**British Society of Thoracic Imaging: Rationale for CTPA in Covid-19 patients, January 2021**

Throughout the first wave of Covid-19, clinical awareness of the macrovascular and microvascular effects of this disease steadily evolved both nationally and internationally. Pooled analysis now suggests that pulmonary thromboembolism (PTE) occurs in about 17% of individuals with Covid-19. However this figure is confounded by including cases of immunothrombosis as pulmonary emboli. Immunothrombosis is in situ microvascular thrombosis seen as part of local inflammation due to acute respiratory distress syndrome (ARDS), with data suggesting that the rates of immunothrombosis are higher than ARDS due to other viral pneumonias (*in press Doyle et al*). These changes lead to local arteriolar stasis, which in turn will cause segmental and subsegmental changes on CTPA.

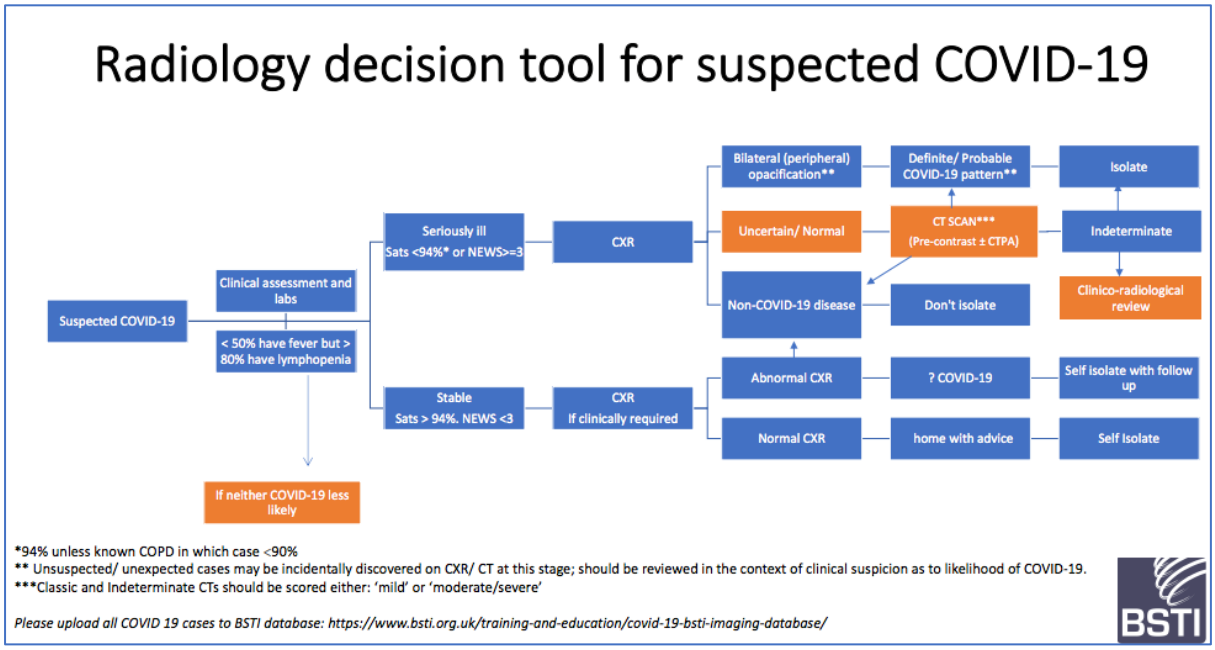


*Figure 1. BSTI NHSE decision support tool for Covid-19*

In this latest wave, we have perceived an increase in requests for CTPA in Covid-19 patients.

1. ***Why are we seeing more CTPA requests?***

The reasons are probably several including:

- Heightened awareness by clinicians of PTE in these patients;
- The wider patient population we are (probably) admitting, resulting in more patients who are stable enough to go through the scanner. It is also *possible* that patients are now presenting earlier in the course of illness;
- The breadth of expertise, experience and level of seniority of clinicians managing these patients is wider;
- It is an unfortunate reflection of the overall increase in Covid-19 patient burden across the country.
- Lack of understanding that an increased D-dimer occurs with inflammation as well as thrombosis and secondly forgetting that we use a negative D-dimer to exclude PE, not an increased D-dimer level to indicate a need for searching for VTE.

2. ***If we know that there is an increased incidence of macro- and microvascular PTE in Covid-19, why not just treat them with therapeutic anticoagulation?***

Firstly, recent data suggests that treating *all critically ill* Covid-19 patients with empirical therapeutic dose anticoagulation does not improve outcomes. We do not yet have data on non-severe Covid-19 patients. That said, a strategy of enhanced prophylaxis (ie more than would normally be given) may appear to have some benefit. As such, knowing whether patients have a PE does potentially influence management decisions.

Secondly there is no evidence that immunothrombosis should be managed by anticoagulation, the pathogenesis is that it is due to inflammation and arguably an anti-inflammatory agent may be better.

3. ***What criteria are useful in suspecting PTE in Covid-19?***

Diagnosing PTE in Covid-19 is notoriously difficult. An elevated D-dimer is expected in COVID-19 patients as part of the inflammatory response and lung injury. As such, it would be useful to exclude PE but not to diagnose it. So, we have stipulated that an elevated D-dimer (range or rate of increase) cannot be the sole criteria for suspecting PE in Covid-19, reinforcing national guidance. An elevated Wells score does not differentiate PTE and non-PTE groups in Covid-19 either.

We therefore need to return to diagnosing PE on clinical grounds as was practiced before the use of pretest probability scores. Therefore, a clinical deterioration which is sudden and difficult to explain is probably our only useful indicator. In the Emergency Department, of course, where a patient may be presenting for the first time, judging clinical deterioration would be more subjective, and may rely upon self-reported worsening of symptoms.

**Suggestions:**

1. The original BSTI/NHSE algorithm above remains the main stay of imaging advice, with CTPA reasonable to perform in severely ill Covid-19 patients **if** the outcome would influence initiation of therapeutic anticoagulation.
2. A less severely ill patient with classic Covid-19 on CXR should not trigger a CTPA routinely.
3. CTPA in symptomatic patients with Classic Covid-19 on CXR should ideally be reserved for 'disproportionate hypoxia', 'discordant clinical picture' or a 'sudden clinical deterioration'. **This should be mentioned in all CTPA requests**.
4. A presenting high D-Dimer in a patient with Covid-19, or an elevation/upward trend **should not solely** be used to trigger a CTPA.
5. At all times, patient stability and infection control considerations must be weighed against the benefit of undertaking the CTPA, especially given the higher infectivity of the new variant.
6. When reporting CTPA the radiologist should not use the term "PE" for those with just segmental and/or subsegmental changes but describe the changes and then suggest they may represent PE or immunothrombosis (e.g. "a filling defect is noted; whether or not this represents embolus or immunothrombosis is uncertain").

**Contributors and thanks to:**

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