

Dialysis Dependence and Treatment Modality Impact Complication Rates Following Shoulder Arthroplasty

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Background:

While abundant literature has cited dialysis-dependence as an independent risk factor for increased complications following total hip (THA) and total knee arthroplasty (TKA), no studies have distinguished if the modality of treatment has an effect on these complications. Furthermore, no current studies have demonstrated if dialysis carries similar risks for similar complications following shoulder arthroplasty (SA). Therefore, the goal of the present study was four fold: 1) to compare periprosthetic joint infection rates after THA, TKA, and SA in hemodialysis (HD) and peritoneal dialysis (PD) patients 2) to compare adverse events after THA, TKA, an SA in HD and PD patients 3) to compare adverse events after THA, TKA, an SA in HD and PD patients with matched controls without dialysis dependence, and 4) to determine the incidence of dialysis dependent patients undergoing SA.

Methods: Dialysis-dependent patients undergoing THA, TKA, and SA were identified in a national insurance database and compared to a control cohort without dialysis dependence, matched in a 3:1 ratio by age, sex, year of procedure, obesity, tobacco use, alcohol abuse and diabetes mellitus. A subgroup analysis was performed comparing patients using PD with a group of patients using HD that were matched in a 1:1 ratio using the same demographic variables. Complications were assessed for all cohorts using ICD-9 and CPT codes including in-hospital death, emergency room visits, hospital readmission, infection, and revision surgery. Statistical comparisons were completed with a logistic regression analysis controlling for additional comorbidities.

Results: The incidence of SA in dialysis-dependent patients significantly increased over the study period ($p < 0.0001$). Compared to matched controls, dialysis dependence at the time of SA was associated with increased rates of in-hospital death (OR 7.60, $p < 0.0001$), emergency room visits (OR 4.16, $p < 0.0001$), hospital admission (OR 1.63, $p < 0.0001$), and infection within one year (OR 1.90, $p = 0.009$) [Table 1]. Compared to matched SA patients on HD, PD patients had lower rates of in hospital death (OR 0.40; $p = 0.008$), hospital readmission (OR 0.43, $p = 0.047$), a lower incidence of infection (OR 0.30, $p = 0.018$), and revision surgery (OR 0.23, $p = 0.037$). Compared to controls, SA patients on PD had similar rates of in hospital death ($p = 0.342$), readmission ($p = 0.888$), infection ($p = 0.789$), and revision surgery ($p = 0.701$) [Table 2]. When comparing TKA patients on PD to matched HD controls, PD patients experienced significantly lower periprosthetic infection rates (OR 0.67, $p = 0.026$) and similar rates of other measured complications. When comparing TKA patients on PD to matched non dialysis controls, there were no differences in periprosthetic infection ($p = 0.395$) or revision TKA (0.478) [Table 3]. Similarly, when comparing THA patients on PD to matched HD controls, there was also significantly lower periprosthetic infection rates (OR 0.30, $p = 0.006$). When comparing THA patients on PD to matched non dialysis controls, there were no differences in rates of periprosthetic joint infection ($p = 0.382$), readmission within 30 days ($p = 0.276$), and revision THA ($p = 0.593$) [Table 4].

Conclusions: Although there is a significantly increased risk of postoperative complications in dialysis dependent patients who undergo SA, THA, and TKA, this risk is highly influenced by the type of dialysis. Whereas patients on HD have a significantly higher risk of infection, patients on PD do not appear to have this same risk when compared to non-dialysis dependent patients. To our knowledge, this is the only study to date to distinguish patients by the type of dialysis and suggests the type of dialysis should be used to assess risk when considering hip, knee, and shoulder arthroplasty.

Table 1. Comparison of Adverse Events and Complications after Shoulder Arthroplasty

Complication	Dialysis		Matched Controls		Comparison (Dialysis v Control)		
	N	%	N	%	OR	95% CI	P
In-Hospital Death (1 yr)	78	6.37%	31	0.84%	7.60	[4.69 - 12.31]	< 0.0001
ER Visit (30 d)	166	13.55%	98	2.67%	4.16	[3.11 - 5.56]	< 0.0001
Admission to Hosp (30 d)	121	9.88%	205	5.58%	1.63	[1.25 - 2.13]	< 0.0001
Infection (1 yr)	37	3.02%	46	1.25%	1.90	[1.40 - 2.58]	0.009
Revision (1 yr)	52	4.24%	75	2.04%	1.48	[0.97 - 2.26]	0.067

Table 2. Comparison of Adverse Events and Complications after Shoulder Arthroplasty

Complication	Peritoneal Dial.		Hemodialysis		Controls		Comparison (PD v HD)			Comparison (PD v Control)		
	N	%	N	%	N	%	OR	95% CI	P	OR	95% CI	P
In-Hospital Death (1 yr)	7	5.38%	13	10.00%	5	1.28%	0.40	[0.22 - 0.74]	0.008	4.87	[1.24 - 19.16]	0.342
ER Visit (30 d)	23	17.69%	23	17.69%	10	2.56%	0.94	[0.49 - 1.82]	0.855	6.88	[2.91 - 16.26]	< 0.0001
Admission to Hosp (30 d)	10	7.69%	20	15.38%	23	5.90%	0.43	[0.19 - 0.99]	0.047	1.06	[0.46 - 2.46]	0.888
Infection (1 yr)	2	1.54%	6	4.62%	7	1.79%	0.30	[0.11 - 0.79]	0.018	0.79	[0.14 - 4.47]	0.789
Revision (1 yr)	3	2.31%	8	6.15%	6	1.54%	0.23	[0.06 - 0.81]	0.037	1.36	[0.28 - 6.63]	0.701

Table 3 Comparison of Adverse Events and Complications after TKA

Complication	Peritoneal Dialysis		Hemodialysis		Matched Controls		Comparison (PD v HD)			Comparison (PD v Control)		
	N	%	N	%	N	%	OR	95% CI	P	OR	95% CI	P
In-Hospital Death (1 yr)	30	5.65%	28	5.27%	12	0.75%	1.13	[0.65 - 1.96]	0.487	6.16	[3.04 - 12.46]	< 0.0001
ER Visit (30 d)	72	13.56%	75	14.12%	113	7.09%	0.98	[0.69 - 1.39]	0.910	3.15	[2.18 - 4.55]	< 0.0001
Admission to Hosp (30 d)	45	8.47%	43	8.10%	70	4.39%	1.03	[0.66 - 1.60]	0.896	2.01	[1.38 - 2.93]	< 0.0001
Infection (1 yr)	18	3.39%	32	6.03%	42	2.64%	0.67	[0.49 - 0.93]	0.026	1.28	[0.73 - 2.24]	0.395
Stiffness (1 yr)	4	0.75%	7	1.32%	49	3.08%	0.57	[0.16 - 1.98]	0.379	0.32	[0.11 - 0.91]	0.012
Revision TKA (1 yr)	16	3.01%	21	3.95%	41	2.57%	0.79	[0.41 - 1.52]	0.483	1.24	[0.68 - 2.28]	0.478

Table 4. Comparison of Adverse Events and Complications after THA

Complication	Peritoneal Dialysis		Hemodialysis		Matched Controls		Comparison (PD v HD)			Comparison (PD v Control)		
	N	%	N	%	N	%	OR	95% CI	P	OR	95% CI	P
In-Hospital Death (1 yr)	37	6.47%	37	6.47%	15	0.87%	1.11	[0.68 - 1.80]	0.675	7.22	[3.58 - 14.55]	< 0.0001
ER Visit (30 d)	96	16.78%	110	19.23%	85	4.95%	0.88	[0.65 - 1.20]	0.436	3.23	[2.32 - 4.50]	< 0.0001
Admission to Hosp (30 d)	38	6.64%	38	6.64%	86	5.01%	1.04	[0.65 - 1.68]	0.857	1.26	[0.83 - 1.92]	0.276
Infection (1 yr)	9	1.57%	24	4.20%	38	2.21%	0.30	[0.12 - 0.71]	0.006	0.68	[0.36 - 1.29]	0.382
Dislocation (1 yr)	23	4.02%	26	4.55%	32	1.86%	0.99	[0.55 - 1.77]	0.966	2.00	[1.11 - 3.59]	0.020
Revision THA (1 yr)	18	3.15%	22	3.85%	42	2.45%	0.77	[0.41 - 1.47]	0.433	1.17	[0.65 - 2.10]	0.593