Neuroimaging as presence of significant cerebellar swelling or an Arnold Chiari malformation are contraindications to LP (Engelborghs et al., 2017).***
- Lumbar puncture should include microscopy, cell count, paired glucose, paired lactate and paired oligoclonal bands.
- CSF viral and bacterial PCR analysis should be considered if initial results are indicative of infection.
- CSF and blood autoimmune encephalitis serology (particularly NMDA) should be considered particularly if an additional movement disorder and/or seizures are present as well as ataxia.
- ***In viral cerebellitis MRI brain including the cerebellum may be entirely normal on presentation***, repeat interval MRI brain may show some degree of cerebellar atrophy

5. Demyelination

- Where demyelination is present on MRI testing MOG and Aquaporin 4 antibodies should be considered.
- Lumbar puncture is useful diagnostically particularly CSF cell count protein and paired oligoclonal bands.
- In ADEM there is often evidence of a transverse myelitis in addition to cerebellar demyelination so spinal MRI should be considered
- Demyelination in an older child without encephalopathy may be the result of Clinically Isolated Syndrome (CIS) or potentially Multiple Sclerosis if evidence of recurrent demyelination in time and space is seen (Hacohen et al., 2017).
- Treatment with high dose IV steroids is often required if there are ongoing symptoms. In cases where significant symptoms are still present after steroids treatment with Intravenous Immunoglobulin or plasma exchange should be considered (Wong et al., 2018).
- ***Please discuss all cases of Demyelination with the on-call neurology team and consider outpatient referral to Professor Wassmer's Demyelination Clinic.***

6. Toxic/metabolic aetiologies

- Infection can be a stress trigger for decompensation in inherited disorders of metabolism which can present with an acute ataxia (for instance Ornithine transcarbamylase deficiency, Hartnup' Disease, Maple Syrup Urine Disease and mitochondrial disorders) (Pavone et al., 2017).
- Metabolic disorders are more likely to be the cause in younger children where there is a history of consanguinity.
- Glucose, lactate and ammonia are a reasonable 'first-line' screen for metabolic disorders. Urine amino/organic acids, plasma amino acids and carnitine and free acylcarnitine may be considered if a metabolic cause is strongly suspected.
- ***Discussion with the on-call Inherited Metabolic Disease (IMD) team is essential if these investigations are abnormal or a metabolic cause is strongly suspected***
- A urine toxicology screen is a useful investigation in children of all age.
- Medications such as phenytoin, carbamazepine as well as alcohol and illicit drugs can cause ataxia (van Gaalen et al., 2014).

7. Stroke

- Sudden onset ataxia particularly after trauma or physical activity such as hyperextension of the neck should lead to the consideration of a posterior circular stroke, most classically caused by a vertebral artery dissection.
- If there is a clear time of onset then urgent neuroimaging with CT or MRI with angiography should be sought (Hasan et al., 2002). In children above 2 years of age thrombolysis (within 6 hours) or mechanical thrombectomy (within 24 hours) may be considered if an arterial ischemic stroke is detected within an appropriate time window from time of onset.
- Anticoagulation is recommended after AIS.
- ***Please discuss all cases of sudden onset ataxia as urgently as soon as possible with the on-call Consultant Paediatric Neurologist.***

8. Brain tumours

- Subacute worsening ataxia particularly if associated with vomiting and headache may point towards a brain tumour.
- Posterior fossa tumours (such as a pilocytic astrocytomas) are the most common in children and often present with acute hydrocephalous due to their proximity to the ventricular system (Prasad et al., 2013).
- Urgent neuroimaging is indicated in these cases. MRI is superior to CT particularly in imaging the posterior fossa where subtle tumours may not be seen clearly on CT.
- ***Liaise urgently with the on-call Paediatric Neurosurgical Team if a tumour is found***

9. Opsoclonus Myoclonus Ataxia Syndrome

- The presence of opsoclonus (rapid, unpredictable, horizontal and vertical conjugate eye movements) and myoclonus (jerky muscle spasms) in combination with ataxia strongly suggests a diagnosis of Opsoclonus Myoclonus Ataxia Syndrome (OMAS).
- There is often a history of significant irritability and developmental regression.
- OMAS is thought to be an immune mediated disorder which can be paraneoplastic in nature secondary to a Neuroblastoma. Neuroimaging should be performed to exclude an intracranial lesion.
- If neuroimaging is normal then dedicated imaging is needed to to exclude a Neuroblastoma.
- Treatment of OMAS involves immune suppression which may include use of steroids, rituximab and Intravenous Immunoglobulin (Pranzatelli et al., 2005)
- ***Please liaise with the on-call Neurology team in all suspected cases of OMAS***

10. Episodic ataxia

- Recurrent acute (episodic) ataxia may also be seen in childhood
- If encephalopathy is present then toxic/ metabolic causes should be excluded. ***It is important to do these investigations at the time of the acute ataxia as they may be normal between episodes***.
- If headache is present then basilar migraine should be considered particularly if the episodes are short (1-72hours) and associated with nausea, slurred speech, vertigo, numbness, tingling or visual changes (Jen et al., 2007).
- There are a number of genetic episodic ataxias which may present in childhood as well which are associated with channelopathies (Jen et al., 2007).
- Glut-1 deficiency should also be considered if an intermittent ataxia is seen in a child who may also have microcephaly and epilepsy.
- ***Please consider referring all children with episodic ataxia as an outpatient to Paediatric Neurology.***

11. References

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