Effect of BMI and muscle area ratio on complication rate after lower extremity Osseointegration

Mohamed Elghazy Abdelaziz, Zachary Glassband, S Robert Rozbruch, David Otterburn, Taylor Reif, Jason Shih Hoellwarth

INTRODUCTION: Osseointegration (OI) entails attaching prosthetic components directly to the skeleton of the residual limb, thereby bypassing the need for a socket interface. Infections and soft tissue irritation are the most commonly reported complications. There is no literature directly assessing the impact of body mass index (BMI) or the relationship of the limb segment cross-sectional muscle area ratio regarding the rate of postoperative infections or reoperations. The aim of this study was to evaluate the effect of BMI and muscle mass ratio on the occurrence of adverse events after OI.

METHODS: Patients who received lower extremity OI at a single institution with a minimum of one year follow up were retrospectively reviewed. They were categorized into Femur or Tibia level cohorts. Adverse events were defined as surgery to address infection, soft tissue refashioning, and periprosthetic fracture. The cross-sectional muscle area ratio was calculated from the preoperative CT scan cut at the level of the bone cut (Figure 1). First the entire perimeter of the skin was outlined, then the muscle was outlined separate from the total perimeter. The number of muscle pixels were divided by the total pixels of the limb's cross-section to calculate a muscle area ratio. The BMI and muscle area ratio were assessed for their association with postoperative adverse events.

RESULTS: 118 limbs in 114 patients were included. For the 70 femurs, the average follow-up time was 24.9 months, BMI was 28.8 kg/m², and muscle ratio was 51.8%. For the 48 tibias, the averages were 27.0 months, 29.0 kg/m², and 73.2%, respectively. Within the femur cohort, 13 (19%) had surgical debridement for infection whereas 57 did not; there was no statistical difference in muscle area ratio (51.6±15.5% vs 52.5±17.7%, p=.857) or BMI (29.7±6.0 vs 27.4±5.3, p=.274). 11 (16%) had refashioning whereas 59 did not; there was statistical difference in muscle area ratio (42.0±17.0% vs 53.6±15.1%, p=.038) but not for BMI (31.1±4.8 vs 28.4±6.0, p=.100). Within the tibia cohort, 3 (6%) had surgical debridement for infection whereas 45 did not; there was no statistical difference in muscle area ratio (73.0±15.1% vs 75.1±15.3%, p=.792) or BMI (29.2±6.1 vs 27.2±3.7, p=.328). 1 (2%) had refashioning whereas 47 did not; statistical comparison was not performed for muscle ratio (90.1% vs 72.8±14.9%) nor BMI (27.9 vs 29.1±6.0) due to the singular event precluding statistical appropriateness. One femur (1%) and one tibia (1%) implant were removed for infection; statistical comparisons were not performed due to too few events.

DISCUSSION AND CONCLUSION: There was a statistically significant association of decreased muscle ratio (increased fat ratio) with soft tissue revision for femur patients, but not tibia. There is no recognized association of BMI for soft tissue revision for femurs or tibias, and no association of BMI or muscle ratio with femur infection debridement. Additional research is needed to identify predictive risk factors for debridement. It appears beneficial to surgically reduce redundant fat and skin for femur-level patients having osseointegration to avoid subsequent soft tissue refashioning.