Bilateral pulmonary embolism in a 17-year-old girl with a history of COVID-19 and oral contraceptive use

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Background

- Young, healthy adolescents without a genetic predisposition are considered a low-risk group for the development of venous thromboembolism (VTE).[1]
- Multiple risk factors predispose a patient to the development of VTE, including obesity, smoking, prolonged immobilization, trauma, hereditary thrombophilia, and malignancy.[1]
- Oral contraceptives (OCP) have also been understood to increase the risk. The risk of contraception-related VTE is highest in the first six to 12 months of use.[2] VTE in OCP users younger than 20 years also account for 5-10% of contraception-related VTE events.[2] In addition, most adolescents who experience OCP-related VTE have additional transient or inherited risk factors at the time of VTE.[2]
- Infection with SARS-CoV-2 has been associated with coagulopathy that produces an inflammatory and hypercoagulable state; studies have shown increased rates of VTE in hospitalized COVID-19 patients.[3]

Figures 1-4: CTA chest w/ contrast. Multiple bilateral pulmonary emboli. Right lower lobe peripheral infiltrate which may represent a pulmonary infarct. Trace right pleural effusion.

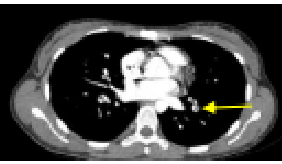


Figure 1: Filling defect consistent with pulmonary emboli (yellow arrow) within **left** lower lobe pulmonary artery extending into left lower lobe segmental arteries and lingular segmental arteries.

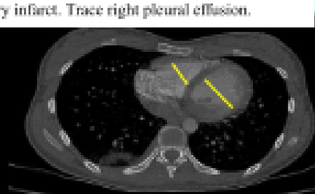


Figure 3: RV/LV ratio is normal, 0.59. Right ventricular strain = RV/LV ratio ≥ 0.9

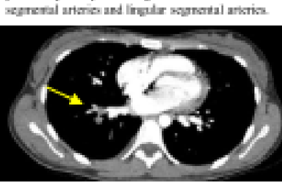


Figure 2: Filling defect consistent with pulmonary emboli (yellow arrow) within **right** lower lobe pulmonary artery extending into several right lower lobe segmental arteries.

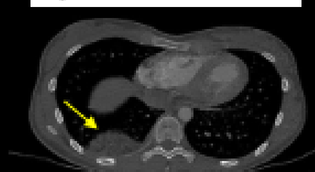


Figure 4: Focal peripheral wedge-shaped infiltrate in right lower lobe, may indicate a pulmonary infarct (yellow arrow).

Case Description

History

A 17-year-old female presented to the emergency department with a one-week history of fatigue, chest pain, and shortness of breath. She recalled a sudden sensation of sharp pain along the right side of her chest and ribs a week ago and was evaluated at another facility at that time. She was diagnosed with bronchitis and discharged home with prednisone and an albuterol inhaler.

With no improvement in symptoms, she presented to the ED for further evaluation.

She denied fever, chills, cough, abdominal pain, nausea, and leg pain.

Her past medical history was significant for a spontaneous right-sided pneumothorax one year ago and COVID-19 five months prior. She also began taking combined oral contraceptive pills two months ago.

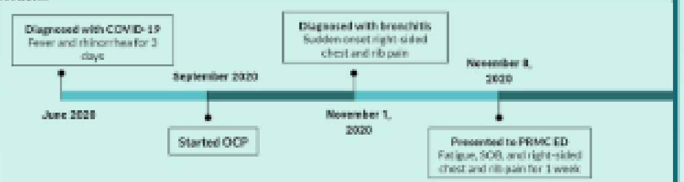
No family history of PE, DVT, or bleeding/clotting disorders.

Denied recent travel, tobacco use, alcohol use, and other substance use.

Physical Exam

Vitals in ED:
- BP: 112/72 - P: 109 - RR: 16 - T: 98F
- SpO2: 100% on RA - BMI: 14.8

General: Thin young woman lying in bed quietly, appears uncomfortable but alert and awake
CV: Tachycardic, normal rhythm, no M/R/G, peripheral pulses symmetrical
Respiratory: Decreased breath sounds bilaterally, no wheezes, rales, or rhonchi, no accessory muscle use or signs of respiratory distress
Chest: Tender to palpation in right lateral rib
Lower extremities: No edema, pain, or changes in skin color
Skin: No diaphoresis or changes in skin color



DDX: Community-acquired pneumonia, acute bronchitis, pulmonary embolism, pneumothorax, costochondritis, precordial catch syndrome, anxiety

Diagnostic Results

CBC: 15.7 / 13.1 / 39.6 / 234
BMP: 135 | 100 | 11 / 3.7 | 26 | 0.59 / 105

PT 10.5	AST 18	Troponin <0.05
INR 0.98	ALT 49	Total Protein 7.4
PTT 23.4	AlkP 69	Albumin 4.1
	Tbili 2.6	Calcium 9.1

ECG: Sinus tachycardia

Urinalysis: Moderate leukocyte esterase with WBCs and RBCs
Urine pregnancy test: Negative

TTE: EF is 60-65%. No pericardial effusion. Trace mitral and trace tricuspid regurgitation. Technically a difficult study.

Venous Doppler US: No deep venous thrombus formation identified in bilateral lower extremities.

Hypercoagulable workup was negative, including protein C activity, protein S, anti-thrombin III activity, Factor V Leiden mutation, prothrombin G20210A mutation, homocysteine, anti-cardiolipin IgG antibody, anti-cardiolipin IgA antibody, and anti-cardiolipin IgM antibody.

Discussion

- In a young female on OCP presenting with chest pain and dyspnea, inherited thrombophilias such as Factor V Leiden (FVL) or antiphospholipid syndrome must be considered. FVL increases the risk of VTE by a factor of 35 in women who use OCP.[2]
- Acute PE has been described as a frequent complication of COVID-19 in hospitalized patients[3]; however, the period of hypercoagulability following COVID-19 infection is not fully understood. There have been several case reports of late acute PE several weeks after mild COVID-19 disease in otherwise healthy patients.[4,5]
- It is probable that OCP use played a role in our patient's PE and subsequent pulmonary infarction given that she is a first-time OCP user who started taking OCP two months prior. Her initial hypercoagulable workup was also negative, and she did not have a family history of clotting disorders. Pulmonary infarction is also an uncommon complication of PE; risk factors include younger age, increasing body height, lower BMI, and smoking.[6]
- Studies show that the majority of young women with contraception-related VTE have at least one VTE risk factor in addition to OCP.[2] Although it is not possible to confirm that previous COVID-19 infection contributed to our patient's PE since she tested positive five months prior, it is an additional risk factor that may be considered in the development of VTE since COVID-19 has been associated with coagulopathy[3], and the temporal progression of COVID-19's hypercoagulable period is unknown.

<u>Case Outcome:</u> Patient was admitted and treated with enoxaparin. She was also treated with ceftriaxone for a UTI. OCP were discontinued. Hypercoagulable workup was negative, and she was discharged the next day with apixaban for a minimum of six months, cefdinir empirically for three days, and a referral to hematology.

Conclusion

- Young patients (<45 years) with a diagnosis of VTE should be tested for hypercoagulable disorders.
- All young women on hormonal contraception containing both estrogen and progestin should be counseled on the risk of VTE and the symptoms of PE and DVT.
- Further research is needed on the post-acute phase and period of hypercoagulability after recovery from COVID-19, as well as prior COVID-19 infection as a potential risk factor for VTE.

References

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