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Case report

Description of using transthoracic ultrasound in the diagnosis of low-risk pulmonary embolism in a patient after multiple trauma

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ABSTRACT

Introduction: Pulmonary embolism (PE) is a clinical manifestation of venous thromboembolism. We present a case of low-risk pulmonary embolism in a patient suffering multiple trauma due to a traffic accident.

Aim: The aim of this work was to present and analyze the possibilities of using TUS for the diagnosis of low-risk PE.

Case study: A 29-year-old patient with multiple trauma following a traffic accident was admitted to our Intensive Care Unit. During hospitalization, the patient suffered transfusion-related complications following administration of fresh frozen plasma. This was further complicated by a tendency in the patient to be hypercoagulable. Hemolytic anemia was diagnosed. Transthoracic ultrasound (TUS) of lung performed on 16th day of hospitalization revealed an area of consolidation in the right middle lung lobe originating from the pleura, suggestive of PE.

Results and discussion: TUS can be used in the diagnosis of PE when computed tomography is inadvisable or unavailable. A diagnosis of PE is certain when two or more characteristic lesions are visualized, and is likely when one typical lesion is accompanied by pleural effusion.

Conclusions: (1) TUS is a safe, reproducible and inexpensive diagnostic tool. (2) The use of TUS in the diagnosis of PE is well documented, but requires further research including a larger sample size. (3) High sensitivity and specificity of TUS as compared to pulmonary

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angiography as a reference method, make it a reliable tool in the diagnosis of PE. (4) The lack of blood flow within the consolidated area allows for the exclusion of inflammatory lesions.

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1. Introduction

Pulmonary embolism (PE) is a clinical manifestation of venous thromboembolism. Based on the recommendations of the Working Group of the European Society of Cardiology for the diagnosis and management of PE, it is divided into high- and low-risk categories depending on the likelihood of early death.¹ In low-risk PE, the emboli are small, located at the periphery and usually do not cause cardiopulmonary instability. Here we present the details of a patient with low-risk PE and multiple trauma following a traffic accident. Choosing the described diagnostic tool of transthoracic ultrasonography (TUS) assisted in making a final diagnosis.

2. Aim

The aim of this work was to present and analyze the possibilities of using TUS for the diagnosis of low-risk PE.

3. Case study

A 29-year-old woman with multiple trauma occurring as a result of a traffic accident was admitted to our Intensive Care Unit (ICU) for treatment. On admission, the patient was sedated and unconscious. The patient reacted to pain stimulation of the upper limbs, but not the lower limbs. The pupils were constricted, equal and reactive. The withdrawal and deep tendon reflexes were intact. Babinski's and Battle's signs were negative on both sides. The neck was symmetrical and a Shanz collar brace was in place. The patient was breathing ineffectively so was intubated. Breathing was assisted with a ventilator in the synchronized intermittent mandatory ventilation (SIMV) mode with FiO₂ 50%. Mobility of the chest was observed to be normal and a vesicular murmur was auscultated on both sides. The blood pressure, which was measured using the direct method, was 145/70 mmHg; it was stabilized using a continuous rate infusion of Levonor (norepinephrine). A sinus rhythm was present with a heart rate of approximately 90 bpm. The peripheral pulses were synchronous. The capillary refill time was prolonged. The abdomen was soft without pathological resistance and peristalsis was audible. Physical examination revealed a spectacle hematoma of the right eye and right forehead, numerous scratches and bruises, and swelling of the right forearm. The patient had increased urination because of diuresis. The body temperature was approximately 35.6°C. Computed tomography of the head, abdomen and chest performed on admission revealed the following abnormalities: subarachnoid hemorrhage, disseminated hemorrhagic foci with generalized edema of the brain, contusion of the right

lung, fracture of both lateral masses of the sacrum, fracture of the upper branch of the right pubic bone, and a hematoma within the right iliac muscle. After admission to the ICU, the following treatment was instituted: assisted breathing with the ventilator, fluid therapy, anti-thrombotic prophylaxis (TED stockings and pneumatic boots), and a protocol of strict glycemic control. Samples were collected for a panel of laboratory tests. Treatment for intracranial hypertension was implemented. This consisted of diuretic therapy including mannitol and hypertonic saline (3% NaCl), and analgesation (thiopental) which resulted in muscle flaccidity. The patient was fit with a sensor to measure intracranial pressure. The continuous rate infusion of Levonor was continued in order to stabilize mean arterial pressure (MAP) and cerebral perfusion pressure (CPP).

On the 10th day of hospitalization, the patient suffered transfusion-related complications following the administration of fresh frozen plasma. These included the development of urticaria and generalized erythema as well as deterioration in blood oxygen saturation. Oliguria and increased inflammatory parameters were also noted. The transfusion was halted and the complications were reported to the Regional Blood Center. Hemodialysis treatment was instituted as well as local anticoagulation. Samples for culture were collected, including those obtained via bronchoalveolar lavage (BAL). Empirical antibiotic therapy with cefepime was introduced. Chest radiographs revealed fluid in the right pleural cavity with a blurred outline of the right dome of the diaphragm and shading of the right lower lung field. Culture of the BAL fluid resulted in the growth of *Klebsiella oxytoca*; the other cultures yielded no growth. The patient was diagnosed with pneumonia, and treatment with cefepime was descaled based on the results of the antibiogram.

On the 12th day of hospitalization the patient developed a hypercoagulable tendency demonstrated by sudden clotting in the dialysis system, despite the use of local anticoagulation (citrate or heparin). Laboratory tests revealed evidence of hemolysis (haptoglobin of zero, anemia, increased lactate dehydrogenase – LDH), prolonged clotting times, a decrease in fibrinogen, and an increase in D-dimers. Further treatment of the patient was complicated by recurrent generalized bleeding (from the respiratory tract, bladder, catheter/needle insertion sites, and mouth). The patient was given repeated doses of recombinant factor VII and red blood cell concentrates (irradiated, leukocyte-depleted and rinsed). A hematologist and a transfusionist were consulted for treatment recommendations. Extensive immunologic and virologic testing was performed in addition to blood smears and a bone marrow biopsy. Microscopic examination revealed coating of the red blood cells with immunoglobulin G, but no antibodies to the red blood cells themselves. A diagnosis of acquired hemolytic anemia (secondary to infection) was made.

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