

From Guidelines to Action: Movement Disorders Care Through Regional & Multidisciplinary Collaboration

Miami, Florida, USA | November 7-8, 2026

International Parkinson and Movement Disorder Society Pan American Section

In collaboration with:

Baptist Health

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UPDATE ON

DYSTONIA

Diagnosis, pathophysiology, epidemiology & medical management

OVERVIEW

Disclosures

Financial disclosure

None

Conflict of interest

None

Use of AI

AI tools were used to create tables, educational cartoons and slide design. I reviewed all content.

Definition of Dystonia

MDS CONSENSUS DEFINITION (2013)

"Dystonia is a hyperkinetic movement disorder characterized 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 action and associated with overflow muscle activation."

1

Sustained or intermittent contractions

Muscle contractions can be continuous or come and go. They drive the abnormal movement or posture that defines the disorder.

2

Abnormal, repetitive movements and postures

The contractions produce movements, postures, or both. The same pattern tends to recur in the same body region rather than being random.

3

Patterned, twisting, may be tremulous

Movements follow a consistent pattern, often twisting, and may be tremulous (dystonic tremor). This helps separate dystonia from other hyperkinetic disorders.

4

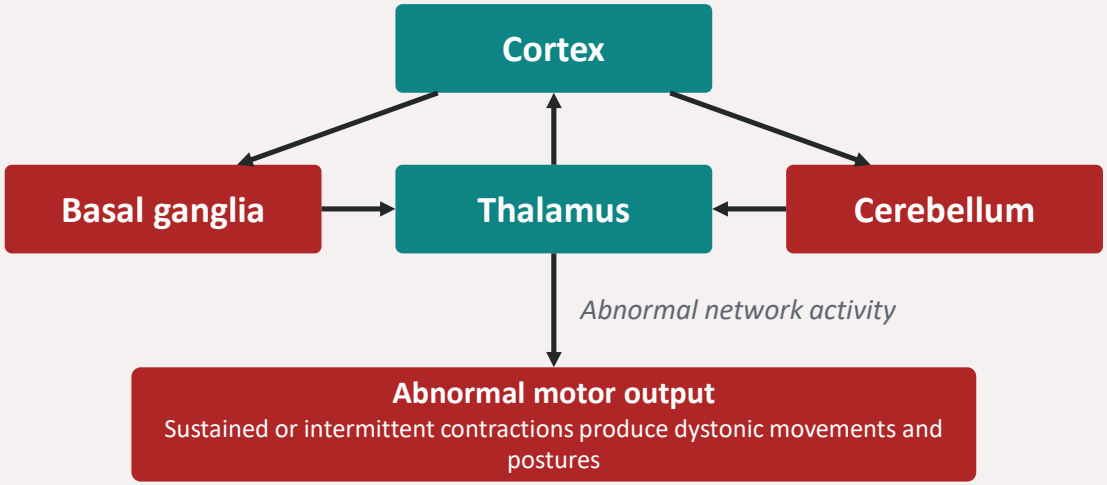
Voluntary action and overflow

Dystonia is often initiated or worsened by voluntary action. Overflow means muscles not needed for the intended movement also become active.

Source *Albanese A, et al. Phenomenology and classification of dystonia: a consensus update. Movement Disorders. 2013;28(7):863–873.*

Pathophysiology: The Motor Network Model

Dystonia reflects dysfunction across distributed sensorimotor networks, including basal ganglia, cerebellar, thalamic, and cortical circuits.



Three core abnormalities

1 Loss of inhibition
Reduced inhibitory control within sensorimotor circuits.

2 Sensory dysfunction
Altered sensory processing impairs sensorimotor integration.

3 Maladaptive plasticity
Excessive, abnormal plasticity may reinforce abnormal motor patterns.

Sources: Jinnah et al. (2017); Quartarone & Hallett (2013); Balint et al. (2018). Simplified schematic; not all connections are shown.

Approach to a Patient With Dystonia

1 Confirm the phenomenology

- Sustained or intermittent abnormal postures or movements
- Patterned movements, task specificity, tremor, overflow, or sensory tricks

2 Classify the dystonia

- Clinical: distribution, age at onset, temporal pattern, associated features
- Etiology: acquired, inherited, or idiopathic/unknown; structural or degenerative pathology when present

3 Look for secondary causes

- Medication/toxin exposure, neurological injury, other neurological features, rapid progression, or atypical findings
- Review family history and perform a neurological examination

4 Select investigations when clinically indicated

- MRI or targeted testing for secondary causes or important mimics
- Genetic testing when onset, phenotype, or family history supports it
- PET, electrophysiology, and biomarkers are not routine tests

5 Plan individualized management

- Multidisciplinary assessment and functional goals
- Botulinum toxin for many focal dystonias when appropriate
- Selective oral medication trials, rehabilitation, and specialist DBS evaluation in carefully selected medically refractory cases

Clinical anchor Diagnosis is primarily clinical; investigations are guided by phenotype and suspected cause.

Based on MDS consensus classification and diagnosis/treatment guidance; AAN evidence reviews.

Diagnosing Dystonia

Diagnosis: history and neurological examination

Recognition of the patient's historical and clinical features is essential to achieving the diagnosis.

Adjuncts

- MRI and other tests help evaluate secondary causes or mimics.
- Genetic testing is considered when phenotype and family history support it.

GENETIC TESTING

Recognition of causative genetic defects has allowed delineation of clinical phenotypes and prognoses, and insights into molecular mechanisms and potential therapies.

Lohmann and Klein 2013; Gonzalez-Latapi et al. 2021)

Dystonia classification

Clinical characteristics (Axis I)

Age of onset
Infancy • Childhood • Adult-onset

Body distribution:
Focal • Segmental • Multifocal • Generalized • Hemidystonia

Temporal pattern:
Static • Task-specific • Paroxysmal • Progressive

Associated features:
Isolated dystonia or Dystonia combined with other movement or neurological features

Etiology (Axis II)

Nervous-system pathology:
Structural or degenerative
or
No identifiable lesion

Inheritance:
Acquired • Inherited • Idiopathic/unknown

Adapted from MDS consensus classification of dystonia.

Isolated, Combined, and Complex Dystonia

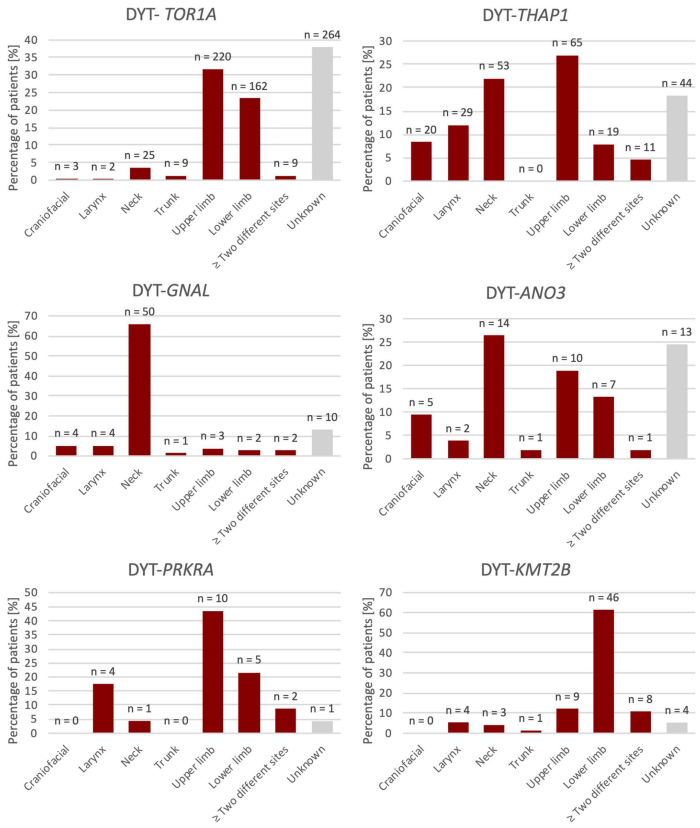
Isolated — Dystonia is the only presenting feature, except for a possible tremor.

Combined — Dystonia is associated with another movement disorder.

Complex — Dystonia is a (possibly less prominent) part of other neurological or systemic disorders.

Source *Lange LM, et al. Genotype–Phenotype Relations for Isolated Dystonia Genes: MDSGene Systematic Review. Mov Disord. 2021;36(5):1086–1103. doi:10.1002/mds.28485.*

Initial Site of Onset per Gene



Movement Disorders
Official Journal of the International Parkinson and Movement Disorder Society
Review | Open Access

Genotype–Phenotype Relations for Isolated Dystonia Genes: MDSGene Systematic Review

KEY PATTERNS: INITIAL SITE OF ONSET

TOR1A Mostly limbs: upper limb and lower limb.

THAP1 Mixed: upper limb and neck, also larynx and craniofacial.

GNAL Predominantly neck.

ANO3 Neck most often, with upper and lower limb involvement.

PRKRA Upper limb and lower limb, plus larynx.

KMT2B Predominantly lower limb.

Takeaway: affected body region differs by gene, which helps guide testing.

Source *Figure adapted from Lange LM, Junker J, Loens S, et al. Genotype–Phenotype Relations for Isolated Dystonia Genes: MDSGene Systematic Review. Mov Disord. 2021;36(5):1086–1103. https://doi.org/10.1002/mds.28485*

DYT-ANO3 and DYT-GNAL: Similar Features, One Clinical Hint

SHARED FEATURES

>20 years — Late median age at onset

Focal — Typically remain focal

Craniocervical — Predominant involvement

Clinically difficult to distinguish from one another and from idiopathic dystonia.

CLINICAL HINT: MYOCLONUS

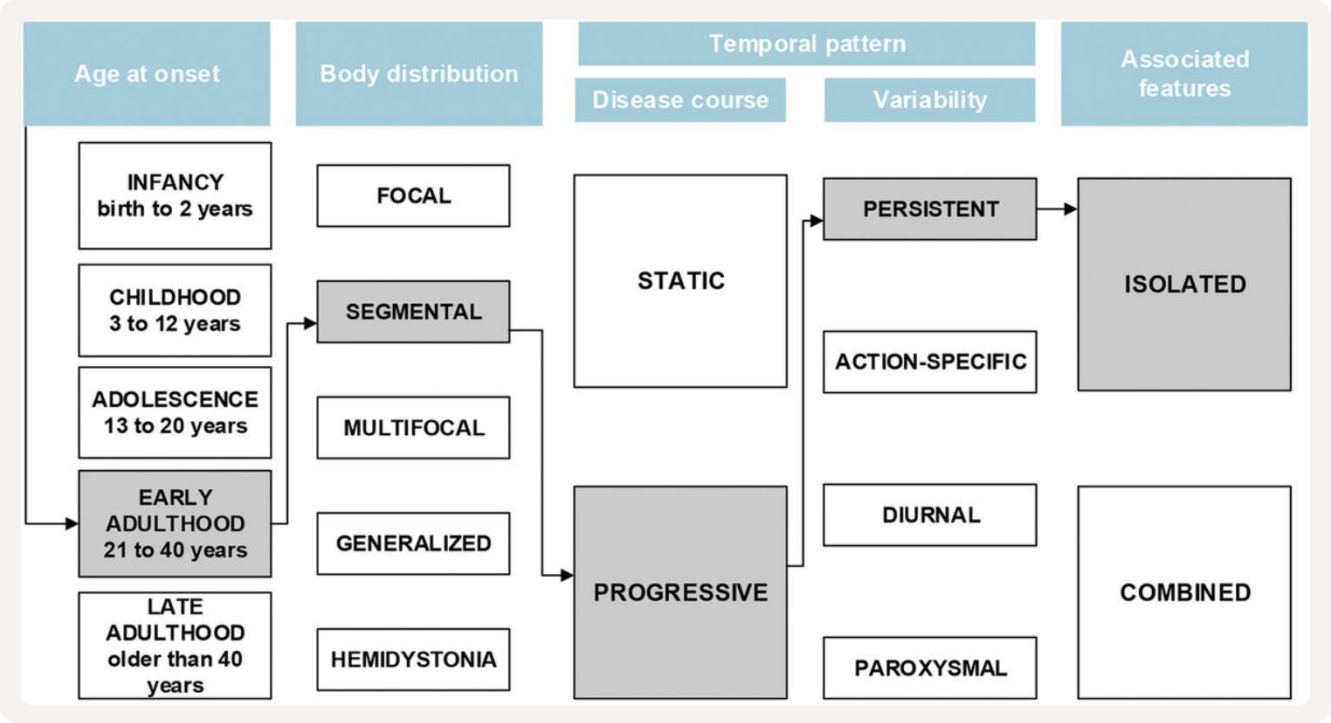
DYT-ANO3
Recurrent feature

DYT-GNAL
Rare

Idiopathic dystonia
Rare

Source *Lange LM, Junker J, Loens S, et al. Genotype–Phenotype Relations for Isolated Dystonia Genes: MDSGene Systematic Review. Mov Disord. 2021;36(5):1086–1103. https://doi.org/10.1002/mds.28485*

Dystonia Classification Axis I



Axis I: clinical characteristics

- Age at onset
- Body distribution
- Temporal pattern: disease course and variability
- Associated features: isolated or combined

Dystonia. By Sarah Pirio Richardson, MD, FAAN. CONTINUUM (MINNEAP MINN) 2025;31(4, MOVEMENT DISORDERS):1050–1065.

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UPDATE ON DYSTONIA

GENETICS

- Major challenges for neurologists are to decide whom to test, for which gene, and how to interpret the result.
- Hundreds of genes are linked to dystonia
- Genetic testing finds the underlying variant
- Results guide to diagnosis, treatment, and family care



Sources *Lohmann K, Klein C. Curr Neurol Neurosci Rep. 2017;17(3):26. doi:10.1007/s11910-017-0735-0. Zech M, et al. Brain. 2025;148(8):2827–2846. doi:10.1093/brain/awaf059.*

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Genetic Testing in Dystonia

1 Confirm the phenotype

Document age at onset, distribution, progression, isolated versus combined features, medication exposures, MRI findings, and a 3-generation family history.

2 Exclude acquired and treatable causes

Review drugs and toxins, structural lesions, metabolic disorders, and other secondary causes. In early-onset or atypical cases, consider a levodopa trial when dopa-responsive dystonia is possible.

3 Identify features that increase genetic suspicion

Prioritize testing for childhood or young-adult onset, generalized or segmental dystonia, family history, progressive or atypical disease, and associated developmental, cognitive, seizure, myoclonus, parkinsonism, ataxia, spasticity, or neuropathy features.

4 Choose the test

Prefer exome or genome sequencing with copy-number analysis; use a phenotype-guided dystonia or movement-disorder panel when appropriate. Consider trio testing when available. Escalate unresolved cases to reanalysis, genome sequencing, or long-read and functional studies.

5 Interpret the result clinically

Pathogenic or likely pathogenic variants must fit the phenotype and inheritance pattern. A VUS is not diagnostic and should not independently direct major treatment or predictive testing. A negative result does not exclude genetic dystonia.

6 Counsel, act, and re-evaluate

Discuss inheritance, penetrance, recurrence risk, secondary findings, and testing of relatives. Use actionable results to guide management and family care, and schedule periodic reanalysis as knowledge evolves.

Recent evidence Exome yield was 8.1% overall, 28.6% in generalized dystonia, and 20.4% with onset before age 30 in a 2025 study of 1,895 previously unsolved patients.

References 1. Zech M, et al. Combined genomics and proteomics unveils elusive variants and vast aetiologic heterogeneity in dystonia. Brain. 2025;148(8):2827–2846. doi:10.1093/brain/awaf059. PMID: 39937650.
2. Genetic Diversity and Expanded Phenotypes in Dystonia: Insights from Large-Scale Exome Sequencing. medRxiv. 2024. doi:10.1101/2024.12.02.24316741.
3. Kumar KR, et al. Genome sequencing reanalysis increases the diagnostic yield in dystonia. Parkinsonism & Related Disorders. 2024.

Who should undergo genetic testing?

- Childhood- or adolescent-onset dystonia warrants particular consideration.
- Generalized, segmental, multifocal, or progressive presentations raise testing priority.
- Dystonia with developmental, epileptic, cognitive, psychiatric, pyramidal, cerebellar, or parkinsonian features suggests a broader syndrome.
- A compatible family history, atypical isolated dystonia, or early spread can support testing.
- Treatment-responsive features may point to metabolic or neurotransmitter disorders.

Source: contemporary dystonia genetics review, PMC9320296

Academic Articles on the Genetics of Dystonia

BRAIN · 2025

Combined genomics and proteomics unveils elusive variants and vast etiologic heterogeneity in dystonia

Genome-wide searches of nuclear and mitochondrial DNA, combined with proteomics, found 38 (ultra)rare diagnostic-grade findings in 37 of 305 index patients (12.1%). Many had been missed by exome sequencing because of its methodological limits or pipeline limitations.

Zech M, et al. Brain. 2025;148(8):2827–2846. doi:10.1093/brain/awaf059. PMID: 39937650.

MOVEMENT DISORDERS · 2021

Genotype–Phenotype Relations for Isolated Dystonia Genes: MDSGene Systematic Review

Reviewed 7 genes that can cause isolated dystonia: TOR1A, THAP1, GNAL, ANO3, PRKRA, KMT2B, and HPCA. Data on ~1,200 patients with 254 different mutations showed differences in age at onset, site of onset, and distribution of symptoms across mutation carriers in all 7 genes.

Lange LM, et al. Mov Disord. 2021;36(5):1086–1103. doi:10.1002/mds.28485.

CURR NEUROL NEUROSCI REP · 2017

Update on the Genetics of Dystonia

Next-generation sequencing drove the discovery of new dystonia genes and a new classification of inherited dystonias. Reviews TOR1A, THAP1, and GNAL (isolated) and GCH1, ATP1A3, and SGCE (combined), plus KMT2B and VAC14 as newer genes.

Lohmann K, Klein C. Curr Neurol Neurosci Rep. 2017;17(3):26. doi:10.1007/s11910-017-0735-0. PMID: 28283962.

Article: Update on the Genetics of Dystonia

MAIN MESSAGE

Next-generation sequencing has rapidly expanded dystonia genetics.

It led to novel dystonia genes, a new classification and nomenclature for inherited dystonias, and a better understanding of pathophysiology.

DEFINITION

Next-generation sequencing (NGS)

A high-throughput DNA-sequencing technology that reads millions of DNA fragments in parallel, allowing many genes, or the whole exome or genome, to be analyzed at once.

Lohmann K, Klein C. Curr Neurol Neurosci Rep. 2017;17(3):26. doi:10.1007/s11910-017-0735-0. PMID: 28283962

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What Is Next-Generation Sequencing?

DEFINITION

NGS reads millions of DNA fragments at the same time.

Much faster and cheaper per base than Sanger sequencing, which reads one fragment at a time. Used as gene panels, whole-exome, or whole-genome sequencing.

1 Prepare the library

DNA from blood or saliva is broken into small fragments and tagged with adapters.

2 Sequence in parallel

Every fragment is read simultaneously: millions of reads per run.

3 Align and call variants

Software maps reads to the human reference genome and flags differences.

4 Interpret

Geneticists and clinicians judge which variants are likely to cause disease.

Genetic Dystonia: Types and Clinical Clues

Gene / disorder	Typical onset and pattern	Distinguishing clinical features
TOR1A-related dystonia	Childhood; limb onset, often generalizes	Usually isolated dystonia; normal cognition and MR; reduced penetration
THAP1-related dystonia	Childhood to young adulthood; cranial, cervical, laryngeal, or limb	Dysarthria or dysphagia; cranial and laryngeal involvement may occur
KMT2B-related dystonia	Childhood; progressive generalized	Cranial, bulbar, and cervical involvement; developmental, cognitive, or psychiatric features may occur
GNAL-related dystonia	Adult; focal or segmental, especially cervical	Cervical dystonia with tremor; generalized disease is less common
GCH1-related dopa-responsive dystonia	Childhood; lower-limb onset	Diurnal fluctuation and marked, sustained response to low-dose levodopa
SGCE-related myoclonus-dystonia	Childhood or adolescence; upper-body predominant	Myoclonus with dystonia; alcohol may improve symptoms; apparent paternal inheritance
ADCY5-related movement disorder	Childhood; episodic or continuous	Facial or perioral dyskinesia, chorea-dystonia, and sleep-related exacerbations
ATP1A3-related dystonia	Childhood to adulthood; variable	Dystonia-parkinsonism, episodic neurologic symptoms, or rapid-onset dystonia spectrum
VPS16- or ANO3-related dystonia	Childhood to adulthood	Isolated or combined dystonia; cervical dystonia and dystonic tremor may occur

References 1. Lohmann K, Lange L, Klein C, Zech M. Monogenic Isolated Dystonia Overview. GeneReviews®. Updated 2025. 2. Zech M, et al. Genotype-phenotype relations for isolated dystonia genes: MDSGene systematic review. Movement Disorders. 2021;36:1086–1103. doi:10.1002/mds.28485.
3. Lohmann K, Klein C. Update on the genetics of dystonia. Current Neurology and Neuroscience Reports. 2017;17:26. doi:10.1007/s11910-017-0735-0. 4. Ozelius L, Lubarr N. DYT-TOR1A. GeneReviews®. 5. Swoboda KJ, et al. ATP1A3-Related Disorder. GeneReviews®.

Treatment of Dystonia

1 Define goals

Reduce abnormal movements and pain; improve function, participation, and quality of life.

2 Focal dystonia

Botulinum toxin is an established first-line treatment for many focal dystonia when administered by an experienced clinician. Treatment is individualized by body region, muscles involved, response, and adverse effects.

3 Oral medications

Consider selective trials when appropriate. Benefit is variable and adverse effects should be monitored. Options may include anticholinergic medication, baclofen, or benzodiazepines in selected patients.

4 Rehabilitation and support

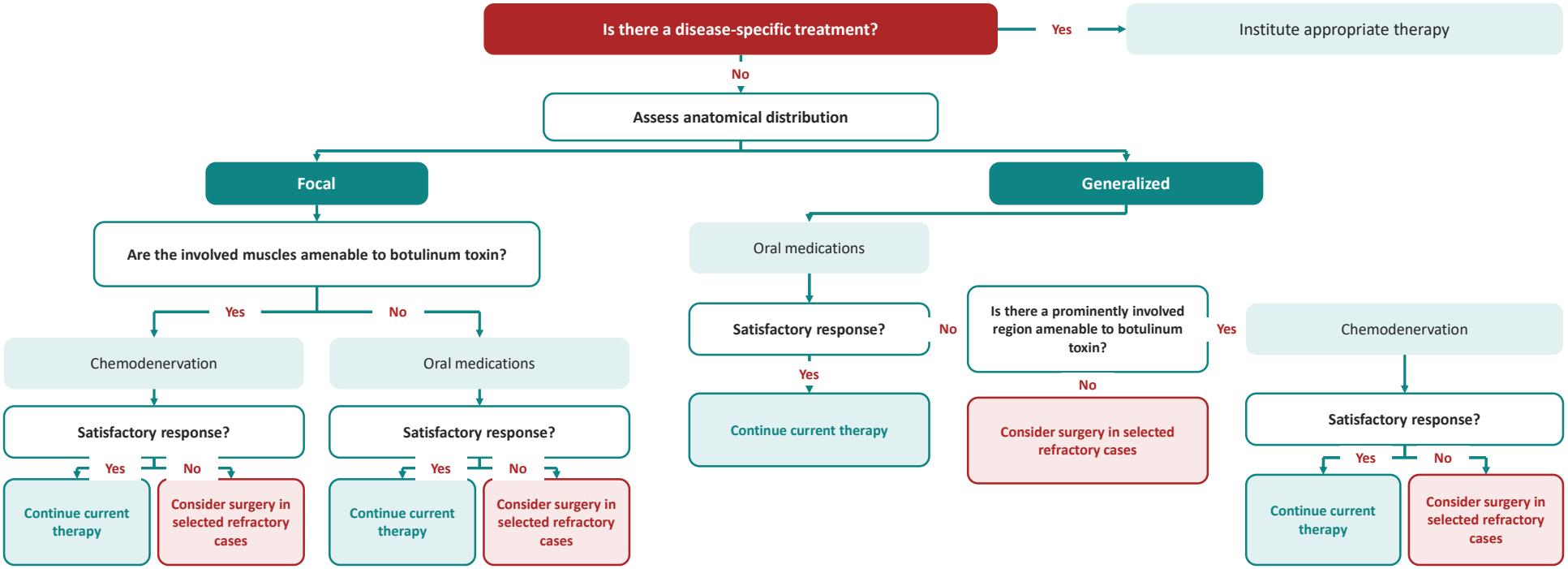
Use physiotherapy, occupational therapy, speech therapy, sensory strategies, and education as appropriate to support function and treatment goals.

5 Medically refractory dystonia

Refer for specialist assessment. Deep brain stimulation may be considered in carefully selected patients with disabling, medically refractory dystonia. Gene therapy and novel neuromodulation remain investigational unless supported by specific evidence.

Based on MDS and EFNS guidance, AAN evidence reviews, and peer-reviewed PubMed-indexed studies.

Treatment Decision Guide for Dystonia



Geyer HL, Bressman SB. Treatment of dystonia. Continuum: Lifelong Learning in Neurology. 2007;13(1):94–121.

Oral Options for Dystonia

Generic name	Trade name	Usual daily dosage (mg)
ANTICHOLINERGIC		
Trihexyphenidyl	Artane	6–40
Benztropine	Cogentin	4–15
Etopropazine	Parsitan (Canada)	100–400
BENZODIAZEPINE		
Clonazepam	Klonopin	1–4
Lorazepam	Ativan	1–6
Diazepam	Valium	10–60
GABA-B AGONIST		
Baclofen	Lioresal	40–120
DOPAMINE PRECURSOR		
Levodopa-carbidopa	Sinemet	75/300–200/2000
MONOAMINE DEPLETOR		
Tetrabenazine	Xenazine, Nitoman	50–200

GABA = γ-aminobutyric acid. Source: Geyer HL, Bressman SB. Treatment of dystonia. Continuum: Lifelong Learning in Neurology. 2007;13(1):94–121.

Therapy Options for Dystonia

Botulinum toxin
First-line option for many focal dystonias, including cervical, blepharospasm, oromandibular, and laryngeal dystonia. Injections are tailored to involved muscles by an experienced clinician.

Targeted therapy for acquired or tardive dystonia
Review potentially causative dopamine-blocking medicines where clinically feasible; specialist assessment may include VMAT2 inhibitors or focal botulinum toxin.

Levodopa
Consider a therapeutic trial when dopa-responsive dystonia is suspected, especially with childhood- or young-onset symptoms.

Individualized treatment plan

Oral medications
Selected trials may include trihexyphenidyl, baclofen, clonazepam, or other specialist-directed options; benefit and adverse effects vary.

Advanced therapies
GPi deep-brain stimulation for carefully selected patients with disabling, medically refractory dystonia; intrathecal baclofen may be considered in selected severe generalized or acquired cases.

Rehabilitation and supportive therapy
Physiotherapy, occupational therapy, speech or voice therapy, sensory-motor retraining, posture and task modification, pain management, and education.

Evidence-informed options; treatment requires individualized specialist assessment.

Emerging Therapies in Dystonia

Where the field is heading

Current therapy is symptomatic; disease-modifying treatment remains a major unmet need.

Gene-based and small-molecule therapies

Emerging approaches target disease mechanisms rather than symptoms. Success will depend on identifying molecular targets and tailoring treatment to each patient.

Molecular pathway targets

Transcriptional regulation, protein turnover, nuclear envelope and mitochondrial function are being explored to define biological subgroups.

MRI-guided focused ultrasound

Incisionless ablation of brain targets that avoids burr-hole surgery risks. An emerging modality; evidence in dystonia is still being established.

Sources: Dzinovic & Zech (2026); Momin et al. (2024). Investigational approaches; not yet supported by guideline-level evidence.

Investigational Drugs for dystonia

Sodium oxybate

Isolated focal laryngeal dystonia

Rationale

GABA-acting; effect similar to alcohol, which relieves symptoms in some patients.

Trial

Phase IIb, double-blind, placebo-controlled crossover; 106 patients; single 1.5 g dose.

Findings

Better than placebo in alcohol-responsive patients only. Average benefit about 41%, waning by 300 min without rebound. Cognition and vital signs unchanged.

Zonisamide

Myoclonus-dystonia

Rationale

Antiepileptic with proven benefit on myoclonus in progressive myoclonus epilepsy.

Trial

Randomized, double-blind, placebo-controlled crossover; 24 patients; 300 mg/day.

Findings

Improved action myoclonus ($p = 0.003$), disability ($p = 0.007$) and dystonia, BFM movement ($p = 0.009$), vs placebo. Well tolerated.

Perampanel

Cervical dystonia, Myoclonus-dystonia

Rationale

Selective AMPA-receptor antagonist approved for epilepsy; AMPA blockade eased dystonia in preclinical models.

Trial

Phase 2a open-label safety study; 25 patients; titrated from 2 to 12 mg/day over 6 weeks.

Findings

Variable tolerability: 4 withdrew for adverse events; 1 reached 12 mg/day

Response to medications is variable, with poor tolerability limiting their use.

Sources: Simonyan et al. (2024); Hainque et al. (2016); Fox et al. (2021); Belli et al. (2023).

Surgical Therapies for Dystonia

1 Medical refractoriness

Persistent, disabling dystonia despite optimized medical therapy and, when relevant, botulinum toxin

2 Multidisciplinary evaluation

Movement-disorders neurologist, functional neurosurgeon, neuropsychology, rehab team

3 Procedure selection

Phenotype-based target and procedure choice with shared decision-making

4 Surgery & long-term care

Implantation, programming, rehabilitation, and ongoing follow-up

DEEP BRAIN STIMULATION (DBS)

GPi-DBS PRINCIPAL OPTION

GPi-DBS is the principal surgical therapy for medically refractory dystonia.

STN-DBS SELECTED ALTERNATIVE

STN-DBS may be considered as an alternative in experienced centers.

Other selected options

- Selective peripheral denervation for refractory cervical dystonia
- Myectomy / myotomy for selected focal dystonias
- Intrathecal baclofen for severe generalized dystonia with prominent spasticity
- Ablative procedures (pallidotomy or thalamotomy) only in exceptional cases—lesions are irreversible.

Counseling and risks

- Multidisciplinary movement-disorders and functional-neurosurgery evaluation
- Phenotype-based target selection
- Realistic goals and expectations

Risks: hemorrhage, infection, hardware complications, stimulation effects, and maintenance/programming

Key point GPi-DBS remains the principal surgical therapy; target and procedure selection are individualized.

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MOVEMENT DISORDERS: HYPERKINETIC MOVEMENT DISORDERS 2 | June 10, 2026 | Check for updates

The Efficacy and Safety of MRI-guided Focused Ultrasound for Primary Dystonia: A Systematic Review (P7-16.014)

Meet Kachhadia, Neel Parikh, Janhavi Deshpande, Anagha Shree, Asiya Tasleema Shaik, S. Sara, Anis Shaikh, Sanjana Palakodeti, and Anjana Chowdary Elapolu | AUTHORS INFO & AFFILIATIONS

1 Objective and methods

Systematic review of MRgFUS in adults with medication-refractory primary dystonia. PubMed, Embase and ClinicalTrials.gov searched to August 2025; narrative synthesis.

2 Evidence base

7 studies, 25 patients. Targets: thalamic nuclei (VIM, VOP, Vo) and globus pallidus / pallidothalamic tract. Follow-up 6 to 24 months.

3 Efficacy

Cervical dystonia (n=14): TWSTRS severity improved 70.6%–86%. Focal hand dystonia (n=11): mean WCRS improvement 71.4%.

4 Safety

Mostly mild, transient events; some persistent dysarthria and sensory disturbance; 30% recurrence in one study.

CONCLUSION

Limited by small samples, MRgFUS offers meaningful benefit for refractory focal dystonia with an acceptable safety profile. Larger controlled studies are needed to validate efficacy, refine targets and define long-term outcomes. It may become a non-invasive alternative to DBS in selected patients.

Kachhadia M, et al. 2026;106(11_Supplement_1):2483. Abstract P7-16.014

Treatment of Dystonia in Conditions With Disease-Modifying Therapies (1/2)

Disease state (grouped by common age of onset)	Treatment
INFANCY	
Aromatic L-amino acid decarboxylase deficiency	Dopamine agonists, monoamine oxidase inhibitors
Biotinidase deficiency	Biotin
Cobalamin deficiencies (inherited subtypes A–G)	Cobalamin derivatives, protein restriction, or both
Cerebral creatine deficiency type 3	Creatine
Guanidinoacetate methyltransferase deficiency	Arginine restriction, creatine, and ornithine
Pyruvate dehydrogenase deficiency	Thiamine, ketogenic diet, dichloroacetate
EARLY CHILDHOOD TO ADOLESCENCE	
Cerebral folate deficiency	Folinic acid
Propionic aciduria	Protein restriction, avoid or treat aggressively any intercurrent illness
EARLY CHILDHOOD TO ADULTHOOD	
Glutaricaciduria type 1	Lysine restriction, avoid or treat aggressively any intercurrent illness
Niemann-Pick C disease	N-Butyldeoxynojirimycin (miglustat)
Wilson disease	Zinc, penicillamine, trientine

Treatment of Dystonia in Conditions With Disease-Modifying Therapies (2/2)

Disease state (grouped by common age of onset)	Treatment
CHILDHOOD	
Dystonia with brain manganese accumulation	Chelation therapy
Homocystinuria	Methionine restriction
Maple syrup urine disease	Leucine restriction, thiamine
Methylmalonic aciduria	Protein restriction, avoid or treat aggressively any intercurrent illness
CHILDHOOD TO ADULTHOOD	
Abetalipoproteinemia	Vitamin E, reduced-fat diet
Ataxia with vitamin E deficiency	Vitamin E
Cerebrotendinous xanthomatosis	Chenodeoxycholic acid
Galactosemia	Lactose restriction
ANY AGE	
Coenzyme Q10 deficiency	Coenzyme Q10

Recent Clinical Trials in Dystonia

STN-DBS

RELAX: generalised or segmental

Rationale

STN is an alternative DBS target for medication-refractory dystonia, but lacked high-level evidence.

Trial

Randomized, double-blind, sham-controlled; 67 patients aged 6–60 at 7 centres in China; STN vs GPi, then 3 months active vs sham.

Findings

Active STN-DBS beat sham at 3 months ($p = 0.028$); benefit lasted >3 years and matched GPi-DBS. No ongoing serious adverse events.

Other recent studies

Early-phase oral drug trials

Valbenazine: cervical dystonia

Open-label, 13 patients; TWSTRS improved at 12 weeks ($p = 0.01$).

Deutetrabenazine: isolated dystonia

Open-label AUDYT study, 15 patients; 6 of 15 (40%) tolerated the 48 mg/day maximum.

Dipraglurant: blepharospasm

Phase 2a, placebo-controlled, 15 patients; well tolerated but no clinical benefit.

Sources: Wang et al. (2025); Ly et al. (2025). Trial results are as reported by the investigators.

Recent Trials: Botulinum Toxins

LetibotulinumtoxinA
Essential blepharospasm

Rationale
New botulinum toxin type A formulation for essential blepharospasm.

Trial
Industry-sponsored (Hugel); 220 patients; primary outcome was change in the Jankovic Rating Scale (JRS).

Findings
Significant JRS reduction at week 4 ($p < 0.0001$), confirming non-inferiority.

PrabotulinumtoxinA
ABP-450 in cervical dystonia

Rationale
Botulinum toxin type A injection tested for safety and efficacy in cervical dystonia.

Trial
Phase 2 randomized, double-blind, placebo-controlled (57 patients) and open-label repeat-dose study (51).

Findings
No treatment-related serious adverse events, up to 20 weeks and up to 52 weeks of follow-up.

IncobotulinumtoxinA
Cervical and hand dystonia

Cervical: injection interval
Open-label; 207 patients with <10 weeks of benefit from onabotulinumtoxinA; two injection schedules.

Cervical: result
Shorter intervals gave significant TWSTRS improvement and were non-inferior.

Musician's hand dystonia
Placebo-controlled crossover pilot, 19 patients: better dystonia severity ($p = 0.04$) and performance ($p = 0.027$).

Source: Ly et al. (2025), summarizing registered trials from 2020 to January 2025. Results as reported there.

Recent Trials: Surgical Approaches

Meige syndrome
DBS vs pallidotomy cohort

Rationale
Compares surgical targets in primary Meige syndrome, a craniofacial dystonia.

Trial
Prospective cohort; 98 patients; BFMDRS compared with baseline at 1 and 3 years.

Findings
Improvement at 1 / 3 years: GPi 61% / 65%; STN 66% / 71%; pallidotomy 58% / 50%.

Ongoing DBS trials
GPi vs STN target comparisons

Meige syndrome
Randomized STN vs GPi; 100 patients; recruiting (Shandong, China).

Craniofacial dystonia
Multicenter GPi vs STN; 110 patients; recruiting (Beijing Tiantan Hospital).

Cervical dystonia (PASTS-CD)
Randomized pallidal vs subthalamic DBS; 98 patients; not yet recruiting.

Focused ultrasound
and laryngeal DBS

MRgFUS pallidotomy
Phase 1 for task-specific hand dystonia; 10 patients; recruiting; primary outcome is adverse events.

X-linked dystonia-parkinsonism
MRgFUS pallidothalamic tractotomy; available through expanded access.

Laryngeal dystonia DBS
Recruiting at Mass Eye and Ear (120 patients) and Indiana University (12 patients).

Source: Ly et al. (2025), summarizing registered trials from 2020 to January 2025. Most are small or still ongoing.

Recent Trials: Neuromodulation and Rehabilitation

rTMS
Hand and cervical dystonia

Task-specific hand dystonia
Sham-controlled crossover, 16 patients: real rTMS improved the writer's cramp score ($p = 0.002$).

Cervical dystonia
Two small studies (9 and 5 patients): TWSTRS 13 ± 6 vs 17 ± 8 in one; no difference in the other.

Ongoing
fMRI-guided individualized TMS (50 patients) and accelerated TMS for hand dystonia (20); both recruiting.

Sensory stimulation
Cervical and laryngeal dystonia

TENS for cervical dystonia
Sensory-threshold TENS; 40 patients; TWSTRS fell 8 points from baseline ($p = 0.0001$).

Laryngeal vibration
Spasmodic dysphonia, 42 patients: voice quality decayed within 30 min; no conclusive lasting benefit.

Vibrotactile stimulation
Cervical dystonia, 40 patients (University of Florida); completed, results not posted.

Rehabilitation and BCI
Ongoing trials

Personalized exercise
Cervical dystonia on botulinum toxin; 34 patients; TWSTRS-Pain outcome; recruiting (Ankara).

Segmental muscle vibration
Cervical dystonia pain; 28 patients; active, not recruiting (Italy).

Closed-loop brain-computer interface
Laryngeal dystonia; 40 patients; outcome is dystonic voice breaks; recruiting.

Source: Ly et al. (2025), summarizing registered trials from 2020 to January 2025. Most are small or still ongoing.

Future Directions and Key Takeaways

Phenotype-driven diagnosis remains central, with genetics and imaging used as adjuncts when clinically indicated.

Management and research priorities

Management should be multidisciplinary and individualized, balancing expected benefit, adverse effects, patient goals, and access to experienced care. Better biomarkers, stronger comparative studies, and well-designed clinical trials remain priorities.

QUESTIONS & DISCUSSION

THANK YOU



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