Analyzing Abdominal Adipose Distribution on Computed Tomography as a Predictor of Weight Loss After Bariatric Surgery

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BACKGROUND

- Previous studies have shown that preoperative visceral adipose tissue is associated with improved metabolic disease burden after bariatric surgery.
- It is unknown whether adipose distribution influences weight loss.

AIM

Determine if the distribution of adipose tissue (visceral, subcutaneous or total) as measured on CT influences weight loss outcomes following bariatric surgery.

METHODS

- **Study design:** retrospective cohort study
- **Population:** Patients who underwent sleeve gastrectomy or RNY gastric bypass with CT imaging within 1 year pre-op or 30 days post-op
- **Primary outcome:** L3+L4 adipose volume, postoperative weight loss
- Latent class growth modeling and U-net segmentation used to quantify adipose volume on CT. Machine learning models were used to predict trajectory group

RESULTS

Table 1. Demographic Characteristics and Outcomes

Variable	Limited Loss	Significant Loss	P-value
Age at Surgery (years)	43.7 ± 13.1	42.4 ± 13.6	0.4
Sex			0.4
Female	161 (83.4%)	111 (87.4%)	
Male	32 (16.6%)	16 (12.6%)	
Race			0.09
Black	106 (55.2%)	54 (43.2%)	
White	76 (39.6%)	65 (52.0%	
Other	10 (5.2%)	6 (4.8%)	
Ethnicity			0.4
Not Hispanic	183 (96.8%)	119 (94.4%)	
Hispanic	6 (3.2%)	7 (5.6%)	
Preoperative BMI	47.4 ± 9.1	53.1 ± 10.8	**<.001**
Procedure Type			0.2
RNYGB	85 (44.3%)	64 (52.5%)	
Sleeve	107 (55.7%)	58 (47.5%)	
% BMI loss at 2 years	-22.9 ± 7.8	-44.0±8.1	**<.05**
L3 VAT Adipose Ratio	0.3 ± 0.1	0.3 ± 0.1	0.6
L4 VAT Adipose Ratio	0.28 ± 0.09	0.28 ± 0.10	0.6
L3 Total Adipose (cm²)	922.9 ± 175.3	1012.9 ± 196.6	**<.001**
L4 Total Adipose (cm²)	955.3 ± 179.7	1053.3 ± 201.3	**<.001**

Key demographic, clinical and adipose distribution characteristics stratified by weight loss trajectory. Continuous variables are presented as mean ± SD, and categorical variables as counts with percentages. VAT Adipose Ratio represents the proportion of VAT to total adipose tissue.

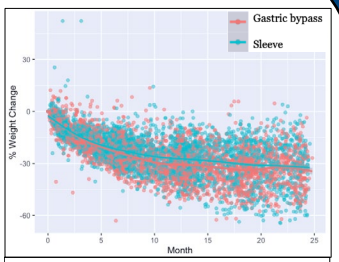

Figure 1. Percent weight loss by procedure type plotted vs. time since surgery (months).

Logistic regression models using demographics, total adiposity and VAT ratio showed adequate weight loss predictability **(AUC=0.71)**

Significant Findings

Strong predictors of weight loss:

- Total **L4 adipose tissue volume** (955.3 vs. 1053.3 cm², p<.001)
- **Preop BMI** (47.4 vs. 53.1, p<.001) was a strong predictor of postop weight loss

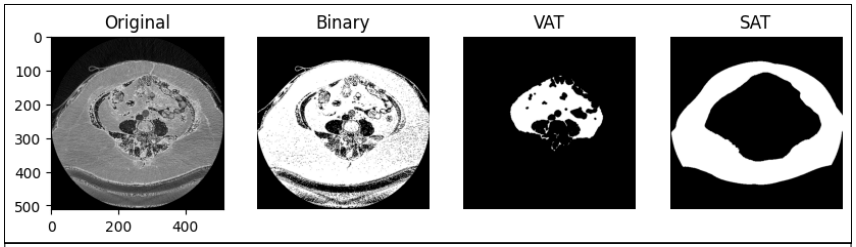

Figure 2. Representative images of L3 CT cuts used to determine VAT and SAT ratios.

Abbreviations: visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT),computed tomography (CT), lumbar vertebral body 3/4 (L3/4), body mass index (BMI).

RESULTS

VAT-to-total adipose ratios were significantly higher in:

- Males (38%) > females (28%)
- White (34%) > black patients (26%)

Age had a positive correlation with VAT ratio

CONCLUSIONS

- Our analysis found the VAT-to-total adipose ratio did not differ meaningfully in limited versus significant weight loss.
- Total adipose tissue was associated with greater weight loss trajectory at 2 years than VAT or SAT alone.
- While adipose distribution varies across demographic groups, total adipose volume remains the more clinically relevant factor in predicting bariatric outcomes.

Future studies will focus on analysis of comorbidities associated with VAT, SAT and postoperative weight loss.

DISCLOSURES

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