

Clinical Correlations & Imaging Characteristics of COVID-19-Associated Pulmonary Embolism



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BACKGROUND

Pulmonary embolism (PE) is the 3rd most common cardiovascular cause of death in the U.S. and is a known consequence of COVID 19 infection [1,2]. There is little data comparing clinical characteristics and imaging findings between COVID 19 associated PE (CAPE) and non COVID 19 associated PE (NCAPE). Our study examines existing clinical databases to characterize both the acute and medium term manifestations of CAPE compared to NCAPE, as well as provide insight into how PE care changed during a stress on the healthcare system.

METHODS

647 patients with PE were retrospectively identified, of which 288 have been adjudicated thus far. Demographics, medical history, echocardiography (echo), computed tomography angiography (CTA), therapeutics, and outcomes were reviewed from hospital presentation and up to 12 months from discharge. Certain outcomes were followed up to time of data collection (up to 3 years post discharge). The CAPE cohort was defined as having a positive PCR test for SARS CoV 2 within 30 days of admission.

RESULTS

	CAPE	NCAPE
N of Patients	45	243
Age (years)	64.7 ± 12.1	67.9 ± 16.1
Gender (% male)	42	51
Weight (kg)	95.9 ± 34.8	91.7 ± 27.3
Initial PESI Score	109 ± 38	106 ± 39
Baseline # of Cardiopulmonary Comorbidities	2.56 ± 1.45	2.31 ± 1.57
History of Prior DVT (%)	15.6	9.9
Baseline Platelet Inhibitor Use (%)	24.4	21.4
Baseline Anticoagulant Use (%)	6.67	7.82

Table 1. Health and demographics of CAPE vs NCAPE Patients at Hospital Presentation. All continuous variables are recorded as mean ± SD. PESI PE severity index; DVT deep venous thrombosis.

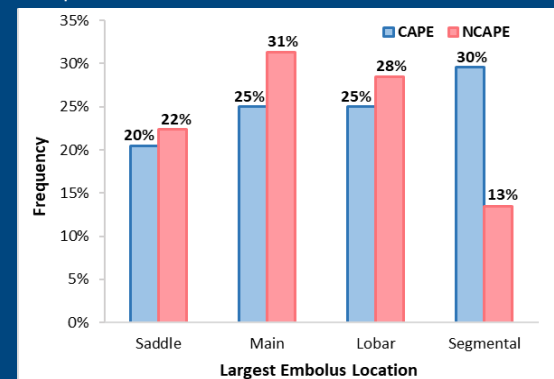


Figure 1. PE locations in CAPE vs NCAPE at Hospital Admission. CT scans were used to identify PEs in main, lobar, segmental, or subsegmental pulmonary arteries, or at the bifurcation of the main pulmonary artery (saddle).

	CAPE	NCAPE	Difference
LV Enlargement	12%	27%	15%
Residual Segmental PE	88%	73%	15%
Tricuspid Regurgitation	19%	37%	18%
IVC Enlargement	12%	32%	20%
Residual Subsegmental PE	100%	79%	21%
Mitral Regurgitation	12%	38%	26%
Ground-Glass Opacifications	57%	20%	37%

Table 2. Rates of Select Imaging Abnormalities in CAPE vs NCAPE at First Follow Up (1 6 months post discharge). Absolute differences in frequencies of ≥15% are shown and sorted by ascending magnitude via color gradient.

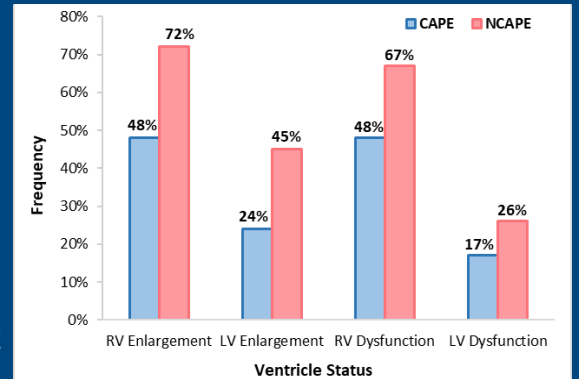


Figure 2. Rates of right and left ventricular enlargement and dysfunction in CAPE vs NCAPE at Hospital Admission. Cardiac abnormalities were identified using echo. No differences were noted in atrial size or dynamic measures such as ejection fraction. NCAPE patients had an 18% greater frequency of tricuspid regurgitation (not shown).

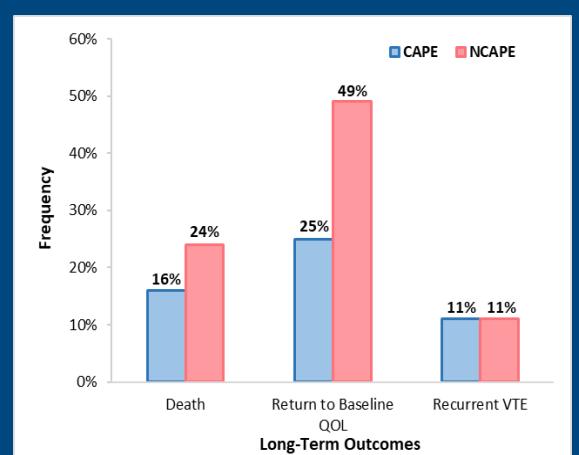


Figure 3. Long term Outcomes of CAPE vs NCAPE. Patient charts were reviewed for subsequent venous thromboembolism (VTE) and mortality up to the time of data collection. Return to baseline quality of life (QOL) was subjectively defined by the patient at the first follow up (1 6 months post discharge). QOL data was available for 16 CAPE and 73 NCAPE patients.

CONCLUSIONS

- Baseline health and demographics are similar between the CAPE and NCAPE groups.
- CAPE patients have higher rates of peripheral (defined as segmental and subsegmental) PE, whereas NCAPE patients have higher rates of central PE.
- NCAPE patients have higher rates of both right and left ventricular enlargement and dysfunction.
- CAPE patients experience a slower return to baseline quality of life.
- At 1 6 months post discharge, NCAPE patients are more likely to have abnormal echo findings, while CAPE patients are more likely to have residual PE and other pulmonary abnormalities on CT.
- Recurrence rates of VTE are equivalent between the two groups. This supports recent findings suggesting that provoked PE (CAPE) has a similar recurrence rate as unprovoked PE.

FUTURE DIRECTIONS

- More than double our study's sample size with the addition of 359 patients.
- Conduct multivariable analysis to identify potential confounding factors such as dosage and duration of anticoagulation.
- Compare the incidence and characteristics of PE among COVID 19 subvariants.

REFERENCES

[1] Tapson, V. F. (2008). Acute pulmonary embolism. *New England Journal of Medicine*, 358(10), 1037–1052. <https://doi.org/10.1056/nejra072753>.
 [2] Hauguel Moreau M, Hajjam ME, De Baynast Q, Vieillard Baron A, Lot AS, Chinet T, Mustafic H, Bégue C, Carlier RY, Geri G, Dubourg O, Beaune S, Mansencal N. Occurrence of pulmonary embolism related to COVID 19. *J Thromb Thrombolysis*. 2021 Jul;52(1):69–75. doi: 10.1007/s11239-020-02292-4. Epub 2020 Oct 6. PMID: 33025502; PMCID: PMC7538189.