Prior COVID-19 and Venous Thromboembolism Risk in Total Joint Arthroplasty

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INTRODUCTION:

Deep vein thrombosis (DVT) can occur in up to 21.6% of patients after receiving elective total joint arthroplasty (TJA), and is associated with worse clinical outcomes such as revision surgeries, increased hospital length of stay, and serious postoperative complications including venous thromboembolism (VTE) and pulmonary embolism (PE).

COVID-19 has been associated with an increased risk of VTE, including DVT and PE, due to heightened inflammatory and hyper-coagulable states. However, it is unclear how prior diagnosis of COVID-19 has impacted patients undergoing TJA. We investigated 1) VTE, PE, and DVT rates post-TJA from 2016-2019 compared to 2020 and 2) the association between prior COVID-19 and VTE, PE, and DVT risk post-TJA.

METHODS: This IRB-exempt retrospective cohort study utilized the Medicare Limited Dataset including TJAs performed between 2016 and 2020. Here, we compared 2016-2019 to 2020 in terms of post-TJA VTE, PE, and DVT rates; chi-square tests were applied. Secondly, using only April-December 2020 data, multivariable logistic regression models measured the association between a previous COVID-19 diagnosis and 90-day VTE, PE, and DVT. Odds ratios (OR) with 95% confidence intervals (CI) are reported. Statistical significance was set at $p<0.05$.

RESULTS:

Among 2,040,507 TJA cases performed between 2016 and 2020, we found overall 90-day VTE, PE and DVT rates of 2.1%, 0.8% and 1.6%, respectively. When comparing 2016-2019 to 2020 we observed a paradoxical decrease in VTE, PE, and DVT rates in 2020, with VTE decreasing from 2.2% to 1.7% from April 2020 (all $p<0.0001$); **Figure 1**.

We included 170,344 TJAs performed between April and September 2020 of which 1,094 (0.6%) had a previous COVID-19 diagnosis. The rates of 90-day VTE, PE, and DVT were 2.9%, 1.6%, and 1.6%, respectively, in patients with a history of COVID-19 and 1.8%, 0.7%, and 1.3% in those without a history of COVID-19. After adjusting for covariates, a prior COVID-19 diagnosis was significantly associated with increased odds of PE (OR 1.98, 95% CI 1.21-3.22, $p=0.0062$) but not VTE (OR 1.41, 95% CI 0.99-2.03, $p=0.0598$) or DVT (OR 1.03, 95% CI 0.63-1.68, $p=0.899$).

DISCUSSION AND CONCLUSION:

We found lower VTE rates in 2020 compared to 2016-2019. This may be due to a nationwide decrease in elective orthopedic surgeries during the COVID-19 pandemic, where patients with comorbidities associated with increased VTE risk may not have opted to receive TJA. Moreover, length of hospitalization was lower in 2020 given the strong incentives to prevent COVID-19 transmission, which may also have impacted VTE risk. We additionally observed that a history of COVID-19 was associated with increased odds of PE post-TJA but not VTE or DVT. This indicates that after infection with SARS COV-2, the pathophysiology of developing PE may differ from developing other thromboembolic events in post-TJA patients.

As an increasing number of patients will have a history of COVID-19 and more data becomes available, longer-term and larger studies should be performed to investigate how COVID-19 affects outcomes and complications associated with TJA.

Figure 1. Trends in the Incidence Rates of Pulmonary Embolism (PE), Deep Vein Thrombosis (DVT), and Venous Thromboembolism (VTE) from 2016 to 2020. Chi-square statistics were applied to compare rates of PE, DVT, and VTE incidents from 2016 to 2020.