From Dyspnea to Recovery: Multidisciplinary Management of Hormonal Contraceptive-Associated PE in an Adolescent

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No Conflicts of Interest in all parties involved

Background

Incidence

- The purpose of this case is to highlight the utility, efficiency, and need for a multidisciplinary team to treat, intervene, and provide symptomatic relief to patients with pulmonary emboli complicated by lung parenchymal infarction
- Incidence of PE in children is 8.6-57 per 100,000 hospitalized children and 0.14-0.9 per 100,000 in non-hospitalized children

Methods

- Case report using retrospective chart review of Electronic Medical Records (EMR) via the EPIC system

Patient Presentation

History of Present Illness

- 17 y/o female with no significant medical history presented to an outside hospital (OSH) with a 2-week history of B/L pleuritic chest pain and dyspnea on exertion
- Started transdermal hormonal contraception two months prior and endured a 12-hour car ride 3-weeks prior
- LMP 5 weeks prior
- FHx significant for VTE in maternal grandfather, but likely cancer-related. No other family history of hypercoagulability or frequent miscarriages

Physical Exam

- Vitals: Tachycardic to 130s, normotensive, saturating >92% on ambient air.
- BMI 25.56 kg/m^2
- Exam: Moderate distress, otherwise unremarkable

Laboratory Data

- CBC, CMP & β-hCG normal
- High Sensitivity Troponin & NT-proBNP normal
- D-dimer 11.62 mg/dL (Reference range 0.0-0.5 mg/dL)

Diagnostics

- EKG showed sinus tachycardia
- CTA PE revealed B/L Pulmonary emboli with bibasilar parenchymal lung infarction

Clinical Course

Transfer
- Patient transferred to the tertiary care Children's Hospital while on Heparin gtt
- A multidisciplinary team of Interventional Cardiology, Pediatric Hematology/Oncology, and Pediatric ICU/Hospitalist team consulted

Further Diagnostics
- TTE showed EF 71%, no RWMA, no RV strain
- B/L LE Duplex negative
- Anti-thrombin III (ATIII) level low & Protein S activity 26% (Normal >60%)
- Protein C, Factor V Leiden, Prothrombin II, and Antiphospholipid Syndrome negative

Intervention
- Interventional Cardiology performed mechanical thrombectomy with Inari FlowTriever 3.0 due to the patient's profound DOE and evidence of lung infarction from B/L PE
- Pulmonary Artery pressures noted to be normal. The thrombi were then removed from the right and left pulmonary arteries.

Post-Intervention
- Transitioned from Heparin gtt to full dose Enoxaparin (1 mg/kg) BID
- Significant improvement in DOE. Patient was medically optimized for discharge with full-dose Enoxaparin BID for 3 months and close outpatient follow-up

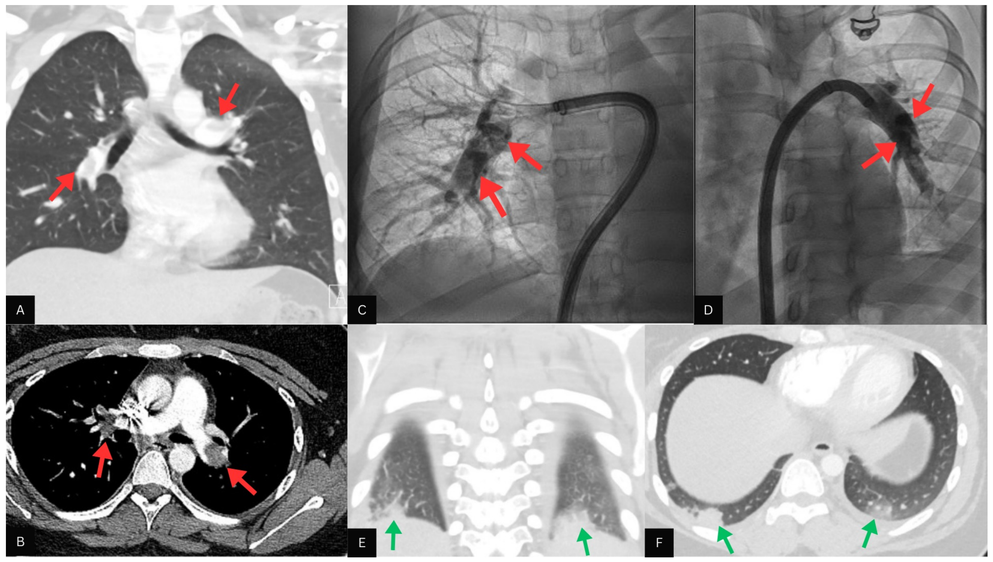

Figure 1. Computed Tomography Angiography (CTA) PE contrast protocol, Coronal (A) & Axial (B) cuts, with right (C) and left (D) pulmonary artery angiogram imaging demonstrating bilateral pulmonary embolisms (red arrows). Additionally, CTA PE contrast protocol imaging of bilateral lung base parenchymal infarctions (green arrows) in Coronal (E) and Axial (F) cuts.

Discussion

Hormonal Contraception

- Albeit rare, among all adolescent girls who develop VTE, 79% were more likely to use hormonal contraception
- Adolescents aged 15-19 y/o account for 5.9% of all HC-associated VTE
- Relative HC-associated VTE is highest within the first year of use, especially within the first 6 months
- Prior studies have shown a statistically significant 2.2-2.3 increased risk of developing a VTE while on a hormonal patch compared to OCP
- Transdermal patch contraception contains ethinyl estradiol, which, compared to estradiol in OCP, undergoes both first-pass and second-pass metabolism by producing active metabolites that stimulate hepatic production of clotting factors when re-circulated

Hypercoagulability

- Pediatric Heme/Onc noted the low ATIII level could have been influenced by the Heparin gtt
- Additionally, the disproportionate decrease of Protein S activity was a factor in the VTE burden in the setting of a provoked event with new OCP and prolonged immobility
- Patients with Protein S deficiency have been shown to have a 5.4-fold increased risk of first-time VTE
- A DOAC was avoided on discharge due to the potential for DOAC artificially raising Protein S levels
- Pediatric Heme/Onc outpatient follow-up with repeat testing revealed true protein S deficiency with PROS1 gene testing. The patient was transitioned from full-dose Enoxaparin BID to Rivaroxaban 20 mg daily

References

1. Woods GM, Kerlin BA, O'Brien SH, Bonny AE. A Review of Hormonal Contraception and Venous Thromboembolism in Adolescents. J Pediatr Adolesc Gynecol. 2016 Oct;29(5):402-408. doi: 10.1016/j.jpag.2015.05.007. Epub 2015 May 30. PMID: 27491960.
2. Tepper NK, Dragoman MV, Gaffield ME, Curtis KM. Nonoral combined hormonal contraceptives and thromboembolism: a systematic review. Contraception. 2017 Feb;95(2):130-139. doi: 10.1016/j.contraception.2016.10.005. Epub 2016 Oct 19. PMID: 27771476; PMCID: PMC11025291.
3. Bates, S.M., Dowlut-McElroy, T., McLean, K. (2020). Thrombophilia and Hormonal Therapy in Adolescents. In: Srivaths, L. (eds) Hematology in the Adolescent Female. Springer, Cham. https://doi.org/10.1007/978-3-030-48446-0_15
4. Zaidi AU, Hutchins KK, Rajpurkar M. Pulmonary Embolism in Children. Front Pediatr. 2017 Aug 10;5:170. doi: 10.3389/fped.2017.00170. PMID: 28848725; PMCID: PMC5554122.
5. Reid, J. A., & Jensen, J. T. (2021). Venous and Arterial Risks Associated with Combined Hormonal Contraception. In *Trends in Andrology and Sexual Medicine* (pp. 115-134). (Trends in Andrology and Sexual Medicine). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-030-70932-7_9