Content available at: https://www.ipinnovative.com/open-access-journals

IP International Journal of Medical Paediatrics and Oncology

Journal homepage: https://www.ijmpo.com/

Short Communication

Clinical insights into movement disorders in children: A review of etiology, diagnosis, and treatment options

Aron Christy[1]*, **Ramya A**[2]

[1]*Dept. of Mental Health Nursing, SRM Trichy College of Nursing, Trichy, Tamil Nadu, India*
[2]*Dept. of Paediatric Nursing, Thanthai Rovers College of Nursing, Perambalur, Tamil Nadu, India*

ARTICLE INFO

Article history:
Received 28-11-2024
Accepted 14-12-2024
Available online 20-12-2024

Keywords:
Etiology
Movement Disorders
Hypokinetic
Hyperkinetic

ABSTRACT

Movement disorders in children encompass a broad range of neurological conditions that result in abnormal motor activity. These disorders can be either congenital or acquired. They can be classified into hyperkinetic or hypokinetic categories. The underlying causes of these conditions vary widely, including genetic, metabolic, structural, and inflammatory factors. Proper diagnosis and early intervention are keys to managing these disorders, as they often have significant long-term developmental and social implications. This article reviews the major movement disorders seen in children, focusing on their clinical presentation, diagnostic approach, and current treatment strategies, while also discussing emerging therapies and future directions in paediatric neurology.

1. Introduction

Movement disorders in children are a heterogeneous group of conditions characterized by abnormal voluntary or involuntary motor activity. These disorders can present at any stage of childhood and may be secondary to genetic, structural, metabolic, or acquired causes. Understanding the etiology, clinical features, and available treatments is essential for effective management, as movement disorders in children can significantly affect quality of life, development, and cognitive function.[1]

2. Classification of Movement Disorders in Children

Movement disorders can be broadly classified into two categories: hyperkinetic (excessive or abnormal movement) and hypokinetic (insufficient or slow movement) disorders. These disorders often overlap in their clinical presentation and may require complex diagnostic workups.[2]

2.1. Hyperkinetic movement disorders

2.1.1. Chorea

Chorea involves rapid, irregular, and unpredictable movements of the limbs, face, and other parts of the body. It may result from basal ganglia dysfunction and can be associated with conditions such as Huntington's disease, Sydenham's chorea (a sequela of rheumatic fever), and inherited metabolic disorders like Wilson's disease.[3]

2.1.2. Dystonia

Dystonia is characterized by sustained muscle contractions leading to abnormal postures and twisting movements. It may be focal or generalized and can be seen in conditions such as primary dystonias (e.g., DYT1 dystonia) or secondary dystonias due to neurodegenerative diseases or brain injury.

* *Corresponding author*.
E-mail address: edvinaprincy@gmail.com (A. Christy).

https://doi.org/10.18231/j.ijmpo.2024.026

2.1.3. Tics and tourette syndrome

Tics are sudden, repetitive movements or vocalizations, and when they occur frequently, they are classified as Tourette syndrome. While the exact cause is unknown, it is believed to involve abnormalities in the basal ganglia and dopaminergic systems.

2.2. Myoclonus

Myoclonus refers to sudden, brief, involuntary jerks or twitches. This movement disorder can be caused by a wide range of conditions, including epilepsy, metabolic disorders, and neurodegenerative diseases.[4]

2.3. Hypokinetic Movement Disorders

2.3.1. Parkinsonism

Parkinsonism in children is a rare condition that is usually associated with neurodegenerative diseases such as neurodegeneration with brain iron accumulation (NBIA). It is characterized by bradykinesia, rigidity, and tremor.[5]

2.3.2. Ataxia

Ataxia refers to the lack of coordination and balance, often resulting from cerebellar dysfunction. It can be caused by inherited disorders (e.g., spinocerebellar ataxia) or acquired conditions such as infections, metabolic disturbances, or post-encephalitic sequelae.[6]

2.4. Etiology of movement disorders in children

The causes of movement disorders in children are diverse, and the underlying pathology often determines the prognosis and treatment options. Some of the most common etiologies include:

2.4.1. Genetic factors

Several genetic mutations can lead to movement disorders, such as in hereditary dystonias, Huntington's disease, or mitochondrial disorders. Advances in genetic testing have facilitated early diagnosis, allowing for better management strategies.

2.4.2. Metabolic disorders

Inborn errors of metabolism, such as Wilson's disease, can present with movement abnormalities, including dystonia and tremors. Treatment of the underlying metabolic disturbance can often alleviate or improve motor symptoms.

2.4.3. Structural abnormalities

Lesions or abnormalities in the brain, particularly in the basal ganglia or cerebellum, can lead to movement disorders. These may be due to congenital malformations, trauma, or ischemia.

2.4.4. Autoimmune and inflammatory conditions

Conditions such as Sydenham's chorea, which follows a streptococcal infection, or paraneoplastic syndromes may result in movement disorders due to immune system dysregulation affecting the central nervous system.

2.4.5. Infectious causes

Infections, including encephalitis and post-infectious syndromes, may lead to movement disorders in children. Neuroinflammatory conditions can cause both hyperkinetic and hypokinetic symptoms.[7]

2.5. Diagnosis of movement disorders in children

Diagnosing movement disorders in children requires a comprehensive approach that includes:

2.5.1. Detailed medical history

The onset, progression, and nature of symptoms (e.g., whether the movement is voluntary or involuntary) are essential for narrowing down the differential diagnosis.

2.5.2. Neurological examination

A thorough exam to assess the type of movement (e.g., chorea, dystonia) and any associated neurological signs (e.g., cognitive impairment, muscle weakness).

2.5.3. Genetic testing

In cases of suspected hereditary conditions, genetic testing can identify specific mutations.

2.5.4. Imaging studies

MRI or CT scans can reveal structural abnormalities in the brain, while specialized imaging such as PET scans can help assess metabolic activity.

2.5.5. Laboratory tests

Blood tests to check for metabolic disorders or autoimmune markers, as well as cerebrospinal fluid analysis when an infection or inflammation is suspected.[8]

2.6. Treatment of movement disorders in children

Treatment strategies for movement disorders in children are often multidisciplinary and depend on the underlying cause of the condition:

1. Pharmacological Interventions: Medications are commonly used to manage movement disorders These may include:
   (a) Dopamine antagonists for conditions like dystonia or tics.
   (b) Anticonvulsants for myoclonus or chorea.
   (c) Levodopa in Parkinsonism or parkinsonian syndromes.

(d) Immunotherapy (e.g., corticosteroids or intravenous immunoglobulin) for autoimmune-related movement disorders.[9]

2. Neurorehabilitation: Physical therapy, occupational therapy, and speech therapy can help children cope with movement disorders by improving motor coordination, posture, and speech.[10]
3. Surgical Interventions: In some cases, surgical treatments such as deep brain stimulation (DBS) or selective basal ganglia surgery may be considered for children with refractory movement disorders, particularly those with dystonia or tremor.[11]
4. Emerging Therapies: Advances in gene therapy, cell transplantation, and other experimental treatments hold promise for the future of pediatric movement disorder management. Clinical trials are ongoing to test new approaches for treating genetic and neurodegenerative disorders in children.[12]

3. Prognosis

The prognosis of movement disorders in children depends largely on the underlying cause. Some disorders, such as tics and Sydenham's chorea, may resolve with time or with appropriate treatment, while others, such as hereditary dystonias or neurodegenerative diseases, may worsen over time. Early diagnosis and intervention are crucial for improving long-term outcomes.[13]

4. Conclusion

Movement disorders in children are a diverse group of conditions with a wide range of causes and manifestations. Advances in genetic testing, imaging techniques, and therapies have improved the ability to diagnose and treat these disorders. Early intervention and a multidisciplinary approach are essential for optimizing outcomes and quality of life for children affected by movement disorders. Ongoing research into the underlying mechanisms and potential therapies holds promise for even better treatments in the future.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Jain R, Pandey S, Raghav S. Movement Disorders in Children. *Indian Pediatr*. 2021;58(9):861–70.
2. Mo A, Ebrahimi-Fakhari D. Chapter 12: Movement disorders. *Neurology*. 2023;100(16_supplement_1):158–9.
3. Cleveland Clinic. Chorea: Involuntary muscle movements. Available from: https://my.clevelandclinic.org/health/symptoms/21192-chorea.
4. National Institute of Neurological Disorders and Stroke. Tourette Syndrome. Available from: https://www.ninds.nih.gov/health-information/disorders/tourette-syndrome.
5. Leuzzi V, Nardecchia F, Pons R, Galosi S. Parkinsonism in children: Clinical classification and etiological spectrum. *Parkinsonism Relat Disord*. 2020;82:150–7. doi:10.1016/j.parkreldis.2020.10.002.
6. Hafiz S, Jesus OD. Ataxia. Treasure Island (FL): StatPearls Publishing; 2024.
7. Jain R, Pandey S, Raghav S. Movement disorders in children: A review. *Indian Pediatr*. 2021;58(9):861–70.
8. Brandsma R, Van Egmond M, Tijssen MAJ. Diagnostic approach to paediatric movement disorders: a clinical practice guide. *Dev Med Child Neurol*. 2021;63(3):252–8.
9. Dissanayaka N, White E, O'Sullivan JD, Marsh R, Pachana NA, Byrne GJ, et al. The clinical spectrum of anxiety in Parkinson's disease. *Mov Disord*. 2014;29(8):967–75.
10. Smits-Engelsman B, Verbecque E. Pediatric care for children with developmental coordination disorder, can we do better? *Biomed J*. 2021;45(2):250–4.
11. Bhatia K, Marsden CD. Movement Disorders: A Video Atlas. 1st ed. Cham: Springer; 2020. doi:10.1007/978-3-030-53622-0..
12. Rowland N, Sammartino F, Lozano AM. Advances in surgery for movement disorders. *Mov Disord*. 2017;32(1):5–10.
13. Park JE. Functional movement disorders: Updates and clinical overview. *J Mov Disord*. 2024;17(3):251–61.

Author's biography

Aron Christy, Professor https://orcid.org/0009-0001-6432-6291

Ramya A, Professor https://orcid.org/0009-0001-7511-9108

Cite this article: Christy A, Ramya A. Clinical insights into movement disorders in children: A review of etiology, diagnosis, and treatment options. *IP Int J Med Paediatr Oncol* 2024;10(4):103-105.