HYPOCAPNIA AS TRIGGER FOR THE DIAGNOSTIC PROTOCOL IN PULMONARY EMBOLISM

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ABSTRACT:
THE ARTICLE ANALYZES THE CASES OF PULMONARY EMBOLISM PRESENTED IN THE EMERGENCY UNIT OF THE EMERGENCY UNIVERSITARY CLINICAL HOSPITAL IN THE PERIOD JANUARY – DECEMBER 2014 AND EMPHASIZES THE IMPORTANCE OF HYPOCAPNIA AS A TRIGGER FOR THE INITIATION OF THE DIAGNOSTIC PROTOCOL FOR PULMONARY EMBOLISM. IT CORRELATES CLINICAL, LABORATORY, AND IMAGISTIC DATA FROM 79 PATIENTS DIAGNOSED WITH PULMONARY EMBOLISM IN THIS TIME PERIOD. THE PRESENCE OF HYPOCAPNIA IN THE MAJORITY OF THE PATIENTS IS ASCERTAINED, WITH THE RECOMMANDATION FOR EVALUATING ITS UTILITY IN THE DIAGNOSIS OF PULMONARY EMBOLISM.

KEY WORDS: PULMONARY EMBOLISM, HYPOCAPNIA, DYSPNEA, ARTERIAL BLOOD GAS

INTRODUCTION

Pulmonary embolism (PE) is a dramatic and life-threatening complication of underlying deep venous thrombosis. Most clinically relevant pulmonary emboli originate as proximal venous thrombi in the leg or pelvic veins. Pulmonary embolism occurs when thrombi detach and are carried through the great veins to the pulmonary circulation. Pulmonary vascular occlusion has important physiologic consequences which lead to the manifestations of illness as well as to clues to diagnosis. Pulmonary embolism has an impact most notably on gas exchange and the circulation. Physical obstruction to pulmonary artery flow creates dead space in the segments served by the affected arteries. The creation of dead space has several effects on the partial pressure of carbon dioxide (P_{CO2}) and end-tidal CO_2 (ET_{CO2}), which can provide clues to the diagnosis. If minute ventilation does not change, P_{CO2} will rise. However, most patients augment minute ventilation more than necessary to maintain elimination of CO_2, so that P_{CO2} typically falls with pulmonary embolism.[4]

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[4] Nuala J. Meyer, Gregory A. Schmidt, "Pulmonary Embolic Disorders: Thrombus, Air, and Fat", in *Principles of Critical Care, Third Edition,* ed. Jesse B. Hall et al. (McGraw-Hill, 2005), 347-348

This article's aim is to evaluate the presence of hypocapnia in patients with pulmonary embolism and its eventual use as a marker in the diagnosis of the condition.

MATERIALS AND METHOD

The article presents the experience of the Emergency Unit – Emergency Universitary Clinical Hospital Bucharest in the period January – December 2014. There were 79 patients diagnosed with pulmonary embolism. Out of these, 42 (53.1%) were female, and 37 (46.9%) were male. The most affected age group was over 60 years (see following charts), with 62 patients (78.4%). Symptoms included dyspnea in 54 patients (68%), syncope in 4 patients (5.06%), chest pain in 11 cases (13.92%). 15 patients (18.98%) were asymptomatic or with atypical complaints.

Figure 1. Age Distribution in Pulmonary Embolism

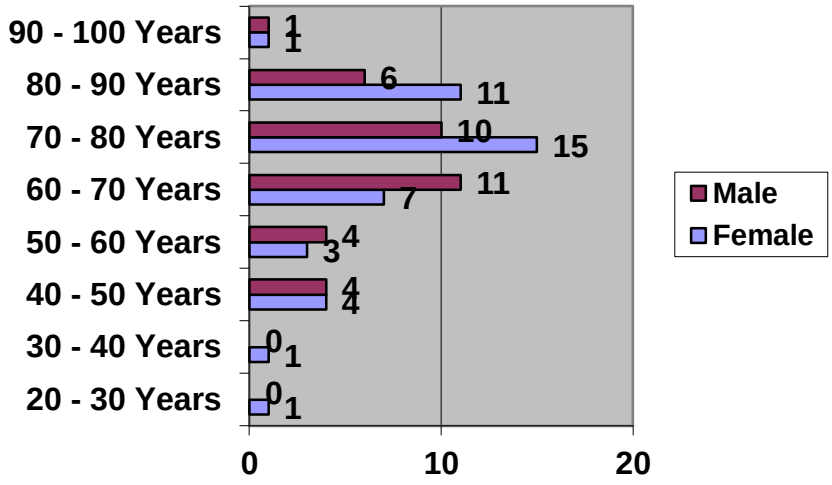


Figure 2. Clinical Symptoms in PE

Out of the 79 examined patients, 69 (87.3%) had a $P_{CO2} < 35$ mmHg. Out of 29 patients diagnosed with high-risk PE, 27 had hypocapnia (93.1%). Out of 39 patients diagnosed with intermediate risk PE, 33 presented with hypocapnia (84.61%). In contrast, hypoxemia was present at only 49 patients (62.02%).

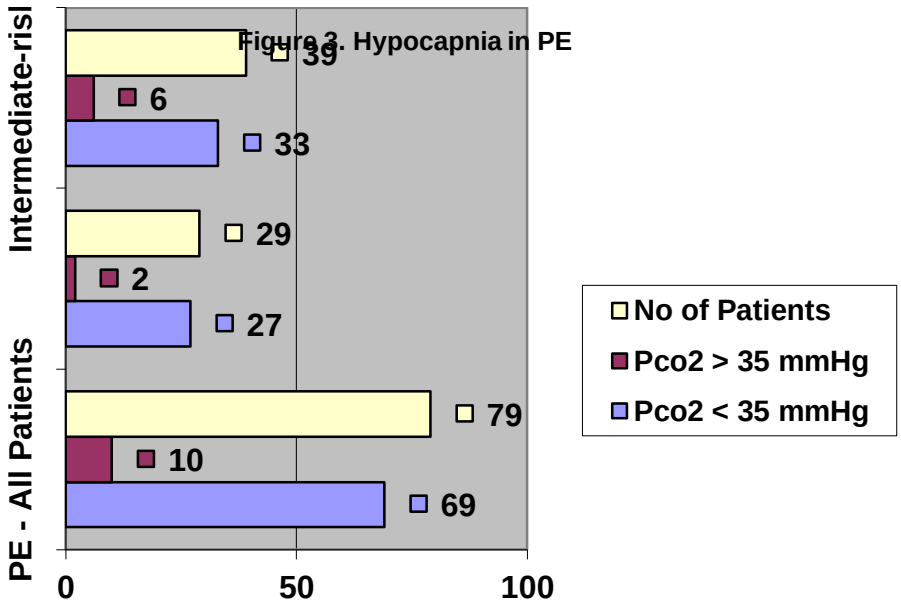
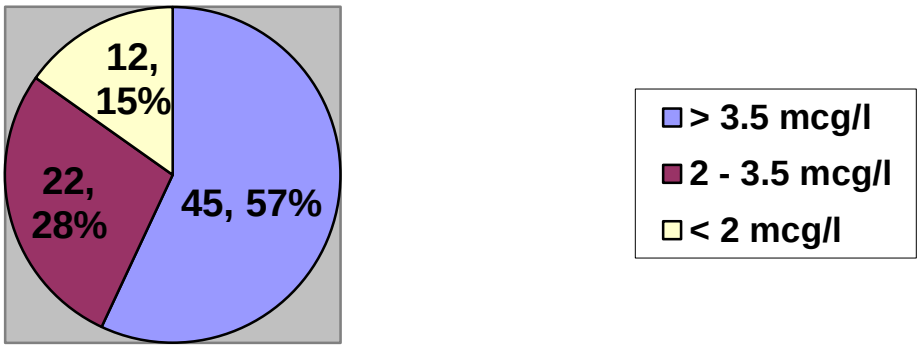


Figure 3. Hypocapnia in PE

D-dimer testing showed elevated D-dimer levels in most of the patients. Electrocardiographic changes (right bundle-branch block, inversion of T-waves in leads V1-V4, S1Q3T3 pattern) were present in 31 cases (39.2%). Haemodynamic instability was present in 23 patients (29.11%).

Figure 4. D-Dimer Levels in PE



The diagnosis of pulmonary embolism was confirmed in all cases by thoracic computer tomography with intravenous contrast. The patients were admitted in the cardiology clinic of the Emergency Universitary Clinical Hospital.

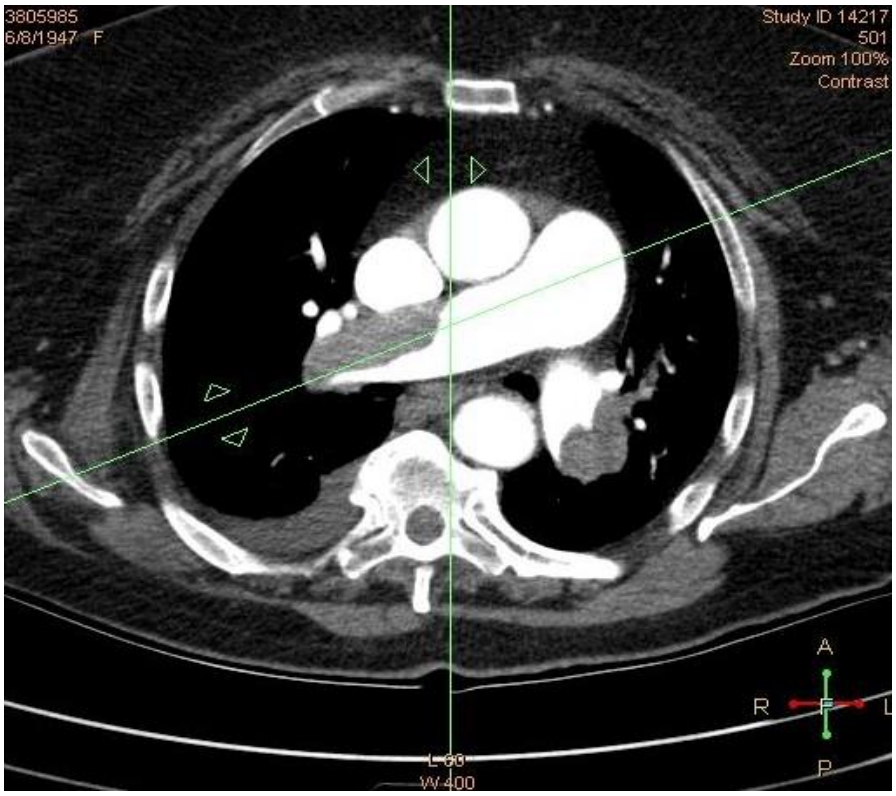


Figure 5. Massive bilateral PE in a 67 year old female patient[5]

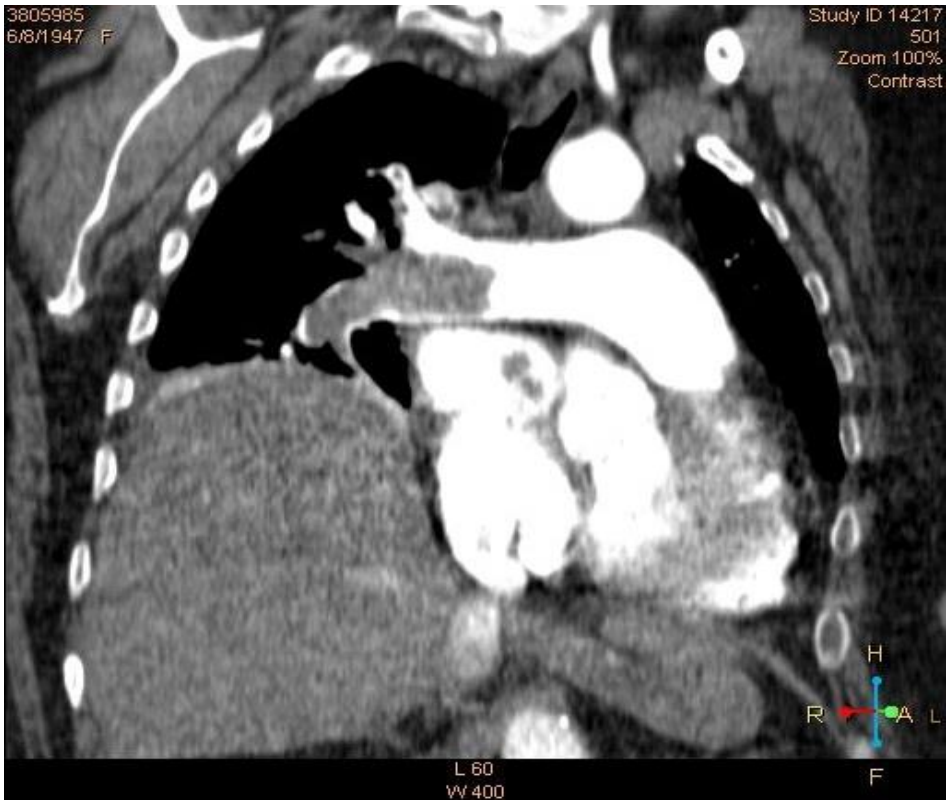


Figure 6. Massive bilateral PE in a 67 year old female patient[6]

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CONCLUSION

Hypocapnia is associated in a significant percentage with the diagnosis of pulmonary embolism, confirmed by CT imaging. As this article shows, hypocapnia may be used as a trigger in initiating the protocol for diagnosis of pulmonary embolism in the emergency department. Monitoring and careful investigation of all patients presenting with hypocapnia in the emergency room is also recommended.

REFERENCES

1. **Meyer, Nuala J., Schmidt, Gregory A.,** *Pulmonary Embolic Disorders: Thrombus, Air, and Fat*,in *Principles of Critical Care, Third Edition,*edited by **Jesse B. Hall**, **Gregory A. Schmidt, Laurence D. H. Wood,** McGraw-Hill, 2005, 347-348