



ELBOW

Obesity is associated with increased postoperative complications after total elbow arthroplasty



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Background: Obesity has become a significant public health concern in the United States. Few published data have examined the association between obesity and postoperative complications after total elbow arthroplasty (TEA).

Methods: Patients who underwent TEA were identified using the PearlDiver database *Current Procedural Terminology* codes. Patients were divided into obese and nonobese cohorts using *International Classification of Diseases, Ninth Revision* codes. Each cohort was then assessed for major and minor complications within 90 days postoperatively. Odds ratios, 95% confidence intervals, and χ^2 tests were calculated, with $P < .05$ considered significant.

Results: From 2005 to 2011, 7580 patients who underwent TEA were identified, of whom 1030 patients (14%) were coded as obese (body mass index > 30) and 611 patients (8%) were coded as morbidly obese (body mass index > 40). The obese TEA patients had increased risk of 90-day major and minor complications. The rate of postoperative venous thromboembolism differed significantly between groups, with a trend toward a higher venous thromboembolism rate in obese patients (2.2%) vs. nonobese patients (0.7%). Rate of postoperative stiffness was similar between groups. Infection rates were higher in obese patients compared with nonobese patients. Medical complications were higher in obese patients (16.7%) compared with the nonobese cohort (4.7%). A significant difference in implant removal was notable at 6 months and 1 year in morbidly obese patients compared with nonobese counterparts.

Conclusions: Obesity and associated medical comorbidities place patients at increased risk for complications after TEA. Obese patients and especially morbidly obese patients thinking of undergoing TEA should be appropriately counseled preoperatively about their increased risk for complications.

Level of evidence: Level III, Retrospective Cohort Comparison Using Large Database, Treatment Study.
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Keywords: Total elbow arthroplasty; postoperative complications; elbow stiffness; revision total elbow; perioperative risk assessment; obesity

This study was exempt from Institutional Review Board Ethical Committee approval.

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The prevalence of obesity continues to rise, and it remains a major public health concern across the globe. Within the United States alone, since the 1970s, the rate of obese adults has doubled to epidemic proportions, with approximately 33% of men and 36% of women being

considered obese.¹⁴ Commonly associated with other risk factors including obstructive sleep apnea, diabetes, and heart disease, obesity is currently the fifth leading cause of death and is directly related to increased health care costs. Not surprisingly, the number of morbidly obese patients seeking joint replacement surgery is on the rise as well.

Several studies have identified obesity as a risk factor in patients undergoing elective joint arthroplasty, although to date most studies have focused on hip and knee arthroplasty. This has led many surgeons to limit lower extremity arthroplasty to patients with a body mass index (BMI) <40. The role of obesity in elbow arthroplasty is not as clear and has not often been studied. Total elbow arthroplasty (TEA) volume has increased significantly during the past 2 decades. Certain traumatic conditions in the elderly population are being increasingly addressed with elbow arthroplasty.

Although significant advances have been made in TEA design, complications continue to occur. Many complications, both specific and nonspecific, are reported after TEA and continue to plague upper extremity surgeons.^{12,31,32,46,77} Specific complications include infection, neurovascular injury, component malposition, joint stiffness, and dislocation.^{12,31,46} Nonspecific complications include deep venous thrombosis, pulmonary embolism, blood transfusions, and infection.¹²

In a growing culture of moving toward bundled payments, cost containment, and focus on preventive medicine, preoperative identification and documentation of expected outcomes are critical. Obesity has become a significant public health concern in the United States. Obesity has been associated with increased perioperative and postoperative complications after numerous orthopedic procedures. These include total hip and knee arthroplasty^{1,7,11,16,18,19,26,39,41,42,45,50,52,54,59,61,68,72,73,80,81,84}; total shoulder arthroplasty^{20,51}; spine surgery^{33,43,53,57,64,67,70,78,79,88}; fixation of acetabulum, ankle, and femur fractures^{37,48,49,56,66,74,76}; knee arthroscopy^{13,75,86}; shoulder arthroscopy^{60,83}; and others.^{17,23,71}

Few studies have examined the association between obesity and postoperative complications after TEA. To date, there has been no large population-based study examining the association between obesity and TEA. The objective of this study was to use a national database to assess the association of obesity and its medical comorbidities with postoperative complications after TEA.

Methods

All data were ascertained from a publicly available patient database, the PearlDiver Patient Records Database (www.pearldiverinc.com; PearlDiver Inc, Fort Wayne, IN, USA). The database contains procedure volumes, demographics, and average charge information for patients with *International Classification of Diseases, Ninth Revision* (ICD-9)

diagnoses and procedures or *Current Procedural Terminology* (CPT) codes. Data for the present study were derived from the Medicare database within the PearlDiver records, which has a total of 135,509,904 individual patient records from 2005 to 2011. Access to the database was granted by PearlDiver Technologies for the purpose of academic research. The database was stored on a password-protected server maintained by PearlDiver. CPT and ICD-9 codes can be searched in isolation or in combination with one another. The search results yield the number of patients with the searched code or combination of codes.

For the purposes of this study, the database was queried for the procedure of TEA by CPT code. The associated CPT and ICD-9 codes used to define the operative cohort are listed in [Table I](#) (online only). We excluded patients who underwent surgery for revision total elbow but did include revision for fracture to eliminate as many confounding variables as possible. Patients were then divided into nonobese and obese cohorts by ICD-9 codes for overweight, obesity, morbid obesity, and BMI >30 as listed in [Table I](#).

The obese and nonobese cohorts were queried for basic demographics including sex, age (<65, 65-80, >80 years), and smoking status ([Table II](#)). Comorbidities for each cohort, including diabetes mellitus, obstructive sleep apnea, hyperlipidemia, hypertension, peripheral vascular disease, congestive heart failure, coronary artery disease, chronic kidney disease, chronic lung disease, and chronic liver disease, were assessed by ICD-9 codes for each disease.

The obese and nonobese cohorts were then queried for postoperative complications within a set time period after the surgical procedure. Infection, stiffness, venous thromboembolism (VTE), medical complications, and transfusion were evaluated out to 90 days. Dislocations, loosening, and periprosthetic fractures were evaluated out to 1 year. Revision TEA was included out to 2 years postoperatively. The PearlDiver database cannot report patient groups of fewer than 10 patients to remain Health Insurance Portability and Accountability Act compliant; thus, complications were pooled to yield usable data. Overall complications were queried as local and systemic complications. Systemic complications included pulmonary embolism, deep venous thrombosis, acute myocardial infarction, respiratory failure, acute postoperative cerebrovascular accident, urinary tract infection, pneumonia, acute renal failure, cholecystitis, and need for postoperative blood transfusion. Local complications included diagnosis of postoperative infection, need for postoperative irrigation and débridement, postoperative stiffness requiring manipulation under anesthesia or lysis of adhesions, dislocation, implant loosening, and periprosthetic fracture. Postoperative implant removal and revision were also separately queried. The associated ICD-9 and CPT codes for each postoperative complication are provided in [Table I](#).

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