

Increased Perioperative Risks After Total Knee Arthroplasty in Nonalcoholic Fatty Liver Disease Not as Severe as Cirrhosis

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INTRODUCTION: Total knee arthroplasty (TKA) is a common procedure with generally excellent outcomes. However, as utilization increases, a growing number of patients with comorbidities are considered for TKA, potentially elevating their risk of adverse outcomes. Although liver cirrhosis has been associated with inferior outcomes following TKA, the more common condition of non-alcoholic fatty liver disease (NAFLD), which affects nearly 25% of United States adult population, has not been assessed.

METHODS: Adult patients undergoing primary TKA were identified from the 2010-2023 Q1 PearlDiver M170 database. Exclusion criteria included: age < 18 years, diagnosis of trauma, infection, or neoplasm within 90 days before surgery, and lack of database activity for at least 90 days postoperatively. Our institutional review board deemed studies utilizing PearlDiver exempt from review as all data is deidentified and aggregated. Patients with NAFLD were identified using International Classification of Diseases (ICD) -9 and -10 codes for uncomplicated fatty liver or nonalcoholic steatohepatitis. Patients who later progressed to cirrhosis formed a separate cohort. A random sample of 200,000 patients without liver disease were the controls.

Ninety-day individual and aggregated (any, severe, or minor) adverse events were identified for the control, NAFLD, and cirrhosis patients. These were then compared using multivariable logistic regression with the non-liver disease cohort as reference. Regression models controlled for age, sex, obesity, diabetes, and metabolic syndrome. Statistical significance was set at $p < 0.003$ after Bonferroni correction for multiple comparisons. Odds ratios (ORs) with 95% confidence intervals (95% CIs) were reported. Differences between ORs for cirrhosis and NAFLD were assessed for aggregated outcomes using Wald tests, reported as an OR ratio (ORR, cirrhosis : NAFLD) with 95% CIs. Five-year reoperation rates were evaluated with Kaplan-Meier survival analysis and log-rank testing (statistical significance set at $p < 0.05$).

RESULTS: In total, 45,303 NAFLD patients and 2,139 cirrhosis patients were compared with 200,000 controls. Patients with NAFLD and cirrhosis had increased odds of multiple 90-day adverse events, with cirrhosis generally conferring higher risk (Figure 1). Significant associations included sepsis (NAFLD-OR: 1.39, cirrhosis-OR: 2.05), ED visits (NAFLD-OR: 1.49, cirrhosis-OR: 1.95), urinary tract infection (NAFLD-OR: 1.33, cirrhosis-OR: 1.62), pulmonary embolism (NAFLD-OR: 1.25, cirrhosis-OR: 0.89), acute kidney injury (NAFLD-OR: 1.16, cirrhosis-OR: 1.76, $p < 0.001$ for all). Aggregated outcomes were elevated for all adverse events (AAE; NAFLD-OR: 1.14, cirrhosis-OR: 1.53), severe adverse events (SAE; NAFLD-OR: 1.15, cirrhosis-OR: 1.41), and minor adverse events (MAE; NAFLD-OR: 1.14, cirrhosis-OR: 1.58). Adverse events significant only for cirrhosis included bleeding events (hematoma/transfusion; OR: 2.23), and hospital readmission (OR: 1.44) ($p < 0.001$ for all).

Wald testing of ORs showed that cirrhosis led to 35% greater odds of AAEs (ORR: 1.35, $p < 0.001$), 23% greater odds of SAEs (ORR: 1.23, $p = 0.029$), and 39% greater odds of MAEs (ORR: 1.39, $p < 0.001$) compared with NAFLD (Figure 1). Five-year survival to reoperation was also lowest among cirrhosis patients (96.8% cirrhosis vs. 97.6% NAFLD vs. 97.7% for controls, $p < 0.001$).

DISCUSSION: Patients with NAFLD undergoing TKA were at increased odds of perioperative complications and revision compared to those without liver disease, though their risk was lower than that of patients with cirrhosis. Given the high prevalence of NAFLD, these findings emphasize the need for awareness and risk mitigation in the NAFLD population but underscore that not all degree of liver disease confer the same risks.

SIGNIFICANCE/CLINICAL RELEVANCE: With NAFLD affecting nearly one quarter of United States adults, it is an increasingly common comorbidity in patients undergoing TKA. While NAFLD is associated with perioperative complications, these risks are lower than those observed in cirrhosis. The stepwise increase in risk as fatty liver disease progresses highlights the importance of early recognition and tailored perioperative management.

IMAGES AND TABLES:

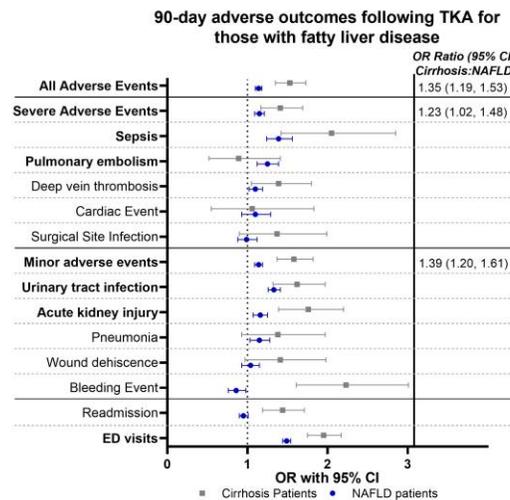


Figure 1. Forest plot of odds ratios (OR) with 95% confidence intervals (CI) for 90-day adverse events following total knee arthroplasty (TKA) in patients with NAFLD and cirrhosis. No liver disease as reference. The right column reports the ratio of ORs (cirrhosis : NAFLD) for aggregated adverse events, calculated using Wald's test.