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A comparison of outcomes in morbidly obese, obese and non-obese patients undergoing primary total knee and total hip arthroplasty

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ABSTRACT

Background: Obesity is a growing public health issue with the prevalence of morbid obesity, (Body Mass Index (BMI) ≥ 40 kg/m²) increasing. There is some evidence these patients have more peri- and post-operative complications and poorer outcomes when undergoing arthroplasty procedures. This audit aimed to determine and compare the outcomes of non-obese, obese and morbidly obese patients undergoing arthroplasty at our institution.

Method: This was a retrospective audit of patients from our institution who had undergone total knee (TKA) or total hip arthroplasty (THA) in 2009. Data collected were: age, gender, BMI, length of stay (LOS), Oxford knee or hip score (OKS/OHS), satisfaction and complications up to two years post operation. Patients were divided into three groups: BMI < 30, BMI 30–40 and BMI > 40. Outcomes for each BMI group were compared.

Results: 1014 TKA and 906 THA operations were included. When compared to obese and non-obese patients, morbidly obese patients undergoing TKA had a mean LOS one day longer, a mean OKS four points lower and higher rates of postoperative problems, 37% vs. 21%. For THA patients there was no difference in LOS, OHS score was two points lower for each increasing BMI category and postoperative problems increase from 25% for non-obese to 31% for obese and 38% for morbidly obese patients.

Conclusion: These results will be useful in informing obese patients of their potential outcomes following TKA or THA. These patients can then make a more informed choice before proceeding with arthroplasty.

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Introduction

The World Health Organization defines obesity as a Body Mass Index (BMI) ≥ 30 kg/m² and lists three classes of obesity; Class

I = 30–34.99, Class II = 35–39.99, Class III = ≥ 40 .¹ The definition of severe or morbid obesity has varied, with NIH defining it as BMI > 35 in 1991² and NICE defining it as BMI > 40 in 2002.³ Within the UK morbid obesity is more usually used to refer to BMI > 40. The prevalence of obesity in the United Kingdom is

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rising, with a trebling in the number of obese people in England and Wales over the last 20 years.⁴ Recent meta-analyses have shown complications are higher for obese patients after total knee arthroplasty (TKA)^{5,6} and that in total hip arthroplasty (THA) there were more complications and worse functional outcomes.⁷

However much of the literature has been carried out on: historical cohorts with a wide range of operation dates meaning that they also reflect substantial changes in practice and variations of proportions of obese patients within the population during the study; cohorts where there are only small numbers of morbidly obese patients or comparisons have not been made across all obesity groups i.e. morbidly obese are compared to non-obese; only TKA or THA cohorts or these have been analysed as total joint arthroplasty so there is little information comparing TKA and THA arthroplasty from the same practice. Therefore the aims of this audit were to determine the function, satisfaction and complications within two years of operation for all patients undergoing arthroplasty at our institution within a single calendar year. Knees and hips would be treated separately and the outcomes compared based on obesity groups (non-obese, obese and morbidly obese). This would provide information on outcomes and complications for obese and morbidly obese patients and highlight any difference between knee and hip patients in order to guide future practice.

Methodology

This was a retrospective audit carried out under the Clinical Governance procedures of our institution, including Caldicott Guardian approval for the use of patient data. As this study was purely a retrospective review of data already collected as part of each patient's clinical treatment it did not require ethical review. The selection criteria for the study were having had either an elective primary total knee arthroplasty (TKA) or primary total hip arthroplasty (THA) carried out by any of the nine consultant orthopaedic surgeons working at our institution in 2009, giving an unselected consecutive series. Uni-condylar knee replacements, emergency procedures and revision operations were excluded.

A list of patients meeting the selection criteria was collated from both the hospital and departmental databases. All data for any events or appointments up to two years following operation were reviewed. For each patient the following data were collected either from hospital databases or case notes: age, gender, BMI, length of stay (LOS – patients were admitted on day prior to operation), Oxford knee scores (OKS) or Oxford hip scores (OHS) (0–48 scale, 48 being best outcome) and patient satisfaction, both from the one year follow up, which was the standard clinical care review point when these data were recorded. All post-operative appointments up to two years post-surgery were reviewed for any indication of problems relating to surgery. This included any problems reported by patients, those identified by the independent Arthroplasty Service which carried out both routine and addition follow-up appointments and those identified via consultant review. Standard appointments were at six weeks and one year post-operative for TKAs, and three months and one year for THAs. In addition all complications leading to readmission to any

hospital in Scotland up to two years after surgery were obtained from NHS Information Services Division (ISD). The following complications related to surgery were identified: Acute Myocardial Infarction (AMI); Cerebrovascular accident (CVA); death; Deep Vein Thrombosis (DVT)/Pulmonary Embolism (PE); dislocation (THA only); infection; revision surgery. Readmissions for other reasons were grouped under “other”.

Patients were divided into three groups: those with BMI < 30 (non-obese), patients with BMI of 30–40 (obese) and those with BMI > 40 (morbidly obese). Outcomes for each group were compared using appropriate statistical tests (Chi-square for categorical/ordinal data, median test for non-parametric continuous data and ANOVA for parametric continuous data).

Results

Total knee arthroplasty

A total of 1014 TKA operations were included. Fifty-four percent of the cohort was female, mean age was 68.6 years (SD 8.8, range 41–96) and mean BMI was 32.0 (SD 5.4, range 16–55). When grouped by BMI 35.8% of patients were not obese (BMI < 30), 54.7% were obese (BMI of 30–40) and 7.7% were morbidly obese (BMI > 40). Patient in the morbidly obese group were significantly younger and more likely to be female compared to those in other BMI groups ($p < 0.001$). The comparison of demographics across BMI groups is given in [Table 1](#).

The median LOS was 5 days in both the non-obese and obese groups but was significantly longer at 6 days in the morbidly obese group (median test $p = 0.042$) ([Table 2](#)). At one year follow-up the mean OKS was 38 in both non-obese and obese groups, but was 34 in the morbidly obese group which was significantly lower (ANOVA $p < 0.001$) ([Table 2](#)). In the morbidly obese group fewer patients were very satisfied although this was only approaching significance (72% vs, 84% and 84%, Chi-squared $p = 0.054$) but there was no significant difference in the numbers unsure or dissatisfied (3% vs, 6% and 6%, Chi-squared $p = 0.635$) ([Table 2](#)).

In the morbidly obese group 37% of patients had a complication (requiring readmission) or problem (dealt with through outpatient clinic) related to surgery, which was significantly more than the non-obese group, 21%, and the obese group, 21% (Chi-square $p = 0.004$) ([Table 3](#)). The majority of these problems were in the immediate post-operative period and resolved satisfactorily. Within the first two years after operation 14% of morbidly obese patients (11 patients) were readmitted to hospital for any reason compared to 8% of non-obese and 8% of obese patients. For readmissions related to surgery these were 12% (9 patients) in the morbidly obese

Table 1 – Demographics of the different BMI groups for TKA; Data presented as mean (SD) [range].

	BMI ≤ 30	30 < BMI ≤ 40	BMI > 40
n	381	555	78
Gender	47% female	55% female	78% female
Age	71.3 (8.7) [42–96]	67.5 (8.6) [41–86]	63.7 (7.5) [48–77]

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