The Journal of Arthroplasty xxx (2018) 1–6

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

No Difference in Morbidity and Mortality After Total Joint Arthroplasty in Liver Transplant Recipients: A Propensity Score–Matched Analysis of a Nationwide, Population-Based Study Using Universal Healthcare Data

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ARTICLE INFO

Article history:
Received 25 April 2018
Received in revised form
16 May 2018
Accepted 28 May 2018
Available online xxx

Keywords:
total joint arthroplasty
liver transplantation
complication
mortality

ABSTRACT

Background: Controversy remains regarding the outcomes after total joint arthroplasty (TJA) among patients with or without liver transplantation (LT). This study aimed at investigating the prevalence of TJA in patients after LT and comparing the morbidity and mortality with the non-LT group.
Methods: We conducted a nationwide, population-based study, with data extracted from a universal health insurance database, based on the International Classification of Disease, Ninth Revision, Clinical Modification. Patients who underwent TJAs between January 2001 and December 2014 were included. Patients who had bilateral TJAs or a TJA before LT were excluded. A total of 43 patients with LT and 350,337 patients without LT were included. The analysis was implemented using data from all patients and those matched by 1-to-10 propensity score matching. Multivariable logistic regression was used to control confounding variables.
Results: The prevalence of patients undergoing TJA after LT was 1.3% (43/3276). After propensity score matching, patients with LT were not associated with 30-day complications (adjusted odds ratio [aOR], 0.98; 95% confidence interval [CI], 0.93-1.03; $P = .35$), 30-day readmission rates (aOR, 0.93; 95% CI, 0.92-1.08; $P = .87$), 90-day complication rates (aOR, 0.95; 95% CI, 0.88-1.02; $P = .16$), 1-year infection rates (aOR, 1.04; 95% CI, 0.96-1.12; $P = .35$), reoperation rates (aOR, 1.06; 95% CI, 0.92-1.23; $P = .41$), or mortality (aOR, 0.91; 95% CI, 0.80-1.04; $P = .18$).
Conclusion: The morbidity and mortality seem to be comparable whether TJA is performed in patients with or without LT. Methods for risk assessment would be feasible in liver transplant recipients.

Liver transplantation (LT) is an increasingly popular treatment option for patients with the end-stage liver disease or hepatocellular carcinoma [1]. Annually, more than 5000 LTs are performed in the United States, which accounts for 0.018% of US population [2]. Since 1984, more than 3000 LTs (0.010%) have been conducted in Taiwan, which has the highest survival rate in the world [3]. With the judicious patient selection, advancement of perioperative care, surgical technique, and immunosuppressive medications, the survival rate of patients after LT is promising [4].

No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to https://doi.org/10.1016/j.arth.2018.05.045.

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https://doi.org/10.1016/j.arth.2018.05.045
0883-5403/

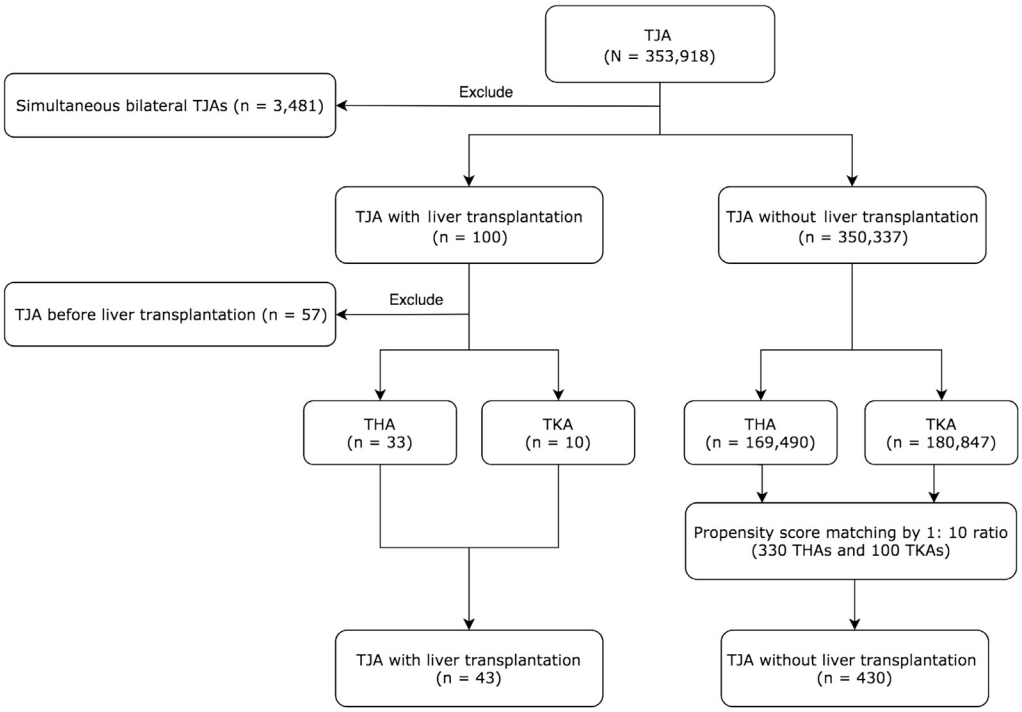

Fig. 1. A flowchart of the study cohort. TJA, total joint arthroplasty; TKA, total knee arthroplasty; THA, total hip arthroplasty.

As the survival rate of liver transplant recipients continues to improve, patients are living longer; they may later need total joint arthroplasty (TJA) due to the development of age-related osteoarthritis or immunosuppressive medication–induced osteonecrosis, as immunosuppressive therapy can result in reduced bone quality and increased susceptibility to infection [5–8]. The current literature remains divided on the morbidity of patients with LT who underwent TJA. Some reports indicated that patients with LT had higher rates of infection [9,10], surgically related complications [10,11], and reoperations [12]. Furthermore, patients with LT were also reported as having higher rates of in-hospital complications, including acute kidney injury, cardiac and respiratory complications [13,14]. However, other studies demonstrated that there were no increases in significant complications (dislocation or infection) nor revision rates following TJA in patients with LT [6,15–17]. All of these studies were limited by small sample size, limited follow-up time, or included patients who are receiving TJA before LT.

Therefore, we used a nationwide, population-based registry dataset to investigate the incidence of TJA in patients after LT and compare the 30-day complication rates, 90-day complication rates, 30-day readmission rates, 1-year infection rates, reoperation rates, and mortality with the non-LT group.

Materials and Methods

Data Source

This retrospective cohort study was conducted using national datasets. The Health and Welfare Data Science Center database is a set of healthcare-related databases providing information compiled from over 30 departments and ministries, including the National Health Insurance Research Database (NHIRD). The NHIRD is an administrative dataset containing claims records derived from Taiwan's universal National Health Insurance program. It was established in 1995 and has enrolled 99% of the

Table 1
Postoperative Complications Identified by ICD-9-CM Codes.

Complications	ICD-9-CM Codes
Cardiovascular	410-410.99, 411, 411.0, 411.1, 411.8, 411.81, 411.89, 428-428.09, 428.1, 428.2, 428.21, 428.23, 428.3, 428.30, 415.0, 426-427.99, 428.31, 428.33, 428.4, 428.40, 415, 428.41, 428.43, 428.9, 429.5, 429.6, 429.79, 429.81
Respiratory	480.x-486.x, 512-512.99, 998.81, 799.1, 513-513.99, 511-511.99, 518-519.99, 786.3-786.39, 514, 786.03, 799.02, 999.1-999.19
Deep venous thrombosis	444.2-444.29, 451.1-451.29, 451.84, 451.89, 451.9, 453.2, 453.3, 453.4, 453.40, 453.41, 453.42, 453.82, 453.83, 453.84, 453.85, 453.86, 453.87, 453.89, 453.9
Pulmonary embolism	415.1, 415.11, 415.13, 415.19
Acute renal failure	584.5-584.9
Transfusion	99.0, 99.02, 99.04, 99.03, 99.05
Readmission	Subsequent claim records in 30 d
Infection	996.66, 996.67
Reoperation	81.53, 81.55, 80.05, 80.06, 80.15, 80.16

ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification.