Does the Type of Fat Matter? : Association of Visceral and Subcutaneous Fat with Adiponectin Levels in Post-Menopausal Women with Obesity

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Background

- Increased body fat, obesity, and prediabetes are all linked to increased risk of cancers in postmenopausal women
- Excess fat can create inflammatory environment -> tumor cell invasion and proliferation[1]
- Visceral fat in particular is known to cause adipose tissue dysfunctionality leading to inflammation[2]
- Adiponectin (APN) is a protein with anti-inflammatory, antiproliferative, and proapoptotic properties
  - decreased in women with obesity
  - potentially a link between obesity and cancer risk[3]

Research Question

Circulating level of APN is inversely correlated with obesity, but… can it be correlated with specific types of fat?

Objective: determine whether visceral fat (around the internal organs and along the muscle wall) or subcutaneous fat (just beneath the skin) are correlated with APN levels

Methods

Secondary analysis of baseline data from 26 postmenopausal women with obesity (body mass index >30) from a randomized biomarker study of metformin and lifestyle intervention.[4]

- Adiponectin was measured using routine clinical testing procedures after a fasting blood draw
- Visceral fat area was estimated from Dual Energy X-Ray Absorptiometry Scan (Hologic Discovery W QDR DXA system,Waltham, MA).
- Approximated subcutaneous fat mass by subtracting visceral fat mass from total fat mass

Data analysis:

Correlation test: to test associations between adiponectin and subcutaneous fat and visceral fat

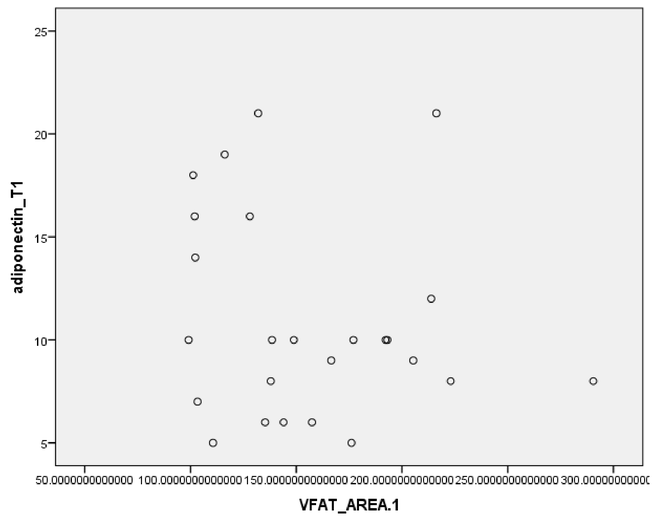
Multiple Regression: to determine if subcutaneous fat and visceral fat can predict adiponectin levels when controlling for participant body mass index

Results

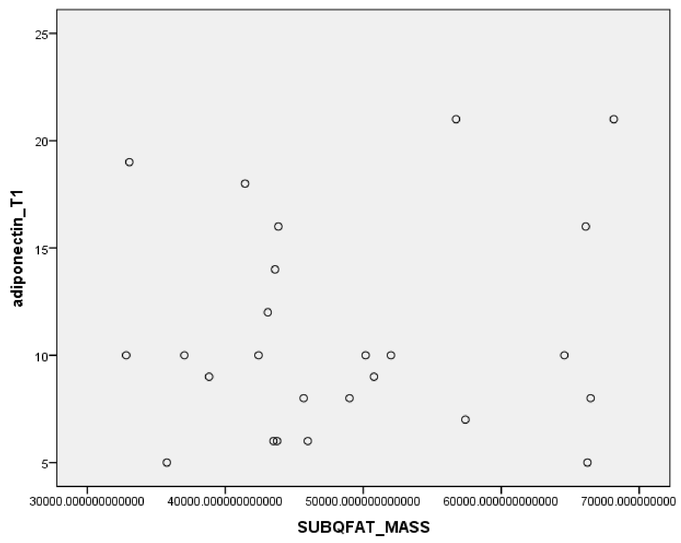
Demographics of Study Participants

	N	%
Race (Black/White/Other)	12 / 15 / 2	41.1 / 51.7 / 6.8
Ethnicity (Hispanic/Non-Hispanic)	5 / 24	17.2 / 82.8

Scatter Plot showing Correlation between Adiponectin Levels and Visceral Fat Area



Scatter Plot showing Correlation between Adiponectin Levels and Subcutaneous Fat Mass



Binary Correlation of Visceral and Subcutaneous Fat with Adiponectin

	Correlation to APN	Significance
Visceral Fat (n=25)	-.178	.395
Subcutaneous Fat (n=25)	.098	.640

Neither correlation is significant, but visceral fat is weakly negatively correlated with APN while subcutaneous fat is not correlated with APN.

Results Continued

Tables Detailing Results from Multiple Regression Controlling for Participant BMI

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Value	Significance (P Value)
1	.072[a]	.005	-.038	4.996	.119	.773[a]
2	.353[b]	.125	.000	4.904	.998	.413[b]

a. Predictors: (Constant), BODY_MASS_INDEX.1
b. Predictors: (Constant), BODY_MASS_INDEX.1, VFAT_AREA.1, SUBQFAT_MASS.1.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	13.324	6.922		1.925	.067
	BODY_MASS_INDEX.1	-.061	.176	-.072	-.345	.733
2	(Constant)	17.329	7.209		2.404	.026
	BODY_MASS_INDEX.1	-.408	.329	-.483	-1.241	.228
	VFAT_AREA.1	-.019	.022	-.191	-.862	.399
	SUBQFAT_MASS	.000	.000	.572	1.495	.150

a. Dependent Variable: adiponectin_T1

Multiple Regression does not give statistically significant prediction of APN levels. None of the variables on their own are statistically significant.

Discussion

- Visceral fat area and subcutaneous fat mass cannot be used to predict APN levels in post-menopausal women who are obese and have pre-diabetes
- Neither the correlation between APN and visceral fat nor the correlation between APN and subcutaneous fat is significant

Limitations of the data available:

- Subcutaneous fat mass is an estimation and includes intramuscular fat
- Data doesn't include full range of BMI (obese women only) and thus association between adiposity and APN may be reduced
- Limited sample size

Future Directions:

- More investigation is needed to determine if there is a connection between visceral fat or subcutaneous fat and APN
- Consider using data with larger sample size to account for smaller range and thus, try for statistically significant results

Relation to Cancer Prevention:

- Further investigation into the type of fat associated with biomarkers of cancer risk such as APN can direct interventions in high risk people, potentially increasing the effectiveness of these interventions

References

1. Kang C, LeRoith D, Gallagher EJ. Diabetes, Obesity, and Breast Cancer. Endocrinology. 2018 Nov 1;159(11):3801-3812.
2. Unamuno X, Gómez-Ambrosi J, Rodríguez A, Becerril S, Frühbeck G, Catalán V. Adipokine dysregulation and adipose tissue inflammation in human obesity. Eur J Clin Invest. 2018 Sep;48(9):e12997
3. Di Zazzo E, Polito R, Bartollino S, Nigro E, Porcile C, Bianco A, et al. Adiponectin as link Factor between Adipose Tissue and Cancer. . Int J Mol Sci. 2019 Feb 15;20(4):839.
4. Yates MS, Coletta AM, Zhang Q, Schmandt RE, Medepalli M, Nebgen D, et al. Prospective randomized biomarker study of metformin and lifestyle intervention for prevention in obese women at increased risk for endometrial cancer. *Cancer Prev Res (Phila)* 2018;11:477–490

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Responsible Research Conduct: All data was deidentified, and data was requested through proper channels