

Patient in cardiac arrest secondary to hypothermia and myxedema coma

Paciente con paro cardiorrespiratorio secundario a hipotermia con coma mixedematoso

Severe forms of hypothyroidism were described in 1879 at St Thomas' Hospital by Williams Ord following 12 cases, of which 2 patients presented in a state of coma. Vincent Summer was the first to coin the term myxedema coma in 1953.¹ With an estimated prevalence of 0.22 cases per million inhabitants per year, on average worldwide with a female to male preponderance of 8:1 in patients with a clinical picture that is characterized by various alterations in the level of attention and content of consciousness, potentially presenting in 30% of cases in coma.¹ Predisposing factors include lack of adherence to treatment and low temperature seasons. The main trigger is infectious conditions in 52% of cases. Mortality in patients with timely diagnosis and treatment is 30%, although it may be as high as 60% in some case reports and series.²

A 78-year-old woman, obese (Body Mass Index, 32), found with loss of consciousness at her home, with no precise information on the duration of the condition. Upon admission, she presented without response to painful stimuli, with a

capillary glucose of 121 mg/dL, intermediate bilateral mydriatic reactive pupils, central pulse present, heart rate of 50 beats per minute, systolic blood pressure 60 mmHg, respiratory rate of 6 breaths per minute, distal cyanosis, and livedo reticularis in the lower limbs. During initial resuscitation and emergency ancillary studies, she complicated with a cardiorespiratory arrest, requiring orotracheal intubation with detection of a non-shockable rhythm, and a total of 5 doses of adrenaline were administered. In the peri-arrest ultrasound assessment, peri-arrest images of infiltrate with air bronchogram in the right pulmonary base were detected, without pleural effusion, without signs of right heart chamber overload, without pericardial effusion or free abdominal fluid. Spontaneous return of circulation was noted after 15 minutes of resuscitation, and in the post-arrest care, a core esophageal temperature of 28°C was diagnosed, so internal and external rewarming measures were performed at central anatomical points with warmed solutions and the use of thermal blankets with a higher target temperature until a temperature of 32°C was reached. The patient remained on mechanical ventilation, requiring noradrenaline and dobutamine. Troponin T was < 40 ng/L. A lumbar puncture was performed, obtaining clear fluid, glucose 88 mg/dL, protein 0.07 g/dL, leukocytes 1/mm³. The condition was in-

terpreted as a septic shock with a SOFA (Sequential Organ Failure Assessment) score of 10 points and a probable pulmonary focus. In the following 24 hours, she developed acute renal failure requiring hemodialysis. During day 2, due to suspicion of myxedema coma due to persistent bradycardia and refractory shock, the family history of non-adherent hypothyroidism was obtained, so thyroid hormone levels were requested, obtaining the following values: TSH 123 mIU/L, free T4 0.03 ng/mL. Levothyroxine tablets via nasogastric tube were started 36 hours after admission with a loading dose of 300 mcg and the same maintenance dose, in addition to IV corticosteroids hydrocortisone 300 mg/day.

On day 12 of admission, mechanical ventilation was successfully weaned, and she also showed good neurological recovery, being transferred to the general ward, with TSH levels of 31 mIU/L, T4 0.59 ng/mL, and T3 0.36 ng/mL.

Based on the chronology of the case and its evolution during the initial management, added to the complications, the patient's clinical picture clearly presents different challenges for the treating physician that are intended to highlight the importance of critical patient management in the emergency department.

Firstly, to consider that poor prognostic factors are identified, which Rizzo *et al.* in 2017 clearly detail as the presence of severe hypothermia < 32°C, which constitutes a condition of poor

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evolution, and the presence of hyponatremia as a mortality multiplier factor by 60 times.

Another complication observed in 5-10% of patients is adrenal insufficiency, as well as the presence of cardiogenic shock, with an increased risk of arrhythmia.¹

Regarding characteristic clinical findings, it is noted in the literature that the decrease in basal metabolism due to hormonal suppression conditions a state of low cardiac and metabolic output, which explains the presence of bradycardia, bradypnea, and hypothermia in different stages, which are clinical characteristics to gather at the time of suspected diagnosis.^{2,3} These situations represent causes of cardiorespiratory arrest, and in this sense, the degree of documented severe hypothermia and respiratory depression due to the underlying condition, added to the altered level of consciousness, were considered the responsible causes of cardiac arrest in our patient. Faced with these complications, the state of severe hypothermia requires prolonging resuscitation times, as documented in several cases, for example with resuscitation times of 8 hours and 40 minutes with good neurological response at 6 months.^{4,5}

Regarding diagnosis, the determination of thyroid hormones contributes to a definitive diagnosis, and several cases relate their values, such as TSH levels > 100 mIU/L, with a worse prognosis.⁶

Popoveniuc *et al.*, after retrospectively analyzing in two centers in Washington over 20 years the medical records of patients diagnosed with myxedema coma, obtained 22 patients and managed to develop diagnostic criteria by logistic regression according to predictive potential and develop a diagnostic scale that shows an area under the ROC curve of 0.88 (95% IC, 0.65-1.00). Furthermore, with scores > 60, they had a sensitivity rate of 100% and a specificity rate of 85% to diagnose and treat these patients early and promptly (Table 1).⁷

Regarding treatment, guidelines and reviews highlight 3 pillars: adrenal treatment, thyroid hormone replace-

Table 1. Diagnostic scale for myxedema coma*

Cardiovascular dysfunction		Temperature dysfunction (°C)	
Absent	0 pts	> 35 °C	0 pts
Heart rate 50–59	10 pts	32-35 °C	10 pts
Heart rate 40–49	20 pts	< 32 °C	20 pts
Heart rate < 40	30 pts	GI symptoms	
Other ECG changes**	10 pts	Anorexia / Abdominal pain	5 pts
Pleural/pericardial effusion	10 pts	Constipation	
Pulmonary edema	15 pts	Reduced intestinal motility	15 pts
Cardiomegaly	15 pts	Paralytic ileus	20 pts
Hypotension	20 pts	Metabolic disturbances	
CNS Involvement		Hyponatremia	10 pts
Absent	0 pts	Hypoglycemia	10 pts
Drowsiness / Lethargy	10 pts	Hypoxemia	10 pts
Confusion (Obnubilation)	15 pts	Hypercapnia	10 pts
Stupor	20 pts	Reduced glomerular filtration	10 pts
Coma / Seizures	30 pts	Precipitating factor	
		Absent	0 pts
		Present	10 pts

*A score > 60 points indicates a probable diagnosis of myxedema coma, a score between 29-59 points is associated with a risk of developing the disease, and a score < 30 points is improbable.

**ECG other changes: prolonged or low voltage QT; bundle branch block or non-specific ST segment or T wave changes or heart blocks.

Adapted from Popoveniuc *et al.* Endocrine Practice;2014⁷.

ment therapy, and supportive measures. In this sense, the ATA (American Thyroid Association) in its 2016 management guideline recommends treatment with dexamethasone 2-4 mg every 12 hours, as it does not interfere with the cortico- adrenal axis, and as an alternative, hydrocortisone 50-100 mg every 8 hours, a loading dose of levothyroxine of 200-400 mcg per day, calculated at 4 mcg/kg/day, and a maintenance dose of 75% of the loading dose, calculated at 1.6 mcg/kg/day. Due to its more active function, triiodothyronine (T3) is recommended at a loading dose of 5-20 mcg and a maintenance dose of 2.5-10 mcg every 8 hours to avoid complications such as cardiogenic shock, hypoxemia, or coma.⁸ Similarly, in patients with severe presentation and poor prognosis, other additional therapeutic measures, not available in Argentina, are described in the literature, such as ADH inhibitors, whose best-known commercial presentations in the United States are conivaptan and tolvaptan.⁸

Given the above and the lack of availability of IV levothyroxine in the retrospective observational study by Rajendran *et al.* 2020 (14 patients), 2 of whom presented in coma, treatment with oral levothyroxine at doses of 300-500 mcg every other 48 hours

until day 12 was administered, with only 1 patient death among those studied.⁹

We want to highlight the importance of suspecting this entity in the initial emergency care, despite its low prevalence, and also keep diagnostic scores in mind, to achieve timely treatment in the initial management that contributed to modifying the prognosis.

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