

Effect of Sleeve Gastrectomy on Marrow Adipose Tissue in Adolescents with Obesity

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PURPOSE

Sleeve gastrectomy (SG), the most commonly performed weight loss surgery in adolescents, has deleterious effects on bone. Recent studies have identified marrow adipose tissue (MAT) as a dynamic endocrine organ that responds to changes in nutrition and might serve as a novel biomarker for bone quality. The distribution of MAT varies by age and skeletal site. The purpose of our study was to determine the effects of SG on volumetric BMD (vBMD) and MAT content in adolescents with obesity. We hypothesized that SG would lead to a decrease in BMD and differential changes in MAT.

METHOD AND MATERIALS

This prospective study was IRB-approved and HIPAA-compliant. Written informed consent/assent was obtained. We examined 46 adolescents with moderate to severe obesity (33F, mean age: 17.5±2.4 years, mean BMI 45±7 kg/m²): 23 before and 12 months after SG, and 23 nonsurgical controls followed for 12 months. At baseline and 12-month, subjects underwent QCT of the lumbar spine (L1) to assess vBMD and single voxel 1H-MRS at 3T (PRESS pulse sequence without water suppression) of the lumbar spine (L1), mid femur and distal tibia to quantify MAT. Groups were compared by Student t-test and within group comparisons were performed by paired t-test. Spearman correlations were used to determine 12-month change between vBMD and MAT.

RESULTS

Adolescents who underwent SG lost 36±13 kg vs 0.2±9 kg in the control group (p<0.0001). There was a significant decrease in vBMD by QCT in VSG vs. controls (p=0.046). Lumbar MAT increased within the SG group (p=0.013) but the difference was not significant compared to controls (p=0.3). MAT content of the femur and tibia decreased in the SG group vs controls (p=0.049 and p=0.006, respectively). There was an inverse association between 12-mo change in lumbar vBMD and lumbar MAT (r= -0.42, p=0.013) while there were no associations between change in vBMD and peripheral MAT (p>0.1).

CONCLUSION

Adolescents with obesity undergoing SG showed a decrease in lumbar vBMD associated with an increase in lumbar (central) MAT, while extremity (peripheral) MAT decreased. This demonstrates differential changes of MAT in adolescents in response to SG.

CLINICAL RELEVANCE/APPLICATION

Weight loss surgery in adolescents with severe obesity is associated with a decrease in lumbar BMD with a reciprocal increase in lumbar MAT, while peripheral MAT decreased.