

## SCIENTIFIC LETTERS

## Activated charcoal dose in acute drug poisoning

*Dosis de carbón activado en la intoxicación medicamentosa aguda*

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Activated charcoal (AC) has become the most recommended method for digestive decontamination in patients with acute drug poisoning (ADP). However, there is controversy regarding its use. For instance, the dose of AC is not universally accepted and may vary according to the authors: 25 to 100 g in adolescents and adults<sup>1</sup>, 0.5-1 g/Kg in children (with a maximum dose of 50 g)<sup>2</sup>, or a dose of charcoal/dose ratio of 10:1 to 40:1<sup>3,4</sup>. The dosage of AC is not a minor aspect, given the mortality risk of ADPs in our environment<sup>5,6</sup>. The aim of this study was to evaluate the benefit/risk provided to patients with ADP, using a single dose of 25 g of AC.

A retrospective observational study has been conducted for this purpose. Adult patients attended in the emergency department after ADP were included and given a single dose of 25 g of AC as part of their protocol treatment at our centre. This dose of AC falls within the range (25-100 g) established by the European Association of Poisons Centres and Clinical Toxicologists and the American Academy of Clinical Toxicology<sup>1</sup> and, in our hospital, a dose of 25 g is routinely indicated to reduce the frequency of adverse reactions<sup>7</sup>. Intoxicated patients who received, for some reason, two or more doses of 25 g AC were excluded. The sample size was not calculated. The variables taken into account were patient weight, total dose of medication ingested, use of the AC by mouth or gastric tube, side effects of the AC, possible clinical deterioration after giving the AC and final evolution. The result of the qualitative variables is described as absolute frequency and percentage and that of the quantitative variables is expressed as a mean with its standard deviation (SD).

Fifty-five patients were included, of which 41 (74.5%) were women. The mean age was 38 (SD 17) years and the mean weight was 68 (SD 16) kg (range 45 to 120 kg). Benzodiazepines were the most frequently implicated drugs (n = 27) in these ADPs, followed by neuroleptics

(n = 16) and selective serotonin reuptake inhibitors (n = 10). The average intake was 20 (SD 16) pills (range 5 to 70 pills) and the average total dose of drugs ingested was 2,841 (SD 6,045) mg. In 51 (92.7%) cases the AC was administered orally. If we analyze the dose of charcoal administered in relation to the dose of drugs ingested, we find that 76.6% of cases received a dose of charcoal:toxic  $\geq$  10:1 and that in 53.2% of patients this ratio reached  $\geq$  40:1. If we examine the dose of AC in relation to the weight of the patient, we find that in 100% of the cases it was  $<$  1 g/Kg and  $<$  0.5 g/Kg in 92.7% of the poisoned patients. Five (9.1%) patients vomited and one of them, whose airway had not been protected, presented bronchoaspiration.

One patient deteriorated clinically (decreased consciousness) presumably because the dose of AC failed to prevent further absorption of the drug. In this case, the dose of charcoal administered was 0.25 g/Kg, with a ratio of 4.3:1 to the total dose ingested (5,750 mg) of three psychotropic drugs (quetiapine, pregabalin and trazodone). No other factors were found to have contributed to this deterioration, except the aforementioned dose of AC administered in relation to the patient's weight and the dose of drugs ingested. Three (5.1%) patients required admission to the intensive care unit (ICU), but all cases ended up evolving favourably and could be discharged without sequelae.

Although the series presented corresponds to a single center and is reduced by the number of patients, the results suggest that a single dose of 25 g of AC administered to adult patients with the usual ADP in our environment, may be insufficient in some cases. To reduce the risk of clinical deterioration in patients with ADP, the minimum dose of charcoal to be administered should be  $\geq$  0.5 g/Kg and should also reach a ratio of  $\geq$

10:1 in relation to the toxic dose ingested by the patient without exceeding, as an initial dose, 50 g in adolescents and adults or 1 g/Kg in children for better digestive tolerance<sup>8</sup>. As with any other drug, there is a risk of adverse reactions and its indications and contraindications must always be respected, as well as the correct technique for its administration<sup>9</sup>.

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## Prevalence of out-of-hospital nursing diagnosis for patients with chronic conditions: improving our understanding of complexity

### *Prevalencia de diagnósticos enfermeros en pacientes crónicos en emergencias extrahospitalarias: mejorando la comprensión de la complejidad*

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Out-of-hospital emergency care has undergone a major transformation in the last 30 years<sup>1</sup> as a result of ageing populations and complex chronicity<sup>2</sup>. Aspects such as comorbidity and polymedication can almost reduce by half the adherence of these patients to the health system<sup>2</sup>, which results in negative outcomes such as increased use of hospital services or excess mortality<sup>3</sup>.

Educational interventions provided by nurses and pharmacists have shown positive impact on reducing morbidity<sup>4</sup>. The detection in emergencies of the loss of autonomy of chronic patients is associated with safety risks and allows preventive actions to be activated<sup>5</sup>. Therefore, the approach to variables linked to care needs is very relevant in this type of population. Nursing diagnoses have shown to be good at detecting the level of complexity of the patient's situation in any setting, including at home<sup>6</sup>. In the Public Health Emergency Company (EPES in Spanish) of Andalusia, the implementation of nursing diagnoses has existed for over a decade<sup>1,7</sup> and has been incorporated into the Digital Medical Record<sup>8</sup>. However, research on nursing diagnoses and results of care and clinical characteristics of patients in emergencies is limited. The objective of this study was to identify the most prevalent nursing diagnoses in the chronic population

attended by the 061 and to know their association with the care results and their socio-health characteristics.

An observational, cross-sectional, analytical study was conducted with retrospective data collection on emergency medical records during the years 2013 to 2017. The random sample required for an alpha value of 0.05 and an accuracy of 6% was 537 patients. Sex, age, patient's level of autonomy, knowledge of and compliance with the therapeutic regime, existence of caregiver, assistive devices for basic activities of daily living, polymedication and outcome of care (transfer to health centre) were assessed. Descriptive statistics were obtained by means of exploratory analysis, bivariate analysis (chi-square, t for Student, U for Mann-Whitney) and multivariate logistic regression. The study was authorized by the Provincial Research Ethics Committee of Malaga (0587-N-17).

A total of 537 chronic patients were included, 52.3% of whom were women with a mean age of 70.8 years (median 73, IQI 18). The main history detected was: diabetes (20.9%), heart disease (30.5%), stroke (23.2%) and chronic obstructive pulmonary disease (COPD) (15%). A total of 29.6% of the sample presented some type of total or partial limitation to the performance of daily living activities. Of these, 69.8% did not have a caregiver or did not provide sufficient care. Some 78.0% of the patients attended were polymedicated, with an

average of 6.73 (SD 2.36) drugs, 72.8% declaring adherence to treatment and 35.2% lacking an adequate lifestyle. In addition, 78.9% claimed to know the prescribed therapeutic regimen. With regard to the outcome of the care, 60.3% of the patients required transfer to hospital.

Ten nursing diagnoses accounted for 75% of cases, corresponding to the domains of safety-protection (n = 252; 38.3%) and activity/rest (n = 179; 27.2%). The most prevalent diagnosis was the risk of falling (33%) (Table 1).

Advancing age was significantly associated with the most prevalent diagnoses, except for ineffective breathing pattern, impaired verbal communication and ineffective healthcare administration. Limited functionality was associated with the diagnoses of risk of falls (p < 0.001), self-care deficit (p < 0.001), impaired ambulation (p = 0.003) and chronic pain (p = 0.008). Adherence showed significant association with the diagnosis of ineffective healthcare management (p = 0.031). Polymedicated patients had more frequent chronic pain (p = 0.034) and self-care deficit (p < 0.001). Finally, patients with risk of falls (p = 0.004), risk of unstable blood glucose level (p < 0.001) and ineffective respiratory pattern (p = 0.017) required hospital transfer, while those with ineffective health management had

**Table 1.** Nursing diagnoses identified among the population with chronic disease in out-of-hospital emergencies

	n (%)
Risk of falling	
Risk of unstable blood glucose level	
Self-care deficit: bathing	
Impaired physical mobility	41 (5.6)
Anxiety	
Deterioration of ambulation	31 (4.2)
Ineffective health management	23 (3.1)
Chronic pain	22 (3.0)
Ineffective breathing pattern	17 (2.3)
Impaired verbal communication	
Functional urinary incontinence	13 (1.8)
Acute pain	
Fear	13 (1.8)
Deterioration of home maintenance	12 (1.6)
Risk of deterioration of the skin integrity	11 (1.5)
Insomnia	11 (1.5)
Emergency urinary incontinence	7 (1.0)
Activity Intolerance	7 (1.0)
Stress urinary incontinence	6 (0.8)
Social isolation	6 (0.8)
Non-compliance	6 (0.8)
Others	72 (10.0)

assistance that was resolved on site ( $p = 0.038$ ).

Multivariate analysis showed how loss of function and transfer to hospital were the most commonly associated predictors of fall risk diagnosis. In the diagnosis of risk of unstable blood glucose, transfer to hospital was inversely associated and the presence of cardiovascular disease showed a strong association with this nursing diagnosis. Finally, the deficit of self-care for bathing was associated with male patients, polymedicated, with compromised functionality (Table 2).

Our results show how the assessment and judgment of out-of-hospital emergency nurses prioritizes patient safety in a popu-

**Table 2.** Multivariate models of factors associated with the presence of the three most prevalent nursing diagnoses

	Beta	p	OR (95% CI)
<b>Risk of falling</b>			
Age	0.06	< 0.001	1.06 (1.04-1.08)
Loss of functionality	1.28	< 0.001	3.60 (2.29-5.66)
Transfer to the hospital	0.80	< 0.001	2.24 (1.44-3.47)
Correct classification: 72.9%; Hosmer-Lemeshow $p = 0.186$ ; $R^2$ Nagelkerke: 0.29.			
<b>Risk of unstable blood glucose level</b>			
Age	-0.03	0.005	0.97 (0.95-0.99)
Transfer to the hospital	-2.11	< 0.001	0.12 (0.07-0.22)
Cardiovascular disease	3.57	0.001	35.67 (4.76-267.55)
Respiratory disease	2.17	0.085	8.78 (0.74-103.93)
Correct classification: 88.1%; Hosmer-Lemeshow: 0.496; $R^2$ Nagelkerke: 0.32.			
<b>Self-care deficit: bathing</b>			
Male	0.74	0.017	2.09 (1.14-3.84)
Polypharmacy	2.36	0.022	10.59 (1.41-79.52)
Loss of functionality	1.98	0.000	7.22 (3.87-13.48)
Correct classification: 88.4%; Hosmer-Lemeshow: 0.784; $R^2$ Nagelkerke: 0.24.			

lation that is inevitably more vulnerable because of their chronic condition. It is remarkable how some diagnoses are associated with hospital transfer and it would be necessary to carry out longitudinal studies to determine their influence on the prognosis of events such as mortality or hospital stay, as has already been shown in hospital studies<sup>9</sup>, especially considering how states of fragility prior to admission are associated with increased mortality in critical patients<sup>10</sup>.

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## Cardiovascular consequences of non-recreational use of shabu methamphetamine: 9 cases of dilated cardiomyopathy

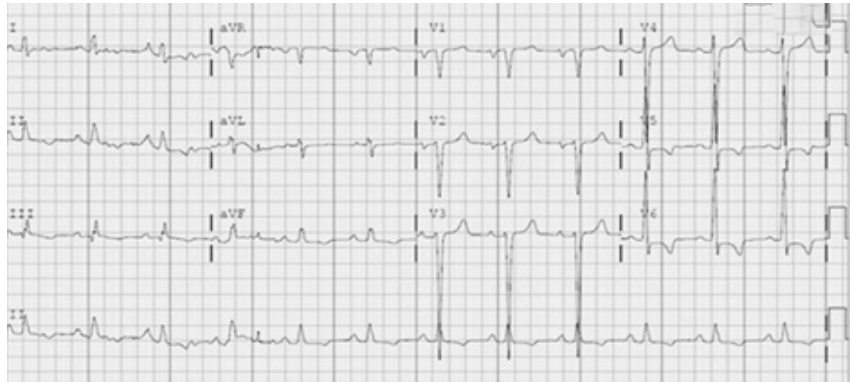
### *Consecuencias cardiovasculares del consumo no-recreativo de shabú (clorhidrato de metanfetamina): nueve casos de miocardiopatía dilatada*

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Amphetamine-type stimulants, methamphetamine and MDMA are the second most abused illicit drug in the world<sup>1</sup>, and their abuse is increasing in Europe<sup>2</sup>. Shabu is the name given to methamphetamine hydrochloride in South-East Asia. It is usually found in the form of a crystalline powder to be consumed through smoking (Figure 1). In these communities, its use is often non-recreational<sup>3</sup> in order to withstand long working hours. Cardiovascular complications related to its abuse range from arterial hypertension, acute aortic and coronary syndrome, pulmonary hypertension or malignant arrhythmias, to other forms of heart disease such as dilated, stress and possibly hypertrophic cardiomyopathy<sup>4-7</sup>.

The aim of this paper is to describe the clinical characteristics of patients admitted to our center with the final diagnosis of methamphetamine-associated cardiomyopathy (MAC).

This is a prospective study from January 2018 to July 2019, which included nine patients who were admitted for heart failure (HF) and had a final diagnosis of MAC due to methamphetamine use and with exclusion of other aetiologies. Methamphetamine use was detected by medical history, toxicology screening, and confirmatory urine methods using liquid chromatography coupled with mass spectrometry (Agilent®) during hospital admission. Clinical, analytical and complementary examination variables were collected during admission, as well as evolutionary variables. Continuous variables are presented as mean (standard deviation - SD) or median (25-75 percentile) and categorical



**Figure 2.** Electrocardiogram with signs of ventricular overload and prolonged QTc.

variables as percentages. The statistical analysis was performed using the R version 3.4.2 program. The study was designed according to the ethical principles established in the Declaration of Helsinki.

The average age was 46 (SD 8) years. Six of the participants were male and all except one were from the Philippines. The clinical characteristics and findings of the complementary explorations are shown in Table 1. The reason for consultation was HF and dilated cardiomyopathy was detected in all cases. One of them evolved into cardiogenic shock and another presented sudden death due to polymorphic ventricular tachycardia. Six patients denied methamphetamine use and 5 cases had previously been diagnosed with idiopathic dilated cardiomyopathy.

The most common electrocardiographic manifestations were sinus tachycardia and long QTc [median 497 (434-511) msec] in 6 cases with signs of ventricular stress in 7 patients (Figure 2). The mean concentrations of NT-proBNP and ultra-sensitive troponin T were 3.908 (SD 1.206 pg/ml) and 25 (SD 4 ng/L), respectively. The echocardiogram showed a left ventricular systolic dysfunction in all patients (mean left ventricular ejection fraction (LVEF) 25% (SD 8), 6 of them with dilated ventricle, with telediastole diameter 62 mm (SD 5), Figure 3) without ventricular hypertrophy. Seven patients also had right ventricular dysfunction (15 mm TAPSE). Coronary angiogra-

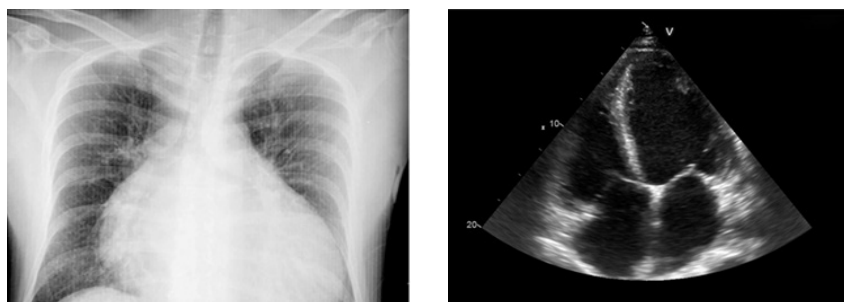
phy ruled out significant coronary disease in all of them. Cardiac MRI was performed on 4 patients, 2 of whom showed late gadolinium capture in the interventricular septum. Although all patients were discharged with chronic treatment for ventricular dysfunction, only 2 abandoned drug use and carried out adequate follow-up, achieving partial recovery from LVEF (Table 1).

To our knowledge, this is the longest MAC series published in Spain. Different forms of cardiomyopathy associated with drug use have been described, but the etiopathogenesis is still unclear<sup>4-8</sup>. Various factors such as male sex, concomitant use of other drugs, racial and genetic factors may contribute to its development<sup>4-8</sup>. The pattern and mode of consumption have also been associated with different types of myocardial damage<sup>8</sup>: while intravenous consumption is more commonly associated with stress cardiomyopathy, especially in women; chronic consumption is mostly with dilated forms and less frequently with hypertrophic forms. In our series, all patients are affected by dilated cardiomyopathy. This form of presentation, when accompanied by HF and ventricular dilatation, is associated with a worse prognosis<sup>8</sup>.

The presence of long QTc on the electrocardiogram can be explained by the blockage of voltage-dependent potassium channels and may induce polymorphic ventricular tachycardia and ventricular fibrillation as occurred



**Figure 1.** Shabu and glass pipe.



**Figure 3.** Left: chest x-ray with cardiomegaly. Right: Echocardiogram compatible with dilated cardiomyopathy.

in one of our patients. The prevalence of long QT in methamphetamine users<sup>9</sup> is higher than expected according to animal experiments, although some studies support a probable genetic susceptibility in the development of “acquired” long QT syndromes<sup>10</sup>. In addition, intramyocardial fibrosis, detected by resonance imaging in two of our patients, has been associated with increased risk of arrhythmias and sudden death in other types of cardiomyopathies.

Proper diagnosis of MAC is crucial, and is probably underestimated. In our series, more than half of the patients had previously been diagnosed with idiopathic dilated cardiomyo-

pathy. As reflected in a Spanish series looking at ED poisoning, methamphetamine use is more prevalent in the foreign population, with a notable proportion of patients of Filipino origin<sup>2</sup>. In addition, probably for cultural reasons, most active users denied methamphetamine use, thus requiring high clinical suspicion in the differential diagnosis of non-ischaemic cardiomyopathies and the performance of confirmatory tests<sup>2</sup>. Abandonment of the drug is essential, since recoveries from LVEF have been described with maintained abstinence<sup>11</sup>. In our case, correct follow-up at discharge was only achieved in 2 patients (only one of Philippine ori-

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In conclusion, consumption of shabu is associated with dilated cardiomyopathy with ventricular dysfunction. This is an often under-diagnosed condition, so high clinical suspicion is essential, especially in population groups with a higher prevalence of consumption.

**Table 1.** Characteristics of nine patients with methamphetamine-associated cardiomyopathy

	Sex, age, nationality	Pattern/route use of other drugs	Cardiovascular Risk factors	Clinical onset	ECG	QTc	Echocardiogram	CMR	Follow-up
1	M, 49 Philippines	Chronic abuse Smoked	Smoking High blood pressure	Biventricular HF	HF, LVG	415 ms	LVTD 53 mm LVEF 27%; DVD	–	Erratic follow-up no echocardiogram
2	M, 39 Noruega	Chronic abuse Oral	Smoking	Left HF (cardiogenic shock)	ST, LVG, HBUAH	511 ms	LVTD 75mm LVEF 15%, DVD	–	Adequate monitoring, abstinent, LVTD 63 mm, LVEF 38%
3	F, 43 Philippines	Chronic abuse Smoked	Smoking High blood pressure	IC izquierda (TVP)	ST, RBBB	625 ms	LVTD 40 mm LVEF 45%, DVD	LGE IVS	Erratic follow-up. Died 3 months after discharge (cause not clarified)
4	F, 40 Philippines	Chronic abuse Smoked	Smoking	Biventricular HF	ST, LVG	500 ms	LVTD 48 mm LVEF 30%, DVD	LGE IVS	Erratic follow-up. no echocardiogram
5	M, 56 Philippines	Chronic abuse Smoked Ex-Enolism	Smoking	Biventricular HF	ST, LVG	497 ms	LVTD 60 mm LVEF 20%, DVD	–	Erratic follow-up, LVEF 24%
6	M, 45 Philippines	Chronic abuse Smoked Moderate enolism	Smoking High blood pressure	Biventricular HF	ST, LVG	454 ms	LVTD 67 mm LVEF 21%	No LGE	Erratic follow-up. Readmission for HF 11 months after discharge
7	M, 33 Philippines	Chronic abuse Smoked Ex-enolism	Smoking High blood pressure	Biventricular HF	ST, LVG	420 ms	LVTD 62 mm LVEF 39%	No LGE	Correct follow-up, abstinent, LVTD 40 mm, LVEF 50%
8	M, 51 Philippines	Former chronic abuse Smoked	Smoking High blood pressure Diabetes mellitus	Biventricular HF	SR	430 ms	LVTD 62 mm LVEF 18%	–	Erratic follow-up, no echocardiogram
9	F, 54 Philippines	Chronic abuse Smoked	Smoking Diabetes mellitus	Left HF	SR, LVG	434 ms	LVTD 63 mm LVEF 29%	–	One visit, no echocardiogram

M: male; F: female; RBBB: right bundle branch block; LVG: left ventricular growth; LVTD: left ventricular telediastolic diameter; RVD: right ventricular dysfunction; ECG: electrocardiogram; AF: atrial fibrillation; LVEF: left ventricular ejection fraction; HBUAH: His bundle upper-anterior hemiblock; HF: heart failure; SR: sinus rhythm; QTc: corrected QT; CMR: cardiac MRI; LGE: late gadolinium enhancement; IVS: interventricular septum; ST: sinus tachycardia; PVT: polymorphous ventricular tachycardia.

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## Nontraumatic atlantoaxial subluxation: Grisel syndrome

### *Subluxación atloaxoidea no traumática: síndrome de Grisel*

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Grisel's syndrome (GS) is a non-traumatic atlantoaxial subluxation secondary to head and neck infections<sup>1</sup> or surgery in the ear, nose, and throat (ENT) area<sup>2</sup>. It is classified into four grades based on cervical computed tomography (CT) findings according to the Fielding and Hawkins classification<sup>3</sup> of atlantoaxial subluxation. Currently, publications on this subject only report isolated cases<sup>4,5</sup>.

This is a series of 19 patients with GS between 2010 and 2017 in a tertiary pediatric hospital, with the purpose of characterizing the clinical presentation and its management.

In our series, GS appeared more frequently in girls, 14/19 (73.7%), in school age [median age of 6 years (IQ 4.4-9.2)] and in healthy population, 18/19 (94.7%). Regarding the clinic of presentation, the median onset of symptoms was 4 days (IQ 3-9). Clinical findings (Table 1) included torticollis and cervical pain. None presented a neurological deficit. All had a previous ENT infection.



**Figure 1.** A) CT image with 7 mm C1-C2 offset (Grisel grade III). B) Continuous cervical traction in a patient with Grisel grade III.

With regard to complementary tests, acute phase reactants (PCR and PCT) and leukocyte or neutrophil counts were found to be elevated in six patients (31.6%). Thirteen patients (68.8%) underwent lateral neck radiography, which in only two cases (10.5%) showed findings that supported the diagnosis. Cervical CT was the test that confirmed the diagnosis in all patients. Seven cases

were classified as grade I, three as grade II and nine as grade III (Figure 1).

All patients were admitted and the average stay was 12.15 days (SD 8.06). All received analgesia, and all but one had cervical immobilization with a rigid collar. Continuous 24-hour cervical traction (Figure 1) with bed rest was implemented in eleven patients (57%) and was maintained

**Table 1.** Symptoms at diagnosis according to frequency of occurrence

	Frequency (%)	Number of patients who presented it
Recent history of ENT infection	100	19
Torticollis	100	19
Neck pain	100	19
Spasm of the sternocleidomastoid	47.3	9
Fever $\geq$ 37.5°C	36.8	7
Odinophagy	36.8	7
Decrease in arc of motion greater than 50%.	21	4
Other neurological symptoms	0	0

for an average of 9.3 days (SD 2.07), all with grade II and III involvement. Only one patient (5.3%), with grade III involvement, required arthrodesis surgery because he did not improve with cervical traction.

Although in four patients there was recurrence of symptoms in the three months following admission, at one year's follow-up all patients were asymptomatic without sequelae.

In relation to the data in our series, we can conclude that in school-aged patients, especially women, who consult for cervical pain, tortico-

llis with a history of ENT infection, fever, spasm of the sternocleidomastoid and limitation of arch of cervical movement, GS should be suspected. In these patients, the indicated test to confirm or rule out this pathology is the neck CT scan. Blood analysis and lateral neck radiography should not be performed due to its low yield and the unspecificity of the findings.

The main treatment is analgesia and immobilization with a rigid cervical collar in patients with grade I involvement and 24-hour cervical

traction in grades II and III. Surgery is not necessary in most cases, with arthrodesis being reserved for grade III patients with torpid evolution or grade IV.

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