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Shoulder arthroplasty in patients with Parkinson's disease is associated with increased complications

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Background: Case series suggest a higher postoperative complication rate after shoulder arthroplasty in patients with Parkinson's disease (PD). The purpose of this study was to evaluate the perioperative complications in patients with PD undergoing conventional total shoulder arthroplasty (TSA), reverse shoulder arthroplasty (RSA), and shoulder hemiarthroplasty (HA).

Methods: Patients with PD who underwent TSA, RSA, or HA were identified in a national insurance database and then matched to controls without a diagnosis of PD based on age, gender, obesity, diabetes, and tobacco use. Complications were assessed, including infection, dislocation, revision, stiffness, fracture, component loosening, and systemic complications.

Results: The final study cohorts included 3390 TSA patients with PD and 47,034 matched TSA controls; 809 RSA patients with PD and 14,262 matched controls; and 2833 HA patients with PD and 38,850 matched controls. PD was associated with significant higher rates of infection (odds ratio [OR], 1.5, 1.7, 1.5, respectively), dislocation (OR, 2.5, 2.0, 2.8, respectively), revision arthroplasty (OR, 1.7, 1.8, 1.4, respectively), and systemic complications (OR, 1.4, 1.7, 1.3, respectively) after all 3 types of shoulder arthroplasty and with higher rates of periprosthetic fracture after conventional TSA (OR, 1.5) and shoulder HA (OR, 1.5). Component loosening was also more commonly noted in patients with PD after conventional TSA (OR, 1.5) and HA (OR, 1.9).

Conclusion: PD is associated with increased rates of infection, dislocation, revision shoulder arthroplasty, fracture, component loosening, and systemic complications after conventional TSA, RSA, and shoulder HA.

Level of evidence: Level III, Retrospective Cohort Design Using a Large Database, Treatment Study.

Keywords: Shoulder arthroplasty; Parkinson's disease; complication; revision; dislocation; infection; loosening; stiffness

Although Parkinson's disease (PD) is a relatively common diagnosis in the elderly population, with an incidence of approximately 1% to 2% in those aged older than 65 years in the United States, little has been written about the outcomes of shoulder surgery in this population.[12,15] Much of the available arthroplasty literature in patients with PD has

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focused on the lower extremity, with reports of successful pain relief but marginal functional benefit and increased perioperative complications after total knee and hip arthroplasty.[16,21,26] Poor functional results after lower extremity arthroplasty in patients with PD have been attributed to preexisting muscle rigidity, severe tremor, dystonia, postural instability, and motor disturbances leading to increased falls. These patients also have a postoperative mortality rate 1.6-times to 3-times higher than that of the general population.[1,11,20,24] Furthermore, patients with PD have a lower bone mineral density and are at a significantly increased risk for low-energy fractures.[25] The upper extremities are more commonly affected than the lower extremity by tremors and choreiform movements, and some have proposed that this, in addition to increased susceptibility to falls and low-energy fractures, may cause even greater failure and complication rates in this population after shoulder arthroplasty.[10,11,13,14]

The available literature evaluating shoulder arthroplasty for traumatic and atraumatic indications in patients with PD is limited to small, retrospective, institutional series.[4,11,13,14] It has been suspected that patients with PD are at higher risk for complications after any type of shoulder arthroplasty due to numerous motor, cognitive, and metabolic factors.[4] However, characterizing and comparing the perioperative complications in patients with PD undergoing shoulder arthroplasty has been difficult to this point due to the relatively low incidence of these procedures in patients with the disease.

This study used a national database to evaluate and compare the perioperative complications in patients with PD undergoing primary shoulder hemiarthroplasty (HA), total shoulder arthroplasty (TSA), and reverse shoulder arthroplasty (RSA) for osteoarthritis and proximal humeral fractures. We hypothesized that patients with PD would have increased rates of postoperative stiffness, revision surgery, fracture, dislocation, and systemic complications after shoulder arthroplasty for osteoarthritis and proximal humeral fracture compared with patients without PD.

Materials and methods

Data for the present study were derived from the PearlDiver Patient Records Database (www.pearldiverinc.com; PearlDiver Inc, Fort Wayne, IN, USA), a for-fee patient database that contains procedure volumes and demographics for patients with International Classification of Diseases, 9th Revision (ICD-9) diagnoses and procedures codes or Current Procedural Terminology (CPT) codes (American Medical Association, Chicago, IL, USA). The present study used data derived from the Medicare database within the PearlDiver records, which has more than 100 million individual patient records from 2005 to 2012. Access to the database was granted by PearlDiver Technologies for the purpose of academic research. The database is stored on a password-protected server maintained by PearlDiver.

Patients who underwent shoulder arthroplasty from 2005 to 2012 were identified using ICD-9 procedure codes and CPT codes, including conventional TSA (ICD-9 81.80, CPT 23472), RSA (ICD-9 81.88), and shoulder HA (ICD-9 81.81 and CPT 23470). Patients with a diagnosis of PD who underwent shoulder arthroplasty were identified using ICD-9 332.0. Patients with secondary parkinsonism (ICD-9 332.1) were not included. A matching control cohort for each of the 3 operative PD cohorts (TSA, RSA, HA) was created, consisting of the maximum number of available patients without PD in the database who underwent the respective procedure that could be included and matched to achieve a statistically similar distribution of 5 key variables: age, gender, obesity, diabetes, and tobacco use. The sequential matching algorithm first matched by gender, then by age group, followed by diabetes, tobacco use, and finally, obesity.

Data for patients in each operative cohort were then queried for basic demographics and comorbidities, including sex, age (<65, 65-79, ≥80 years), obesity, diabetes mellitus, and smoking status, and compared to confirm successful matching of study and control cohorts. Each cohort was then queried for postoperative complications after the surgical procedure by using ICD-9 and CPT codes. Postoperative infection within 6 months, dislocation within 1 year, revision shoulder arthroplasty up to 8 years, shoulder stiffness within 1 year, periprosthetic fracture within 1 year, prosthetic loosening within 1 year, and systemic complications within 3 months postoperatively were queried using the ICD-9 and CPT codes provided in Appendix Table I.

Odds ratios (OR) and 95% confidence intervals were calculated for each comparison between study cohorts and controls. The χ^2 test was used to determine statistical significance, with $P < .05$ considered significant. Statistical calculations were performed in SPSS 22 software (IBM Corp, Armonk, NY, USA).

Results

The final study cohorts included 3390 TSA patients with PD and 47,034 matched TSA controls, 809 RSA patients with PD and 14,262 matched controls, and 2833 HA patients with PD and 38,850 matched controls. A comparison of each cohort's demographics and medical comorbidities is provided in Table I. The matching algorithm was successful because there were no statistically significant differences between the PD and matched control cohorts for the assessed variables.

Patients with PD who underwent TSA had significantly higher rates of most assessed postoperative complications compared with matched controls, including infection (OR, 1.5; $P = .009$), dislocation (OR, 2.5; $P < .0001$), revision arthroplasty (OR, 1.7; $P < .0001$), periprosthetic fracture (OR, 1.5; $P = .034$), prosthetic loosening (OR, 1.5; $P = .030$), and systemic complications (OR, 1.4; $P < .0001$; Table II, *A*). The most notable difference between the 2 cohorts was the rate of dislocation within 1 year postoperatively, which was 4.0% patients with PD compared with 1.6% in matched controls. There was no difference in the rate of postoperative shoulder stiffness between patients with and without PD.

Patients with PD who underwent RSA had similarly higher rates of most of the assessed postoperative complications compared with matched controls, including infection