INTRODUCTION

Increased health risks and medical complications are often associated with being overweight or obese, but a thorough understanding of in vivo motions for obese, overweight and normal weight subjects does not exist. The question whether high body mass index (BMI) TKA subjects perform adequately when compared to their normal BMI counterparts, with similar implants, needs to be investigated. Therefore, the objective of this study was to compare medial and lateral tibio-femoral translations in TKA subjects by BMI. The occurrence of condylar lift-off was also analyzed. The hypothesis of the study was that normal weight patients will have the most normal kinematics of the three groups and the obese subjects will have the least normal kinematics of the three groups.

METHODS

In vivo knee kinematics were determined for 252 TKA subjects during a Deep Knee Bend (DKB) from full extension to maximum flexion using a 3D to 2D image registration technique [1]. Each of these subjects was then classified into one of three BMI categories: obese (BMI greater than or equal to 30), overweight (BMI greater than or equal to 25 and less than 30) and normal weight (BMI less than 25 and greater than or equal to 18.5). Subjects were provided by 11 surgeons using ten different TKA devices. All subjects were deemed clinically successful. Informed consent and Institutional Review Board approval were previously obtained.

RESULTS

On average, from full extension to maximum flexion, the medial condyle for the obese (n=78), overweight (n=113) and normal weight (n=61) groups experienced -5.3mm (-22.2mm to 8.0mm, σ=7.9mm), -6.3mm (-25.2mm to 5.3mm, σ=7.4mm) and -4.8mm (-20.8mm to 5.5mm, σ=6.7mm) of posterior femoral rollback (PFR), respectively (Figure 1).

The percentage of subjects who demonstrated at least one instance of condylar lift-off greater than 1 mm in the obese, overweight and normal weight groups was 16.7%, 10.6% and 11.5%, respectively (Table 1).

DISCUSSION

The normal weight group experienced a significantly more posterior lateral condyle position than the overweight group at full extension and significantly more anterior than the obese group at 90º. The normal weight group was also significantly more posterior on the medial side than both the obese and the overweight group at full extension. The overweight and the normal weight groups were significantly more posterior than the obese group on the medial side at 30º, 60º, 90º and maximum flexion.

The obese group had significantly more PFR on the lateral side from 0º-60º, 30º-60º and 60º-90º than the normal group. Both the obese and the overweight groups had significantly more PFR than the normal weight group on the lateral side from 0º-90º, 30º-90º and 0º-maximum flexion. The overweight and the obese groups had significantly more medial PFR from 0º-30º than the normal weight group.

There were a significantly higher number of cases of condylar lift-off for obese subjects when compared to both normal weight and overweight groups.

The present study shows that obese subjects with a TKA experience less medial translation and more lateral translation than the normal weight TKA subjects. The current study also shows that obese subjects are more likely to experience condylar lift-off than overweight or normal weight subjects. Therefore, it can be concluded that body mass index does play a factor in TKA kinematics. An additional investigation using normalized data is presently being conducted. Also, a more focused study with fewer variables could be beneficial in understanding why these differences take place.

REFERENCE