Radiology

CT Pulmonary Angiography for the Diagnosis of Pulmonary Embolism in Patients with COVID-19: When, Why, and for Who?

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Dear Editor,

The meta-analysis published by Suh and coll. in a recent issue of *Radiology* (1) is just the last of a series of reports that support the concept that pulmonary embolism (PE) is a very frequent complication in patients hospitalized for coronavirus disease-19 (COVID-19). However, this awareness does not correspond to an adequate diagnostic effort towards PE. Indeed, clear indications on the appropriate use of computed tomography pulmonary angiography (CTPA) for the diagnosis of PE in COVID-19 patients are still lacking. If we look at the single studies taken into account by the many meta-analyses published in the last year (1-5), we will see that the proportion of patients who underwent CTPA varied from 2.1% to 100%. In many studies, this information was not even provided. In others, the proportion of patients who underwent CTPA was unknown. It is obvious that this has a strong influence on the end-point of these studies, i.e. the incidence of PE, which might be underestimated. We believe that it would be important to understand why some COVID-19 patients underwent CTPA in these studies, while others did not. Were they different, in terms of demographical, clinical, and/or laboratory characteristics, from those who did not undergo CTPA? More in general, we believe that it would be important to determine which proportion of patients in these studies had a theoretical indication to undergo CTPA, based on the probability scoring systems and the rule-out algorithms that are commonly used for diagnosing PE. Until the decision of ordering CTPA will be left to the discretion of the individual physician, it will be impossible to establish the precise incidence of PE in patients hospitalized for COVID-19, as well its actual impact on prognosis.

References

1. Suh YJ, Hong H, Ohana M, Bompard F, Revel MP, Valle C, Gervaise A, Poissy J, Susen S, Hékimian G, Artifoni M, Periard D, Contou D, Delaloye J, Sanchez B, Fang C, Garzillo G, Robbie H, Yoon SH. Pulmonary embolism and deep vein thrombosis in COVID-19: A systematic review and meta-analysis. Radiology 2021;298:E70-E80. doi:10.1148/radiol.2020203557.
2. Zhang R, Ni L, Di X, Wang X, Ma B, Niu S, Liu C. Prevalence of venous thromboembolic events in novel coronavirus disease-2019 patients: Systematic review and meta-analysis. J Vasc Surg Venous Lymph Dis, doi.org/10.1016/j.jvsv.2020.11.023
3. Boonyawat K, Chantrathammachart P, Numthavaj P, Nanthatanti N, Phusanti S, Phuphuakrat A, Niparuck P, Angchaisuksiri P. Incidence of thromboembolism in patients with COVID-19: a systematic review and meta-analysis. Thromb J 2020; 18: article 34
4. Naazie N, Elsayed N, Mathlouthi A, Marmor R, Clary B. Thromboembolism risk of COVID-19 is high and associated with a higher risk of mortality: A systematic review and meta-analysis. EClinicalMedicine. 2020;29:100639. doi: 10.1016/j.eclinm.2020.100639
5. Porfidia A, Valeriani E, Pola R, Porreca E, Rutjes AWS, Di Nisio M. Venous thromboembolism in patients with COVID-19: Systematic review and meta-analysis. Thromb Res 2020;196:67-74. doi: 10.1016/j.thromres.2020.08.020

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We appreciate your interest (1) and agree that the actual prevalence of pulmonary embolism (PE) should be assessed by uniformly applying computed tomography pulmonary angiography (CTPA) based on objective criteria. However, what ought to be and what is practically achievable or happens in real-world practice are different issues. First, CTPA in COVID-19 is typically indicated when clinical or radiologic observations cannot explain current or worsening respiratory distress (2). The criterion of explainability inevitably depends on individual physicians' discretion. CTPA was indeed requested based on the judgments of various physicians (3), implying that CTPA was not applied to COVID-19 using a uniform rule. Second, objective criteria for when CTPA is indicated also have not been established. Several guidelines exist for anticoagulation in COVID-19, but there are inconsistent recommendations on laboratory testing (including D-dimer) to triage patients at risk for thrombotic complications across those guidelines (4). Third, CTPA might not be an easily-applicable test for COVID-19 patients at some sites due to staff exposure or the lack of an established CT protocol. Bedside echocardiography and lower-extremity Doppler ultrasonography can be adjunct tests for establishing a diagnosis of PE, and even if CTPA is uniformly applied, indeterminate results can hinder interpreting the presence of PE in COVID-19 (5).

Our meta-analysis rapidly provided information on the pooled incidence and range of PE in early studies on COVID-19 patients, and also discussed how the incidence was unevenly distributed according to several important factors such as intensive care unit treatment, deep vein thrombosis, and the proportion of patients who underwent CTPA. We believe that the results of our analysis will help authors understand variation in the reported incidence of PE in the literature on COVID-19. Furthermore, we established a basis for applying the pre-existing rule-out algorithm based on D-dimer (which the authors emphasized) to COVID-19 by soliciting individual patient data from 11 studies. Therefore, the implications of this study go far beyond simply listing a series of reports on PE in COVID-19.

References

1. Suh YJ, Hong H, Ohana M, Bompard F, Revel M-P, Valle C, Gervaise A, Poissy J, Susen S, Hékimian G, Artifoni M, Periard D, Contou D, Delaloye J, Sanchez B, Fang C, Garzillo G, Robbie H, Yoon SH. Pulmonary Embolism and Deep Vein Thrombosis in COVID-19: A Systematic Review and Meta-Analysis. Radiology 2021;298(2):E70-E80.

2. The European Society for Cardiology. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic. https://www.escardio.org/Education/COVID-19-and-Cardiology/ESC-COVID-19-Guidance. (Last update: 10 June 2020).

3. Ooi MWX, Rajai A, Patel R, Gerova N, Godhamgaonkar V, Liong SY. Pulmonary thromboembolic disease in COVID-19 patients on CT pulmonary angiography - Prevalence, pattern of disease and relationship to D-dimer. Eur J Radiol 2020;132:109336.

4. Flaczyk A, Rosovsky RP, Reed CT, Bankhead-Kendall BK, Bittner EA, Chang MG. Comparison of published guidelines for management of coagulopathy and thrombosis in critically ill patients with COVID 19: implications for clinical practice and future investigations. Crit Care 2020;24(1):559.

5. Jones SE, Wittram C. The indeterminate CT pulmonary angiogram: imaging characteristics and patient clinical outcome. Radiology 2005;237(1):329-337.