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Lateral Trunk Dystonia Induced by Metoclopramide and Codeine in an Adolescent Patient: Retrospective Report and Experience in a High Resolution Primary Emergency Care (Sar)

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Abstract:

- ***Introduction:***

Lateral trunk dystonia or Pisa Syndrome constitutes a rare neurological adverse reaction primarily associated with antipsychotics. Its presentation in adolescents due to metoclopramide combined with codeine represents an exceptional clinical event with limited documentation in medical literature, especially in the context of emergency care and resolution services (SAR).

- ***Objective:***

To retrospectively report the case of an adolescent who developed severe lateral dystonia following treatment with metoclopramide and codeine, describing the management experience in an emergency care and resolution service (SAR) and the therapeutic response to intravenous diazepam.

- ***Methodology:***

Retrospective case report of a 16-year-old patient initially seen in outpatient consultation and subsequently in the Emergency Care and Resolution Service (SAR) during March 2024. Clinical records, evolution during observation, and post-discharge follow-up were analyzed. A systematic literature review of similar cases in adolescents was conducted.

- ***Results:***

After 48 hours of outpatient treatment (total metoclopramide 60mg, total codeine 120mg) for gastroenteritis and bronchitis, the patient presented marked lateral inclination of the trunk to the right with evident paravertebral contracture. Administration of intravenous diazepam (5mg) in the SAR produced significant improvement in 30 minutes and complete resolution in six hours, without complications. Literature review identified only 12 similar cases in patients under 18 years in the last 10 years.

- ***Conclusions:***

Adolescents can develop lateral dystonia with standard therapeutic doses of metoclopramide, especially in combination with opioids. Intravenous diazepam constitutes an effective and safe treatment manageable in emergency care and resolution services. Special vigilance is required when prescribing metoclopramide in pediatric populations and training of SAR personnel for recognition of these complications.

Keywords: *Drug-Induced Dystonia, Metoclopramide, Codeine, Diazepam, Adolescent, Emergency Care and Resolution Service, Extrapyramidal Effects.*

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I. INTRODUCTION

Lateral trunk dystonia, colloquially known as "Pisa Syndrome" due to its visual similarity to the inclination of the famous Italian tower, represents a neurological manifestation characterized by sustained and involuntary lateral flexion of the body axis[1]. This clinical entity was initially described by Ekbom et al. in 1972 in psychiatric patients under treatment with typical antipsychotics, but its etiological spectrum has expanded toward other pharmacological agents, occasionally presenting in emergency care and resolution services (SAR)[2].

Available epidemiological data indicate variable prevalence according to the involved medication: 0.1-3% for typical antipsychotics, 0.05-0.8% for metoclopramide, and less than 0.01% in pediatric population[3]. A recent systematic review (2019-2024) identified only 47 reported cases of lateral dystonia due to metoclopramide in patients under 18 years worldwide, which underscores the rarity of this clinical presentation[4].

Metoclopramide, widely used as an antiemetic in primary care, exerts its therapeutic action through selective blockade of dopaminergic D2 receptors at central and peripheral levels, particularly in the area postrema and basal ganglia. This mechanism, responsible for its antiemetic efficacy, also predisposes to the development of extrapyramidal effects when receptor occupancy exceeds the critical threshold of 65-70%[5].

➢ *Neurobiological Vulnerability in Adolescents*

The particular vulnerability of adolescents to these adverse effects finds explanation in multiple neurobiological developmental factors. During adolescence, dopaminergic circuits experience complex maturational processes that extend until the third decade of life, including selective synaptic pruning in prefrontal cortex and striatum, progressive myelination of fronto-striatal pathways, modulation of D2 receptor density in basal ganglia, and increased neuronal plasticity that enhances pharmacological sensitivity[6].

Recent neuropharmacological studies have documented that D2 receptor density in adolescents can be up to 40% higher than in adults, suggesting that higher receptor concentration significantly amplifies the effects of dopaminergic antagonists like metoclopramide[7].

➢ *Context of Emergency Care and Resolution Services*

Emergency care and resolution services (SAR) frequently constitute the first point of contact for patients who develop acute medicamentous adverse effects. In Chile, SARs attend approximately 2.8 million consultations annually, of which 12% correspond to pediatric and adolescent population[8]. The capacity for recognition and initial management of medicamentous neurological complications in SAR is crucial for patient prognosis and optimization of health system resources.

➢ *Objective:*

The purpose of this retrospective report is to present the case of an adolescent patient who developed severe lateral dystonia following concomitant use of metoclopramide and codeine, analyzing the management experience in an emergency care and resolution service (SAR), the therapeutic response to intravenous diazepam, conducting a systematic review of similar cases, and discussing implications for clinical practice at this level of care.

II. METHODOLOGY

➢ *Study Design*

A retrospective descriptive case report was conducted of an adolescent patient who presented lateral trunk dystonia associated with the use of metoclopramide and codeine. The case was initially attended in outpatient consultation and subsequently in the Emergency Care and Resolution Service (SAR) San Miguel, a reference emergency center in the Metropolitan Region, Chile, during March 2024.

➢ *Service Context*

SAR San Miguel constitutes a 24-hour emergency care and resolution service, attending approximately 15,000 consultations annually. The service has general physicians with training in emergency medicine, nurses specialized in emergency care, and paramedic technicians, with capacity for resolution of low and medium complexity emergencies, including initial management of medicamentous adverse effects.

➢ *Case Inclusion Criteria*

Adolescent patient (12-18 years), development of lateral trunk dystonia, recent exposure to metoclopramide, care in SAR with complete resolution, and complete clinical records available.

➢ *Data Collection*

Retrospective documentation of the case included exhaustive review of initial outpatient consultation records, detailed record of SAR care with precise chronology, clinical monitoring during observation period in SAR, structured telephone follow-up post-discharge at 48 hours and 7 days, analysis of management protocols used in the service, and evaluation of resources used and resolution time.

➢ *Variables Studied*

The following variables were retrospectively analyzed: demographics (age, sex, medical history), pharmacological (medications used, doses, treatment duration), clinical (initial presentation, neurological symptoms, evaluation scales), therapeutic (treatment received, response time, adverse effects), and administrative (length of stay, resources used, need for referral).

➢ *Neurological Evaluation*

A structured neurological evaluation was used that included Burke-Fahn-Marsden Dystonia Scale (adapted for emergency use), postural evaluation through systematic visual inspection, severity grading according to Suzuki and

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Remington criteria (2019), and serial monitoring every 30 minutes during the first 6 hours.

➢ *Systematic Literature Review*

A systematic search was conducted in the following databases: PubMed/MEDLINE (2014-2024), Embase (2014-2024), Cochrane Library, and LILACS (Latin American literature).

Search terms: "metoclopramide AND dystonia AND adolescent", "Pisa syndrome AND pediatric", "lateral trunk dystonia AND metoclopramide"

Inclusion criteria: Cases reported in patients under 18 years, lateral dystonia due to metoclopramide, full text available.

Statistical Analysis Given the descriptive nature of the study, descriptive statistics were used for continuous variables (mean ± standard deviation) and frequencies for categorical variables. The 95% confidence interval for resolution time was calculated.

Ethical Considerations This retrospective report complies with ethical standards established for medical publications, maintaining complete patient anonymity. Institutional authorization from SAR San Miguel was obtained for review of clinical records. Given the retrospective and descriptive nature of the analysis, without experimental interventions or identification of personal data, it conforms to institutional regulations that exempt specific informed consent for this type of scientific communications.

III. RESULTS

➢ *Case Characteristics*

Table 1 Demographic and Clinical Characteristics of the Patient

Variable	Value
Age	16 years
Sex	Female
Weight	58 kg
Medical history	None relevant
Habitual medication	None
Known allergies	None reported
Initial consultation	Gastroenteritis + bronchitis

➢ *Case Chronology*

Table 2 Detailed Chronology of Events

Time	Event	Details
Day 0	Outpatient consultation	Gastrointestinal and respiratory symptoms
Day 0	Prescription	Metoclopramide 10mg q8h + Codeine 15mg q6h
Day 1-2	Outpatient treatment	Complete therapeutic compliance
Day 2 (48h)	Neurological symptoms onset	Progressive lateral inclination
Day 2 (52h)	SAR consultation	Established lateral dystonia
Day 2 (52h30min)	SAR treatment	Diazepam 5mg IV
Day 2 (53h)	First improvement	Reduction of muscle contracture
Day 2 (58h)	Complete resolution	Normal posture recovered
Day 4	Telephone follow-up	Asymptomatic
Day 9	Outpatient control	No residual symptoms

➢ *Initial Clinical Presentation in Outpatient Consultation*

The patient initially consulted reporting a three-day clinical picture characterized by persistent nausea with 6-8 daily emetic episodes, diffuse abdominal discomfort of moderate intensity (4/10 VAS), dry and irritative cough without expectoration, marked asthenia and general malaise, and hyporexia with preserved liquid intake.

➢ *Initial Outpatient Clinical Evaluation*

Physical examination in outpatient consultation showed vital signs: BP 110/70 mmHg, HR 88 bpm, RR 18 rpm, T° 37.2°C, $SatO_2$ 98%. Abdominal examination revealed present bowel sounds and mild diffuse tenderness. Cardiopulmonary auscultation demonstrated regular rhythm and preserved vesicular murmur. Hydration status was characterized by moist mucous membranes and capillary refill < 2 seconds. Basic neurological evaluation showed no evident alterations.

➢ *Outpatient Therapeutic Regimen*

Based on symptomatology compatible with viral gastroenteritis and bronchial process, the following was prescribed: Metoclopramide 10mg orally every 8 hours for 5 days (planned total dose: 150mg) and Codeine 15mg orally every 6 hours for 5 days (planned total dose: 300mg). General measures included fractioned oral hydration and progressive bland diet.

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➢ *Cumulative Doses at Time of SAR Consultation*

Metoclopramide: 60mg total (6 doses of 10mg in 48 hours). Codeine: 120mg total (8 doses of 15mg in 48 hours). Therapeutic compliance: 100% according to family reference.

➢ *Presentation in SAR*

The patient consulted in SAR accompanied by her parents, who reported the progressive appearance during the last 4 hours of involuntary lateral inclination of trunk toward right hemibody, inability to maintain normal erect posture, evident muscle contracture in right paravertebral region, reactive anxiety secondary to motor symptoms, absence of pain associated with contracture, and preservation of higher cognitive functions.

➢ *Neurological Evaluation in SAR*

Table 3 Structured neurological evaluation in SAR

Parameter	Finding	Grading
Bipedal posture	Marked right lateral inclination	Severe
Paravertebral contracture	Evident on palpation	Moderate-severe
Voluntary correction	Impossible	-
Myotatic reflexes	Preserved and symmetric	Normal
Cranial nerves	No alterations	Normal
Cognitive functions	Preserved	Normal
Meningeal signs	Absent	Normal
Coordination (limbs)	Preserved	Normal

➢ *Diagnostic Capacity in SAR*

The SAR medical team established the diagnosis of medicamentous dystonia based on directed anamnesis with identification of recent metoclopramide exposure, characteristic clinical pattern showing sustained lateral inclination, temporal correlation with symptom onset 48 hours post-exposure, differential exclusion ruling out structural neurological causes, and fulfillment of Suzuki-Remington diagnostic criteria.

➢ *Therapeutic Management in SAR*

Applied treatment protocol included immediate suspension of metoclopramide and codeine, Diazepam 5mg IV slow (administered over 3 minutes), continuous monitoring of vital signs, serial neurological observation every 30 minutes, and systematic evaluation of therapeutic response.

➢ *Temporal Evolution of Therapeutic Response*

Table 4 Neurological Evolution post-Treatment

Time post-diazepam	Postural evaluation	Muscle contracture	General state
0 minutes	Severe inclination	Evident contracture	Anxious
30 minutes	Notable improvement	Marked reduction	Calmer
60 minutes	Slight inclination	Minimal contracture	Collaborative
120 minutes	Almost normal posture	Residual contracture	Stable
360 minutes	Completely normal posture	No contracture	Medical discharge

➢ *Resources Used in SAR*

Table 5 Resources and costs Associated with SAR management

Resource	Quantity	Time	Observations
General physician	1	6 hours	Evaluation and follow-up
Nurse	1	6 hours	Monitoring
Observation bed	1	6 hours	Emergency box
Diazepam 10mg/2ml	1 ampoule	Single dose	No adverse effects
Basic monitoring	Continuous	6 hours	Vital signs

Total, estimated cost: $45,000 Chilean pesos (approximately 50 USD)

➢ *Post-discharge Follow-up*

Post-discharge Follow-up included 48 hours telephone contact showing asymptomatic patient, 7 days outpatient control with normal neurological examination, and 30 days telephone follow-up confirming no symptom recurrence.

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➢ *Systematic Literature Review*

Table 6 Cases of lateral dystonia due to metoclopramide in adolescents (2014-2024)

Author/Year	Age	Sex	MCP Dose	Onset Time	Treatment	Resolution
Present case	16	F	60mg/48h	48h	Diazepam 5mg IV	6h
García et al. 2023	15	M	40mg/24h	36h	Biperiden 5mg IM	4h
Kim et al. 2022	17	F	80mg/72h	60h	Diazepam 10mg IV	8h
Santos et al. 2021	14	F	30mg/24h	24h	Lorazepam 2mg IV	6h
Chen et al. 2020	16	M	50mg/36h	48h	Diazepam 5mg IV	5h

Review findings revealed total cases identified: 12 cases in patients under 18 years (2014-2024), with a mean age of 15.8 ± 1.2 years. There was a female predominance of 75% (9/12 cases). The mean metoclopramide dose was 52.5 ± 18.3 mg, with a mean onset time of 44.2 ± 14.8 hours and mean resolution time of 5.8 ± 1.9 hours.

IV. DISCUSSION

Case Relevance in SAR Context This retrospective report documents an exceptional case of lateral trunk dystonia induced by metoclopramide in an adolescent, successfully managed in an emergency care and resolution service. The rarity of this clinical presentation, documented in fewer than 15 cases in world literature in the last decade, underscores the importance of this report for the medical community, particularly for professionals working in primary care emergency services.

Pharmacological Analysis of Metoclopramide-Codeine Interaction Although lateral dystonia has traditionally been attributed exclusively to dopaminergic blockade by metoclopramide, our case suggests a possible synergistic effect with codeine. Opioids can indirectly modulate dopaminergic neurotransmission through interactions with the GABAergic system and dopamine release in the nucleus accumbens[9]. This interaction could explain why our patient developed dystonia with a relatively low dose of metoclopramide (60mg in 48 hours) compared to reported cases that required higher doses.

Proposed pathophysiological mechanism involves Metoclopramide causing direct blockade of D2 receptors in basal ganglia, while Codeine provides indirect modulation of dopaminergic system via opioids. The combined effect results in amplified neurotransmitter imbalance. The clinical result is lateral dystonia occurring with individual subtherapeutic doses.

Specific Vulnerability in Adolescents: Neurobiological Evidence Our findings, together with the systematic review, confirm the particular vulnerability of adolescents to extrapyramidal effects from metoclopramide. Analysis of the 12 identified cases reveals consistent patterns: lower doses required compared to adults (52.5mg vs 80-120mg typical in adults), faster onset time (44.2 hours vs 72-96 hours in adults), marked female predominance (75% vs 55% in adults), and faster therapeutic response (5.8 hours vs 12-24 hours in adults).These patterns suggest fundamental neurobiological differences that make adolescents more susceptible but also more responsive to treatment.

Diazepam Efficacy in SAR Context The choice of diazepam as first-line treatment in our SAR was based on multiple practical and pharmacological factors:

Pharmacological advantages include GABAergic action that counteracts dopaminergic imbalance, rapid onset with evident effect in 30 minutes, safety profile well tolerated in adolescents, and route of administration where IV allows precise dosing.

Operational advantages in SAR comprise universal availability with presence in all SARs, cost-effectiveness as a low-cost medication, ease of use not requiring specialized training, and simple monitoring compatible with SAR resources.

➢ *Comparison with Therapeutic Alternatives*

Table 7 Comparison of Therapeutic Options for Medicamentous Dystonia

Medication	Efficacy	SAR Availability	Cost	Adverse Effects	Recommendation
Diazepam IV	High	Universal	Low	Minimal	First line
Biperiden IM	High	Limited	Medium	Moderate	Second line
Lorazepam IV	High	Variable	Medium	Minimal	Alternative
Clonazepam PO	Moderate	Universal	Low	Minimal	Maintenance
Medication	Efficacy	SAR Availability	Cost	Adverse Effects	Recommendation

SAR Resolution Capacity: Implications for Health System Our case demonstrates that SARs can effectively manage complex medicamentous neurological complications, avoiding unnecessary referrals to higher complexity hospital services. This has significant implications:

Patient benefits include rapid resolution without transfers, lower family anxiety, continuity of care, and lower exposure to hospital pathogens.

System benefits comprise decongestion of hospital services, resource optimization, cost reduction (SAR:

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$45,000 vs Hospital: $180,000 estimated), and greater operational efficiency.

SAR Management Protocols: Standardized Proposal Based on our experience and literature review, we propose the following protocol for management of medicamentous dystonia in SAR:

➢ *SAR Protocol for Medicamentous Dystonia:*

Clinical recognition includes directed anamnesis about recent medications, systematic postural evaluation, and exclusion of structural causes.

- Initial evaluation comprises complete vital signs, basic neurological examination, and severity grading.
- Treatment involves suspension of causal agent, Diazepam 5-10mg IV slow, and continuous monitoring.
- Follow-up consists of evaluation every 30 minutes, defined discharge criteria, and programmed outpatient follow-up.

➢ *Study Limitations and Future Directions*

Identified limitations include single case with limited generalization of results, short follow-up of only 30 days, absence of biomarkers as plasma levels were not measured, and lack of validated scales resulting in non-standardized neurological evaluation.

Directions for future research comprise multicenter studies in SAR, development of evaluation scales adapted to emergency settings, pharmacogenetic analysis of susceptibility, and prevention protocols in pediatric population.

Implications for Medical Education in SAR This case underscores the need for continuing medical education programs specific for SAR personnel, including: Recognition of rare medicamentous adverse effects, standardized management protocols for neurological emergencies, clear evidence-based referral criteria, and structured post-discharge follow-up for complex cases.

V. CONCLUSIONS

Lateral trunk dystonia can present in adolescents with standard therapeutic doses of metoclopramide, especially when combined with opioids like codeine, constituting an exceptional but manageable adverse event in emergency care and resolution services.

Emergency care and resolution services (SAR) have the technical capacity and necessary resources to effectively manage this neurological complication, avoiding unnecessary hospital-level referrals and optimizing health system resources.

Intravenous diazepam (5mg) constitutes an effective, safe, and rapid-acting first-line therapeutic option for management of medicamentous dystonia in the SAR context, achieving complete resolution in a mean time of 6 hours.

Adolescents present specific vulnerability to extrapyramidal effects from metoclopramide, requiring lower doses to develop symptoms but showing faster therapeutic response compared to adults.

The SAR experience demonstrates the importance of continuous personnel training in recognition of medicamentous adverse effects and development of standardized management protocols for neurological complications in primary emergency care.

Successful SAR management offers significant advantages in terms of cost-effectiveness, patient accessibility, and health system resource optimization, with an estimated cost 75% lower compared to hospital management.

Development of specific protocols for SAR, continuing medical education programs, and structured follow-up systems for cases of medicamentous adverse effects managed at this level of care is required.

This retrospective experience contributes significantly to evidence about the resolution capacity of emergency care and resolution services and their fundamental role in managing medicamentous neurological complications in pediatric population.

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APENDDIX

A. Annex 1. SAR Neurological Evaluation Protocol for Medicamentous Dystonia

➢ *Initial Evaluation (first 15 Minutes)*

- Directed anamnesis about recent medications
- Complete vital signs
- Postural evaluation in standing and sitting positions
- Basic neurological examination

➢ *Severity Grading*

- Mild: Postural inclination < 15°, partial correction possible
- Moderate: Postural inclination 15-30°, limited correction
- Severe: Postural inclination > 30°, impossibility of correction

➢ *Hospital Referral Criteria*

- Consciousness compromise
- Signs of neurological focalization
- Hemodynamic instability
- Lack of response to initial treatment

B. Annex 2. Post-treatment Follow-up Sheet

Evaluation every 30 minutes during first 6 hours:

Time	Posture	Contracture	Vital Signs	Observations
0 min				
30 min				
60 min				
120 min				
180 min				
360 min				

➢ *Discharge criteria:*

- Normal posture maintained for 2 hours
- Absence of muscle contracture
- Stable vital signs
- Patient and family educated about warning signs

C. Annex 3. Discharge Instructions for Patients and Families

➢ *Suspended medications:*

- Metoclopramide (definitive suspension)
- Codeine (temporary suspension)

➢ *Warning signs (consult immediately):*

- Reappearance of body inclination
- Involuntary movements
- Altered state of consciousness
- Difficulty speaking or swallowing

➢ *Programmed follow-up:*

- Telephone control in 48 hours
- Outpatient medical control in 7 days

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- Avoid metoclopramide for life

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AUTHOR CONTRIBUTIONS Dr. Camilo Vidal Araya: Direct clinical care of the case in SAR, retrospective analysis of records, systematic literature review, manuscript writing, critical analysis of content, and approval of final version.

Dr. María José Yarí: Detailed retrospective analysis of medical records, evaluation of SAR experience, contribution to systematic review, critical review of scientific content, and analysis of implications for practice in emergency care and resolution services.

Dr. Amanda Oraa: Supervision of retrospective analysis, comprehensive critical review of manuscript, analysis of implications for SAR practice, contribution to development of proposed protocols, and approval of final version.

All authors have actively participated in the elaboration of the retrospective report, have critically reviewed the intellectual content, and have approved the final version for publication.

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