The Journal of Arthroplasty 31 (2016) 842–845

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Morbidly Obese vs Nonobese Aseptic Revision Total Hip Arthroplasty: Surprisingly Similar Outcomes

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A B S T R A C T

Background: We aimed to compare the outcomes between matched morbidly obese (BMI ≥ 40 kg/m^2) and nonobese (BMI <30 kg/m^2) patients undergoing first-time aseptic revision THA with at least 4 years of follow-up.
Methods: Groups were matched 1:1 using sex, age, and date of revision surgery (123 patients in each group).
Results: The overall incidence and risk of complication, reoperation, and re-revision were similar between groups. Morbidly obese patients were more likely to dislocate (odds ratio [OR], 3.3; $P = .03$), but were less likely to develop polyethylene wear (OR, 0.1; $P = .04$) and aseptic loosening (OR, 0.3; $P = .03$).
Conclusion: Quality outcome measures such as hospital readmission were not addressed by this study and could be the basis for future studies. Level of evidence: level III, prognostic study.

Article history:
Received 10 April 2015
Accepted 10 August 2015
Keywords: morbid obesity, revision hip arthroplasty, aseptic, complication, implant survival

Obesity has rapidly become a global epidemic which now affects over one-third of American adults and more than 500 million people worldwide [1,2]. Obesity has been linked with the development of hip osteoarthritis and the need for total hip arthroplasty (THA) in younger patients [3–5]. This trend is particularly worrisome for the healthcare system because of the increased complications and need for revision associated with primary THA in these patients [6–11].

Although multiple studies have described the outcomes of primary THA in obese patients, there are limited data regarding the outcomes of aseptic revision THA in these patients [12]. The aims of this study were to compare the (1) complications, (2) survival free of reoperation or repeat revision, (3) risk factors for failure, and (4) clinical outcome scores between matched cohorts of morbidly obese (body mass index [BMI] ≥40 kg/m^2) and nonobese (BMI <30 kg/m^2) patients undergoing first-time aseptic revision THA.

Patients and Methods

After obtaining approval from our institutional review board, we conducted a single-center, retrospective, 1:1 matched cohort analysis. Our institutional total joint registry, which prospectively captures survival data and patient outcomes, was used to identify 4223 index revision THAs performed for aseptic reasons over a 20-year period (1987-2007), including 165 in patients with morbid obesity and 2771 in patients with BMI less than 30 kg/m^2. Patients were excluded if there was any history of ipsilateral hip revision or periprosthetic joint infection (PJI). Periprosthetic joint infection, which was defined using the Musculoskeletal Infection Society criteria [13], was excluded in all hips prior to revision using serum inflammatory markers and aspiration when clinically indicated. We then only considered patients with minimum of 5-year follow-up, which was available for 75% of patients with morbid obesity and 76% of patients with BMI less than 30 kg/m^2 ($P = .83$). All (n = 123) knees meeting the criteria in patients with morbid obesity were included and matched with a cohort of 123 patients with BMI less than 30 kg/m^2 using sex, age (±2 years), and date of revision THA (±3 years). Authors were blinded to patient outcomes at the time of group matching.

There were 123 patients in each group, with each group consisting of 75 (61.0%) females. The mean age was 59 (range, 25-86) years in the morbidly obese group and 59 (range, 27-86) years in the nonobese group. There were more diabetic patients in the morbidly obese group (24% vs 5%, $P < .001$), but similar numbers of rheumatoids (11% vs 11%, $P = .99$) and smokers (11% vs 11%, $P = .99$). The most common reason for revision was aseptic loosening in each group, and similar

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements, refer to http://dx.doi.org/10.1016/j.arth.2015.08.036.

The institution of all authors has received funding from Zimmer (Warsaw, Indiana), Stryker (Mahwah, New Jersey), DePuy (Warsaw, Indiana), and Biomet (Warsaw, Indiana). One or more of the authors consult for Zimmer (D.G.L.).

Institutional review board no. 14-001561.

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http://dx.doi.org/10.1016/j.arth.2015.08.036
0883-5403/

Table 1
Comparison of Patient Characteristics Between Groups.

Variable	Morbidly Obese	Nonobese	*P*
Patients	123	123	
Gender: female	75 (61%)	75 (61%)	.99
Age (y)	59 (25-86)	59 (27-86)	.85
BMI (kg/m^2)	44 (40-67)	25 (15-30)	<.001
Follow-up (mo)	101 (50-245)	106 (55-244)	.34
Rheumatoid	14 (11%)	14 (11%)	.99
Current smoker	14 (11%)	13 (11%)	.99
Diabetes mellitus	30 (24%)	6 (5%)	<.001
Reason for revision			.77
Aseptic loosening	78 (63%)	73 (59%)	
Osteolysis	32 (26%)	37 (30%)	
Instability	13 (11%)	13 (11%)	
Components revised			.94
Liner	12 (10%)	12 (10%)	
Femur	49 (40%)	48 (39%)	
Cup	35 (29%)	39 (32%)	
Femur and cup	27 (22%)	24 (20%)	
Head size (mm)			.98
<28	11 (9%)	11 (9%)	
28-32	97 (79%)	98 (80%)	
>32	15 (12%)	14 (11%)	

components were revised in each group (Table 1). Mean head size was 30 mm (range, 22-44 mm) in the morbidly obese group and 30 mm (range, 22-40 mm) in the nonobese group (Table 1). Mean follow-up was 8.4 years (range, 5-20 years) and 8.8 years (range, 5-20 years) for the morbidly obese and nonobese groups, respectively ($P = .34$).

All outcomes were analyzed using appropriate summary statistics, including 95% confidence intervals, where appropriate. Baseline covariates were assessed to evaluate homogeneity between groups and compared using χ^2 tests or logistic regression (for categorical outcomes), or 2-sample tests or Wilcoxon rank sum tests (for outcomes measured on a continuous scale) as applicable. Kaplan-Meier estimates were used to assess survival and compared using log-rank tests. Risk analysis was performed using Cox multivariate analysis. All statistical tests were 2 side, the threshold for statistical significance was set at $\alpha = .05$.

Results

Complications

The proportion of patients who experienced at least 1 complication was similar in each group, but the type of complications varied between groups. In the morbidly obese group, 49 (40%) patients sustained at least 1 complication, compared with 50 (41%) patients in the nonobese group ($P = .99$). The most common complication in both groups was intraoperative or postoperative femur fracture (18% morbidly obese vs 23% nonobese; odds ratio [OR], 0.74; $P = .43$). Morbidly obese patients were more likely to sustain at least 1 dislocation postoperatively (12% vs 4%; OR, 3.28; $P = .03$), but were less likely to encounter polyethylene wear (0.8% vs 6.5%; OR, 0.12; $P = .04$) or aseptic loosening (3% vs 11%; OR, 0.26; $P = .03$). There were no major differences in the risk of PJI ($P = .21$), heterotopic ossification ($P = .21$), venous thromboembolism ($P = .99$), hematoma ($P = .99$), delayed wound healing ($P = .99$), osteolysis ($P = .68$), or nerve palsy ($P = .62$) between groups (Table 2).

Incidence and survivorship

We found no difference in the incidence or survivorship free of reoperation or re-revision between groups. In the morbidly obese group, 15 (12%) patients required a reoperation, whereas 22 (18%) of nonobese patients underwent at least 1 reoperation (hazard ratio, 1.5; $P = .27$). Reasons for reoperation included PJI (n = 5), aseptic loosening (n = 5), periprosthetic femur fracture (n = 4), instability (n = 2), and wound complications (n = 2) in the morbidly obese group, compared with aseptic loosening (n = 13), periprosthetic femur fracture (n = 6), instability (n = 3), osteolysis (n = 2), wound complications (n = 2), and PJI (n = 2) in the nonobese group. Likewise, a similar number of morbidly obese patients underwent re-revision compared with nonobese patients (10% vs 13%; hazard ratio, 1.4; $P = .37$). Reasons for re-revision included aseptic loosening (n = 5), instability (n = 3), periprosthetic femur fracture (n = 2), and PJI (n = 1) in the morbidly obese group, compared with aseptic loosening (n = 13), instability (n = 2), and osteolysis (n = 1) in the nonobese group. Patient survivals, free of reoperation and revision, were similar between groups at 5, 10, and 15 years (Fig.).

Table 2
Comparison of Complications Between Groups.

Complication	Morbidly Obese	Nonobese	OR (95% CI)	*P*
Infection	5 (4.1%)	1 (0.8%)	5.17 (0.60-44.91)	.213
Fracture	22 (17.9%)	28 (22.8%)	0.74 (0.40-1.38)	.428
Dislocation	15 (12.2%)	5 (4.1%)	3.28 (1.15-9.32)	.033
Heterotopic ossification	5 (4.1%)	1 (0.8%)	5.17 (0.60-44.91)	.213
Polyethylene wear	1 (0.8%)	8 (6.5%)	0.12 (0.02-0.98)	.036
Venous thromboembolism	3 (2.4%)	3 (2.4%)	1.00 (0.20-5.05)	.999
Aseptic loosening	4 (3.3%)	14 (11.4%)	0.26 (0.08-0.82)	.025
Hematoma	2 (1.6%)	1 (0.8%)	2.02 (0.18-22.53)	.999
Delayed wound healing	6 (4.9%)	5 (4.1%)	1.21 (0.36-4.08)	.999
Osteolysis	2 (1.6%)	4 (3.3%)	0.49 (0.09-2.74)	.684
Nerve palsy	3 (2.4%)	1 (0.8%)	3.05 (0.31-29.73)	.622

Predictive risk factors

Using multivariate analysis, we did not find morbid obesity, age at least 60 years, sex, diabetes, rheumatoid arthritis, or tobacco use to be predictive of complication, reoperation, or repeat revision (Table 3).

Clinical outcome scores

Harris hip scores were similar between groups prior to revision (50 ± 16 vs 53 ± 13; $P = .14$). Patients in both groups improved significantly after surgery ($P < .001$). Nonobese patients had significantly better scores than did the morbidly obese group at 2 and 5 years, but similar scores at 10 and 15 years (Table 4).

Discussion

Given the rapidly expanding prevalence of obesity and the high rate of complications after primary THA in this patient population, a dramatic increase in the number of obese patients necessitating revision THA is anticipated [3–5]. Recognizing and understanding the risks and outcomes of these patients will be important considerations in management. Several studies outline the risks associated between obesity and primary THA [6–10], but little has been published regarding the outcomes of revision THA in obese patients. Houdek et al [14] previously reported on the outcomes of morbidly obese patients undergoing 2-stage revision THA for infection, and Pulos et al [12] recently published short-term complications in patients with BMI ≥ 35 kg/m^2 undergoing revision THA for any reason (septic or aseptic), but the outcomes of septic and aseptic revisions are not necessarily comparable [15–17]. Limited literature exists analyzing the outcomes after aseptic revision THA in obese patients. We found that morbidly obese patients (BMI ≥ 40 kg/m^2) experienced similar complications, reoperations, and re-revisions when compared with a matched cohort of nonobese (BMI < 30 kg/m^2) patients.

In this study, the incidence of complication was roughly 40% in each group, which is compatible with previous studies reporting 30% to 75% complications after revision THA [18]. Although our groups had similar rates of overall complication, we found that morbidly obese patients had an increased risk of dislocation. Although obesity has previously