Correlation Between a Dedicated Orthopedic Complication Grading System and Early Adverse Outcomes in Joint Arthroplasty

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Disclosures:  D.Y. Harris: None. J. McAngus: None. Y. Kuo: None. R.W. Lindsey: None.

Introduction: There is no widely accepted definition or classification system for orthopedic surgery complications. We retrospectively stratified 90-day postoperative complications in a consecutive cohort of primary total hip and total knee arthroplasty (THA and TKA) patients at a single center by using a modified version (1) for orthopedics of the Clavien-Dindo Surgical Complication Classification System (CDS) to assess whether an association exists between modified-DS grade and length of hospital stay (LOS) and readmission/reoperation (RA/RO) rates.

Methods: Complications were stratified by the five-point grading scale of the modified CDS. Bivariate analyses were conducted to identify associations of complication grade with early adverse outcomes (LOS and RA/RO rates) and patient variables (age, gender, BMI, ASA). Chi-square testing and ANOVA were used for categorical and continuous variables, respectively. To quantify the magnitude of complication grade in patients with multiple complications, we used total complication and maximum complication grades, the former defined as the sum of all complications and the latter as the highest-grade complication. The association between total and maximum complication grades and LOS and 90-day RA rate was adjusted for age, sex, TDC (Texas Department of Corrections) status, ASA, BMI, and TKA or THA. All of the tests were two-sided with alpha set at 0.05.

Results: A total of 254 complications were documented in 137 procedures (hip 89, knee 108). Sixty (30.5%) procedures were associated with no postoperative complications. Average LOS was 4.80 ± 2.78 days (range 2-30 days). The difference in complications incidence between TKA patients (84.3%) and THA patients (57.4%) was significant (p<0.0001). TKA was significantly associated with increasing total and maximum complication grades. When total and maximum grades were analyzed with respect to LOS and RA within 90 days adjusted for age, sex, TDC status, ASA, BMI, and TKA or THA, maximum complication grade was significantly associated with a longer index hospital stay (p<0.0001) and more RA/RO (p=0.0001). Total complication grade was also significantly associated with both a longer index hospital stay (p<0.0001) and more RA/RO (p<0.0001). The total complication grade accounted for 35% of the variation in LOS (R2 value). The area under receiving operation curve (ROC) was 0.94 (95% CI: 0.90-0.98) for the model with total complication grade and covariates. The total complication grade was a better predictor than maximum complication grade of LOS and RA rate.

Discussion: This study to our knowledge is the first to determine the association between THA/TKA modified CDS complication grade and orthopedic surgical outcomes. Both the total and maximum complication grades were significantly associated with increased LOS and RA/RO. Total complication grade was a better predictor of LOS than maximum grade, and suggests that multiple complications of a lesser grade may affect outcomes as much as a single higher-grade complication. In summary, our study showed that the modified CDS classification system is applicable to THA and TKA patients in terms of
documenting the severity of complications and indicating early adverse outcomes with respect to length of hospital stay and readmission rate.

**Significance:** A proposed orthopedic complications grading system for total hip and total knee arthroplasty was found to be valid for documenting the severity of complications and indicating early adverse outcomes.

*ORS 2015 Annual Meeting*

*Poster No: 1781*