

Supplementary Online Content

Pincus D, Jenkinson R, Paterson M, Leroux T, Ravi B. Association between surgical approach and major surgical complications in patients undergoing total hip arthroplasty. *JAMA*. doi:10.1001/jama.2020.0785

eFigure 1. Testing the proportional hazard assumption

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eFigure 2. Cumulative Incidence of Major Surgical Complications in Patients Undergoing Total Hip Arthroplasty by Surgical Approach Type After Matching

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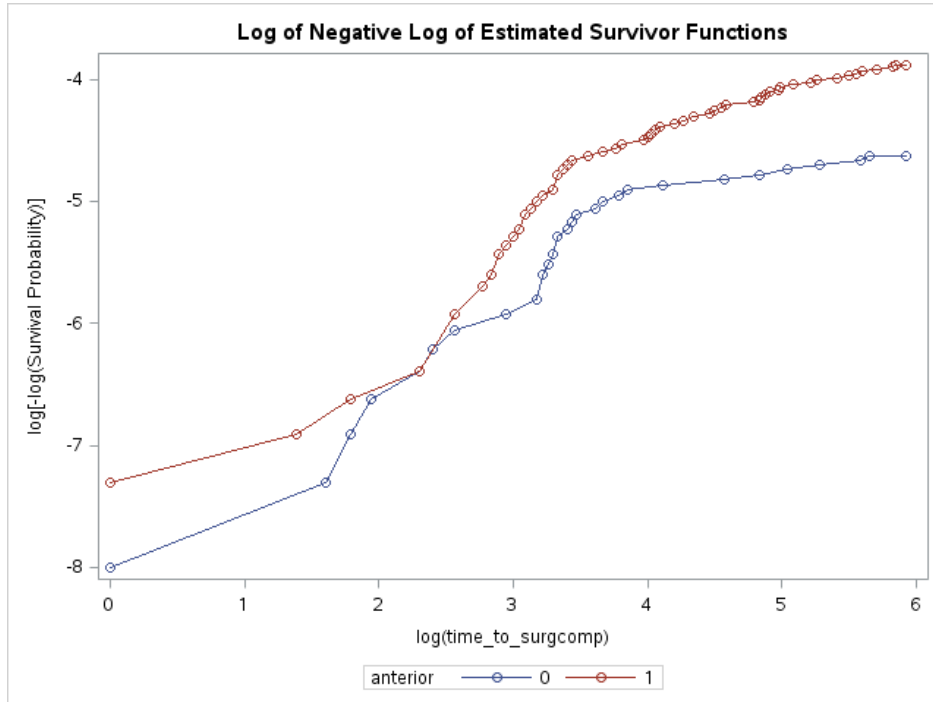
eAppendix 3. Analyses accounting for clustering

eTable. Number of surgeons with major surgical complications by approach after matching

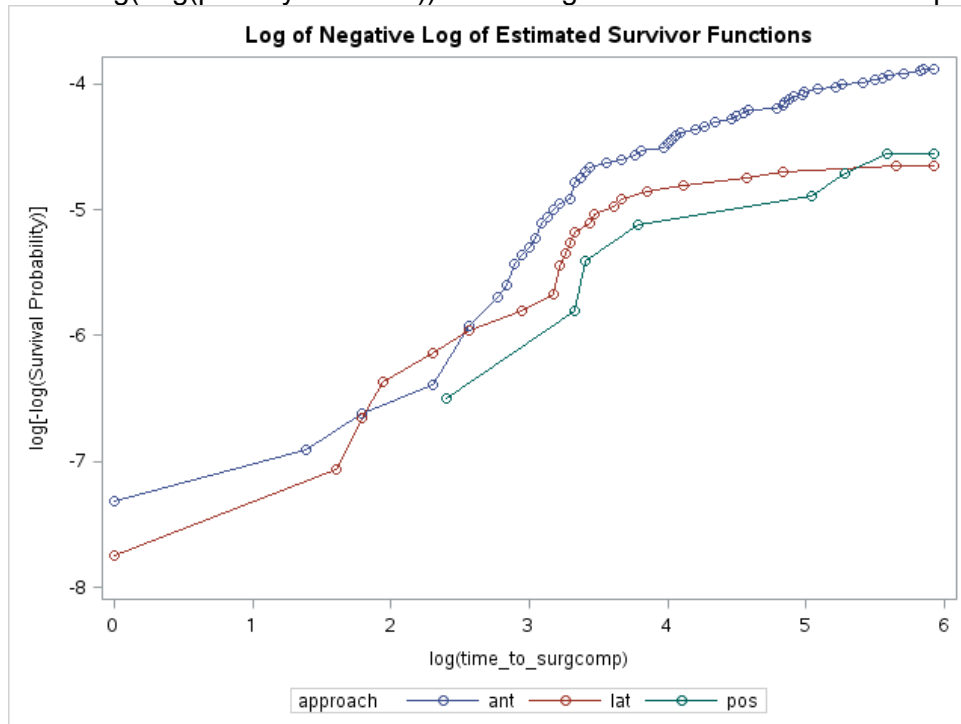
This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure 1. Testing the proportional hazard assumption

The proportionality assumption was tested by graphical methods and met for the primary analysis. The graph of the $\log(-\log(\text{primary outcome}))$ versus \log of survival time resulted in parallel lines:



The proportionality assumption was also tested met for the sensitivity analysis in Appendix 2. The graph of the $\log(-\log(\text{primary outcome}))$ versus \log of survival time resulted in parallel lines:



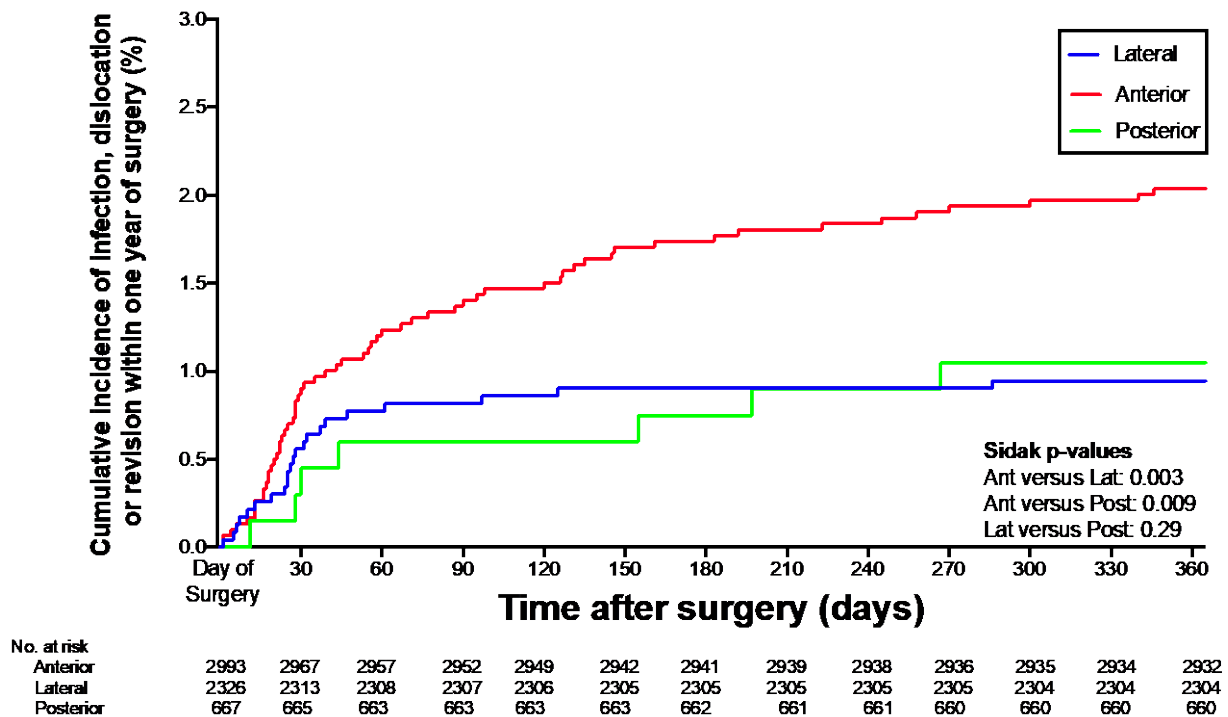
eAppendix 1. Results of lateral and posterior approaches analyzed separately

Patients undergoing muscle-splitting approaches (lateral and posterior) were grouped together in the primary analysis *a priori* and analyzed separately in sensitivity analyses *post-hoc* below. Lateral and posterior approaches were distinguished based on the specific primary surgeon involved and their own practice pattern.

The cumulative probability of major surgical complication events (deep infection requiring surgery, dislocation requiring closed or open reduction, or revision surgery) were calculated after matching using the Kaplan-Meier method (Supplementary Figure below). Patients were categorized by approach type (anterior, lateral or posterior) and follow-up was one year for patients in all 3 groups. Sidak tests were used to calculate *P* values to account for multiple comparisons. Generalized estimating equations (GEEs) calculated percent absolute risk differences (% absolute risk difference [RD], with 95% CIs). Analyses were conducted among the propensity-score matched patients from the primary analysis (N=2,993 anterior, N=2,326 lateral, N=667 posterior).

Compared to patients that had a lateral approach, patients that had an anterior approach had a significantly greater risk of a major surgical complication within one year (absolute risk difference 1.10% [95% CI 0.46%-1.74%]; Sidak *p* = 0.003). Compared to patients that had a posterior approach, patients that had an anterior approach had a significantly greater risk of a major surgical complication within one year (absolute RD 0.99% [95% CI 0.06%-1.93%]; Sidak *p* = 0.009). Patients undergoing lateral and posterior approaches did not have a significant difference in the risk of a major surgical complication within one year (Sidak *p* = 0.29).

eFigure 2. Cumulative Incidence of Major Surgical Complications in Patients Undergoing Total Hip Arthroplasty by Surgical Approach Type After Matching



eAppendix 2. Analysis accounting for experience with the anterior approach

An analysis adjusting for surgeon experience with the anterior approach was conducted. A new variable was created. The total number of anterior THAs performed by each surgeon during the study period was measured and considered as a covariate ('volume of anterior THAs'). Analyses were conducted among the propensity-score matched patients from the primary analysis (N=2,993 anterior, N=2,993 lateral/posterior). Generalized estimating equations (GEEs) adjusted for the 'volume of anterior THAs' calculated percent absolute risk differences (% absolute risk difference [RD], with 95% CIs).

For surgeons of patients in the matched anterior group, the median (inter-quartile range, IQR) number of THAs was 114 (30-240). After adjusting for the 'volume of anterior THAs', as compared to patients that had a lateral or posterior approach, patients with an anterior approach had a significantly greater risk of a major surgical complication (deep infection requiring surgery, dislocation requiring closed or open reduction, or revision surgery) within one year (absolute risk difference 1.01% [95% CI 0.14%-1.89%]).

eAppendix 3. Analyses accounting for clustering

Analyses accounting for clustering at both surgeon and hospital levels were conducted. Generalized estimating equations (GEEs) were used to calculate odds ratios that account for clustering. Analyses were conducted among the propensity-score matched patients from the primary analysis (N=2,993 anterior, N=2,993 lateral/posterior).

After accounting for clustering at the hospital level, patients with an anterior approach had a significantly greater risk of a major surgical complication (deep infection requiring surgery, dislocation requiring closed or open reduction, or revision surgery) within one year [adjusted OR 2.05 (95%CI 1.24-3.38, $p<.001$)] as compared to patients that had a lateral or posterior approach.

After accounting for clustering at the surgeon level, patients with an anterior approach had a significantly greater risk of a major surgical complication (deep infection requiring surgery, dislocation requiring closed or open reduction, or revision surgery) within one year [adjusted OR 2.04 (95%CI 1.25-3.33, $p<.001$)], as compared to patients that had a lateral or posterior approach.

eTable. 'Number of surgeons with major surgical complications by approach after matching'

Outcome	Anterior Approach (N=133)	Lateral/Posterior Approach (N=263)
Primary outcome		
Major surgical complication [N (%)] within 1 year	27 (20.3%)	24 (9.1%)
Secondary outcomes		
Individual surgical complications within 1 year		
Deep infection [N (%)]	15 (11.3%)	7 (2.6%)
Dislocation [N (%)]	17 (12.8%)	11 (4.2%)
Revision [N (%)]	22 (16.5%)	18 (6.8%)