ORIGINAL ARTICLES

Weight Changes Following Lower Limb Arthroplasty: a Prospective Observational Study

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Abstract

The aim of this study was to assess patterns of weight loss/gain following total hip or knee joint replacement.

Four hundred and fifty primary lower limb arthroplasty patients, where the current surgery was the last limiting factor to improved mobility, were selected.

Over a one year period 212 gained weight (mean 5.03kg), 92 remained static, and 146 lost weight. The median change was a weight gain of 0.50Kg ($p=0.002$). All patients had a significant improvement in Oxford outcome scores. Hip arthroplasty patients were statistically more likely to gain weight than knee arthroplasty patients.

A successful arthroplasty, restoring a patient's mobility, does not necessarily lead to subsequent weight loss. The majority of patients put on weight with an overall net weight gain. No adverse effect on functional outcome was noted.

Introduction

Hip and knee arthroplasties are one of the most cost-effective and successful surgical procedures in modern medicine.[1] Obesity is an ever increasing problem. Rates have trebled in the United Kingdom (UK) over the past 24 years.[2] Arthroplasty in obese patients remains controversial, with many authors reporting poorer results and higher complication rates.[3,4,5,6] Others would suggest that obesity makes no difference.[7,8,9] Recently, one English NHS trust started to ration arthroplasty surgery, excluding any obese patients with a BMI>30.[10] Obese patients, however, are more likely to have osteoarthritis requiring joint replacement surgery.[11,12,13]

Patients often quote an inability to exercise and difficulty mobilising as their reason for being overweight. The primary aim of our study was to investigate patterns of weight change following primary hip or knee arthroplasty, and secondly to see if this had any correlation with functional outcome.

Materials and Methods

Full ethical approval was obtained. Four hundred and fifty consecutive hip or knee arthroplasty patients were recruited. Inclusion criteria were patients with isolated joint disease, or patients undergoing the last arthroplasty in a series of lower limb joint arthroplasty.

Exclusion criteria were patients with inflammatory joint disease, multiple joint disease (still a limit to mobility following surgery), revision arthroplasty, or a limiting concurrent medical disability or condition. These ensured that following surgery there was no other physical reason preventing an increase in activity levels. All patients attended pre-operative assessment two weeks prior to surgery, and post-operative follow up was at three months and one year. At each of these visits their height and weight were measured, BMI calculated, and an Oxford Hip or Knee Score gained. The Oxford Scores are a subjective assessment of functional outcome. They consist of 12 questions relating to different daily activities. These are scored one to five giving a score ranging from 12 (no functional impairment) to 60 (severe functional impairment)

Statistical analysis was performed using Minitab (version 14). Weight changes were compared using paired comparisons. Where differences were normally distributed, paired t-tests were performed; otherwise, Wilcoxon tests were done. A general linear model was then used to test the changes over time while correcting for age, gender, and type of operation. A significance level of 5% was chosen for all tests.

Results

Four hundred and fifty patients were recruited prospectively matching the inclusion and exclusion criteria. Two hundred and twenty four were total knee replacements and 226 were total hip replacements. There were 282 females with a mean age 69.2 $\pm$ 10.0 (range 32-93), and 168 males with a mean age 68.8 $\pm$ 9.9 (range 28-89).

A full table of the descriptive statistics for weight, BMI, and Oxford score pre-op, and at three months and one year is shown in Table I. Pre-operatively the majority of the patients were overweight with 82% having a BMI>25 (See Figure 1 for full BMI distribution). Univariate analysis results for pre-op to three months and one year for weight, BMI, and Oxford score are shown in Table II. The median change from pre-op to three months was a weight loss of -0.50kg ($p=0.002$) which was associated with a decrease in BMI ($p<0.001$).

Table I: Pre-op, Three Month and One Year Descriptive Statistics

Variable	Mean	St. Dev.	Median	Range
Pre-op Wt (Kg)	78.00	16.18	76	37-131
3/12 Wt (Kg)	77.73	16.14	76	45-135
1 yr Wt (Kg)	79.26	16.69	77	45-135
Pre-op BMI	29.51	5.51	29	18-50
3/12 BMI	29.28	5.46	29	18-52
1yr BMI	29.71	5.76	29	18-52
Pre-op Oxford	46.00	6.17	46	24-59
3/12 Oxford	26.20	7.70	25	12-53
1 yr Oxford	22.50	7.56	21	12-55

Figure 1: BMI Distribution

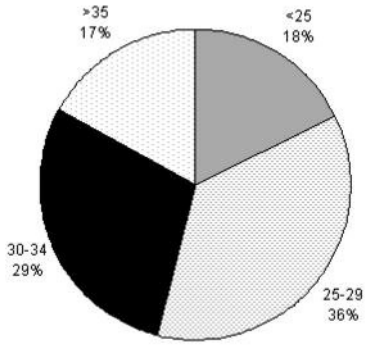
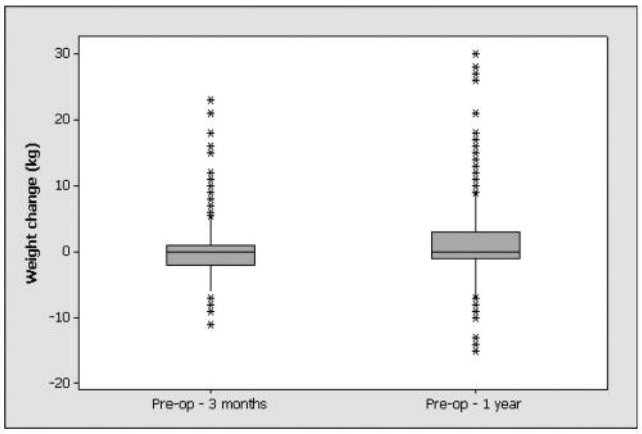


Table II: Univariate Analysis of Changes over Time

Variable	Comparison	Median Difference	95% CI	p-value
Weight (Kg)	Pre-op – 3/12	-0.50	-0.50, 0.00	0.002
	Pre-op – 1 year	0.50	0.50, 1.00	<0.001
BMI	Pre-op – 3/12	0.00	-0.17, 0.00	<0.001
	Pre-op – 1 year	0.00	0.00, 0.00	0.094
Oxford Score	Pre-op – 3/12	-20.0	-21.00, -19.00	<0.001
	Pre-op –1 year	-22.45	-24..50, -23.00	<0.001

However, the median change from pre-op to one year was a weight gain of 0.50kg ($p<0.001$) and an slightly increased BMI. The distribution of these weight changes over time is shown in Figure 2.

Figure 2: Boxplot Demonstrating Weight Changes Over Time



At three months 177(39%) patients lost weight, 148(33%) patients remained static and 125(28%) gained weight. Of the 125 that gained weight, there was an average weight gain of 3.78Kg (range 0.45 – 21 Kg). Over the one year period 146 (32%) patients lost weight, 92 (20%) remained static, and 212 (47%) gained weight. Of the 212 that gained weight there was an average weight gain of 5.03Kg (range 0.4 – 30 Kg). Mean Oxford Scores improved significantly from pre-op to three months ($p<0.001$) and pre-op to one year ($p<0.001$). Multivariate analysis of the weight change from pre-op to one year was analysed using a general linear model which included gender, age, operation type, and pre-op oxford score to determine factors associated with the change. Gender ($p=0.509$), age ($p=0.266$) and pre-op Oxford score ($p=0.807$) were not significant. There was an effect of operation ($p<0.001$), where the weight change is greater in the THR group than in the TKR group.

Discussion

The rationing of joint arthroplasties within one English trust, with the refusal to fund joint replacements with a BMI>30,[10] has again raised the issue of obesity and total joint arthroplasty. In the UK in 2002, 23% of men and 25% of women were clinically obese with a BMI>30, and this number is increasing.[2] Jacobsen et al[12] and Wendelboe et al[13] have confirmed the risk of requiring a total hip arthroplasty is related to an increased BMI.

There is conflicting evidence regarding the risk of operating on obese patients. Bowditch et al[3] reported a significant increase in mean total blood loss in hip patients, and Aderinto et al[14] found weight to be a significant factor in the need for post-operative blood transfusion. Foran et al[4] concluded that any degree of obesity has a negative effect on the outcome of surgery. Miric at al[6] also reported a significant increase in complications following surgery in an obese population. Conversely, Spicer et al[8] found similar Knee Society scores and 10 year survivorship figures for knee arthroplasty in obese and non-obese patients. Stickles et al[9] concluded that obese patients enjoyed as much improvement and satisfaction following surgery as non obese patients.

Previous work has suggested an increase in weight post op in total hip arthroplasty patients[15] but little or no effect on weight of total knee arthroplasty surgery.[16] Our study confirmed this association with a statistically significant risk of increased weight gain following total hip replacement. Our study differs from previous work by looking specifically at patients in whom their surgery would represent the final limiting factor to improved mobility and decreased pain levels. Despite this, there is still a tendency for weight gain. It could be that with the resolution of their pain and decreased analgesic requirements, patients' appetites return to a normal level, overshadowing any increased activity by an increased calorific intake. It is unclear why this should be more marked in hip as opposed to knee replacement. There is a statistically significant trend towards weight loss in the initial three months. This may be secondary to decreased food intake during hospitalisation, increased post-op pain levels, and increased initial activity levels with early focused physiotherapy. Finally, our results show no association between functional outcome and weight change, with all patients sharing the same functional improvements regardless of post-operative weight change.

Conclusion

Following a successful total hip or knee arthroplasty that restores a patient's mobility, the tendency is for patients to put on weight, more so in total hip arthroplasty. Time is the only other associated factor with this weight increase. This information is useful for the clinical setting to inform patients that quote their arthritis as their reason for being overweight. They should be advised that their weight problem is an independent pathological process, and should be treated as such.

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