Hip Resurfacing Arthroplasty in Severely Obese Patients

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Abstract

We conducted a study of outcomes of modern hip resurfacing arthroplasty (HRA) in severely obese patients. Patients who had undergone HRA and been followed for a minimum of 2 years were divided into 2 groups, those with body mass index under 35 (control, 366 hips) and those with body mass index of 35 or above (study, 63 hips). At mean follow-up of 41 months, there was no significant difference between the groups with respect to postoperative Harris Hip Scores, complication rates, and need for revision. Six revision surgeries were required in the control group (98.4% survival), and 2 were required in the study group (96.8% survival). These results suggest that severely obese patients should be considered candidates for HRA.

Hip resurfacing arthroplasty (HRA) has seen a recent revival in popularity, with the latest generation of metal-on-metal (MoM) components and hybrid fixation proving to be more successful than previous methods.[1,2] Despite recent controversy, multiple studies have demonstrated good outcomes in the intermediate follow-up period.[2-5] Proposed benefits of MoM-HRA include improved patient function and lower wear rates.[6]

Recent evidence suggests that sex and femoral head size are early-failure risk factors.[7,8] HRA outcomes in obese patients, however, have not been well elucidated. There are disparate reports on patient outcomes and implant survival of HRA in the obese.[6,9-11] Le Duff and colleagues[12] retrospectively reviewed a series of patients with body mass index (BMI) above 30 and found a protective effect of obesity with respect to patient outcomes and prosthetic survival. However, the US Food and Drug Administration (FDA) recommended including severe obesity (BMI ≥35) as a contraindication to HRA.[9] That recommendation is found throughout the literature, though to our knowledge there are no data specifically addressing outcomes of modern MoM-HRA in this patient population (BMI ≥35).[6,9]

We conducted a study to determine if there is a correlation between severe obesity (BMI ≥35) and survivorship of MoM-HRA. We hypothesized that survivorship and clinical outcomes would be similar for the severely obese and the other patients in our cohort.

Materials and Methods

Between June 2006 and July 2009, 449 Birmingham HRA prostheses (Smith & Nephew, Memphis, Tennessee) were implanted in 365 patients. All surgeries were performed by the senior author (SR) at a single institution. Patient data were reviewed retrospectively. Study inclusion criteria consisted of Birmingham HRA, a minimum of 24 months of monitoring after surgery, skeletal maturity, and documented height and

Table I. **Patient Demographic and Operative Detail**

	Study Group (63 cases)			Control Group (366 cases)			
	Mean	Median	Range	Mean	Median	Range	P
Age,[a] y	53.1	53	37-68	53.8	55	22-74	.322
Body mass index	38.2	37.5	35-51.2	27.6	27.9	17-34.7	—
Acetabular cup size,[a] mm	56	56	48-64	55	56	42-64	.080
Femoral head size,[a] mm	49	50	42-54	49	50	38-59	.128

[a]Compared using Mann-Whitney U test. [b]Compared using χ^2 test.

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weight for BMI calculation. Exclusion criteria included insufficient preoperative data for BMI calculation, insufficient documentation of postoperative Harris Hip Scores (HHS) scores, and prior hip arthroplasty. Of the 449 HRA cases, 436 met the inclusion criteria. Sixty-five cases (58 patients) had BMI of 35 or above and met the inclusion criteria. Two cases had insufficient documentation of postoperative HHS scores and were excluded from analysis, leaving 63 cases (56 patients). For comparison, patients who had BMI under 35 and underwent Birmingham HRA during the same period, and met the same inclusion criteria, were included in a control group (366 cases, 295 patients).

Two weeks before surgery, clinical evaluations were performed, demographic information (eg, age, BMI) was recorded (**Table I**). Overall, 46 patients (73%) and 269 patients (74%) were men in the study and control group, respectively. HHS questionnaires were administered, and preoperative diagnoses were recorded (**Table II**). The surgeon's preferred technique has been described in the literature.[13] Operative reports were reviewed to obtain the implanted femoral head and acetabular cup sizes.

Clinical evaluations were also performed 1 and 6 months after surgery and annually thereafter. Patients were asked to complete the HHS questionnaire at each postoperative visit. All patients without postoperative HHS or recent follow-up data were contacted by telephone, administered the HHS questionnaire, and asked if they had any complications or required any additional surgery since their most recent postoperative visit.

Revision and complication rates were assessed with Fisher sexact tests. Mann-Whitney U tests were used to compare preoperative and postoperative HHS scores as well as other nonparametric variables (age, acetabular cup size, femoral head size). P<.05 was considered statistically significant.

Results

Mean follow-up was 40 months for the control group and 41 months for the study group; range of follow-up 24-60 months for both groups. Mean age at time of surgery was 53.8 years for the control group and 53.1 years for the study group (P = .322). Seventy-four percent and 73% of patients in the control and study groups were female, respectively (P = .936). Median (mean) femoral head size was 50 (49) mm for the control group and 50 (49) mm for the study group (P = .080). In addition, there was no statistically significant difference in median acetabular cup size (control, 56 mm; study, 56 mm; P = .128) (**Table I**).

Mean BMI was 27.6 and 38.2 (P = .936) in the control and study groups, respectively (**Table I**). The control group's preoperative HHS (49.4) was statistically significantly higher (P = .006) than the study group's preoperative HHS (45.7) (**Table III**). Both groups showed significant improvement after surgery. However, there was no difference in mean HHS scores between the control group (97.2) and the study group (96.7) (P = .908).

Two study group patients (3.2%) and 6 control group patients (1.6%) required revision surgery. The difference was insignificant (P = .333).

The indication for revision surgery in the 2 study group patients was persistent pain. In 1 of these patients, conversion to total hip arthroplasty (THA) was performed 3 years after the original surgery, and pseudotumor formation was discovered during the revision. The other revision was performed 18 months after the original surgery, and the revision surgeon found inflammatory changes and gross soft-tissue appearance consistent with metallosis. No pseudotumor was identified, and the infection workup was negative.

Of the 6 control group patients who required revision surgery, 2 underwent conversion to THA for femoral component loosening at 34 and 44 months, respectively; 1 underwent conversion to THA for a subtrochanteric femur fracture sustained in a fall 16 months after surgery; 1 sustained a femoral neck fracture; 1 underwent revision for recurrent instability at 2 and 6 months; and 1 underwent conversion to THA at 48 months for pain, attributed to metallosis. All revision patients were converted to conventional THA without complication.

There were 4 complications in the study group and 23 in the control group. For each group, the overall complication rate was 6.3%.

The 4 study group com-

Table II. Preoperative Diagnoses for Study and Control Groups

	Study Group (63 cases)		Control (366 cases)	
Diagnosis	**cases**	**%**	**cases**	**%**
Osteoarthritis	51	81	313	86
Osteonecrosis	7	11	25	7
Hip dysplasia	4	7	21	5
Other	1	2	7	2

Table III. Results for Study and Control Groups

	Preoperative			Postoperative		
	Study	**Control**	**P**	**Study**	**Control**	**P**
Harris Hip Scale scores						
Mean	45.7	49.4	<.001	96.7	97.2	.908
Median	46.2	51.7		100	100	
Range	25.3-69.3	16.5-73.7		72-100	47-100	
Complications[a]	—	—	—	4/63 (6.3%)	23/366 (6.3%)	>.99
Revisions[a]	—	—	—	2/63 (3.2%)	6/366 (1.6%)	.333

[a]Fisher exact test.

plications consisted of the 2 revision surgeries already described, and 2 transient nerve palsies and/or paresthesias (obturator, sciatic), which fully resolved by last follow-up (3.2%, 2/63).

The 23 control group complications consisted of the 6 revision surgeries and 17 complications that did not require operative intervention: 4 transient nerve palsies and/or paresthesias (obturator, sciatic, lateral femoral cutaneous), which fully resolved without additional intervention (1.1%, 4/366); 9 cases of heterotopic ossification (2.4%, 9/366), 2 of which restricted range of motion; and 4 cases of postoperative iliopsoas tendonitis (1.1%, 4/366).

There were no deep infections requiring operative irrigation and debridement in either group. Superficial wound infections and prolonged wound drainage were not tracked. There was no significant difference in overall complication rates between the groups (P>.99).

Discussion

To our knowledge, this is the largest study of MoM-HRA outcomes in the severely obese (BMI ≥35). Morbid obesity alone was not a predictor of poor outcomes. The study and control groups' implant survival rates, clinical outcome measures, and complications were all comparable, as were their preoperative demographic data and component sizes, which allowed us to assess the independent effect of BMI on survivorship and clinical outcomes.

The literature continues to show significant controversy regarding the effects of obesity on survivorship of both THA and HRA. Historically, the THA literature has suggested that implant survival and patient outcomes are significantly diminished in obese patients.[14-16] Therefore, many authors have recommended against routine use of THA in this population. Similar recommendations appear in the HRA literature. In their review of modern MoM-HRA, Seyler and colleagues[9] specifically suggested that BMI over 35 should be considered a relative contraindication to HRA—a suggestion based largely on FDA guidelines, which make similar recommendations.

Recent literature challenges the guidelines. Work by McLaughlin and Lee[17] suggests that, at long-term follow-up, there is no difference in THA survivorship and patient outcomes in the obese population. Le Duff and colleagues[12] reviewed their patient cohort to compare clinical outcomes and survivorship of MoM-HRA in patients with BMI over 30. They found a protective effect of obesity on patient outcome measures and hypothesized that this effect might be secondary to obese patients' larger femoral heads, higher bone mineral density in the proximal femur, and less activity after surgery.

Unlike for THA, no studies have specifically addressed implant survival and patient outcomes of HRA in the severely obese. The suggestion that obesity be considered a contraindication to HRA, however, is not unfounded. Callanan and colleagues[18] showed that obesity (BMI >30) was an independent risk factor for cup malpositioning in THA. In addition, acetabular cup malpositioning has been shown to increase the risk for metal ion formation and subsequent implant failure[19,20] after MoM-HRA. Therefore, it is not unreasonable to assume a correlation between obesity and implant failure. However, the HRA literature includes no clinical data supporting that assumption.

Current controversies regarding MoM-HRA often center on concern about metallosis and pseudotumor formation. Recent studies have shown an extremely low incidence of pseudotumor formation after HRA.[21] Our series showed a comparable rate (0.8%) of symptomatic metallosis and/or pseudotumor formation. Interestingly, though, both failures in the study group required revision secondary to metallosis and/or pseudotumor formation. Some authors have suggested that obesity is a risk factor for development of metallosis in Birmingham HRA.[22] Although our study showed no difference in implant survival between the severely obese and the rest of the population, there is a suggestion that severe obesity may predispose a patient to metallosis. However, our cohort's metallosis rate was too low to make any definitive statements.

This study had several limitations that must be considered when interpreting its results. As with other retrospective chart reviews, the study design was associated with an inherent bias. In addition, there was no radiographic correlation to compare implant orientation and clinical outcomes. Furthermore, a surgeon who implants more than 150 Birmingham HRAs a year performed all the surgeries included in the study. This setup gave a homogeneity to the results, which we consider a significant strength of the study, but caution must be exercised when applying these results to a less experienced surgeon, as the HRA procedure itself tends to be more challenging in obese patients.

As the percentage of obese patients continues to increase, it is important to have clinical data that outline potential risks associated with elevated BMI. Certainly, the technical aspects of the HRA procedure may be more challenging in obese patients. However, our data suggest that, with appropriate patient selection and surgical technique, BMI alone should not be considered a contraindication to HRA. Although weight loss should continue to be recommended to obese patients, our data suggest that even severely obese patients (BMI ≥35) should be considered candidates for MoM-HRA.

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This paper will be judged for the Resident Writer's Award.