- Our study demonstrates a strong positive correlation between BMI and ALTFF thickness across all thigh points.
- Female patients consistently had thicker thigh tissue than males despite similar BMI, aligning with known fat distribution patterns and limiting their suitability for ST-ALTFF.
- BMI strongly correlates with flap thickness; helping surgeons anticipate when ST-ALTFF is achievable versus when alternative strategies may be required.

BMI and Sex as Predictors of Anterolateral Thigh Free Flap Thickness for Oral/Oropharyngeal Reconstructions

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Introduction

Anterolateral thigh free flaps (ALTFF) and radial forearm free flaps (RFFF) have become workhorse flap options for oral and oropharyngeal reconstructions. Given the anatomic space limitation in the oral cavity and oropharynx, flap thickness is a crucial factor that influences flap choice. Excess tissue bulk may compromise functionality and aesthetic outcome. The novel super-thin ALTFF (ST-ALTFF) has been introduced as a feasible option in such circumstances.

Reliable predictors of flap thickness remain limited. Patient body mass index (BMI) and sex may serve as markers to aid in flap choice decision-making.

In this study, we aim to evaluate the association between ALTFF thickness and BMI and sex. We seek to provide head and neck reconstructive surgeons with reliable and practical markers that can guide perioperative planning and improve patient outcomes.

Methods

This study cohort included patients that underwent ST-ALTFF or RFFF reconstruction after oral cavity/oropharyngeal SCCa resection between 2020 and 2024. Eligible patients had preoperative skull-base to mid-thigh PET/CT scans which were used for analysis. Demographic data collected included age, sex, height, weight, and BMI (<25 vs ≥25). (Tables 1, 2)

Flap thickness was measured using PET/CT scans. Thickness was defined as the perpendicular distance from the rectus femoris–vastus lateralis junction to the overlying skin surface. Given the three-dimensional nature of the ALTFF and the variable subcutaneous fat deposition along the thigh, three measurements were taken. Point A: proximal ¼, Point B: midpoint, Point C: distal ¼ of line connecting the ASIS and patella. (Figure 1)

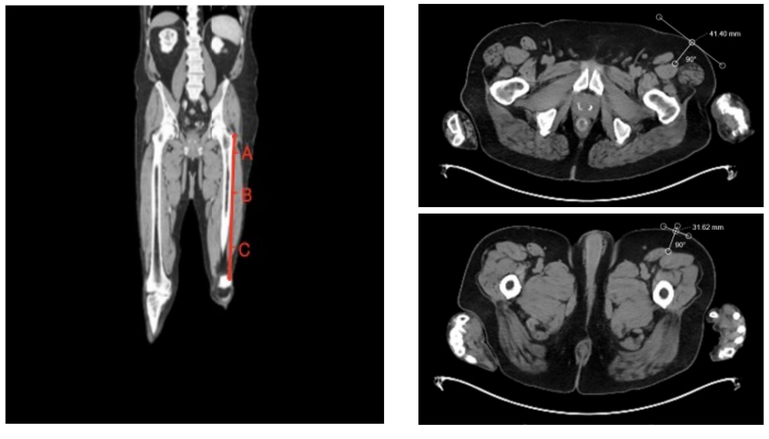

Figure 1: Landmarks of thickness points along the thigh

Results

Female patients demonstrated significantly thicker flaps at all measurement points compared to males, despite similar BMI (Point A: p=0.02; Point B: p=0.0001; Point C: p=0.0001).

Flap thickness was greatest proximally (Point A: 24.2 mm ± 8.0) and decreased distally (Point B: 18.4 mm ± 7.8; Point C: 12.6 mm ± 7.2), with statistically significant differences between measurement points (p=0.004 and p=0.0025).

Higher BMI was significantly correlated with greater flap thickness at all points (Point A: p<0.0001, r=0.776; Point B: p=0.0006, r=0.631; Point C: p=0.001, r=0.619). (Figure 2)

	BMI<25	BMI>25	*p* value
Total	18 (55%)	15 (45.5%)	-
Age (years)	64.53	56.71	0.132
Sex			
Male	13 (72%)	6 (40%)	0.0623
Female	5 (28%)	9 (60%)	
Mass (kg)	64.86	86.06	**0.0001***
Height (cm)	171.94	168.13	0.365
Flap type			
ST-ALTFF	12 (66.7%)	3 (20%)	-
RFFF	6 (33.3%)	12 (80%)	-
Mean ALTFF thickness (mm)			
Point A	19.37	29.90	**<0.0001***
Point B	14.37	23.21	**0.0006***
Point C	9.05	16.87	**0.0014***

Table 1: Influence of BMI on Flap Selection.

	Male	Female	*p* value
Total	19 (58%)	14 (42%)	-
Age	60.47	61.66	0.822
BMI	24.5	27.27	0.202
Height (cm)	178.34	159.17	**<0.0001**
Mass (kg)	78.07	69.64	0.188
Flap type			
ST-ALTFF	14 (74%)	1 (7%)	-
RFFF	5 (26%)	13 (93%)	
Mean ALTFF thickness (mm)			
Point A	21.35	27.96	**0.018***
Point B	14.14	24.15	**0.0002***
Point C	8.33	18.41	**0.0001***

Table 2. Influence of Sex on Flap Selection.

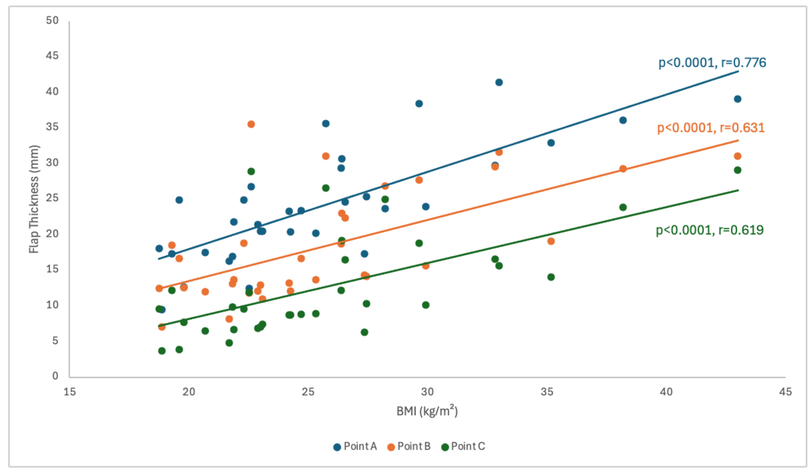

Figure 2. Flap thickness as a function of BMI.

Discussion

Flap donor site choice is a critical decision and flap thickness plays a crucial role in this decision making. Reliance on subjective measures such as the “pinch test” may not always be accurate.

Our study demonstrates a strong positive correlation between BMI and ALTFF thickness across all thigh points. Female patients consistently had thicker thigh tissue than males despite similar BMI, aligning with known fat distribution patterns.
In females and patients that have higher BMI’s, traditional ALTFF may bee too bulky, likely compromising function such as breathing and swallowing and negatively impacts cosmesis. In such patients, alternatives such as the ST-ALTFF may be a feasible option. This way flap thickness would be adequate without risking donor site morbidity commonly associated with other flaps such as the RFFF.

Conclusions

BMI and sex are practical, objective, and cost-effective tools for estimating ALTFF thickness and therefore feasibility in oropharyngeal reconstruction.
Incorporating both BMI and sex into preoperative planning enables individualized flap selection, reduces reliance on costly imaging or subjective assessments, and optimizes reconstructive outcomes.

References