Is the Use of New Ceramic Heads with Titanium Sleeves on Retained Femoral Stems in Revision Total Hip Arthroplasty Associated with Femoral Head or Neck Junction Failure at Midterm Follow-up?

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INTRODUCTION:

Ceramic heads are frequently used in revision total hip arthroplasty (rTHA) when the femoral stem is retained to treat or reduce the risk of trunnion corrosion. The ceramic heads used in rTHA typically utilize a titanium sleeve adapter to protect the ceramic head from damage by the retained femoral stem taper. However, there is sparse mid- to long-term data on this practice, and factors associated with failure remain largely unknown. The purpose of this study was to determine survival free from revision for failure of the head and/or neck junction (HNJ) and all-cause re-revision when using a ceramic head with a titanium sleeve on a retained femoral stem in rTHA, and to identify implant and surgical factors associated with failure.

METHODS:

We retrospectively reviewed our institutional database to identify all consecutive aseptic rTHAs that used a new ceramic head with a titanium sleeve on a retained femoral stem from 2011 to 2022. Septic revisions were excluded, as were 7 patients with less than 2-year follow-up, none of whom underwent re-revision. A total of 316 rTHAs (295 patients) were included in the study with a mean follow-up of 7.7 years (range 2.1-14.3) (Table 1). Mean patient age was 65.7 (34.8-94.2), BMI was 28.7 (17.9-49.9), and 57% were female. The most common indications for rTHA were adverse local tissue reaction (ALTR) to metal debris (46%), instability (29%), and acetabular aseptic loosening (12%). An isolated modular component exchange was performed in 38% of revisions; the remaining 62% also underwent acetabular cup revision. Kaplan Meier analysis was used to determine survival with failure of the HNJ and all-cause re-revision as the endpoints. Multivariate logistic regression was used to identify risk factors for HNJ failure and all-cause re-revision including implant and surgical with a p-value of <0.10 in univariate analysis (Table 2).

RESULTS:

There were no re-revisions for failure of the HNJ. The 10-year survival free from re-revision for HNJ failure was 100%. Sixty-six hips (21%) underwent re-revision at a mean time of 1.8 years (0-9.6). The most common reasons for re-revision were instability (39 of 66), infection (17 of 66), and aseptic loosening (8 of 66). All-cause re-revision-free survival was 81.1% (95% CI 78.9-83.3) at 5 years and 77.0% (95% CI 74.4-79.6) at 10 years (Figure 1). No implant or surgical factors were associated with failure at the HNJ. Multivariate analysis identified cup revision (OR 0.474, 95% CI 0.24 to 0.92, p=0.027) reduced the odds of subsequent re-revision, and an indication of instability for rTHA (OR 2.253, 95% CI 1.1 to 6.4, p=0.042) was a risk factor for re-revision (Table 3).

DISCUSSION AND CONCLUSION:

The use of new ceramic heads with titanium sleeves when the femoral stem is retained in rTHA is a safe practice. There were no cases of re-revision for HNJ failure, and no implant or surgical factors were associated with HNJ failure in this large cohort at mid-term follow-up. Retaining the acetabular component and revisions for instability were risk factors for all-cause re-revision.

Figure 1. Kaplan-Meier survival estimate with all-cause re-revision as the endpoint.

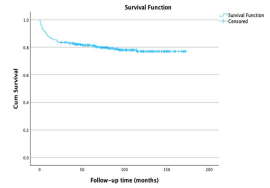

Table 1. Demographic, Implant, and Surgical Factors

Number of Hips	316	
Number of Patients	295	
Sex (n, %)		
Female	170	(57.6)
Male	125	(42.4)
Mean age at index revision (range)	65.7	(34.8 to 94.2)
Mean BMI at index revision (range)	28.7	(17.9 to 49.9)
Stem composition (n, %)		
Titanium alloy	286	(90.5)
Cobalt-chrome	5	(1.6)
Missing	25	(7.9)
Stem offset (n, %)		
Standard offset	163	(51.6)
High offset	96	(30.4)
Missing	57	(18)
Revision ceramic head size (n, %)		
<36mm	64	(20.3)
≥36mm	177	(56)
Dual mobility	75	(23.7)
Revision Ti-sleeve neck length (n, %)		
Negative (<0mm)	35	(11.1)
Neutral (0mm)	81	(25.6)
Positive (>0mm)	192	(60.8)
Missing	8	(2.5)
Indication for revision THA (n, %)		
ALTR	144	(45.6)
Instability	90	(28.5)
Acetabular aseptic loosening	38	(12)
Other	44	(13.9)
Type of revision THA (n, %)		
Modular component exchange	119	(37.7)
Cup revision	197	(62.3)

Table 2. Univariate analysis of surgical and implant related factors associated with re-revision

Variable	Re-Revised n=66	Not Re-Revised n=259	*p*-value
Stem composition			0.587
Titanium alloy	60	226	
Cobalt chrome	0	5	
Indication for revision			
ALTR	20	124	0.005*
Instability	35	55	<0.001*
Aseptic loosening	3	35	0.036*
Other	8	36	0.634
Cup revision			<0.001*
Revised	29	168	
Not revised	37	82	
Head size			
<36mm	20	44	0.022*
≥36mm	30	147	0.052*
Dual mobility	16	59	0.913
Stem offset			0.235
High offset	24	72	
Standard offset	42	178	
Neck length			
Negative	4	31	0.144
Neutral	16	65	0.771
Positive	42	150	0.59

* Included in multivariate analysis model.

Table 3. Multivariate analysis of surgical and implant related factors associated with re-revision

Variable	*p*-value	Odds Ratio (95% CI)
Indication for revision		
ALTR	0.516	0.738 (0.30 to 1.8)
Instability	0.042	2.253 (1.1 to 6.4)
Aseptic loosening	0.327	0.500 (0.12 to 2.1)
Cup revised	0.027	0.474 (0.24 to 0.92)
Head size		
<36mm	0.631	0.801 (0.32 to 2.0)
≥36mm	0.602	0.812 (0.37 to 1.8)