COVID-19 Infection and Vaccinations on Surgical Outcomes in Pediatric Patients with Adolescent Idiopathic Scoliosis: A Rigorous Propensity-Matched Cohort Analysis with Three-Year Follow Up

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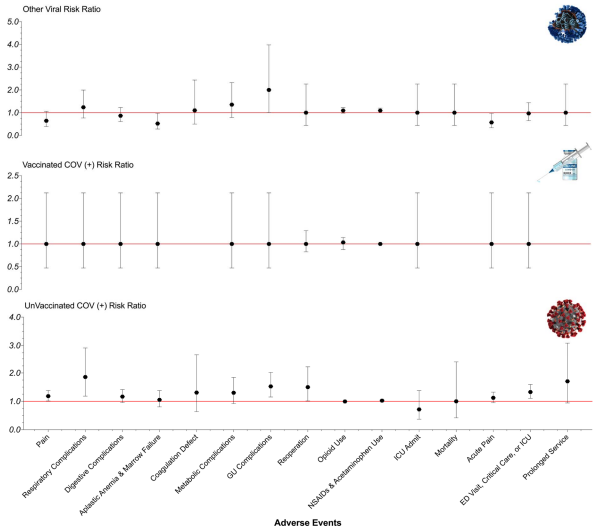
INTRODUCTION:
The mid-term and long-term impacts of COVID-19 infection and vaccination on postoperative outcomes are not yet fully understood. As precautions begin to be lifted across the country, better understanding of clinical sequelae and consequences after major surgical intervention is necessary. This study aims to evaluate the impact of COVID-19 infection and vaccination on postoperative complications in pediatric patients with adolescent idiopathic scoliosis (AIS) undergoing spinal fusion surgery.
METHODS:
This is a retrospective population-based cohort, utilizing the TriNetX Analytics platform, a federated, aggregated electronic health record research (EHR) network containing deidentified EHR data of more than 103 million patients. We evaluated all pediatric patients with AIS who underwent surgical management. The main exposures being evaluated are COVID-19 infection status; COVID-19 vaccination status; and presence of a non-COVID viral infection. Main outcomes were postoperative complications (pain, respiratory, gastrointestinal, hematologic, coagulation, metabolic, genitourinary) and outcomes (need for pain medications, secondary surgery, extended length of stay, subsequent emergency department, critical care, or intensive care unit admission, and mortality). Patients were matched on data from 1 year before surgery and followed for 3 years after surgery.
RESULTS:
The study included 4,135 patients, of which 2,711 were unvaccinated COVID-negative (control group), 1,284 were unvaccinated COVID-positive, 54 were vaccinated COVID-positive, and 86 had another viral illness. After propensity score matching, 2,034 patients qualified for the primary analysis comparing outcomes between unvaccinated COVID-positive and unvaccinated COVID-negative cohorts. Secondary analyses compared 76 vaccinated COVID-positive patients and 150 non-COVID viral infection patients with the control group. Compared to unvaccinated COVID-negative patients, unvaccinated COVID-positive patients were at 1.18x greater risk for developing pain-related complications (relative risk [RR]=1.183; 95% confidence interval [CI], 1.013-1.382; p=0.033), 1.86x greater risk to develop postoperative respiratory complications (RR=1.857; 95%CI, 1.183-2.916; p=0.006), and 1.53x greater risk for developing genitourinary complications (RR=1.527; 95%CI, 1.154-2.020; p=0.003). Unvaccinated COVID-positive patients were 1.50x more likely to undergo secondary spine surgery (RR=1.50; 95%CI, 1.015-2.217; p=0.04) and 1.33x more likely to require a subsequent ED, critical care, or ICU visit (RR=1.327; 95%CI, 1.106-1.593; p=0.002). There were no statistically significant differences between vaccinated COVID-positive and unvaccinated COVID-negative cohorts. Figure 1 demonstrates the risk ratio of all complications and outcomes evaluated among the three groups analyzed in this study.
DISCUSSION AND CONCLUSION:
Our findings suggest that COVID-19 infection increases the risk of postoperative complications and worsened outcomes in pediatric patients undergoing spinal fusion surgery. Vaccination for COVID-19 may be protective against postoperative complications, as it mitigates these risks to rates comparable to unvaccinated COVID-negative patients, though a larger sample size is needed.


Other Viral Risk Ratio
5.0
4.0
3.0
2.0
1.0
0.0
Vaccinated COV (+) Risk Ratio
2.5
2.0
1.5
1.0
0.5
0.0
UnVaccinated COV (+) Risk Ratio
4.0
3.0
2.0
1.0
0.0
Pain
Respiratory Complications
Digestive Complications
Aplastic Anemia & Marrow Failure
Coagulation Defect
Metabolic Complications
GU Complications
Reoperation
Opioid Use
NSAIDs & Acetaminophen Use
ICU Admit
Mortality
Acute Pain
ED Visit, Critical Care, or ICU
Prolonged Service
Adverse Events