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Effect of COVID-19 Pandemic on Mechanical Thrombectomy for Acute Ischemic Stroke Treatment in United States

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There is accumulating data suggesting that the ischemic stroke may be increased in patients with corona virus disease 2019 (COVID-19) due to hyper coagulopathy.^{1,2} An increase in acute ischemic stroke patients who require mechanical thrombectomy is to be expected particularly in regions with high rates of COVID-19.¹

We used national utilization data of a specific stent retriever (Trevo™, Stryker Neurovascular, Inc. Fremont, California, United States), as a surrogate for mechanical thrombectomy procedures, per month and for each state since January 1 2019 to April 30, 2020. Although Stryker Neurovascular, Inc kindly provided access to the national device utilization information, they did not have any role in the analysis of the data, or the writing of the present communication. We calculated the median number of mechanical thrombectomy performed per month based on data from pre-COVID 12-month period (March 1, 2019 to February 29, 2020). We excluded 25 states where median mechanical thrombectomy performed per month in the pre-COVID 12-month period was 10 or less from the primary analysis. As the monthly mechanical thrombectomy volume was not normally distributed, we used one-sample two-tailed Wilcoxin signed rank test with alpha = 0.05 to compare the number of mechanical thrombectomy performed in March and April 2020 with monthly median value for pre-COVID 12-month period for each of the respective 24 states. Compared with the

median value per month for pre-COVID 12-month period, number of mechanical thrombectomy performed in March 2020 was significantly lower in 7 states and higher in 6 states, and not significantly different in 11 states. In April 2020, the number of mechanical thrombectomy compared with the median value per month for pre-COVID 12-month period was significantly lower in 11 states, higher in 3 states, and not significantly different in remaining 10 states. Interestingly the number of mechanical thrombectomy performed in New York state, which was most affected from COVID-19 was significantly reduced in March 2020 (47 procedures), but not in April 2020 (52 procedures) compared to the median monthly value of 58.5 procedures in pre-COVID 12-month period. We identified the total number of COVID-19 cases (per million) in each state at April 30th, 2020. The bar graph (Fig. 1) demonstrates the change in number of mechanical thrombectomy performed per state according to total number of COVID-19 cases within respective state. There was no relationship visualized between the total number of COVID-19 cases in a state and change in number of mechanical thrombectomy performed. In an *Ad Hoc* exploratory analysis, the results were similar for 25 states with an average of 10 or less procedures per month. In March 2020, 5 states had reduction in number of mechanical thrombectomy performed, 8 had an increase, and no change was observed in 12 states. Whereas in April 2020, 11 states had had reduction in number of mechanical thrombectomy performed, 2 states had an increase and no change was observed in 12 states.

In general, we observed no change in March but an overall reduction in April 2020 in number of mechanical thrombectomy performed for acute ischemic stroke. There was a variation between states in regards to change in number of mechanical thrombectomy performed with most states experiencing no change, an increasing proportion experiencing a decrease, and a minority actually experiencing an increase in mechanical thrombectomy performed. This

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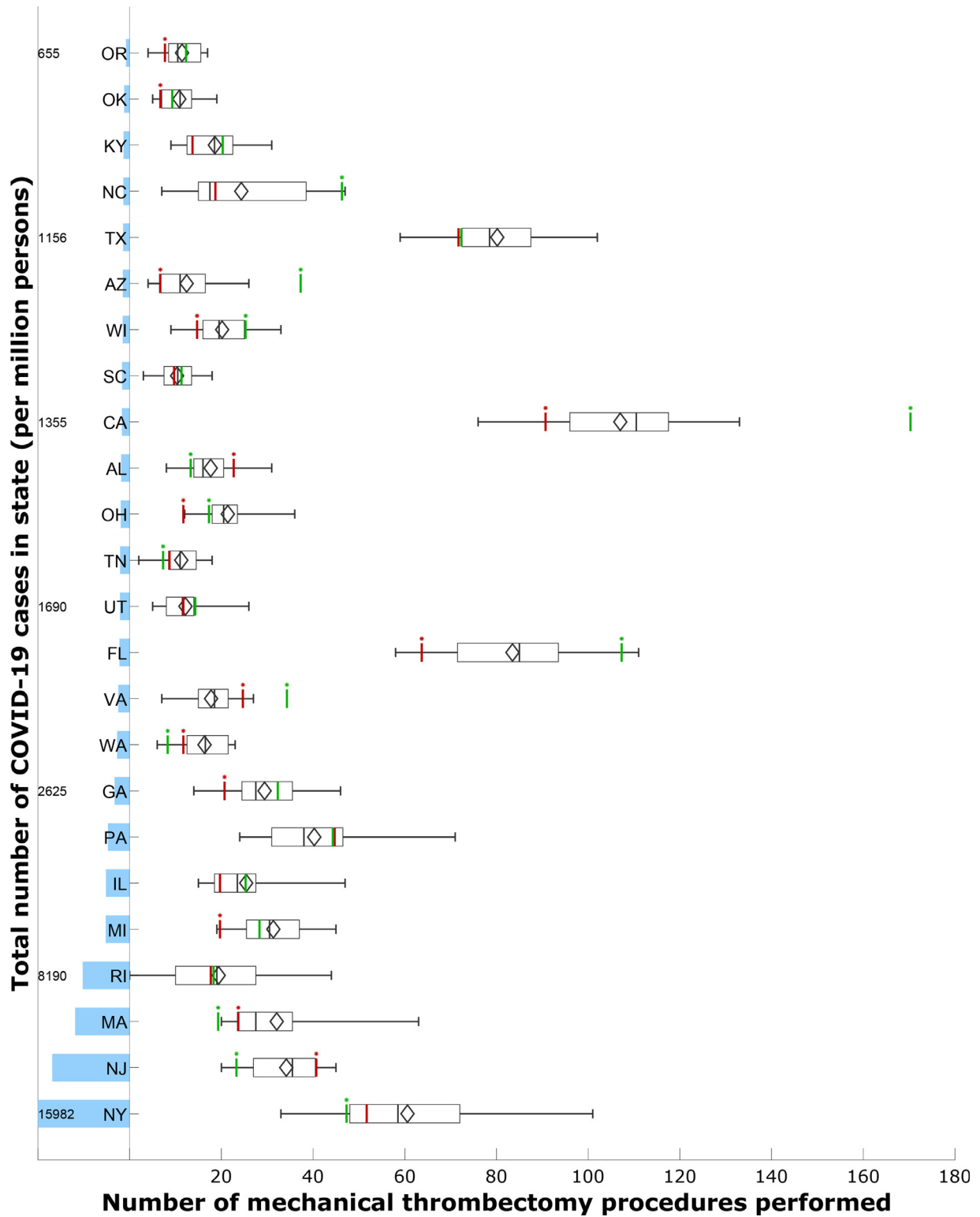


Fig. 1. Box plot representing median, interquartile range, minimum and maximum values of mechanical thrombectomy performed in each state presented according to COVID-19 cases within respective state (in ascending order from top to bottom). The red and green bars represent mechanical thrombectomy performed in March and April, 2020, respectively. The diamond represents the mean value; Red bars with * if $p < 0.05$ for difference between March 2020 and median value per month of pre-COVID 12-month period; Green bars with * if $p < 0.05$ between April 2020 and median value per month of pre-COVID 12-month period.

change in number of mechanical thrombectomy performed was not explained by differences in occurrence of COVID-19 between states. We understand that Trevo™ stent retriever is not the only device for use in mechanical thrombectomy but it is unlikely that practitioners will change device preference due to COVID-19 pandemic and therefore, the observed changes are likely due to actual change in numbers of mechanical thrombectomy performed. Plausible reasons for the apparent reduction in performance of mechanical thrombectomy during April 2020 include: a) Delays in accessing specialized care, resulting in patients presenting outside of the therapeutic window³, b) Reluctance of acute ischemic stroke patients to present at emergency departments⁴, and c) Reduction in stroke occurrence during the COVID-19 pandemic as a result of mandated social distancing. In regards to reluctance of patients to present at emergency department, acute ischemic stroke patients who require thrombectomy typically have severe neurologic deficits and are unlikely to avoid hospitalization unlike those with transient ischemic attack or minor deficits.³ Concerning the possibility of an effect by mandated social distancing, this could reflect the reduction that such a practice may have on exposure to a larger number of other respiratory tract infections that independently increase the risk of ischemic stroke.^{4,5} Our data is reflective of early part of the

COVID-19 pandemic and additional changes may be seen as the pandemic continues to evolve.

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