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POST-OPERATIVE MORBIDITY OF THE OBESE PATIENT UNDERGOING POSTERIOR LUMBAR SURGERY

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ABSTRACT

Background: **Obese patients are making up an increasing proportion of patients being seen by spine surgeons in hospital today.**

Objective: **To evaluate the perioperative morbidity in obese patients compared with non-obese patients who underwent posterior lumbar spinal surgery.**

Study design: **A prospective case series.**

Patients: **One hundred consecutive patients appearing for lumbar spine surgery at Hospital for Joint Diseases Orthopaedic Institute from August 2008 to June 2009.**

Outcome measures: **Post-operative morbidity measures – infection, seroma, pulmonary embolism, urinary tract infection, neurological injury and dural tears.**

Methods: **One hundred consecutive patients undergoing posterior lumbar spine surgery were enrolled in the study. Three fellowship trained attending orthopaedic spine surgeons performed the lumbar spine surgeries. The procedures consisted of lumbar discectomy, single and multi-level laminectomy, and single and multi level fusions. Obesity was defined as a body mass index greater than thirty. The patients were divided into two groups, obese and non-obese, and then subsequently subdivided into five groups based on the surgical procedure that was performed.**

Results: **Thirty-five of one hundred patients were classified as obese. The average weight of the patients within the obese group was 215.11 lbs compared with 170.04 lbs in the non-obese group. There were four postoperative infections, only one of which was in the obese population. There was no difference on other post-operative morbidity measures in the two groups.**

Conclusions: **There did not appear to be an increased risk of perioperative complications in obese patients as compared to non-obese patients in this study. We believe that lumbar spine surgery should not be withheld from obese patients, when surgery is properly indicated.**

INTRODUCTION

The successful outcome of lumbar spinal surgery is dependent on several factors. Two essential factors include patient selection and meticulous surgical technique. Obesity is a risk factor that has been associated with an increased incidence of postoperative complications and surgical morbidity and mortality (1). Co-morbidities associated with obesity include coronary heart disease, hypertension, stroke, colon, breast and endometrial cancer, non-insulin dependent diabetes, gallbladder disease, dyslipidemia, osteoarthritis, gout, pulmonary disease, and sleep apnea (2). Obesity is defined as being 30% over desirable body weight, by the Metropolitan Insurance Company weight tables of 1959, or having a Body Mass Index (BMI) of thirty or greater. (BMI is a measurement of the relative percentages of fat and muscle mass in the human body, in which weight in kilograms is divided by height in meters^2). The current prevalence rates for obesity are approximately 20 - 25% in American adults and 15 - 20% in Europeans (3).

The purpose of this study was to evaluate and compare the perioperative morbidity in obese and non-obese patients who have undergone posterior lumbar spine surgery.

MATERIALS AND METHODS

One hundred consecutive patients who underwent lumbar spinal surgery at The Hospital for Joint Diseases Orthopaedic Institute during the period from August 2008 to June 2009 were prospectively analyzed. The patients were divided into obese and non-obese groups based on their BMI. Obesity was defined as a BMI that was greater than thirty. Thirty-five patients were classified as obese. The average weight of the obese group was 215.11 lbs compared with 170.04 lbs in the non-obese group. There were twelve males and twenty three females in the obese

group (total thirty five) with an age range from nineteen to eighty four years (mean 56.02 years). The non-obese group contained sixty five patients (twenty eight males, thirty seven females) and ranged in age from nineteen to eighty three years of age (mean 56.67 years). Both groups had similar characteristics with the exception of BMI. Patients with diabetes mellitus and previous back surgery were excluded from the study.

The surgical diagnoses included; herniated nucleus pulposus, lumbar spinal stenosis and degenerative spondylolisthesis. The patients were subdivided into five groups based on the surgical procedure that was performed: group one (discectomy), group two (one level decompression), group three (single level fusion), group four (multi level decompression) and group five (multi level fusion). The parameters that were examined included; age, sex, height, weight, BMI, hemovac output, operative time, estimated blood loss, wound length, the depth of the skin to fascia, the depth of the fascia to the lamina, transfusions, time until the wound was dry, time to discharge, the occurrence of a wound infection and other noted complications. Laboratory tests including white blood cell count and albumin level were preformed preoperatively to determine the patients' nutritional status. Measurements including length of the wound and the depths of the skin to fascia and the fascia to lamina were measured intra-operatively. The data was then analyzed using chi-squared analysis and Students t-test.

RESULTS

A total of 35 patients in the obese group and 65 patients in the non-obese group were recruited into the study. Discectomy was the most common procedure done in both groups (Table 1).

The obese group overall did not demonstrate significant differences in length of hospitalization, nutritional status, hemovac output, and transfusion requirements when compared to the non-obese group. BMI was found to be significantly greater in the obese population in all groups. In addition wound length, as well as depth of the skin to the fascia and the depth of the fascia to the lamina were found to be significantly different in the obese vs. the non-obese groups, with all results being of greater magnitude in the obese group.

The nutritional status of our patient population was assessed by analyzing the albumin levels and white blood cell counts. Malnutrition was not a factor in our study population.

Table 1

Distribution of type of surgeries in obese and non-obese patients

Groups	Obese	Non-obese
All Patients	35	65
Group 1 (Discectomy)	17	36
Group 2 (One level decompression)	5	9
Group 3 (One level fusion)	4	9
Group 4 (Multi level decompression)	5	7
Group 5 (Multi level fusion)	4	4

Thirteen per cent of the study population used tobacco, five in the obese group and eight in the non-obese group with only one complication occurring in smokers (an obese patient in group one).

Obese patients in group one (discectomy) had greater operative times, wound lengths, and intraoperative anatomic measurements as compared to non obese patients. Surprisingly however obese patients in these groups took a shorter time to dry. Obese patients in Group five (multi level fusion) had longer wound lengths, as well as times until the wound was dry as compared to non-obese patients. Groups two (one level decompression), three (one level fusion), and four (multi level decompression) did not show any significant differences when comparing obese and non-obese patients.

Longer incisions are often required during surgery in the obese patient for adequate exposure, retraction is more aggressive, and patient positioning more challenging (1,4). As indicated in Table 2 the wound lengths in our study were longer in the obese group as a whole and particularly in obese patients in groups one and five (p values: group one: 0.01, group five: 0.03 and all: 0.02) .

Table 2

Mean values (obese/non-obese)

Groups	BMI	Op Time (minuets)	EBL	Wound Length (cm)	Depth S/F (cm)	Depth F/L (cm)	Wound Dry (days)	D/C Home (days)
All Patients	34.8/24.9	154.9/137.6	328.2/214.0	8.56/6.85	3.07/1.96	4.16/3.55	2.22/2.12	3.43/3.07
Discectomy	34.5/23.8	100.9/80.8	54.2/58.3	5.67/4.26	2.99/1.76	4.11/3.00	1.41/1.50	1.35/1.22
One Level decompression	36.3/25.9	123.0/136.9	191.0/175.0	7.60/7.63	3.00/2.24	3.72/3.60	2.80/2.56	4.80/5.22
One level fusion	34.5/26.8	241.3/268.4	750.0/600.0	12.70/11.50	2.68/2.36	5.05/4.60	3.25/2.38	5.50/3.63
Multi level decompression	34.2/25.0	270.0/242.1	982.0/497.6	12.14/11.97	2.18/1.66	4.03/4.59	4.00/4.14	7.00/8.14
Multi level fusion	35.0/37.2	195.0/172.5	425.0/337.5	13.4/8.97	5.03/2.77	4.20/4.43	1.67/2.67	4.00/4.67

Op time = operative time, EBL = estimated blood loss, Depth S/F = the depth of the skin to fascia, Depth F/L = the depth of the fascia to the lamina.

There were four postoperative wound infections, one deep and three superficial, which were found not to be significant when comparing obese vs. non-obese patient groups. The deep infection occurred in an obese patient undergoing multi-level fusion and was the only deep infection in this study. The three superficial infections occurred in the non-obese patient groups (two infections in group one and one infection in group two). The deep infection in the study was treated with an operative incision and drainage and intravenous antibiotics for six weeks. The superficial infections resolved with the use of intravenous and oral antibiotics after a short period of time. All infections were eradicated after treatment.

There were ten other postoperative complications that were relatively minor. These complications included two urinary tract infections, three dural tears, one post-operative sciatica, one upper respiratory tract infection, one superficial wound dehiscence (without infection), one seroma, and one case of urinary retention. Seven of the postoperative complications occurred in the obese group, compared with three in the non-obese group. The difference was not significant. Group three (single level fusion) had five complications, with most of these occurring in the obese group. Overall this group had the highest number of complications when compared to all groups as illustrated in Table 3. These included an upper respiratory infection, three dural tears and a syncopal episode. All of these complications with the exception of one dural tear occurred in the obese patient group.

Table 3

A comparison of complications and infection amongst the different operative procedures (P values)

Groups	1 Disectomy	2 One level decompression	3 One level fusion	4 Multi level decompression	5 Multi level fusion
Complications	0.962	0.164	0.021	0.217	0.285
Infection	0.322	0.439	N/A	0.217	N/A

N/A= not applicable due to no infections were present in these groups

DISCUSSION

Obesity is more prevalent in the United States as compared with other countries. Certain studies have revealed a higher infection rate and wound complication rate in obese patients as compared to non obese patients undergoing general, cardiovascular and obstetrical surgery (5). These wound problems are believed to stem from a variety of local changes that occur in soft tissues with surgery, such as an increase in local tissue ischemia and reduced resistance to infection (5). These changes are related to increased tissue trauma of the larger wound wall in obese patients and adipose tissue which has inferior vascularity. Increased operative time may also play a role in the development of wound problems in obese patients.

The rate of infection in lower back surgery has been related to the complexity and length of the procedure. Single level unilateral laminotomy and disc excision has the lowest infection risk among open surgical procedures of the spine according to Capen *et al* (6). Simple discectomy carries an infection rate of 1% (7,8). Non-instrumented posterior lumbar surgery has an infection rate of 3 – 5% and fusion with instrumentation is associated with a risk of 6% or more (9). Risk factors for wound infections include advanced age, chronic malnutrition, obesity, poorly controlled diabetes, immunosupression, steroid therapy, infection at remote sites and prolonged preoperative hospitalization (9). Our study found no significant difference in the incidence of wound problems between obese and non-obese patients.

Other studies have found similar findings. Andreshak *et al* (10) performed a prospective study which found no significant difference between obese and non obese patients who had lumbar spinal surgery with respect to blood loss, operative time, hospital stay, rate of complications and functional outcome. Hanigan *et al* (11) completed a prospective study, which noted that although obesity was associated with the occurrence of lumbar disc herniation, it could not be included as a negative prognostic factor when patients were considered for surgical intervention.

Recently Yadla and colleagues (4) studied 87 consecutive patients on whom elective thoracolumbar surgery was performed. BMI was not found to correlate to minor major or any complications. Kardaun's study, which examined the acute complications in patients undergoing surgical treatment of lumbar disc herniation, found a complication rate of 3% (30/1000) (12). In our study the complication rate was 14% (14/100), ten of which were relatively minor. Our study evaluated a wider variety of complex surgical procedures and this could certainly account for the greater complication rate than what was found in Kardaun's study.

Telfeian *et al* (13) conducted a study which examined the relationship between the obese patient and spinal surgery. He found that obese patients were associated with a high rate of perioperative morbidity. Telfeian and colleagues (13) stated that with limited modifications of both general patient care as well as improved operative techniques, better outcomes can be achieved in most of these patients. Increased morbidity was not found to be associated with obesity in our study. However, Telfeian's study examined the morbidly obese patients with an average BMI of 52 as compared to our study with an average BMI of 34.8.

Other issues that arise during the treatment of obese patients include difficulties with obtaining adequate pre-operative neurodiagnostic images, as well as difficulty with adequate surgical exposure (11,13). The body habitus of the obese patient, may preclude the use of standard MRI and CT scanners while open imaging systems may be required. The quality of the studies obtained may be poor due the greater mass of these patients. In Telfeian's study (13), three patients could not fit in the standard nor open MRI scanner, so myelograms were obtained to supplant the usual neurodiagnostic studies.

Similar to Telfeian's study obese patients in our study also require longer incisions and greater operative exposure, but that did not necessarily predispose them to higher infection or other post-operative morbidity.

Smoking has been implicated in many series as a significant risk factor for post-operative infection (6). In a study by Kayvanfar *et al* (14) the infection rate was found to be significantly greater in obese patients and patients who smoked after instrumented lumbar spine fusion. Nicotine intake is known to be a preoperative risk factor for wound complications, however, it did not appear to be a compounding variable in our study.

A power study was performed prior to the initiation of this study and the results indicated that a sample size of one hundred subjects would be adequate to

demonstrate a difference between obese and non-obese patients. This study found no significant difference in the incidence of for wound infections between obese and non-obese patients. Based on the results of our study, we believe that obese patients undergoing open lumbar spine surgery are not subjected to unreasonable risk as compared to the non-obese patient.

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