Title: Co-registration of Pulmonary Thrombectomy Case Volume with Local COVID-19 Infection Incidence Rates: Analysis of Institutional PERT Registry Data

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Purpose: Studies have suggested COVID-19 infection to be associated with an increased risk of pulmonary embolism (PE). The purpose of this study is to evaluate correlation between temporal fluctuations in PE thrombectomy case volumes with that of local COVID-19 spread.

Materials and Methods: Public statewide daily COVID-19 positivity and variant data between 3/1/2020 – 8/30/2022 was captured from the State government website. Corresponding daily institutional pulmonary thrombectomy case numbers were queried from the local institutional PE Response Team (PERT) registry data bank. Numerical and categorical variables were compared using the t-test and the Chi2 test, respectively. Time series trends were constructed using the monthly cumulative occurrences of PE thrombectomy at the largest regional health institution and statewide confirmed COVID-19 test positivity numbers. Dynamic Time Warping (DTW) analysis was applied to compare two time series trends. Analyses were done using R and Stata software applications. Number of thrombectomy per 100,000 cases of statewide COVID-19 positive cases per month was calculated using variant data for each published at the end of each month in the state government website.

Results: A total of 2,399,555 COVID-19 statewide confirmed positive cases were recorded in the study period. In the same time period, 318 PE thrombectomy procedures for acute PE performed with a mean age of 61±15 years and 47% females. Among them 52 (16%) were COVID-19 positive by rapid PCR test at presentation. This group of patients were older (61±12 vs 40±21 years; P<0.001), and had lower ratio of female gender (44% vs. 53%; P=0.031). Using dynamic time warping, there was a close correlation between monthly statewide COVID-19 positivity and institutional PE thrombectomy case volumes. An uptick in the number of thrombectomy cases was seen per 100,000 COVID-19 cases per month for the duration that alpha variant was the dominant strain [median (min-max): 2.0(0.9-7.3), 2.8(1.6-5.4), 4.7(1.3-7.4), 2.6(1.1-4.6) and 2.3(0.6-12.9) for epsilon, eta, alpha, delta and omicron variants, respectively].

Conclusion: COVID-19 positivity was seen in 16% of institutional PE thrombectomy cases since start of pandemic. The patients were comprised older population with a higher ratio of male gender preponderance as compared to the total statewide confirmed COVID-19 positive population. There was a direct correlation between fluctuations in statewide COVID-19 positivity and that of institutional PE thrombectomy case volumes signaling direct association between COVID-19 peaks and increased thrombectomy procedure volumes. Especially, dominance of alpha variant among others was associated with higher overall thrombectomy case volumes. This is in agreement with previous studies showing higher mortality and D-dimer deposition in lungs, brain and kidneys with alpha variant.

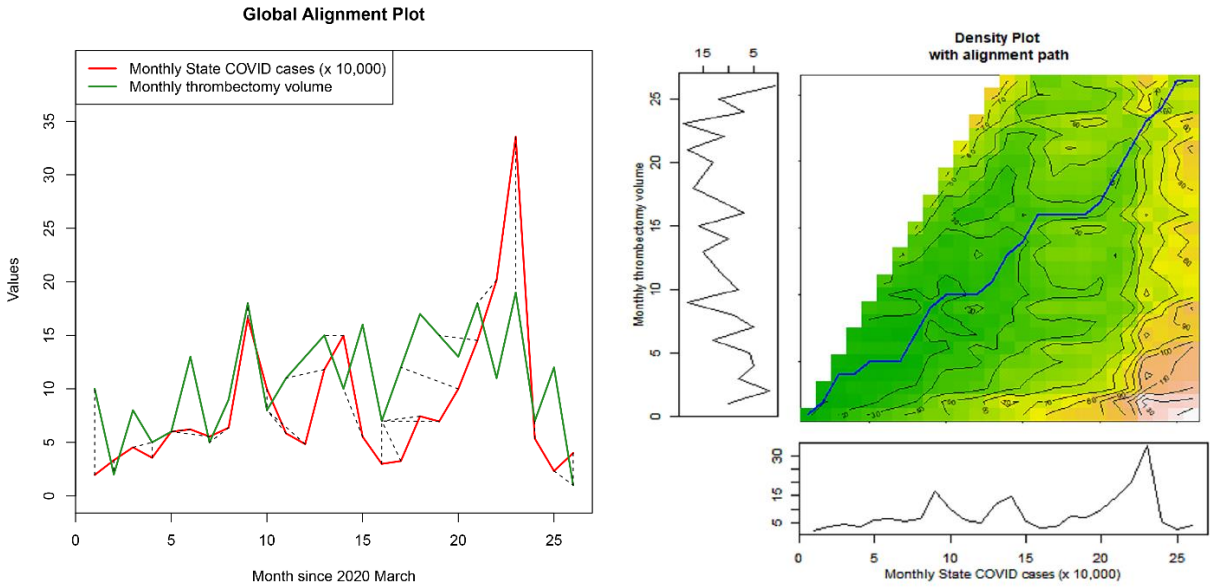

Figure 1) Global alignment plot (A) and density plot with minimal local correlation cost (B) for institutional pulmonary thrombectomy case volume and monthly new statewide COVID-19 cases. Dashed lines (A) show the closest time point with highest correlation between two time series graphs. Almost complete diagonal path of the minimum correlation cost line (blue line in plot B) signals direct correlation between two time series data.