

Case Report

Anaphylactic Reaction in a Patient with Asthma. Treatment with Non-Invasive Mechanical Ventilation. About A Case

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• Anaphylaxis; Asthma; Critical care; Noninvasive ventilation

Abstract

A 34-year-old woman attending the Emergency Department of the Gregorio Marañón University General Hospital (3rd Level Hospital in Madrid-Spain). Anaphylactic reaction in a patient with asthma. It was attributed to an Adverse Drug Reaction (ADR) related to the administration of Dipyrone (Buscopan Compositum) given intravenously.

The treatment given in the shock room at 3.20 pm was: 200 mg of hydrocortisone, 40 mg of methylprednisolone and 1.5 g of magnesium sulphate intravenously; 0.3 mg of subcutaneous epinephrine, removal of arterial sample and aerosol therapy of ipratropium bromide + salbutamol + budesonide with Noninvasive Mechanical Ventilation (NIMV).

In the respiratory level, the patient presented a great evolution. The NIMV was maintained for 150 minutes and could be removed after a determination of the arterial sample with normal values.

The literature review shows, the use of NIMV for the resolution of an acute asthmatic process is controversial and more rigorous methodological studies are needed to determine its degree of recommendation. In the case of an asthmatic woman and possible pregnancy, with an anaphylactic reaction due to medication administration, the administration of airway therapy with NIMV has been favorable. Nursing care favors adaptation and tolerance to NIMV.

ABBREVIATIONS

NIMV: Noninvasive Mechanical Ventilation; ADR: Adverse Drug Reaction; HAD: High Dependence Area; ICU: Critical Care Unit

CASE PRESENTATION

A 34-year-old woman attending the Emergency Department of the Gregorio Marañón University General Hospital (3rd Level Hospital in Madrid-Spain). She arrives at 1.16 pm, being classified at 1.34 pm by nursing triage (supported in the computer system Manchester) as “yellow priority level”, with “abdominal pain” as flowchart and “moderate pain” as discriminator. The patient reports allergies to NSAIDs and Antihistamines, she also refers a possible pregnancy related to the abdominal pain (Table 1: I).

She is assessed by medical staff at 2.40 pm, who request blood and urine samples and decide pharmacological treatment of “Buscopan Compositum” and “Metoclopramide” intravenously. Being administered the treatment, at 3.10 pm highlights its symptomatic change with tachypnea and use of accessory muscles (Table 1: II).

That worsening is attributed to a possible Adverse Drug Reaction (ADR) related to the administration of Dipyrone (Buscopan Compositum) given intravenously. The patient is quickly moved to the Shock Room, where is assessed and given new treatment at 3.20 pm (Table 1: III).

At 3:30 pm, the patient is transferred to the observation area (Table 1: IV). 35 min after (4.05 pm), she presents a new symptomatic change, getting worse again (Table 1: V).

Aerosol therapy is administered again with the same drugs. The decision is to move the patient to the High Dependence Area (HDA) - intermedial care area - with the analytical results available in the Table 2 as Arterial Blood Sample 1.

The patient arrived HDA at 4.15 pm with committed hemodynamic data (Table 1: VI). Arterial blood sample is removed (results in Table 1; GASOMETRY 1) - and Non Invasive Mechanical Ventilation (NIMV) started. Afterwards, she becomes well adapted to Bi-level Positive Airway Pressure (BiPAP) therapy, with hemodynamic stability and symptomatic improvement (Table 1: VII).

Related to the possible pregnancy, abdominal echo was

Table 1: Patient's evolution.

When	Relevant facts	Signs and symptoms	Vital signs	Treatment
I.- Arriving at the ER	"Yellow priority level" Allergies to NSAIDs and Antihistamines Possible pregnancy	Abdominal pain 4/10	HR: 84 beat/min BP:120/47 mmHg	"BuscopanCompositum" IV "Metoclopramide" IV
II.- 30 min after Treatment	Worsening Possible Adverse Drug Reaction (ADR)	Tachypnea Use of accessory breathing muscles	HR: 129 beat/min BP: 180/90 mmHg SaO2: 88%	
III.- Moved to the Shock Room			Normal oropharynx Uvula of normal size and position Conscious, oriented in the 3 spheres Regular general conditions Tachypnea at 30 bpm Heart auscultation: rhythmic and no murmurs Pulmonary auscultation: discrete generalized hypoventilation, without added breath sounds Abdomen: soft, depressible, painful to palpation deep in left iliac region, with positive rebound	200 mg of hydrocortisone IV 40 mg of methylprednisolone IV 1.5 g of magnesium sulphate IV 0.3 mg of subcutaneous epinephrine Aerosoltherapy of ipratropium bromide + salbutamol + budesonide
IV.- Moved to the observation area			HR: 130 beat/min BP: 143/72 mmHg SaO2: 93%	Venturi type ventilation at 35% at 6lpm.
V.- 35 min after	Worsening	Dyspnea and tachypnea	HR: 119 beat/min BP: 94/55 mmHg SaO2: 93% 30 Breath/min	Aerosoltherapy of ipratropium bromide + salbutamol + budesonide
VI.- Moved to the HDA		Respiratory work	HR: 117 beat/min BP: 96/61 mmHg SaO2: 89% 28 Breath/min T ^a = 36,2°C	100% FiO2 on ventilatory support
VII.-Reciveing NIMV		No respiratory work	HR: 102 beat/min BP: 132/87 mmHg SaO2: 96% 17 Breath/min	FiO2 = 0.35 IPAP/EPAP = 16/6 cmH2O 18 breath/min 3 ramp 1.00 respiratory time

Table 2: Analytical blood evolution: Gasometry.

Gasometry Arterial Blood Samples: Evolution		
Sample 1 ARRIVING AT E.R. (FiO2 35%)	Sample 2 ARRIVING AT HDA STARTING NIMV	Sample 3 AFTER 150min NIMV NIMV WITHDRAW
pH 7.39 pCO2 33 pO2 82 SaO2 96%. Bicarbonate 20 Lactate 0,8. Haemogram: Hb 13.5; Hematocrit 40.9%; MCV 82.3; MCH 27.1; Platelets 343000. Leukocytes 14300 (56.8% neutrophils; 11.4% eosinophils). Coagulation: TP 10,1. INR 0,85. TTPA 33,3. Fibrinógeno 480. Biochemistry: GGT 12; Glucose 64; FA 55; CK 104; Creatinine 0.66; Urea 19; Protein 7.5; Na 138; K 4.1; RCP 0.6; Beta-hCG: 762.7. Urine: Normal. Analytical pregnancy test positive. Possible 3 weeks pregnancy	pH 7.39 pCO2 32 pO2 82 SaO2 96% Bicarbonate 20 Lactate 0.8 Sodium 138 Potassium 3.4 Calcium free 1.10.	pH 7.44 pCO2 28 pO2 93 SaO2 98% Bicarbonate 19 Lactate 0.8 Sodium 134 Potassium 3.1 Calcium free 1.10

performed, without neither gestational sac being observed, nor other abnormalities at abdominal level. We discuss the case with Gynecologist and decided to do an ecoTV that discarded gynecological complications, but we did not visualize gestational sac. It was therefore recommended to repeat ultrasonography within 1 week to confirm the presence of pregnancy and to discard ectopic localization.

At respiratory level the patient presented a great evolution. NIMV was maintained for 150 minutes and could be withdrawn after an arterial sample determination - see Table Arterial Blood Sample 3- and good clinical evolution. Subsequently with O₂ in nasal cannula at 2lpm, the patient was eupneic resting and with good general situation.

Given the good clinical situation presented by the patient, she decided to go home 18 hours after having been admitted to the Emergency Department. Cut-off in corticosteroids pattern was prescribed to avoid rebound of allergic reaction (Deflazacort 30mg, 1 tablet daily for 2 days, 1/2 tablet daily for 2 days, and suspend); as well as Paracetamol if pain (1gr/8 hours). It would attend Health Center for gynecological ultrasound in 1 week.

DISCUSSION

The previously analyzed case was diagnosed of asthmatic exacerbation in the context of an Adverse Drug Reaction to NSAIDs (Dipyrone of Buscopan Compositum) given intravenously. The first acute episode was treated in the shock room of the ER, without initiating NIMV. At 55 minutes after presenting a new episode of asthmatic crisis, it was decided to transfer to the HAD [1-4] where treatment intensified initiating ventilatory support in BiPAP mode, obtaining good clinical results. The delay in providing adequate treatment with mechanical ventilatory support decreased the responsiveness, and more considering the vulnerability of the exposed case [5,6]; so, the usual therapy with bronchodilators could not be considered [7].

The use of Non-Invasive Mechanical Ventilation (NIMV) outside critical care units is becoming more wide spread. In a study carried out in 2009 in that same unit with an n = 209 cases, doctors in the emergency department did not request consultation in the ICU to 175 (83%) due to the medical condition believed to be improved in the Emergency service. Only ten of these 175 were later admitted to the ICU [3].

In 2009 Chiumello et al. [8], published a review where it presents and discusses the data currently available regarding the success of NIMV outside the intensive care unit, optimal ventilation strategy and possible solutions to problems. Can NIV present a problem for the nursing community when it is applied outside ICUs? In the unit where ventilator therapy is started, HDA has a nurse-patient ratio of 1/5. Comparing it with the normal ratio in a unit of critics that is usually 1 nurse / 2 patients, we can think of the high burden of care and the economic saving in human resources that it entails [2-4].

Nursing should know the criteria for noninvasive ventilation as well as ventilators and ventilation modes in noninvasive ventilation, choice of interface for acute clinical conditions, management of adjustment parameters, patient / ventilator asynchrony recognition and monitoring [9- 13]. In 2009, a study

was carried out in Italy, where a questionnaire was applied to 115 nurses who did not work in intensive care units, obtaining a response of 78.3% (90 questionnaires). From this group, 67% did not feel involved in the decision-making process, and half felt that they were insufficiently informed. Only 13% of the nurses said that the training was adequate [14]. In the study by Raurell et al., The knowledge of ICU nursing can be verified in third level hospitals, where a similar lack of knowledge is observed [15]. In addition, it is important to emphasize that nurses should perform the appropriate care of the intervention [16-19], among which it is necessary to select the correct interface for each use; the application of Hyper Oxygenated Fatty Acids (HOFA) every 4 hours in the contact zones of the interface; looking after the skin and leaks every 4 hours; hygiene of the mouth and nostrils every 6 hours or whenever aerosol therapy is performed; active humidification; monitoring of ventilation and gasometric parameters; etc. These nursing interventions favor the use and correct adaptation / tolerance of the patient to NIMV, a key point within the treatment.

Noninvasive ventilation (NIV) in severe acute asthma is controversial, but may benefit this population by preventing intubation. There is reason to believe that NIMV could be beneficial for patients with severe acute asthma. However, the evidence surrounding the efficacy of noninvasive positive pressure ventilation is not clear, despite its frequent use in clinical practice [20,21]. Since the publication of the observational study by Meduri and colleagues in 1996 [22] on the use of NIMV in 17 episodes of acute asthma, the effect has been deepened, since the conclusion reached was that NIMV seems very effective in the correction of gas exchange anomalies and the adjustment of acute asthma. However, because of the low methodological quality of the study, clinicians were skeptical about its use.

In 2014, a study in Portugal analyzed the hospitalizations of adults with a primary diagnosis of asthma between 2000 and 2010. The data source was the national database of hospitalizations, which includes administrative and clinical data produced by physicians trained in the coding. Mechanical ventilation was used in 5.1% (n = 747) of the 14 515 hospitalizations with a primary diagnosis of asthma: NIMV in 1.7% (n = 241), and VMI in 3.5% (N = 506). As a result, highlights the increase in the use of NIMV from 1% in 2000 to 3.3% in 2010. The mortality rate was 1.5% for all hospitalizations for asthma: 2.5% when used VMNI [23].

In 2010 Gupta et al. [24], published a study where fifty-three patients with severe acute asthma (42 women and 11 men, mean age +/- 44 +/- 15 and FEV₁ <30%) were randomly assigned to NIMV (n = 28) or standard clinical treatment (n = 25). Baseline variables were similar in the 2 groups except for the mean duration of asthma, which was shorter in the standard therapy group. The median inspiratory and expiratory pressures applied were 12cm H₂O and 5cm H₂O, respectively. There was a significant improvement in respiratory rate, FEV₁ and PaO₂ / F (I) O₂ (but not pH or PaCO₂) in both groups, but there was no significant difference between the 2 groups. The number of patients who improved FEV₁ at 1, 2 and 4 hours was not significantly higher in the NIMV group. ICU time and hospital stay were significantly lower in the NIMV group. The mean inhaled bronchodilator dose was significantly lower in the NIMV group. There were 4 cases of

standard therapy failure, and all patients improved with NIMV. Two patients in the NIMV group required invasive ventilation. There was no mortality [24].

Between 2000 and 2008, NIMV treatment of asthma exacerbation has increased markedly, from 0.34% to 1.9%. Also noteworthy is the decrease in the use of VMI from 1.4% in 2000 to 0.73% in 2008. In this study, the clinical reasons for this increase could not be determined, since hospital stay and mortality remained unchanged [25].

Available studies include a small number of patients. In an editorial, Scala [26] suggests that NIMV could be applied with different goals over time following an episode of severe acute asthma:

- As an alternative to intubation.
- To avoid intubation in patients with mild to moderate acute respiratory failure who do not require immediate ventilatory support.
- To avoid acute respiratory failure in patients who do not have substantial damage in gas exchange.
- To accelerate bronchodilation.

Undoubtedly, the present study by Scala [26] opens the door to future lines of research, since there is a lack of solid evidence recommendations since the mortality rate for asthma is very low without the use of NIV and a greater reduction in mortality may not be an appropriate endpoint for NIMV in patients with acute asthma, unlike studies of exacerbation of COPD and acute cardiogenic lung edema.

In fact, the last two Cochrane reviews published in this field - adults [27] and children [28] - achieve similar results, despite very promising preliminary results. The course of treatment with NIMV for patients with asthma remains controversial despite its continued use in current clinical practice. The data have shown the scarcity of data that exist to support the use of NIV in asthmatic patients. Further large, prospective, randomized controlled trials of rigorous methodological design are needed to determine the role of NIMV in patients with asthma; The current evidence does not allow the confirmation or rejection of the effects of NIMV for the treatment of acute asthma [27,28].

CONCLUSION

The use of NIMV for the resolution of an acute asthmatic process is controversial and more rigorous methodological studies are needed to determine its degree of recommendation.

In the case of an asthmatic woman and possible pregnancy, with an anaphylactic reaction due to medication administration, the administration of airway therapy with NIMV has been favorable.

Nursing care favors adaptation and tolerance to NIMV.

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