Changes in body mass index following primary elective total hip arthroplasty Correlation with outcome at 2 years

Shiv A. JAIN, Richard T. ROACH, John TRAVLOS

Weight has been shown to increase following total hip arthroplasty (THA). It is also reported that the pre-operative weight does not correlate to the outcome of the surgery. Body mass index (BMI) is regarded as a better tool for analysis. However, only a few studies have analysed BMI, BMI change or its correlation to the outcome.

We present a retrospective study of 78 consecutive patients undergoing elective primary cemented THA for osteoarthritis (OA) with a minimum 2-year follow-up from a single centre. Only 26 % had an acceptable BMI at the time of surgery and at follow-up, there was a mean absolute weight increase of 2.5% and BMI increase of 2.1%. Fifty seven percent correctly predicted their weight change. BMI values were independent of the level of satisfaction or mobility using Western Ontario McMaster Universities OA Index (WOMAC) score and SF12 score.

We conclude that the majority of patients undergoing primary THA will increase their BMI given sufficient follow-up irrespective of the outcome. Pre-operative BMI or BMI change post operatively is not a predictor of complications or mid term outcome of THA.

INTRODUCTION

Weight, Bone Mass Index (BMI) and their correlations to morbidity, mortality and outcomes from surgical interventions are the subject of much debate (10, 7, 19). Generalisations are difficult to make due to study designs, populations studied, the inter-relationships to factors such as age and the relevance to individual patients (4). Gross outcomes from anaesthesia appear unaffected but overweight patients do have an altered physiological and metabolic state making them a technically more demanding group, hence at greater risk of problems (5, 6, 15). THA patients are known to bleed more (1, 9, 16) and have a higher morbidity (3, 23) but long-term outcomes seem to be unaffected given sufficient follow-up time (11). There are however publications that refute these views (2, 13). Weight is also implicated in higher aseptic loosening rates (20). This is contentious as podometric studies suggest the converse is true as obese patients have lower 'protective' activity levels (12).

A typical scenario is a patient pre-operatively saying that he/she is unable to lose weight on the basis of pain and hence the inability to exercise. The natural assumption would therefore be that following pain reducing surgery weight would fall. The converse may however occur (22).

From Good Hope Hospital NHS Trust, Sutton Coldfield, U.K. and Staffordshire General Hospital, Stafford, UK.

Shiv A. Jain, FRCS (Glasg), Research Registrar, Department of Orthopaedics, Good Hope Hospital NHS Trust, Sutton Coldfield, UK.

Richard T. Roach, FRCS Ed, Specialist Registrar.

John Travlos, FRCS, FCS (SA) Orth, Mmed (Orth), Consultant Surgeon, Department of Orthopaedics, Staffordshire General Hospital, Weston Road, Stafford ST16 3SA, UK.

Correspondence : Shiv A. Jain, 7 Bedford Road, Sutton Coldfield, B75 6BE, UK. E-mail: shivajdoc@hotmail.com.

Weight is a non-specific parameter and is therefore not ideal for consideration in studies. On the other hand BMI is more accurate as it is height, age and gender specific. It has been shown in studies that BMI varies with age and gender of a patient (18). Thus considering BMI as a parameter makes the study more patient-specific.

The aim of this study was to define a select group of patients and determine BMI changes in relation to the outcome in excess of two years and identify reasons for these changes. The study was not designed to elucidate any age-BMI inter-relationships and therefore conclusions can only be made in the context of this patient group.

MATERIALS AND METHODS

One hundred sixty nine consecutive case notes of patients having total hip arthroplasty (THA) over a one-year period were analysed to select eligible patients for the study. Only primary cemented hip arthroplasties for isolated unilateral osteoarthritis (OA) of the hip were selected. The patients were from all six Consultants at a single District General Hospital. Criteria for exclusion included those likely to require bilateral procedures, previous knee replacements, non-OA patients, uncemented THA, grafting, patients where the hip was not the only lower limb joint significantly affected and those where the pre-operative details were incomplete.

Out of 169 patients, 78 were eligible for study according to our criteria and were mailed a questionnaire. The questionnaire comprised of simple demographic details to check with hospital records, Western Ontario McMaster Universities OA Index (WOMAC) score, Short Form-12 (SF-12 score), Mobility score, Satisfaction score and patient's views about their weight. We selected UK SF-12 and WOMAC score for our study as they are simple, reliable and easily reproducible. The SF-12 score is a validated form of the American SF-36 score in the United Kingdom (21, 8). The WOMAC osteoarthritis index is a well-established, highly reliable and valid and reproducible tool for assessment of the outcome of a joint replacement (14, 17). We also used our own patient satisfaction and mobility score out of 4 (poor/fair/good/excellent). This gave us the true picture of patient's assessment of the operation. Patients were questioned as to their weight and how it might have changed since surgery. Statistical analysis included simple averages and rank correlations using Microsoft Excel.

Table I. — Demographics

Total number of patients contacted	98
Response rate	78/98 (80%)
Male : female ratio	1:2
Mean age (years)	66 (49-89, median 66)
BMI Group :	
Unacceptable (<19.9)	4
Acceptable (20—24.9)	19
Overweight (25-29.9)	38
Obese (>30)	17
Pre-operative medical status	
Hypertensive	27
Diabetic	7
Hyper/ hypothyroid	8
Respiratory disease	13
Cardiac disease	16 (2 infarctions)
Neurological disease	5 (4 strokes)
Previous surgery for cancer	2 (bowel, breast)
OA spine	6
Other	24*
Length of stay (days) mean	11
Time to follow-up (months) mean	27 (21-34, median 27)

* (6 peptic ulcers, 4 depression, 2 varicose veins, 2 pulmonary emboli, 1 deep vein thrombosis, epilepsy, Crohn, Paget, splenectomy, renal failure, syndrome X, gout, ankylosing spondylitis, single functional kidney).

RESULTS

Seventy eight patients responded after second mailing (80%). Table I summarises the demographic details. Only 19/84 (26%) had an acceptable BMI pre-operatively. Table II details basic changes in absolute weight, BMI and percentage weight and BMI. Overall 41 increased their BMI and two had no change. It was noted that at least 20% had a documented reduction in height over such a short follow-up time period. This therefore has a bigger bearing on the BMI due to the square function. We assumed that patient self-reporting was accurate for weight and height. There were no gross fluctuations recorded and indeed some patients attending clinics for other reasons had their parameters recorded on arrival which corresponded to their reported values during our study. Table III summarises the trend of changes with reference to BMI groups.

Pre-operative BMI and BMI change had no correlation to simple scores of mobility or satisfaction

Table II. — Change in weight and BMI at follow-up

Mean pre-operative weight	74.7Kg
Mean pre-operative BMI	26.8
Mean absolute weight change	+ 1.87 Kg (+ 2.5%)
Mean absolute BMI change	+2.1%

Table III. — Trend of BMI changes

	Preoperative BMI (no. of patients)	Postoperative BMI (no. of patients)
Unacceptable (BMI<19.9)	4	3
Acceptable (BMI 20-24.9)5	19	1
Overweight (BMI 25-29.9)	38	41
Obese (BMI > 30)	17	19

when asked to categorise the outcome in terms of Excellent, Good, Fair or Poor. At follow-up they were also independent of the WOMAC scores for pain or function (-0.08 and -0.05).

There was a weak positive correlation (p = 0.42) between SF-12 score (both physical and mental component) and WOMAC function score. Also there was a weak positive correlation (p = 0.39) between WOMAC pain and function scores. Pre-op BMI had no correlation to pain, complications, outcome variables or BMI change after the operation. This was also the case when analysing the change in BMI for each individual in correlation to the outcome variables on the scale of SF-12 and WOMAC scores.

Major complications included 6 deep vein thromboses, 3 pulmonary emboli, 3 minor wound infections, 2 arrhythmias, 1 thrombophlebitis, 1 upper gastrointestinal bleed, 1 bronchopneumonia and 1 early dislocation. There was however no correlation to BMI or its change in this study. In fact, there was a weak negative correlation of pre-operative BMI and length of stay (-0.18, not significant).

Patients were blinded to their pre operative weights and were asked to declare whether their weight had changed. Fifty-seven percent correctly predicted their weight change. Table IV summarises the reasons given by them for their weight change.

Table IV. — Patient reasons for weight change (in order of priority)

Reasons for increased weight	*Reasons for decreased weight*
Decreased activity levels	Increased activity
Change in diet/ appetite	Illness
Enjoyment of food	Weight watchers
Illness	Diet/ appetite
Increased OA other joints	
Lower back pain	
Weather	
Retired	

DISCUSSION

BMI or its change appears to have no bearing on the short-term outcome of total hip arthroplasty. This means that, like weight, it cannot be used as a discriminating factor in predicting pain or functional outcome following surgery. Absolute and percentage changes in the weight and BMI also do not correlate with the outcome at two years.

Cross-sectional studies report that BMI does increase with age due to weight increase and height reduction up to a point determined by gender (3). Longitudinal studies also suggest an age-BMI dependent change as well as a changing risk rate with time for individuals concerned (18). To add to the complexity, once the risk event has occurred this adjusts the future risk status of that individual. Our BMI change may partly be explained by this time dependent factor. Therefore the lack of a suitable control makes more formal conclusions difficult.

Half of our sample group correctly predicted their weight change. The reasons stated by patients for these changes are similar, which demonstrates the complex relationship of many factors including medical status, diet, well being, appetite and exercise levels.

As shown in table I, 90% of the patients had at least one associated medical problem at the time of surgery. The most common was hypertension followed closely by cardiac and respiratory diseases.

These conditions may have more bearing on the outcome of the surgery as compared to the weight or BMI (9, 23). It is therefore important to diagnose and treat these conditions prior to the surgery.

Although weak, there is as expected a correlation between the SF-12 and WOMAC scores. Our findings were consistent with the study by Soderman *et al* (17). They found that both generic instruments (SF-36 and WOMAC) are highly valid and reliable and either of them can be used as an outcome assessment tool. Results in table II and III clearly suggest that 70% of the patients had a high BMI at the time of surgery and it continued to rise after the surgery. We accept that there are technical problems associated with the THA in the obese patients, which can make surgery difficult (1). The lack of correlation between the SF-12 or WOMAC scores and BMI or BMI change gives a clear message that there is no bearing on the outcome of the surgery. The absence of correlation with satisfaction score and mobility score supports this statement further. Similar to the findings of Epstein *et al* and Jiganti *et al* (6, 9), postoperative complications and length of hospital stay were also independent of this BMI.

On the basis of these findings we recommend that neither weight loss nor BMI reduction can be assumed on the basis of pain reducing surgery. Therefore they cannot be used alone as a patient selection tool. The anaesthetic implications however need to be more clearly defined on an individual basis (15). We also reiterate the caution attached to making more general conclusions outside this study group and the decisions must be individualised (10). For these reasons the problem of BMI should be addressed at the time of referral if not before, in the primary care setting. This is especially the case if there are co-existing medical problems which may have a far greater impact on the patient than the major surgery contemplated (23).

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