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CASE REPORT

A DAILY CLINICAL CHALLENGE DURING THE COVID-19 PANDEMIC ERA – HOW TO TREAT PATIENTS WITH PULMONARY EMBOLISM AND HEMOPTYSIS

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Abstract

Introduction/Objective Pulmonary embolism (PE) is a relatively common complication of COVID-19. The results of a study published in 2022 show that 10-15% of hospitalized patients suffer from prothrombotic coagulopathy, resulting in arterial or venous thromboembolic events. We are presenting a COVID-19 patient with PE whose treatment was a challenge because he had developed hemoptysis after being treated with anticoagulant therapy.

Case report. We presented a case of a young patient with COVID-19 induced pneumonia, treated with antibiotics, corticosteroids and prophylactic anticoagulant therapy. During his hospitalization, he developed PE which was why the dosage of anticoagulants was increased. Not long after that, the patient developed massive hemoptysis. A team of specialists decided that he was to continue receiving the anticoagulant therapy while simultaneously introducing a hemostatic drug. The patient responded well to the expanded therapy and was discharged from the hospital two weeks later.

Conclusion. Based on all pre-COVID medical guidelines, the cornerstone of treating PE is anticoagulant therapy. However, even taking into account significant advances in creating innovative drugs and the absolute clinical necessity of prescribing such therapy, it still comes with a series of complications, the most important of which is significant bleeding. Treating patients with comorbidities, PE and hemoptysis is a complex endeavour, because what helps with one disease may worsen another and vice versa. This is why an individualized treatment approach is necessary for each patient and difficult decisions should be made by a team of specialists.

Keywords. pulmonary embolism, COVID-19, anticoagulants, hemoptysis

INTRODUCTION

Thrombotic complications are common in patients with coronavirus disease (COVID-19) [1] as COVID-19 may cause hypoxia, inflammation and prolonged immobilization all of which are independent risk factors for thrombosis [2]. The most common thrombotic complications in COVID-19 patients are stroke [3], deep vein thrombosis (DVT) [4], acute myocardial infarction [5] and pulmonary embolism (PE) [6]. The incidence of PE in COVID-19 patients ranges from 22% to 30% [7]. ECG findings in PE tend to vary extensively, from sinus tachycardia, which is the most common finding, through right axis deviation, complete or incomplete right bundle branch block, T -wave inversion, S1Q3T3 pattern and ST-elevation as the least common ECG finding [8,9].

The cornerstone of treating PE is anticoagulant therapy [10]. However, anticoagulants can cause severe bleeding, especially in the critically ill and patients with many comorbidities [11]. On the other hand, one of the most common clinical manifestations of PE (aside from dyspnea, chest pain, and pre-syncope and syncope) is hemoptysis [10]. It is often difficult to distinguish if hemoptysis is a clinical manifestation of PE or a complication of anticoagulant therapy.

CASE REPORT

Patient J.F. (born in 1988 in Nis, Serbia) was admitted to the Clinical Centre Nis University Clinic for Infective Diseases with dyspnea, dry cough and high temperature. Seven days before hospitalization he had tested positive for COVID-19 and was treated as an outpatient with antibiotics (levofloxacin 500mg, twice daily) and corticosteroids (methylprednisolone, 20mg per day) without effect. He didn't have a significant personal or family medical history. Upon physical examination, the patient was conscious, oriented and dyspnoeic with notably pale skin. Auscultation of the lungs revealed normal breath sounds. His heart rate was regular and no heart murmurs could be detected. Vital parameters: blood pressure 120/80 mm Hg, heart rate 81 bpm, SaO2 94%, body temperature 38.8 °C, respiration rate 19 per minute. Body mass index was 24.8kg/m^2.

Laboratory tests were performed on admission (Table 1). Further laboratory assessment was performed every three to four days during hospitalization (Table 1).

Upon hospitalization, he was given a chest X-ray which showed consolidation in the lower regions of both lungs (Figure 1).

Table 1. Laboratory tests were performed during hospitalization. Pathological findings are in bold.

Laboratory test	On admission	On the 4th day	On the 7th day	On the 10th day	On the 11th day
Leucocytes (x10$^{9)}$	5.6	8.5	**20.3**	**22.2**	
Lymphocytes (%)	**13.3**	**9.1**	**9.8**	**8.6**	
Neutrophils (%)		**89**	**89**	**90.2**	
LDH (U/L)	**1028**	**797**	**668**		
AST (U/L)	**48**	**38**	**38**		
ALT (U/L)		35	**63**		
CRP mg/L	**107.3**	**18**	**78**		
Ferritin (mcg/l)	**956**	**792**	**815**		
PCT (ng/ml)				0.023	
D-dimer (ng/mL)	**374**	**775**	**456**	**313**	**313**
Troponin (ng/mL)				0.01	
CKMB (IU/L)				21	

Abbreviations: LDH – lactate dehydrogenase, AST – aspartate transaminase, ALT – alanine transaminase, CRP – C-reactive protein, PCT – procalcitonin, CKMB – creatine kinase-MB.

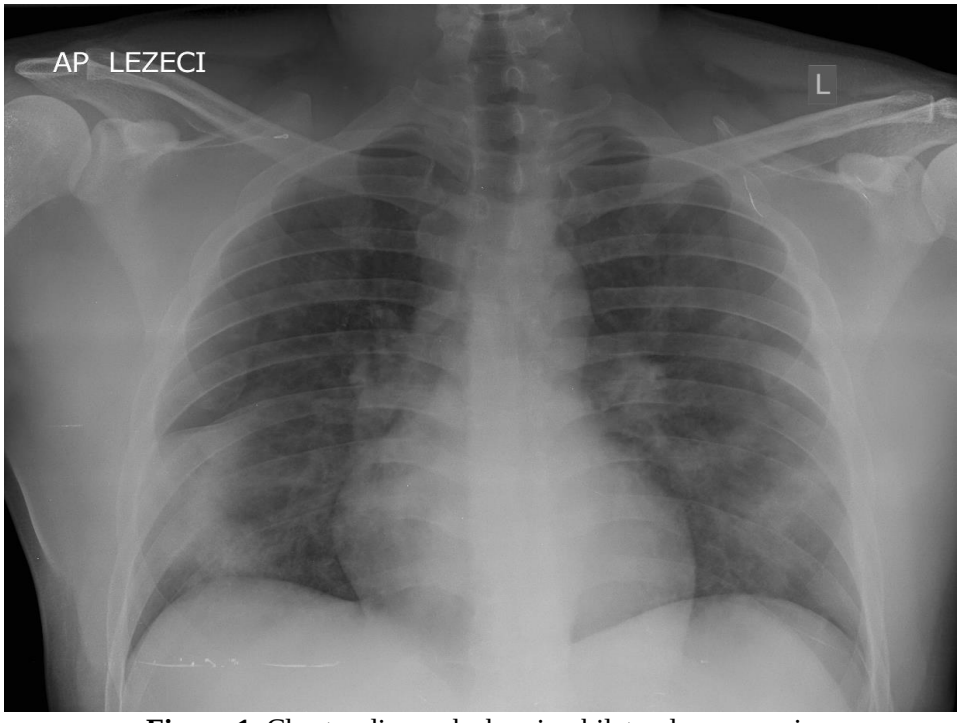

Figure 1. Chest radiograph showing bilateral pneumonia

He was treated with antibiotics (ceftriaxone 2g IV per day), corticosteroids (methylprednisolone 40mg IV, twice a day), vitamins and a prophylactic dose of anticoagulant therapy (low molecular weight heparin – LMWH, 40mg SC, once a day).

On his third day of hospitalization, the patient's condition worsened when he felt severe chest pain. An electrocardiogram was performed but due to technical difficulties, only the precordial leads could be printed out (Figure 2). A newly developed incomplete right bundle block was detected and the patient was immediately referred to multislice computed tomography (MSCT) of pulmonary arteries. A 32-slice CT scanner revealed bilateral segmental and subsegmental pulmonary embolism (Figure 3). Anticoagulant therapy was continued with the therapeutic dosage - LMWH, 80mg SC, twice a day. Two days after the dosage of LMWH was increased, massive hemoptysis occurred. There was a dilemma on how to continue the patient's treatment: should the LMWH be discontinued altogether or just decreased to a prophylactic dosage level? That would have certainly decreased or even stopped the bleeding, but there would have been a good chance that the PE would get worse.

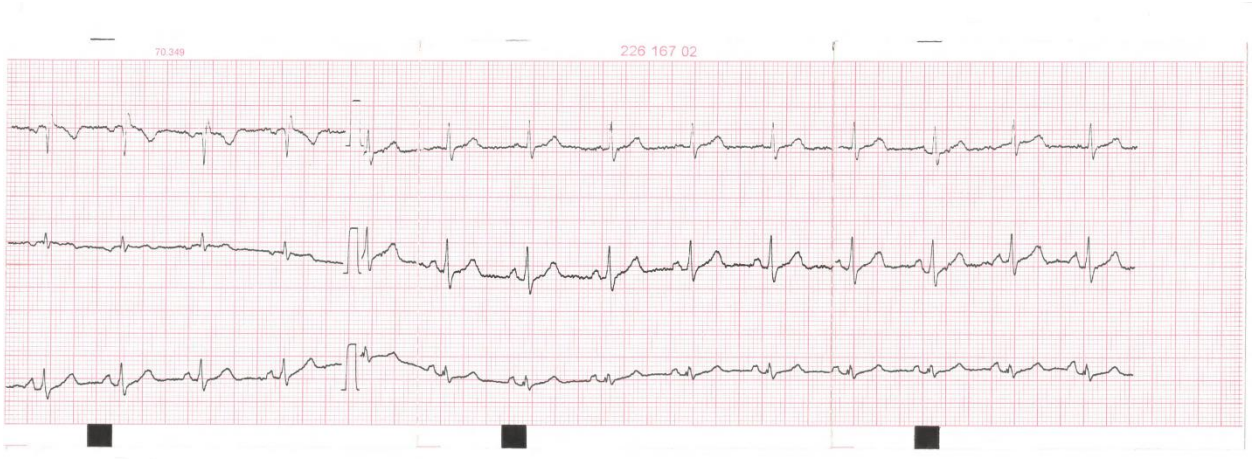

Figure 2. An electrocardiogram showing sinus rhythm, heart rate of 95 per minute, a newly developed incomplete right bundle block, with no premature complexes

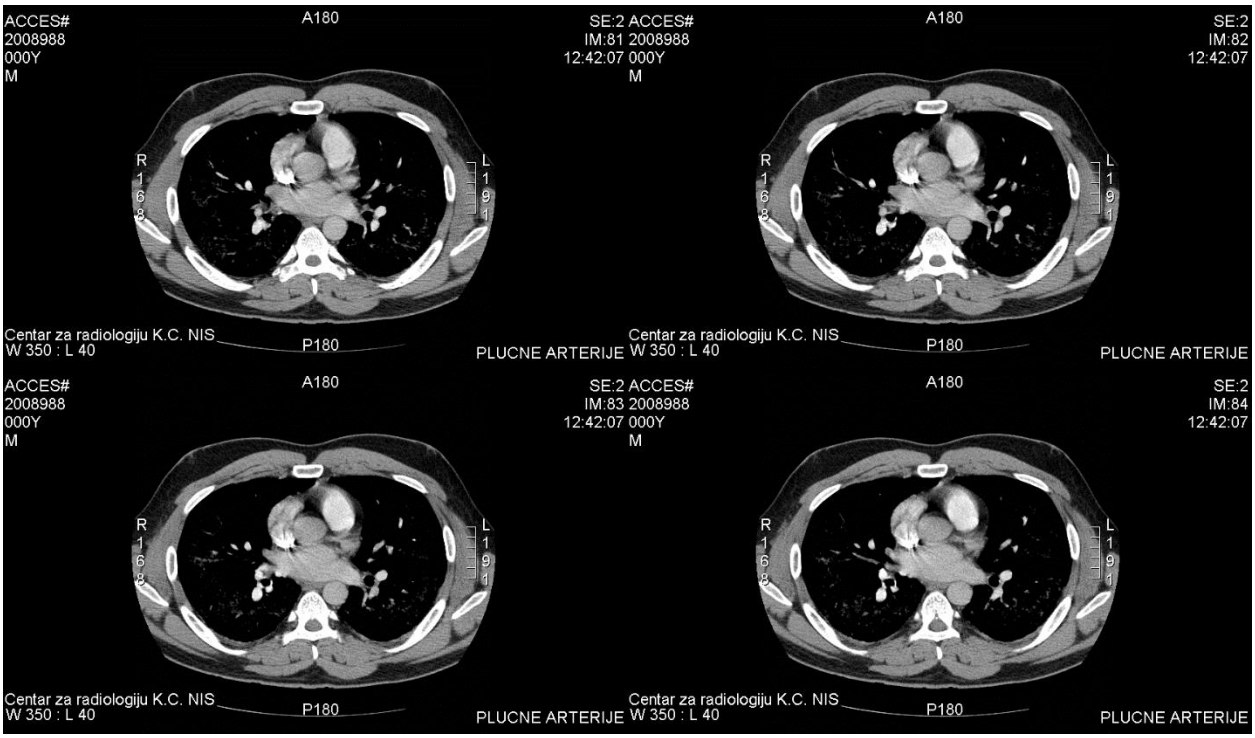

Figure 3. MSCT showing segmental and subsegmental PE

On the other hand, if the full dosage of LMWH were to be continued, it was almost certain that the hemoptysis would get worse. A team of physicians consisting of cardiology, pulmonology and infectious disease specialists decided that the therapy was to continue with the therapeutic dosage of LMWH but also that a hemostatic agent (etamsylate) should be simultaneously introduced.

Four days later, the patient was feeling well. He wasn't experiencing any more chest pain, dyspnoea or hemoptysis. The levels of CRP, LDH and D-dimer in the blood were decreasing and the red blood count was in the normal range. After two weeks of treatment, the patient was discharged from the hospital with a recommendation to continue taking oral anticoagulant therapy (rivaroxaban) for the next three months. He was also referred to have an echocardiogram and a duplex ultrasound of the legs done as an outpatient.

DISCUSSION

Several mechanisms cause the hypercoagulable state in COVID-19. Viruses can trigger a systemic inflammatory response which could lead to an imbalance between procoagulants and anticoagulants [12]. Furthermore, a viral invasion of the lungs can lead to an intensive local inflammatory response that can

cause an endothelial injury which may lead to micro thrombotic formations [13]. Hypoxia and prolonged immobilization also contribute to thrombi formation - hypoxia by increasing blood viscosity, while prolonged immobilization by causing blood stasis [13]. Hemostatic disorders can also be found in critically ill COVID-19 patients, especially disseminated intravascular coagulopathy [14].

PE is a relatively common complication of COVID-19, especially in patients admitted to the intensive care unit [15]. It seems that PE increases the risk of death in COVID-19 patients significantly and independently from other risk factors [16]. Many comorbid conditions that can be found in COVID-19 patients, such as diabetes mellitus, arterial hypertension or cancer, increase the risk of PE mainly by endothelial dysregulation. In addition to that, patient-related conditions like age, obesity or family history of venous thromboembolism may play a role in the development of thrombosis [13]. Luckily, our patient was a young man, with a normal BMI and no comorbidities. This, however, introduces the possibility that the pathogenesis of PE in COVID-19 is linked to severe infection [7].

Hemoptysis is defined as the spitting of blood that originated in the lungs or bronchial tubes and is usually linked to pulmonary diseases. Massive hemoptysis is usually caused by bronchial haemorrhage, while non-massive hemoptysis most commonly originates from pulmonary arterial system disturbances [17]. Massive hemoptysis is less common [18]. Although the differential diagnosis of hemoptysis is broad [19], the most frequent causes are cancer, pneumonia and bronchitis. However, in 1/3 of the patients with hemoptysis, the true origin of the bleeding is never discovered [17].

Hemoptysis is a relatively common symptom in PE as 13% of the patients may be found to expectorate blood at some point during the course of the disease [20]. Treating such patients is a challenge as the use of anticoagulants can make coagulopathy worse [19]. In our patient, the possible cause of hemoptysis can be both the PE and the anticoagulant use. Sometimes, though it is quite rare, a COVID-19 induced pneumonia can in itself cause hemoptysis [21]. In his case, it was decided to proceed with the treatment by continuing with the therapeutic dose of LMWH, but with an addition of a hemostatic agent.

CONCLUSION

The presented case was that of a young man suffering from COVID-19 induced pneumonia, PE and massive hemoptysis. Treating such patients is a complex endeavour because what helps with one disease may worsen another, which is why an individualized treatment approach is necessary for each patient and difficult decisions should be made by a team of specialists.

Conflicts of Interest

Authors have no conflicts of interest to declare.

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PRIKAZ BOLESNIKA

SVAKODNEVNI KLINIČKI IZAZOVI TOKOM KOVID-19 PANDEMIJE – KAKO LEČITI PACIJENTA SA PLUĆNOM EMBOLIJOM I HEMOPTIZIJAMA

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SAŽETAK

Uvod/Cilj Plućna embolija (PE) predstavlja relativno čestu komplikaciju COVID-a 19. Po podacima iz studije objavljene 2022. godine, 10-15% hospitalizovanih pacijenata, ima protrombotsku koagulopatiju. koja rezultira venskim i arterijskim tromboembolijskim događajima. Prikazujemo COVID-19 pacijenta sa PE, koji zbog hemoptizija nastalih nakon primene antikoagulantne terapije je predstavljao izazov u lečenju.

Prikaz bolesnika. Predstavili smo slučaj mladog bolesnika, sa pneumonijom, izazvanom COVID 19, lečenog antibiotskom, kortikosteroidnom i profilaktičkom antikoagulantnom terapijom. Tokom bolničkog lečenja, došlo je do razvoja PE, zbog čega je povećana doza antikoagulantnog sredstva. Ubrzo nakon terapijske intervencije, pacijent je dobio masivnu hemoptiziju. Tim lekara je odlučio da ne prekine primenu antikoagulantne terapije, već da se u terapiju uvede i hemostatik. Pacijent je dobro odreagovao na proširenu terapiju i otpušten je iz bolnice posle dve nedelje lečenja.

Zaključak. Osnova lečenja PE, po svim dosadašnjim terapijskim protokolima je primena antikoagulantne terapije. Međutim, i pored značajnog napretka u primeni inovativnih lekova, kao i jasne kliničke neophodnosti primene ovakve terapije, ona i dalje nosi niz komplikacija, od kojih je najvažnije izazivanje ozbiljnih krvarenja. Lečenje pacijenta sa udruženim stanjima, PE i hemoptizijama je izuzetno komplikovano, jer tretiranje jedne bolesti može pogoršati drugu i obrnuto. Zbog toga je neophodan individualan pristup svakom pacijentu, kao i konzilijarni konsenzus.

Ključne reči: plućna embolija, COVID 19, antikoagulansi, hemoptizije