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Predictors of Total Knee Arthroplasty Deep Infections in 23,089 Cases

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From the Kaiser Permanente National Total Joint Replacement Registry

INTRODUCTION

Infections of total knee replacement (TKA) are devastating to the patient and surgeon. The reported incidence of infections in TKA varies widely, and various unproven prophylactic measures and risk factors have been implicated.

METHODS

We conducted a retrospective analysis of TKA data from April 1, 2001 to March 31, 2006 using a total joint registry of community based hospitals. A comprehensive infection surveillance program was utilized with strict adherence to CDC guidelines. The study population included 23,089 cases (21759 primary and 1330 revisions). Data analysis was performed on 15,788 cases, including 120 with deep infection. We conducted multivariate logistic regression analysis to determine the effects of thirteen patient and clinical variables. Clinical variables included prophylactic measures, surgeon case volume, operative time and use of drains. Patient variables included geographical region, age, gender, ASA score, primary diagnosis, and co-morbidities. For each input variable we calculated adjusted odds ratios with 95% confidence intervals.

RESULTS

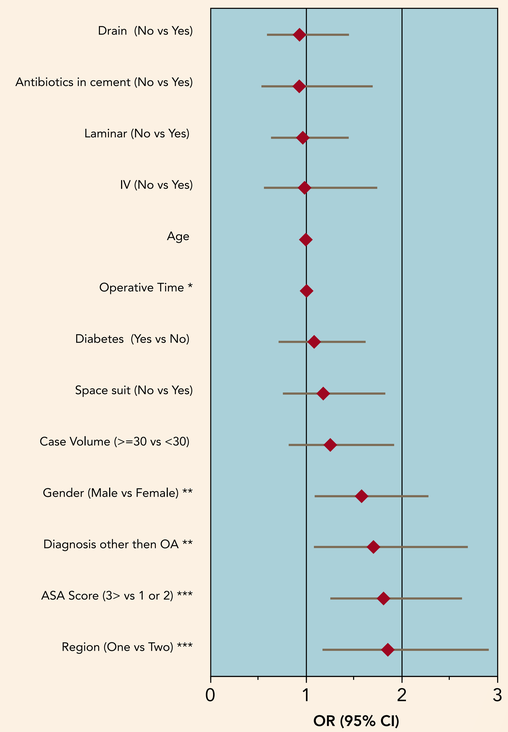
After adjusting for age (p=0.246), diabetes (p=0.754), surgical case volume (p=0.327), use of laminar flow (p=0.831), antibiotic loaded cement (p=0.818), IV (p=0.942), use of body exhaust suits (p=0.473) and insertion of surgical drains (p=0.707), we identified five risk factors of deep infection. Deep Infection was associated with male gender (p=0.013), higher ASA score (p=0.002), diagnoses other than osteoarthritis (p=0.025), geographical region (p=0.008) and operative time (p=0.045). The Table and Figure show odds ratios and confidence intervals.

There was a weak association between longer operative time and deep infections (OR=1.004; 95% CI,1.001-1.008). Of the factors that are under the surgeon's control, only operative time was significant.

Table. Odds Ratios (OR) with 95% Confidence Intervals (CI) by Variable.

Variable	Odds Ratio (OR)	Lower 95% CI	Upper 95% CI	P-value
Gender (Male vs Female)	1.58	1.10	2.27	0.013
Region (One vs Two)	1.84	1.17	2.90	0.008
Case Volume (>=30 vs <30)	1.25	0.80	1.93	0.327
Age (years)	0.99	0.97	1.01	0.246
Operative Time (minutes)	1.01	1.001	1.01	0.045
Laminar (No vs Yes)	0.96	0.63	1.44	0.831
Antibiotics in cement (No vs Yes)	0.93	0.51	1.70	0.818
IV (No vs Yes)	0.98	0.56	1.73	0.942
Diagnosis other then OA (Yes vs No)	1.69	1.07	2.69	0.025
Space suit (No vs Yes)	1.18	0.76	1.83	0.473
ASA Score (3> vs 1 or 2)	1.82	1.25	2.64	0.002
Drain (No vs Yes)	0.92	0.58	1.45	0.707
Diabetes (Yes vs No)	1.07	0.71	1.62	0.754

Figure. Odds Ratios (OR) with 95% Confidence Intervals (CI) by Variable.



CONCLUSION

At the 2005 AAOS meeting, we presented our initial analysis of TKA infections utilizing the Kaiser Permanente Total Joint Registry, reporting a 0.6% infection rate in 5,103 primary cases and 1.5% in 333 revision cases (Namba 2005). The current follow-up analysis shows an infection rate of 0.7% in 14,984 primary cases and 1.6% in 794 revision cases over a five year period. We believe that the large sample size, contemporary time period (2001-2006), and comprehensive infection surveillance program represents an accurate depiction of current TKA infection rates in a community setting.

Patient factors remain an important consideration for possible complications with TKA surgery: male gender, ASA III and IV, and diagnosis other than osteoarthritis were associated with an increased risk of TKA infection. These findings are in agreement with previous investigators (Lai 2007; Hanssen 1996; Wilson 1990). Contrasting previous reports, patient factors which were not observed to be associated with infection include patient age (Thomas 2004) and diabetes mellitus (Lai 2007).

Surgeon factors associated with increased TKA infection included operative time and regional variation. With only 120 cases of deep infections, however, we lacked statistical power to further evaluate these observations. Low surgeon case volume was associated increased overall complication rates (Katz 2004) but the current investigation focuses only on infection. With the numbers available, surgeon case-volume and prophylactic measures such as laminar flow, body exhaust suits, pre-mixed antibiotic-loaded cement were not associated with an increased risk of TKA infection. Further study is needed to determine the underlying cause of regional variation in deep wound infection rates in among KP members undergoing TKR.

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