

Short-Term Complications of Revision Total Hip Arthroplasty of the Acetabular, Femoral, or Both Components

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INTRODUCTION: Revision total hip arthroplasty (THA) is increasingly prevalent in the setting of the rising incidence of primary THA, and as such trends note rising incidence of mechanical failures related to implants, infection, and biological wear. Compared to primary THA, revision THA are often more technical and complex procedures, and are linked with higher rates of infections, mechanical failure, and tissue damage. Indications for revision THA include but are not limited to acetabular cup loosening, polyethylene wear, instability, periprosthetic fractures, femoral stem loosening, and metal-on-metal galvanic reactions. Revision THA is associated with worse outcomes than primary THA. Depending on the wear of implanted components the surgeon can replace the acetabular, femoral, or both components. Understanding the difference in outcomes associated with each type of revision is clinically useful for surgeons and patients alike, therefore the purpose of this study is to elucidate the differential outcomes and complications of revision THA associated with either acetabular, femoral, or both components.

METHODS: Patients who underwent revision THA from January 2010 to December 2020 in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database were included in this analysis. Propensity score matching was performed based on patient demographics. The independent variable was component(s) replaced. The dependent variables were complications. An ANOVA and chi square tests were used to determine if there was a difference between groups. A binary logistic regression was performed to determine the odds ratio (OR) and 95% confidence intervals. Alpha was set to 0.05.

RESULTS: There were 17,963 revision THA consisting of 12,247 revisions of both components, 2,987 revised acetabular components, and 2,729 revised femoral components (Table 1). Matching the acetabular group to the both components group lead to groups with comparable age, BMI, sex, outpatient status, ASA class, race, functional status, smoking status and comorbidities except for malnourishment and preoperative transfusion being more common in the both group. The rate of adverse events was higher in the both revised components group at 31.6% versus 21.9% in the acetabular group. There was also a greater rate of sepsis (2.4%), pulmonary embolism (PE) (0.6%), transfusion (22.6%), and deep vein thrombosis (DVT) (1.2%) in the both components group compared to the acetabular group (sepsis: 1.5%, PE: 0.3%, transfusion: 12.8%, DVT: 0.7) (Table 2). Matching the femoral group to the both components group lead to groups with comparable age, sex, operative time, outpatient status, ASA class, race, smoking status, and comorbidities except for increased steroid use in the both group and increased BMI and preoperative transfusion in the femoral group. The rate of any adverse events was higher in the femoral group at 38.1% compared to 33.4% in the both group. There was also a greater risk of death (2.1%) and transfusions (29.5%) in the femoral group compared to the both group (1.2% and 25.6%, respectively) (Table 3). The linear regression performed on all THA revisions revealed that female sex (OR=0.722, CI:0.717-0.831), inpatient status (OR=0.505, CI:0.367-0.693), and higher BMI (OR=0.984, CI:0.978-0.989) were protective factors against any adverse event (Table 4). Older age, partial or totally dependent function status, longer operative time, longer length of stay, higher ASA class, congestive heart failure, steroid use, malnourishment, bleeding disorder, and preoperative transfusion were associated with an increased risk of any adverse event following revision THA.

DISCUSSION AND CONCLUSION:

The overall rate of any adverse event for revision THA was 29.8% in the 30-day postoperative period. Compared to revising both components, revising the femoral component had higher rates of any adverse event, death, and transfusion while revising the acetabular component had lower rates of any adverse event, sepsis, pulmonary embolism, transfusion, and DVT. A limitation of this study is the lack of detailed information on the specific indications for revision, the extent of wear of the components, the experience level of the surgeons, and the types of implants used. Identification of these complication rates after revision THA, along with patient risk factors for adverse events can help surgeons be aware of certain complications when specific components need to be revised.

	Accidental	Other	Personal	
Age under 20	1.0	0.75	0.5	<0.001
Age 20-29	1.0	0.75	0.5	<0.001
Age 30-39	1.0	0.75	0.5	<0.001
Age 40-49	1.0	0.75	0.5	<0.001
Age 50-59	1.0	0.75	0.5	<0.001
Age 60-69	1.0	0.75	0.5	<0.001
Age 70-79	1.0	0.75	0.5	<0.001
Age 80-89	1.0	0.75	0.5	<0.001
Age 90-99	1.0	0.75	0.5	<0.001
Age 100+	1.0	0.75	0.5	<0.001
Sex	1.0	0.75	0.5	<0.001
Marital status	1.0	0.75	0.5	<0.001
Education	1.0	0.75	0.5	<0.001
Occupation	1.0	0.75	0.5	<0.001
Income	1.0	0.75	0.5	<0.001
Health status	1.0	0.75	0.5	<0.001
Insurance	1.0	0.75	0.5	<0.001
Religion	1.0	0.75	0.5	<0.001
Political affiliation	1.0	0.75	0.5	<0.001
Travel history	1.0	0.75	0.5	<0.001
Substance use	1.0	0.75	0.5	<0.001
Chronic conditions	1.0	0.75	0.5	<0.001
Family history	1.0	0.75	0.5	<0.001
Genetics	1.0	0.75	0.5	<0.001
Environmental factors	1.0	0.75	0.5	<0.001
Stress levels	1.0	0.75	0.5	<0.001
Mental health	1.0	0.75	0.5	<0.001
Substance use	1.0	0.75	0.5	<0.001
Chronic conditions	1.0	0.75	0.5	<0.001
Family history	1.0	0.75	0.5	<0.001
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Mental health	1.0	0.75	0.5	<0.001
Substance use	1.0	0.75	0.5	<0.001
Chronic conditions	1.0	0.75	0.5	<0.001
Family history	1.0	0.75	0.5	<0.001
Genetics	1.0	0.75	0.5	<0.001
Environmental factors	1.0	0.75	0.5	<0.001
Stress levels	1.0	0.75	0.5	<0.001
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Mental health	1.0	0.75	0.5	<0.001
Substance use	1.0	0.75	0.5	<0.001
Chronic conditions	1.0	0.75	0.5	<0.001
Family history	1.0	0.75	0.5	<0.001
Genetics	1.0	0.75	0.5	<0.001
Environmental factors	1.0	0.75	0.5	<0.001
Stress levels	1.0	0.75	0.5	<0.001
Mental health	1.0	0.75	0.5	<0.001
Substance use	1.0	0.75	0.5	<0.001
Chronic conditions	1.0	0.75	0.5	<0.001
Family history	1.0	0.75	0.5	<0.001
Genetics	1.0	0.75	0.5	

	Ace (27137)		Both (27134)		p-value
	No.	Rate (%)	No.	Rate (%)	
Any adverse event	658	21.9	957	31.6	<0.001
Death	13	0.4	22	0.7	0.134
Wound dehiscence	16	0.5	16	0.5	0.980
Sepsis	45	1.5	72	2.4	0.013
Pulmonary Embolism	8	0.3	19	0.6	0.036
Renal complication	3	0.1	4	0.1	0.714
MI	16	0.5	14	0.5	0.697
Cardiac arrest	4	0.1	9	0.3	0.170
Stroke	2	0.1	3	0.1	0.662
Transfusion	383	12.8	685	22.6	<0.001
DVT	21	0.7	37	1.2	0.038
UTI	36	1.2	39	1.3	0.756
Pneumonia	16	0.5	28	0.9	0.074
Intubation issues	12	0.4	14	0.5	0.711
SSI	138	4.6	163	5.4	0.161
Return to OR	192	6.4	199	6.6	0.781

	Femoral (27138)		Both (27134)		p-value
	No.	Rate (%)	No.	Rate (%)	
Any adverse event	1039	38.1	925	33.4	<0.001
Death	57	2.1	34	1.2	0.013
Wound dehiscence	12	0.4	12	0.4	0.974
Sepsis	67	2.5	66	2.4	0.868
Pulmonary Embolism	14	0.5	14	0.5	0.972
Renal complication	9	0.3	4	0.2	0.158
MI	27	1.0	20	0.7	0.284
Cardiac arrest	11	0.4	11	0.4	0.975
Stroke	9	0.3	6	0.2	0.423
Transfusion	806	29.5	709	25.6	0.001
DVT	35	1.3	30	1.1	0.497
UTI	55	2.0	45	1.6	0.281
Pneumonia	38	1.4	26	0.9	0.118
Intubation issues	22	0.8	19	0.7	0.608
SSI	132	4.8	111	4.0	0.137
Return to OR	178	6.5	148	5.4	0.066

	Unweighted EA		Unweighted RFA		Unweighted EA		Unweighted RFA		Unweighted FEM	
	EA	ρ	EA	ρ	EA	ρ	EA	ρ	EA	ρ
Sex	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Support	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Age	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Functional status	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
BSA	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Operative time	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Postoperative pain	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Admission	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Discharge	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Cost	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Survival	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Microhematocrit	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Bleeding Volume	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Transfusion	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Drainage	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05
Index	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05	0.71 ± 0.03	<0.05