

Does Traumatic Brain Injury Increase Surgical and Medical Complications After Total Hip Arthroplasty?

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INTRODUCTION: Traumatic brain injuries (TBI) are a common neurological injury, however it is unknown how systemic effects due to a TBI may influence surgical recovery following a total hip arthroplasty (THA). In this study, we investigated the impact of a prior TBI on the risk of postoperative surgical and medical complications in patients undergoing a THA.

METHODS:

Using the PearlDiver database, we examined adult patients undergoing a primary THA, excluding those with a hip infection, hip fracture, or incomplete demographic information. This resulted in 81,586 (10.5%) patients with a prior TBI diagnosis and 697,562 (89.5%) patients without. We examined the incidence of postoperative complications, including revision surgery and medical complications. Revision outcomes were categorized into all-cause revision, which was subsequently subclassified by indication, including prosthetic joint infection, mechanical loosening, dislocation, and hip fracture. Medical complications included acute kidney injury (AKI), pulmonary embolism (PE), pneumonia, and urinary tract infection (UTI). Multivariate regression models were used to assess the risk of 90- and 365-day complications based on prior TBI diagnosis, adjusting for age, gender, sex, geographical region, insurance plan, Elixhauser comorbidity index, and body mass index.

RESULTS:

We found that a prior diagnosis of a TBI was associated with greater rates of 90- and 365-day revision surgery, including revision indications of PJI, mechanical loosening, dislocation, and fracture ($p < 0.05$). (**Table 1**) The TBI cohort was also associated with greater rates of 90-day and 365-day medical complications, including acute kidney injury, pulmonary embolism, pneumonia, and urinary tract infection ($p < 0.001$ for all). In the multivariable regression analysis, the association between prior diagnosis of a TBI and greater risk of 90- and 365-day all-cause revision surgery persisted. (**Table 2**) This risk was greatest among patients with a 1-year history of a TBI (OR 1.28, 95% CI: 1.07-1.51; $p = 0.005$). Patients with a 1-year TBI history also experienced the greatest risk of 365-day all-cause revision surgery (OR 1.39, 95% CI: 1.21-1.58, $p < 0.001$). In the multivariable analysis for medical complications, patients with a 1-year history of a TBI had the greatest risk of 90-day postoperative pulmonary embolism (OR 1.78, 95% CI: 1.28-2.40; $p < 0.001$), pneumonia (OR 1.56, 95% CI: 1.34-1.81; $p < 0.001$), and urinary tract infection (OR 1.42, 95% CI: 1.29-1.55; $p < 0.001$). (**Table 3**). Prior TBI was similarly associated with a greater 365-day risk of AKI, pulmonary embolism, pneumonia, and UTI ($p < 0.05$ for all)

DISCUSSION AND CONCLUSION: Our findings highlight a prior TBI diagnosis as a potential risk factor for increased surgical and medical complications following a THA. Further research is needed to explore the impact of a TBI on the physiological post-THA state to inform preoperative interventions and reduce the risk of TBI-related adverse events.

Table 1. Incidence of 90-day revision and medical complications between TBI and control patients

	TBI	Control	p-value
Revision complications, n (%)			
All-cause Revision	1,301 (1.6)	7,887 (1.1)	<.001
Revision due to PJI	312 (0.4)	2,266 (0.3)	0.007
Revision due to mechanical loosening	269 (0.3)	1,483 (0.2)	<.001
Revision due to dislocation	355 (0.4)	1,796 (0.3)	<.001
Revision due to fracture	370 (0.5)	2,288 (0.3)	<.001
Medical complications, n (%)			
Acute Kidney Injury	2,024 (2.5)	10,449 (1.5)	<.001
Pulmonary Embolism	284 (0.3)	1,688 (0.2)	<.001
Pneumonia	1,382 (1.7)	6,338 (0.9)	<.001
Urinary Tract Infection	4,479 (5.5)	23,776 (3.4)	<.001

Table 2. Multivariable regression results for risk of 90-day revision surgery based on past TBI diagnosis

	OR [95% CI]	P-value
	Control (Reference Group)	
All-cause Revision		
1-year TBI	1.28 [1.07-1.51]	0.005
1-3-year TBI	1.16 [1.01-1.34]	0.035
3-5-year TBI	1.26 [1.07-1.52]	0.004
>5-year TBI	1.27 [1.18-1.36]	<.001
Revision due to PJI		
1-year TBI	0.98 [0.67-1.38]	0.910
1-3-year TBI	0.96 [0.71-1.26]	0.759
3-5-year TBI	1.09 [0.79-1.47]	0.577
>5-year TBI	1.09 [0.93-1.26]	0.277
Revision due to mechanical loosening		
1-year TBI	1.71 [1.18-2.37]	0.002
1-3-year TBI	1.25 [0.90-1.70]	0.160
3-5-year TBI	1.20 [0.83-1.71]	0.339
>5-year TBI	1.43 [1.22-1.68]	<.001
Revision due to dislocation		
1-year TBI	1.91 [1.42-2.50]	<.001
1-3-year TBI	1.58 [1.25-2.00]	<.001
3-5-year TBI	1.46 [1.07-1.93]	0.012
>5-year TBI	1.24 [1.06-1.44]	0.006
Revision due to fracture		
1-year TBI	1.19 [0.84-1.63]	0.302
1-3-year TBI	1.01 [0.75-1.32]	0.972
3-5-year TBI	1.19 [0.87-1.59]	0.257
>5-year TBI	1.29 [1.12-1.47]	<.001

Table 3. Multivariable regression results for risk of 90-day medical complications based on past TBI diagnosis.

	OR [95% CI]	P-value
	Control (Reference Group)	
Acute Kidney Injury		
1-year TBI	1.13 [0.98-1.29]	0.078
1-3-year TBI	1.07 [0.98-1.20]	0.195
3-5-year TBI	0.97 [0.85-1.11]	0.674
>5-year TBI	1.12 [1.05-1.19]	<.001
Pulmonary Embolism		
1-year TBI	1.78 [1.28-2.40]	<.001
1-3-year TBI	1.27 [0.94-1.68]	0.105
3-5-year TBI	0.91 [0.60-1.33]	0.652
>5-year TBI	1.24 [1.05-1.45]	0.008
Pneumonia		
1-year TBI	1.56 [1.34-1.81]	<.001
1-3-year TBI	1.30 [1.14-1.48]	<.001
3-5-year TBI	1.18 [1.01-1.38]	<.038
>5-year TBI	1.24 [1.14-1.33]	<.001
Urinary Tract Infection		
1-year TBI	1.42 [1.29-1.55]	<.001
1-3-year TBI	1.29 [1.20-1.39]	<.001
3-5-year TBI	1.06 [0.98-1.16]	0.228
>5-year TBI	1.26 [1.21-1.31]	<.001