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A Complex Neurodevelopmental Presentation in a 10-Year-Old Boy: Co-Occurring Autism Spectrum Disorder, Tourette Syndrome, Attention-Deficit/Hyperactivity Disorder, and Stuttering - A Case Report

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Abstract **Case Report**

Background: Neurodevelopmental disorders frequently co-occur, yet their simultaneous presentation in a single patient poses substantial diagnostic and therapeutic challenges. We report the case of a 10-year-old Moroccan boy referred for academic difficulties, attentional problems, and motor tics, in whom a comprehensive psychiatric evaluation revealed four concurrent neurodevelopmental. ***diagnoses:*** Autism Spectrum Disorder (ASD), Tourette Syndrome (TS), Attention-Deficit/Hyperactivity Disorder (ADHD), and a Fluency Disorder (stuttering). ***Case Presentation:*** Mohamed Rayan, a 10-year-old male, presented with a longstanding history beginning in early childhood with language delay, limited eye contact, absent pointing, non-response to his name, echolalia, and motor stereotypies. At school age, significant inattention and hyperactivity emerged. Approximately two years prior to consultation, simple motor and vocal tics appeared, followed one year later by washing rituals. The recent dramatic increase in tic frequency and severity prompted the current consultation. Standardized assessments (SNAP-IV, Conners, M-CHAT, ADI, Vineland-II) confirmed the diagnoses. The patient was initiated on clonidine 0.15 mg/day with notable early improvement in tics. ***Conclusion:*** This case illustrates the high phenotypic complexity that can arise from neurodevelopmental comorbidity. Early recognition, systematic evaluation, and a multimodal, individualized management plan are essential to optimize outcomes in such patients.

Keywords: Autism Spectrum Disorder, Tourette Syndrome, Attention-Deficit/Hyperactivity Disorder, Fluency Disorder, Neurodevelopmental Comorbidity, Pediatrics.

1. INTRODUCTION

Neurodevelopmental disorders (NDDs) encompass a heterogeneous group of conditions arising from atypical brain development and are increasingly recognized to co-occur within the same individual [1]. Among the most prevalent NDDs in childhood are Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), tic disorders, and specific learning disorders, each with its own distinct clinical profile yet sharing overlapping genetic, neurobiological, and environmental risk factors [2,3].

Epidemiological data indicate that up to 70% of individuals with ASD meet diagnostic criteria for at least one additional psychiatric or neurodevelopmental condition, and 40–60% fulfill criteria for ADHD [4]. Tourette Syndrome (TS), characterized by chronic motor and vocal tics with onset in childhood, is also significantly more prevalent among individuals with ASD and ADHD than in the general population, with comorbidity rates ranging from 6 to 22% depending on diagnostic criteria and study design [5,6]. Furthermore, specific learning disorders and fluency disorders (stuttering) are commonly encountered in the context of ASD and add substantial complexity to the clinical picture [7,8].

Despite this growing awareness, the simultaneous recognition and management of four or more neurodevelopmental diagnoses in a single pediatric patient remains clinically rare and underreported in the literature. Treatment decisions in such cases require careful consideration of pharmacological interactions, symptom prioritization, and coordinated multidisciplinary intervention [9].

We present the case of a 10-year-old Moroccan boy in whom a thorough child psychiatric evaluation

culminated in the concurrent diagnosis of ASD, Tourette Syndrome, ADHD combined type, a specific learning disorder, and a fluency disorder (developmental stuttering), with an ongoing workup for an intellectual developmental disorder. This case underscores the importance of systematic neurodevelopmental assessment and highlights nuanced therapeutic decision-making in multiply-diagnosed children.

2. CASE PRESENTATION

2.1 Patient Identity and Social Context

M. R. is a 10-year-old male, the youngest of four siblings (one sister and three brothers), born to non-consanguineous married biological parents with a modest socioeconomic background. His father is a merchant and his mother is a homemaker. He was originally from Ouazzane and lives in Salé, Morocco. He is currently enrolled in the fifth grade of primary school. The family has access to public health coverage.

2.2 Chief Complaint and Reason for Referral

The patient was brought to consultation by his father and referred by his school for academic difficulties, attentional problems, and motor tics.

2.3 Developmental and Biographical History

Perinatal history:

The pregnancy was well monitored. Gestational diabetes was reported and adequately managed. Delivery was at full term by vaginal route, with documented neonatal distress suggestive of perinatal asphyxia (maternal-fetal infection suspected). Birth weight was within normal limits. Breastfeeding was maintained until the age of two years.

Psychomotor development:

The patient demonstrated delayed motor milestones, with independent ambulation achieved at 18 months. Diurnal and nocturnal continence was acquired at two and a half years. A clinically significant language delay was documented at age three, with late appearance of first words. Eight to ten sessions of speech-language therapy were provided at age seven, with slight improvement.

Social functioning:

According to his mother, he has been a recurrent victim of bullying by his peers. He maintains a limited social circle without close friendships.

Academic trajectory:

His academic performance is average, with a first-semester grade of 6/10. He has never repeated a school year, though difficulties in reading and written expression have been consistently reported by teachers.

2.4 Medical and Psychiatric History

Medical history: He had multiple upper respiratory tract infections (including possible sinusitis) around age six. He has untreated asthma.

Psychiatric history: He underwent 8–10 sessions of speech-language therapy at age seven for language delay, with mild improvement.

Family history: An older brother is currently being followed for language delay, suggesting a familial neurodevelopmental vulnerability.

2.5 History of the Illness

The symptomatology appears to originate in early childhood. The mother retrospectively describes:

- **Early signs of autism (before age 3):** Limited eye contact, absence of declarative pointing, failure to consistently respond to his name, toe-walking, motor stereotypies, echolalia, and an early intense preoccupation with technological devices and artificial intelligence.
- **School-age emergence (approximately ages 6–7):** Progressive learning difficulties with attentional deficits (prominent distractibility, frequent forgetting of school materials, difficulty sustaining effort), marked hyperactivity at home, school, and in extended family settings, excessive talking focused on his own interests, and interrupting others without perceiving their disinterest. Reading and written expression difficulties were noted by school staff.
- **Approximately 2 years ago:** Onset of simple motor and vocal tics: repeated eye blinking, shoulder shrugging, throat clearing, and sniffling. These tics waxed and waned but persisted without medical consultation at that time.
- **Approximately 1 year ago:** Onset of repetitive washing rituals involving his own hands and, predominantly, the lids of containers used by others.
- **One month prior to consultation:** Marked exacerbation of motor tics, with near-constant shoulder shrugging and increased tic frequency causing significant functional impairment at home and at school, prompting the current consultation.

2.6 Mental Status Examination

In a clinical interview, the patient presented as a calm boy of average build. He exhibited reduced facial expressivity with an overall robotic quality of interaction. Despite this, he maintained eye contact. His basic psychic functions appeared intact: he was alert, well-oriented in time and place, attentive, and his memory appeared preserved.

His speech was monotone, with frequent interruptions of the examiner. Dysfluency in the form of sound and syllable repetitions, audible blockages, and excessive muscular tension consistent with stuttering was observed. He reported hypersensitivity to odors and

a circumscribed interest in technology and artificial intelligence. No formal thought disorder, perceptual disturbances, or suicidal ideation were elicited. Mood was neutral with congruent affect. Sleep and appetite were reported as preserved.

3. DIAGNOSTIC EVALUATION AND DISCUSSION

3.1 Differential Diagnosis

Based on the clinical presentation, the following diagnoses were considered: (1) Autism Spectrum Disorder (ASD), (2) Tourette Syndrome (TS), (3) Attention-Deficit/Hyperactivity Disorder (ADHD), (4) Specific Learning Disorder, (5) Fluency Disorder (stuttering), (6) Intellectual Developmental Disorder (IDD), (7) Obsessive-Compulsive Disorder (OCD), and (8) an organic etiology (PANDAS syndrome, epilepsy).

3.2 Autism Spectrum Disorder (ASD)

Arguments in favor:

According to DSM-5-TR criteria [10], a diagnosis of ASD requires persistent deficits in social communication and social interaction (Criterion A), as well as restricted, repetitive patterns of behavior, interests, or activities (Criterion B), with symptoms present in the early developmental period (Criterion C) and causing significant functional impairment (Criterion D).

Criterion A – Social communication deficits:

- Reduced eye contact (documented on examination)
- Absence of declarative pointing in infancy
- Inconsistent response to his name
- Echolalia (reported by both parents)

Criterion B – Restricted and repetitive behaviors:

- Motor stereotypies (toe-walking in infancy)
- Intensely restricted interests (technology, artificial intelligence)
- Ritualistic washing behaviors
- Sensory hypersensitivity (odors)

Criterion C: Symptoms documented from early childhood.

Criterion D: Significant scholastic and social functional impairment.

Standardized assessment:

The Modified Checklist for Autism in Toddlers (M-CHAT) indicated moderate risk. The Autism Diagnostic Interview (ADI) was clinically significant. The Autism Diagnostic Observation Schedule (ADOS) was scheduled to complete the diagnostic assessment. The Vineland Adaptive Behavior Scales-II (Vineland-II) revealed an adaptive profile that was adequate for communication and daily living skills but markedly weak for socialization.

The co-occurrence of ASD and tic disorders has been documented in approximately 6–22% of ASD cases, with shared neurobiological substrates in cortico-striato-thalamo-cortical circuits [11]. Furthermore, ADHD co-occurs with ASD in 40–70% of cases, a comorbidity now explicitly recognized in DSM-5 [12].

3.3 Tourette Syndrome (TS)

According to DSM-5-TR, Tourette Syndrome is defined by: (A) multiple motor tics AND at least one vocal tic, (B) duration of more than 12 months with waxing and waning course, (C) onset before age 18, and (D) not attributable to a substance or medical condition [10].

- Multiple motor tics: eye blinking, shoulder shrugging
- At least one vocal tic: throat clearing, sniffling
- Duration > 12 months
- Onset before age 18

The dramatic increase in tic severity over the prior month, leading to functional impairment at home and school, was consistent with the known waxing course of TS [13].

TS and ASD share overlapping neurodevelopmental underpinnings, and their comorbidity frequently complicates the clinical picture. Importantly, in the context of co-occurring ASD, some repetitive motor behaviors may be difficult to distinguish from tics, requiring careful phenomenological analysis [14].

3.4 Attention-Deficit/Hyperactivity Disorder (ADHD)

DSM-5-TR criteria for ADHD combined type include six or more symptoms of inattention and six or more symptoms of hyperactivity/impulsivity in multiple setting for at least six months [10].

Inattention domain:

- Prominent distractibility
- Frequent forgetting of school materials
- Difficulty sustaining effort on tasks

Hyperactivity/impulsivity domain:

- Marked hyperactivity at home, school, and in extended family settings
- Excessive talking predominantly about his interests
- Frequent interruption of others without perceiving social cues of disinterest

Standardized scales:

- SNAP-IV scale: Significant for both inattention and hyperactivity-impulsivity subscales
- Conners Rating Scales: Significant for hyperactivity and inattention

The triple comorbidity of ASD + TS + ADHD represents a particularly complex neurodevelopmental phenotype, with significant therapeutic implications given the risk that psychostimulants may exacerbate tic severity [15].

3.5 Specific Learning Disorder

The patient demonstrated difficulties in reading (decoding, fluency) and written expression, with significant academic impact (grade average 6/10). Per DSM-5-TR, a Specific Learning Disorder requires persistent difficulties in at least one academic area despite appropriate instruction [10].

A comprehensive psychometric assessment (WISC-V IQ testing) and a detailed speech-language evaluation were requested to confirm this diagnosis.

3.6 Fluency Disorder (Developmental Stuttering)

The clinical examination documented repetitions of sounds and syllables, audible blockages, excessive muscular tension during speech, and exacerbation under social stress. These features meet DSM-5-TR criteria for a Fluency Disorder of childhood onset [10].

Stuttering occurs in approximately 2–4% of children with ASD and is associated with additional impairments in pragmatic language [7]. It requires dedicated speech-language therapy targeting fluency in addition to the broader language work.

3.7 Intellectual Developmental Disorder (IDD)

Several features raised the possibility of mild IDD : delayed developmental milestones, academic difficulties, borderline academic performance, a history of perinatal distress, and familial neurodevelopmental vulnerability (brother with language delay). However, the Vineland-II demonstrated adequate adaptive functioning in communication and daily living, and the patient has never repeated a school year.

WISC-V and additional neuropsychological testing were requested to formally evaluate intellectual functioning.

3.8 Obsessive-Compulsive Disorder (OCD)

The patient manifested repetitive washing rituals (hands and lids of containers used by others) with minimal resistance attempts. However, in the context of established ASD, such ritualistic behaviors are better accounted for as restricted and repetitive behaviors characteristic of ASD. No frank obsessional thoughts were elicited, and the functional impact of these behaviors was not independently significant beyond the ASD context.

Nevertheless, should a true OCD diagnosis emerge in the future, first-line treatment would be Cognitive-Behavioral Therapy (CBT) with Exposure and Response Prevention (ERP) for mild-to-moderate severity. Selective serotonin reuptake inhibitors (SSRIs) (sertraline or fluoxetine) are indicated for moderate-to-severe OCD or when CBT alone is insufficient. In cases of OCD with comorbid tics, augmentation with an atypical antipsychotic (e.g., risperidone) may be considered in treatment-resistant cases, alongside concurrent tic management [16,17].

3.9 Organic Etiologies

PANDAS (Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal Infections):

The acute exacerbation of tic severity over the preceding month, combined with a history of recurrent ORL infections, raised the suspicion of PANDAS. However, arguments against include the progressive rather than abrupt initial onset of symptoms, and the absence of a clear history of Group A streptococcal pharyngitis [18]. Cerebral MRI was recommended to exclude structural abnormalities.

Epilepsy:

Given the history of perinatal distress and the presence of stereotypies and possible absence-like episodes, an EEG was ordered to rule out an epileptic component.

4. Therapeutic Management

4.1 General Goals

- Reduction of tic frequency and functional impact
- Structured ASD-targeted interventions
- Improvement of attention and reduction of hyperactivity
- Maintenance of school inclusion
- Parental support and guidance

4.2 Management by Diagnostic Axis

4.2.1 Tourette Syndrome

In accordance with the current evidence-based guidelines (Bloch et al., 2022) [19], psychoeducation and Comprehensive Behavioral Intervention for Tics (CBIT) are recommended as the first-line approach before initiating pharmacotherapy. CBIT, a structured behavioral intervention combining habit reversal training and function-based interventions, has demonstrated robust efficacy in randomized controlled trials [20].

Given the severity of functional impairment in the present case, pharmacological treatment was initiated:

- **Alpha-2 adrenergic agonists** are recommended as first-line pharmacotherapy for tic disorders according to the Florida Best Practice Psychotherapeutic Medication Guidelines for Children and Adolescents [21], particularly in the context of comorbid ADHD and ASD.

- **Clonidine (Catapressan) 0.15 mg/day** was prescribed: 0-0-¼ tablet (0.0375 mg) at bedtime with blood pressure monitoring.
- A notable clinical improvement was observed within the first week, with persistence of some residual motor tics.
- Psychoeducation was provided to the family regarding the importance of blood pressure monitoring; non-adherence to monitoring was encountered as a practical challenge.
- Dose adjustment is planned pending stable blood pressure values.

The use of clonidine is particularly advantageous in this case given its documented dual efficacy for tics and ADHD symptoms [22].

4.2.2 ADHD

Methylphenidate-based psychostimulants represent first-line pharmacotherapy for ADHD [23]. However, in the presence of clinically significant tics, psychostimulants must be used with caution, as they may exacerbate tic frequency and severity in susceptible individuals [15].

In the present case, the dual indication of clonidine (for TS and ADHD) represents an evidence-based strategic choice. If tic control is achieved, careful introduction of low-dose methylphenidate may be considered in the future. Atomoxetine and guanfacine, which have demonstrated efficacy for ADHD without tic exacerbation, are currently unavailable in Morocco.

Behavioral interventions include:

- Barkley's behavioral parent training program [24]
- School accommodations (extended time, preferential seating, reduced written output requirements)
- Psychoeducation for family and teaching staff

4.2.3 Autism Spectrum Disorder

Recommended interventions include:

- **Applied Behavior Analysis (ABA):** Comprehensive early behavioral intervention, considered the gold standard for ASD-targeted skill acquisition [25]
- **Speech-language therapy:** Targeting pragmatic language, communication fluency, and social language
- **Psychomotor therapy:** Addressing sensorimotor integration and stereotypies
- **Social skills training programs:** Structured group interventions targeting social reciprocity and peer interaction
- **School accommodations:** Visual supports, structured environmental organization, sensory adaptations
- **Management of comorbidities:** As outlined above
- **Parental psychoeducation and guidance**

Pending assessments: Auditory Evoked Potentials (AEP), EEG, comprehensive speech-language evaluation, and psychomotor assessment.

4.2.4 Specific Learning Disorder and Fluency Disorder (Stuttering)

Both conditions require:

- Comprehensive speech-language assessment followed by individualized speech-language therapy
- For stuttering specifically: assessment of comorbid anxiety disorders, as anxiety commonly perpetuates dysfluency [26]
- School accommodations (oral examinations, extended time)
- Coordination with educational team

5. DISCUSSION

This case highlights the complexity of neurodevelopmental disorders and the frequent overlap between Autism Spectrum Disorder (ASD), Tourette Syndrome (TS), Attention-Deficit/Hyperactivity Disorder (ADHD), and speech disorders such as developmental stuttering. Increasing evidence suggests that these conditions share common genetic, neurobiological, and developmental pathways, supporting a dimensional rather than categorical approach to neurodevelopmental psychopathology [1,11].

One of the most clinically relevant aspects of this case was the differential diagnosis between ASD, TS, ADHD, and obsessive-compulsive disorder (OCD). Although these disorders may present with repetitive behaviors, impulsivity, emotional dysregulation, and social difficulties, careful developmental and phenomenological assessment is essential to distinguish their underlying mechanisms and guide appropriate treatment [30].

The diagnosis of ASD was supported by a history of early developmental abnormalities, including poor eye contact, absence of declarative pointing, inconsistent response to name, echolalia, sensory hypersensitivity, restricted interests, and repetitive motor behaviors beginning before the age of three years [10]. These symptoms fulfilled DSM-5-TR criteria and reflected the core deficits in social communication and restricted, repetitive patterns of behavior characteristic of ASD [10,12].

A significant diagnostic challenge concerned the presence of repetitive handwashing behaviors. Initially, these rituals raised the possibility of OCD. However, recent literature emphasizes that repetitive

behaviors in ASD differ fundamentally from compulsions observed in OCD [30,32,33]. In OCD, compulsions are typically performed to reduce anxiety generated by intrusive and distressing obsessions and are usually experienced as unwanted and ego-dystonic [30,32]. In contrast, repetitive behaviors in ASD often serve functions related to sensory regulation, predictability, self-soothing, or pleasure and are generally experienced as ego-syntonic [30,31,33].

In the present case, no contamination fears, intrusive thoughts, obsessive doubts, or attempts to resist the washing behaviors were identified. Instead, these behaviors appeared within a broader pattern of rigidity, insistence on sameness, and restricted repetitive behaviors characteristic of ASD. Therefore, the handwashing rituals were considered more consistent with autism-related repetitive behaviors than with a primary diagnosis of OCD [16,30]. Nevertheless, ongoing clinical monitoring remains warranted because individuals with ASD have an increased risk of developing comorbid OCD during adolescence and adulthood [30,33].

Another important differential diagnosis involved distinguishing autism-related stereotypies from Tourette-related tics. Although both are repetitive motor phenomena, they differ considerably in their phenomenology [30,31]. Stereotypies are generally rhythmic, patterned, prolonged, and often associated with sensory stimulation or emotional self-regulation, whereas tics are sudden, rapid, non-rhythmic movements or vocalizations that are frequently preceded by a premonitory urge and followed by temporary relief after their execution [30].

The developmental trajectory observed in this patient strongly supports the coexistence of ASD and TS rather than a simple manifestation of autistic stereotypies. The early toe-walking and stereotyped movements observed during infancy were consistent with ASD, whereas the later emergence of eye blinking, shoulder shrugging, sniffing, and throat-clearing at approximately eight years of age corresponded to the classic clinical presentation of Tourette Syndrome [13,14]. Furthermore, the waxing-and-waning course of symptoms and the progression from simple motor tics to combined motor and vocal tics are hallmark features of TS [13,14].

The co-occurrence of ASD and TS is increasingly recognized in the literature. Epidemiological studies indicate that clinically significant tic disorders occur more frequently among individuals with ASD than in the general population [5,11,30]. Shared dysfunction of cortico-striato-thalamo-cortical circuits and basal ganglia networks has been proposed as a potential neurobiological substrate underlying this association [11,27]. Neuroimaging studies have demonstrated abnormalities within these circuits in both ASD and TS, supporting the hypothesis of partially overlapping neurodevelopmental mechanisms [11,27].

The presence of ADHD further complicated the clinical presentation. ADHD and ASD share several overlapping features, including executive dysfunction, attentional difficulties, emotional dysregulation, and academic impairment [9,12]. However, social difficulties in ADHD differ qualitatively from those observed in ASD. Children with ADHD typically possess intact social understanding but struggle to apply social skills consistently because of impulsivity and inattention. In contrast, children with ASD exhibit fundamental deficits in social reciprocity, nonverbal communication, and social cognition [9,12,30].

In the present case, symptoms of distractibility, forgetfulness, excessive talking, hyperactivity, and poor sustained attention were consistent with ADHD. However, these manifestations could not account for the longstanding deficits in social communication, restricted interests, and repetitive behaviors observed since early childhood. Consequently, the patient's presentation was best explained by the coexistence of ASD and ADHD rather than by either condition alone [9,12].

From a therapeutic perspective, accurate differential diagnosis has important clinical implications. Distinguishing ASD-related repetitive behaviors from OCD compulsions and differentiating stereotypies from tics allows clinicians to select targeted interventions and avoid inappropriate treatments [30]. The favorable response observed with clonidine is consistent with current recommendations supporting alpha-2 adrenergic agonists as effective therapeutic options in children presenting with both tic disorders and ADHD symptoms [21,22]. Such treatments may improve tic severity while simultaneously reducing hyperactivity and impulsivity [21,22].

This case also underscores the importance of comprehensive developmental assessment in children referred for apparently isolated symptoms. Although the recent exacerbation of tics prompted psychiatric evaluation, a detailed developmental history revealed longstanding autistic traits and clinically significant ADHD symptoms that had previously received limited attention. Such diagnostic overshadowing is common in neurodevelopmental psychiatry and may delay access to appropriate interventions and support services [1,9,12].

Overall, this case illustrates the diagnostic challenges posed by overlapping neurodevelopmental disorders and emphasizes the importance of a multidisciplinary and developmental approach. Careful differentiation between ASD, TS, ADHD, and OCD is essential for establishing an accurate diagnosis, understanding symptom trajectories, and implementing individualized evidence-based treatment strategies [30].

6. CONCLUSION

This case report illustrates the clinical complexity and diagnostic richness that can emerge when multiple neurodevelopmental disorders converge in a single pediatric patient. The concurrent diagnosis of Autism Spectrum Disorder, Tourette Syndrome, ADHD combined type, Fluency Disorder, and a probable Specific Learning Disorder required systematic application of DSM-5-TR criteria, multiple validated rating scales, and a carefully tailored multidisciplinary therapeutic plan.

Longitudinal follow-up, neuroimaging, genetic workup, and multidisciplinary coordination will be essential to optimize outcomes for this patient.

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