

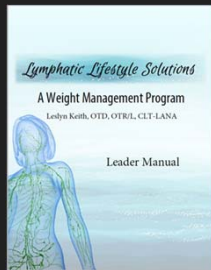
# Ketogenic Way of Eating for Health and Weight Management: Implications for Lymphatic and Fat Disorders

Leslyn Keith, OTD, CLT-LANA

## Disclosures

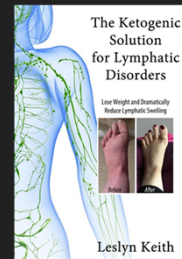
### Program

*Lymphatic Lifestyle Solutions: A Weight Management Program*



### Book

*The Ketogenic Solution for Lymphatic Disorders: Lose Weight and Dramatically Reduce Lymphatic Swelling*



# Ketogenic Way of Eating



- ✓ Real Food Diet
- ✓ Carbohydrate Restriction
- ✓ Healthy Fats
- ✓ Moderate Protein

vol. XX • no. X American Journal of Lifestyle Medicine

**ORIGINAL Research**

Leslyn Keith, OTD, OTR/L, CLT-LANA, Carol Rowsemit, PhD, RN, FNP-C, and Lorie G. Richards, PhD, OTR/L, FAHA

## Lifestyle Modification Group for Lymphedema and Obesity Results in Significant Health Outcomes

**Abstract:** *This study investigated whether a lifestyle modification program that encouraged a ketogenic diet (KD) for participants with lymphedema and obesity would reduce weight and limb volume and improve quality of life. A total of 12 participants with lymphedema and obesity (mean body mass index = 38.38; SD = 7.02) were enrolled in a lifestyle modification group. The timespan from baseline data collection to 30-day follow-up was 18 weeks. Retention rate was 83.3%. Data were analyzed with repeated-measures ANOVA and Pearson correlation. Participants demonstrated statistically significant improvement in most outcome measures. Mean weight loss was 5.18 kg— $F(4, 36) = 11.17$ ;  $P < .001$ —or 4.8% of mean*

*the sample size of the 2 groups was too small to report definitive results. This lifestyle modification program provided insight into the possible value of a KD for obesity and lymphedema management.*

**Keywords:** obesity; ketogenic diet; lifestyle modification; lymphedema

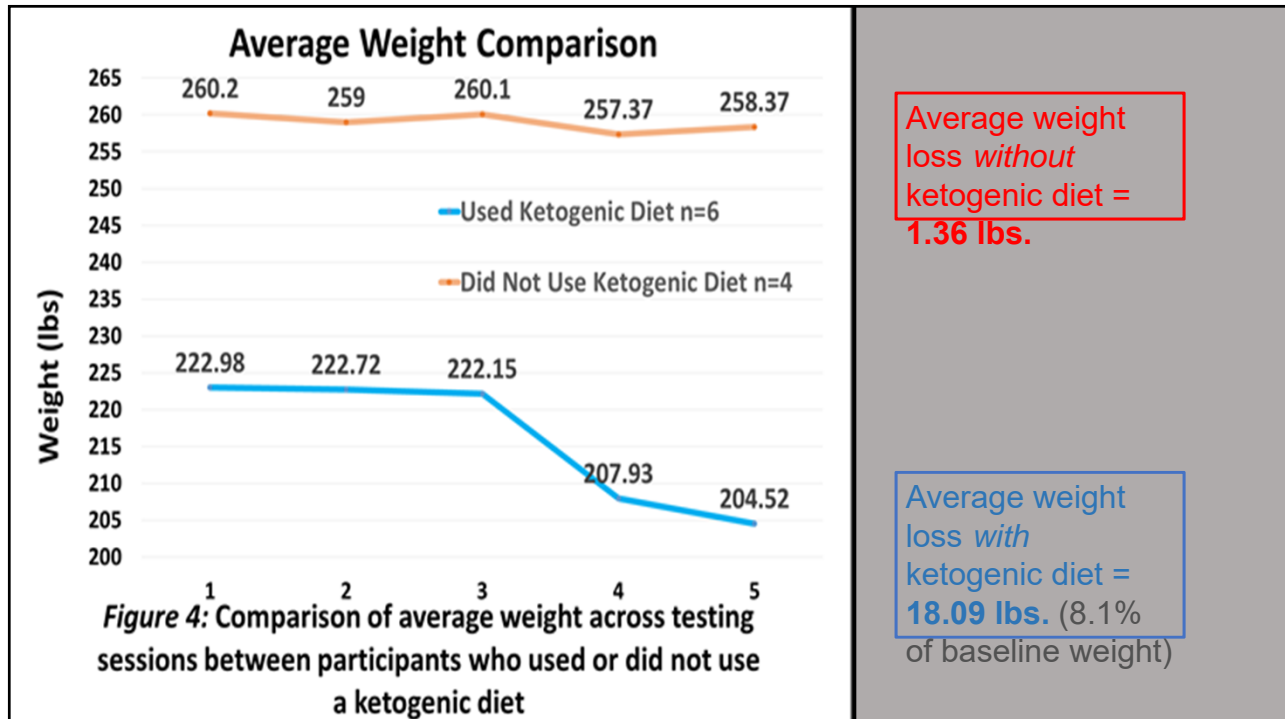
commonly return for repeated treatment, often with progressively increasing weight and further exacerbation of swelling. Several authors have reported increased incidence in obesity-related lower-extremity lymphedema.<sup>3,5</sup> Therefore, weight management must be included in the effective treatment of lymphedema when obesity is a comorbidity.

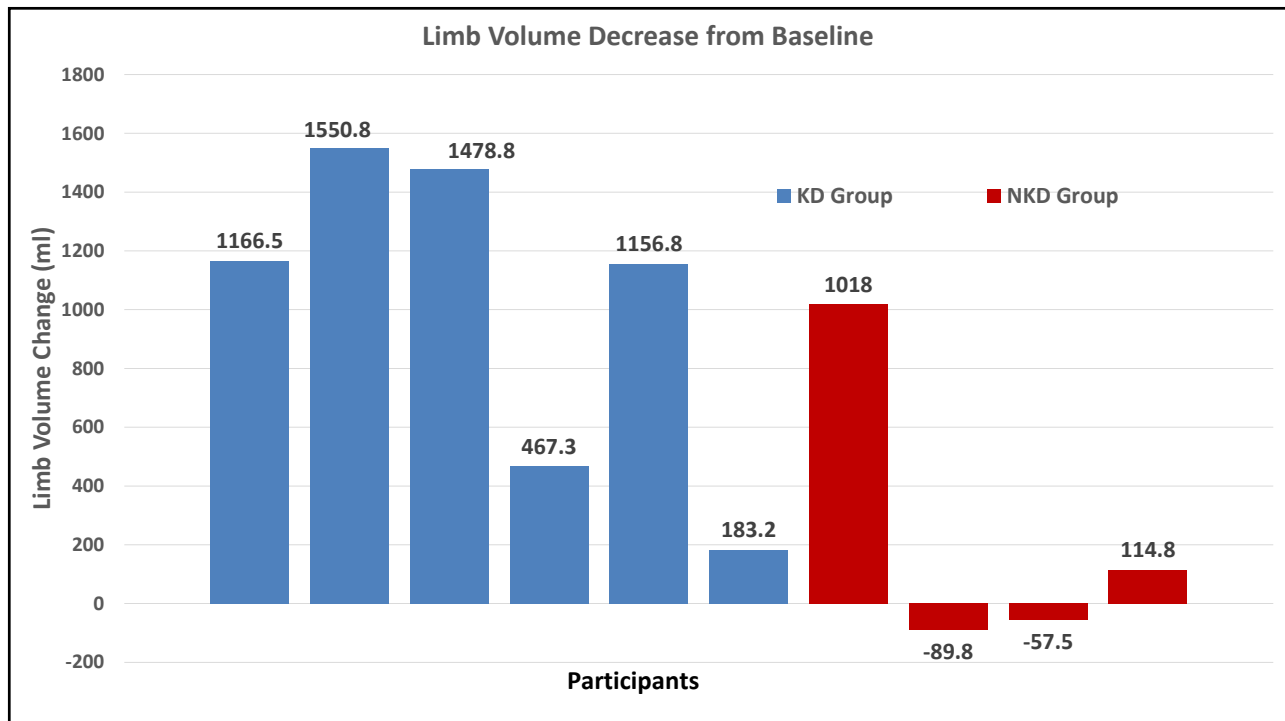
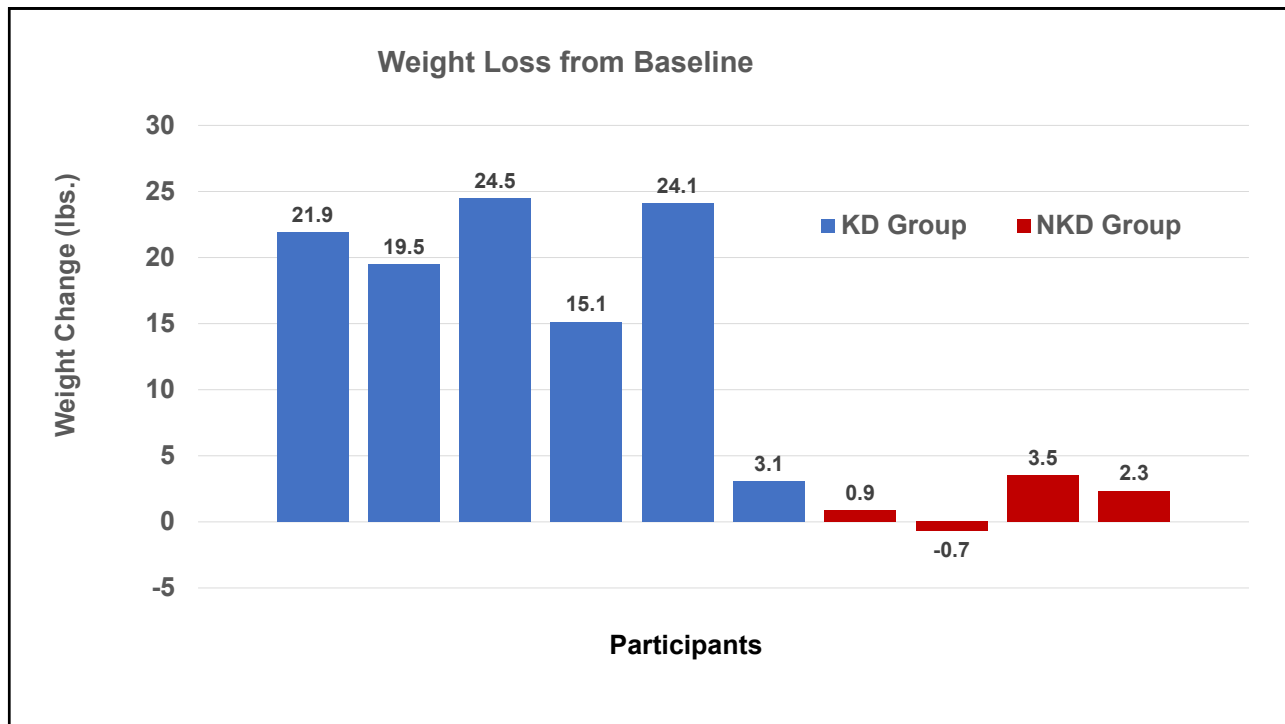
**Adults with obesity exhibit structural lymphatic abnormality, and in some cases, the lymphatic damage may be irreversible.**

lymphedema is a chronic condition | Lymphatic function is reciprocally

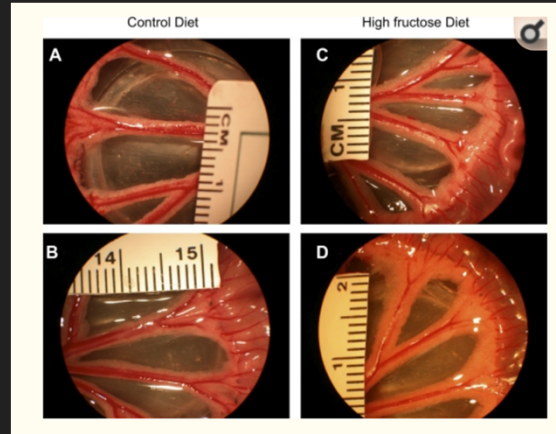
# Results

Weight	-11.42 lbs	<i>p</i> <.001
BMI	-2.0	<i>p</i> <.001
Waistline	-3.75 cm	<i>p</i> =.025
% Body Fat	-1.23	<i>p</i> =.133
Limb Volume	-698.9 ml	<i>p</i> <.001
LLIS	-12.44	<i>p</i> =.002
OWLQOL	+23.98	<i>p</i> <.001
WRSM	-13.14	<i>p</i> <.001
COPM(P)	+2.22	<i>p</i> <.001
COMP(S)	+2.66	<i>p</i> <.001





# Carbohydrates are Inflammatory



*Impairments in the intrinsic contractility of mesenteric collecting lymphatics in a rat model of metabolic syndrome, Zawieja, SD et al. (2012), Am J Physiol Heart Circ Physiol 302, H643–H653.*

## WISER Randomized Clinical Trial

Control Group  
Compression Sleeve

Weight Loss Group  
Compression Sleeve

Nutrisystem  
+ Fruits and  
Vegetables

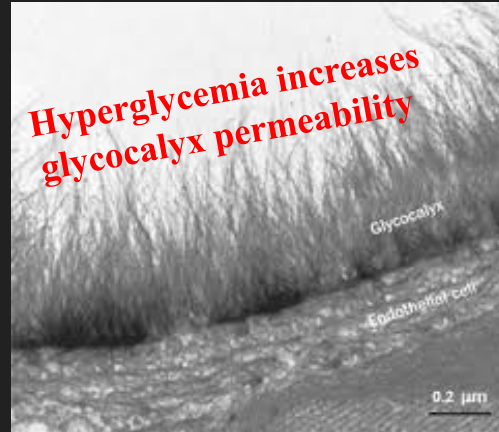
Exercise Group  
Compression Sleeve

Weight Loss & Exercise Group  
Compression Sleeve

**No correlation between weight loss and limb volume reduction**

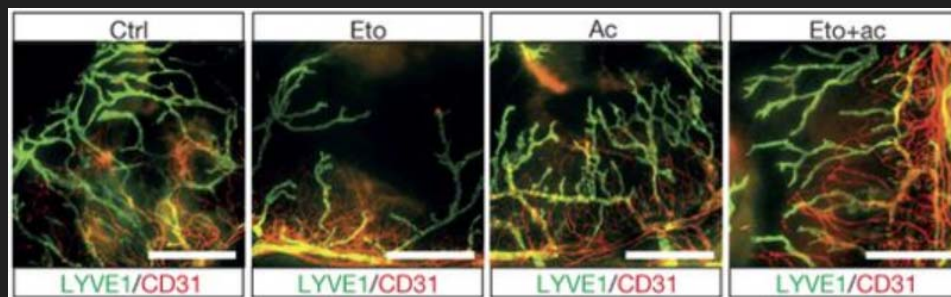
*Effect of Home-Based Exercise and Weight Loss Programs on Breast Cancer–Related Lymphedema Outcomes Among Overweight Breast Cancer Survivors: The WISER Survivor Randomized Clinical Trial. Schmitz et al. (2019), JAMA Oncology, E1-E9.*

## Carbohydrates are Inflammatory



*Short-term hyperglycemia increases endothelial glycocalyx permeability and acutely decreases lineal density of capillaries with flowing red blood cells, Zuurbier, CJ et al. (2005), J Appl Physiol, 99, 1471–1476.*

## Lymphatic System Runs on Fat



*The role of fatty acid  $\beta$ -oxidation in lymphangiogenesis. Wong, BW, et al. (2017), Nature, 542(7639), 49-54.*



## Lymphatic System Runs on Fat

**MCTs found in lymph!**

Table 3. Fatty Acid Composition of Chyle Triglyceride

Fatty acids	Low fat <sup>a</sup>		MCT <sup>a</sup>		TPN <sup>a</sup>	
	$\mu\text{mol/ml}$	Rel %	$\mu\text{mol/l}$	Rel %	$\mu\text{mol/ml}$	Rel %
8:0 (Octanoic)	0.000	0.00	0.126	5.09	0.000	0.00
10:0 (Decanoic)	0.000	0.00	0.344	14.73	0.000	0.00

*Dietary Modification of Chyle Composition in Chylothorax.*  
Jensen et al. (1989), *Gastroenterology* 97,761-5.

## Lymphatic System Runs on Fat



**Obesity, not a high fat diet, impairs lymphatic function and aggravates lymphedema.** (Gousopoulos et al 2017; Garcia Nores et al 2016)

**Acute inflammation causes fat break down**  
**Chronic inflammation results in increased fat storage**

(Harvey, 2008; Harvey & Gordon, 2012)



**KETOLYMPH Study**

Randomized trial


100 participants with lymphedema

48 weeks (24 strict keto, 24 modified Atkins)

<https://clinicaltrials.gov/ct2/show/NCT03991897>





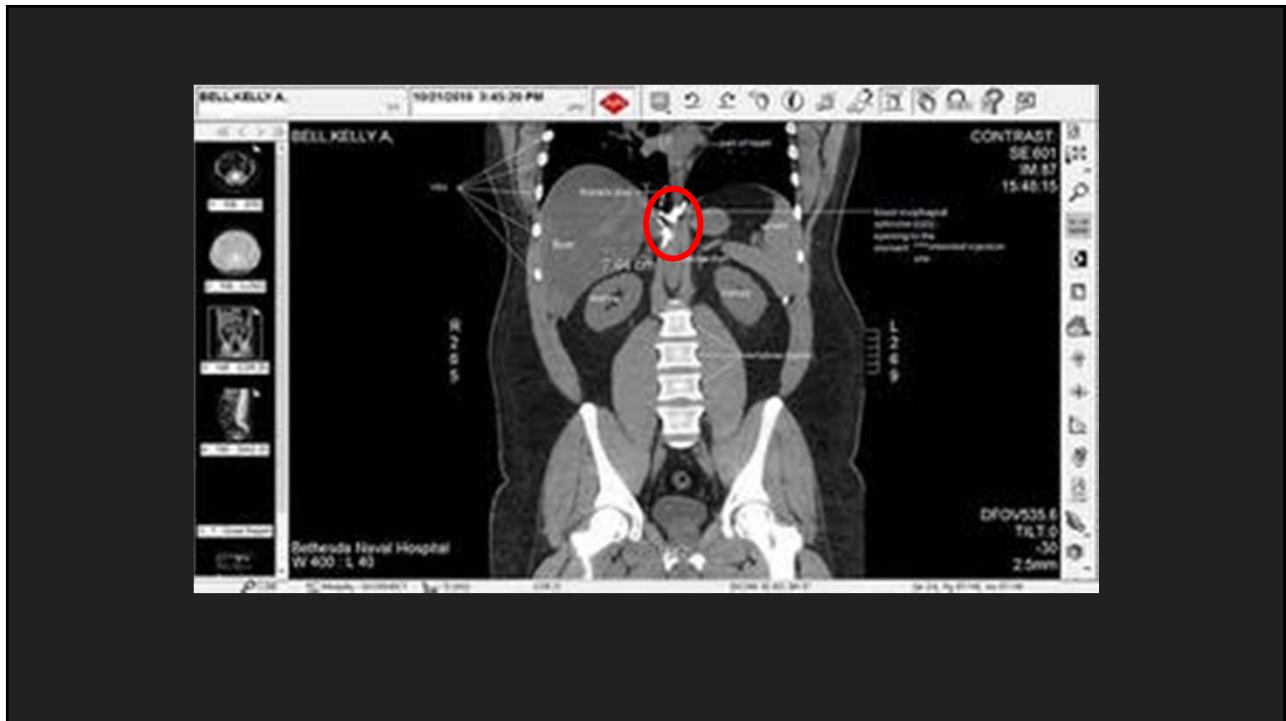


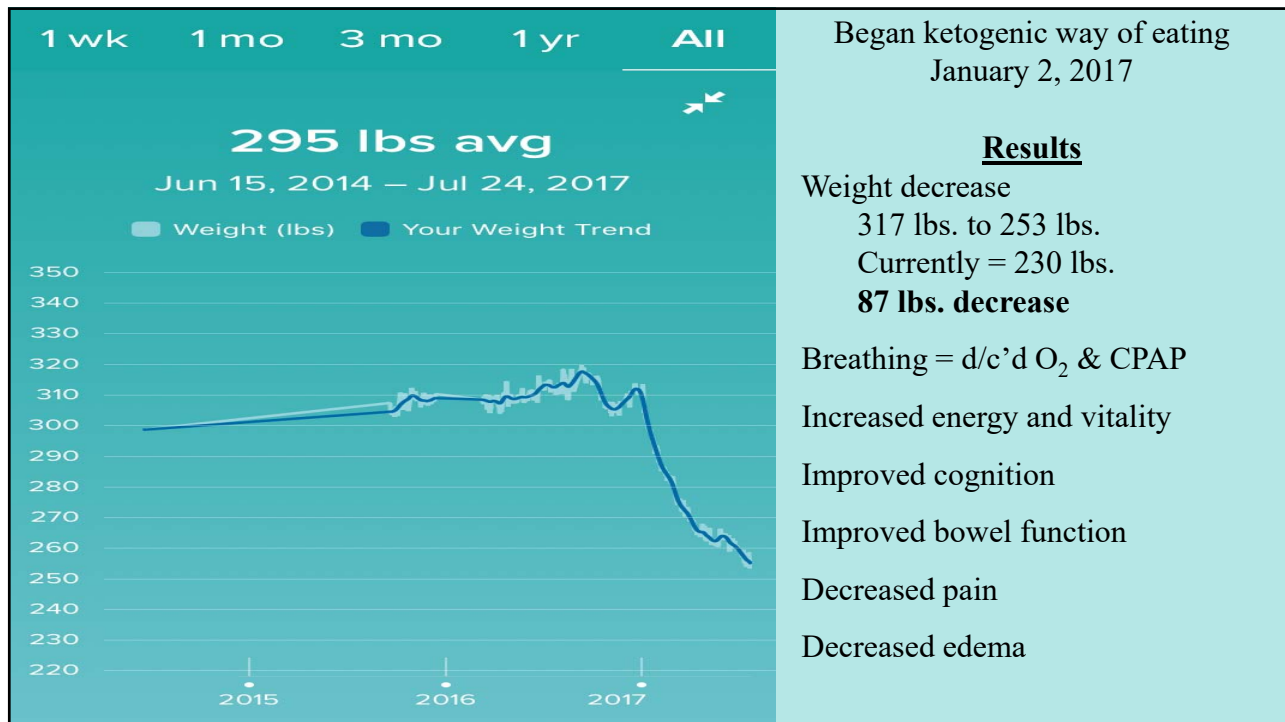
**Kelly Bell**  
51-year-old male  
Military career  
Triathlete

2005 - Treated for misdiagnosed reflux with injection of polymer which infiltrated thoracic duct

Symptoms:  
Weight gain  
Swelling to legs, arms, trunk, R side of face/neck  
Difficulty breathing – CPAP, O<sub>2</sub>  
Severe pain  
GI issues  
Suicidal ideation

Suggested treatment –  
Low fat, low calorie diet  
Exercise





### Improved Lipid Profile

	3/15/2016	3/1/2017	5/29/2019
Total Cholesterol	<b>187</b>	181	<b>212</b>
Triglycerides	<b>208</b>	111	<b>107</b>
HDL Cholesterol	<b>28</b>	35	<b>40</b>
LDL Cholesterol	<b>117</b>	124	<b>150</b>
HbA1c	<b>5.8</b>		<b>5.3</b>
Tg/HDL ratio	<b>7.49</b>	3.17	<b>2.67</b>



## Can Keto Work for Lipedema?

- ✓ Disproportionate deposition of fat to lower half of body
- ✓ Hypersensitivity/pain
- ✓ Easy bruising
- ✓ Widely believed to be resistant to diet and exercise





**400 LBS**

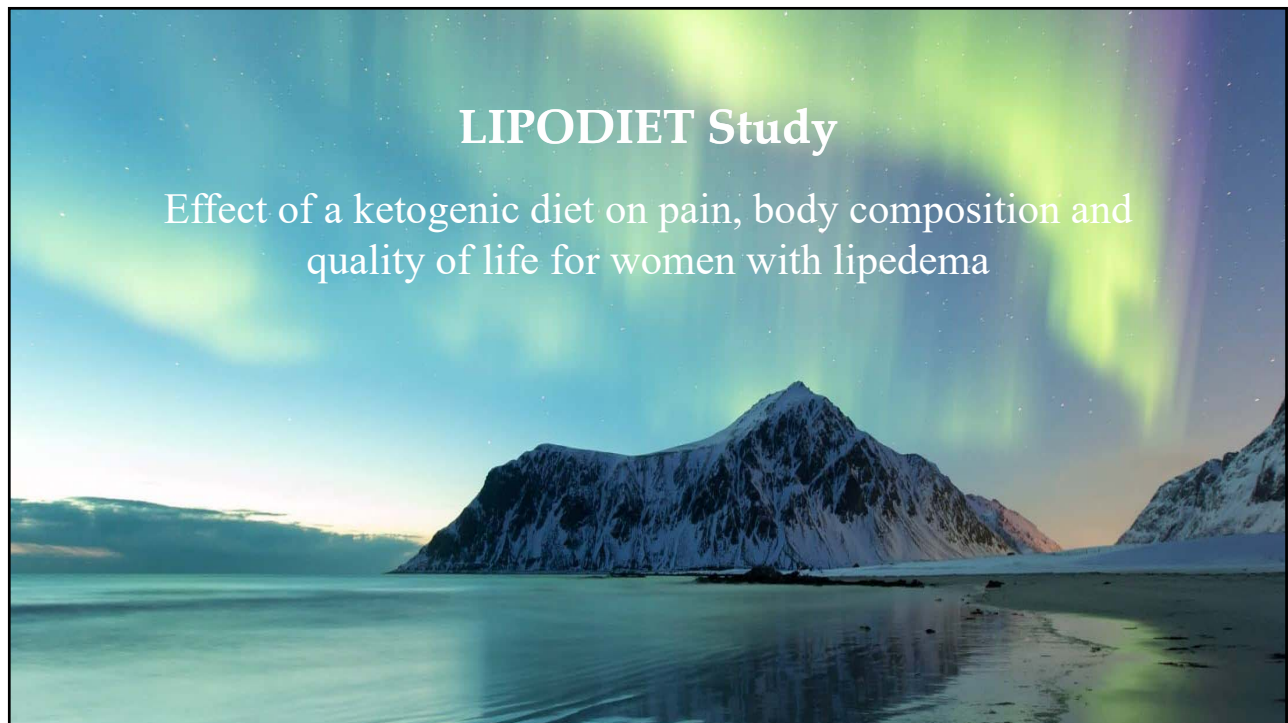
**273 LBS**

**219 LBS**

*181 lbs in less than 2 years "No surgery, no exercise, just [ketogenic] food."*

**Ketogenic Solution for Lipedema**

- Fat loss on lower body
- Decreased or resolved pain
- Increased energy
- Decreased brain fog
- Edema reduction or resolution
- Absence of hunger



**LIPODIET Study**

Effect of a ketogenic diet on pain, body composition and quality of life for women with lipedema



# LipoDiet Study

## Participants/Methods

9 women diagnosed with lipedema

Average age 47 years

Average weight 225 lbs

7 weeks ketogenic diet

6 weeks standard Norwegian fare

## Results

- Weight loss at week 7 (9.5 lbs), maintained at week 13
- Significant decrease in hip measurements at week 7, no decrease at week 13
- ↓ triglycerides at week 7  
↑ at week 13
- ↓ pain at week 7, return of pain to prior levels at week 13 **despite maintenance of weight loss**



## Mende Staggs

46-year-old female

Highest non-pregnant weight:  
**265 lbs.**

BMI: 41.5

Waist Measure: 35"

Hip Measure: 53"

Migraines 20 days/month

Unmanaged PCOS

Hypercholesterolemia

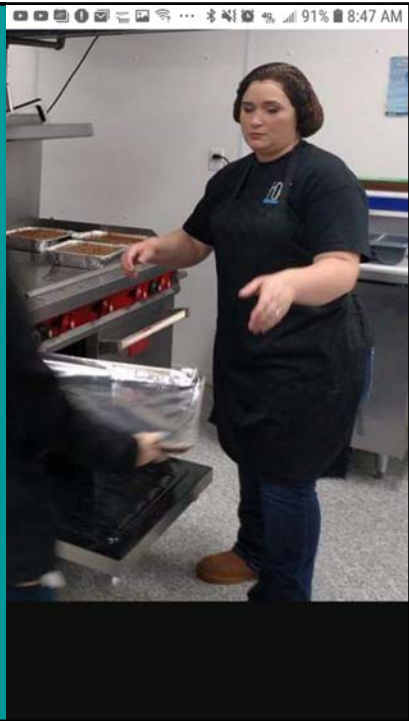
Borderline hypertension

Lymphedema

Lipedema



**Loss of Faith in Medical Community**  
**Powerless to Make Change**  
**Self-Blame for Failure of Multiple Diets**  
**Hopelessness**  
**Mixed Emotions with Lipedema Diagnosis**



Began ketogenic way of eating  
 September 2016

**Results**

Weight decrease  
 254 lbs. to 157 lbs.  
**97 lbs. decrease**

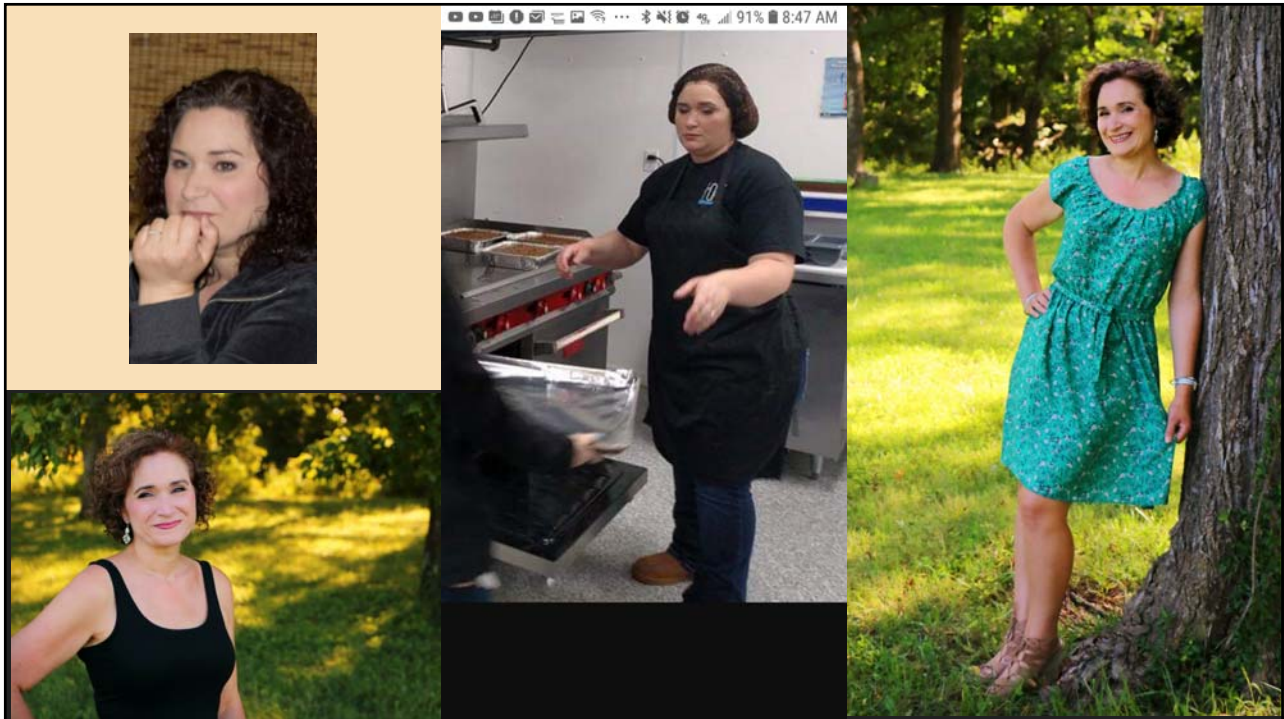
Waist – 25” (10” decrease)  
 Hip – 38” (15” decrease)  
 Clothing size 22 to size 6

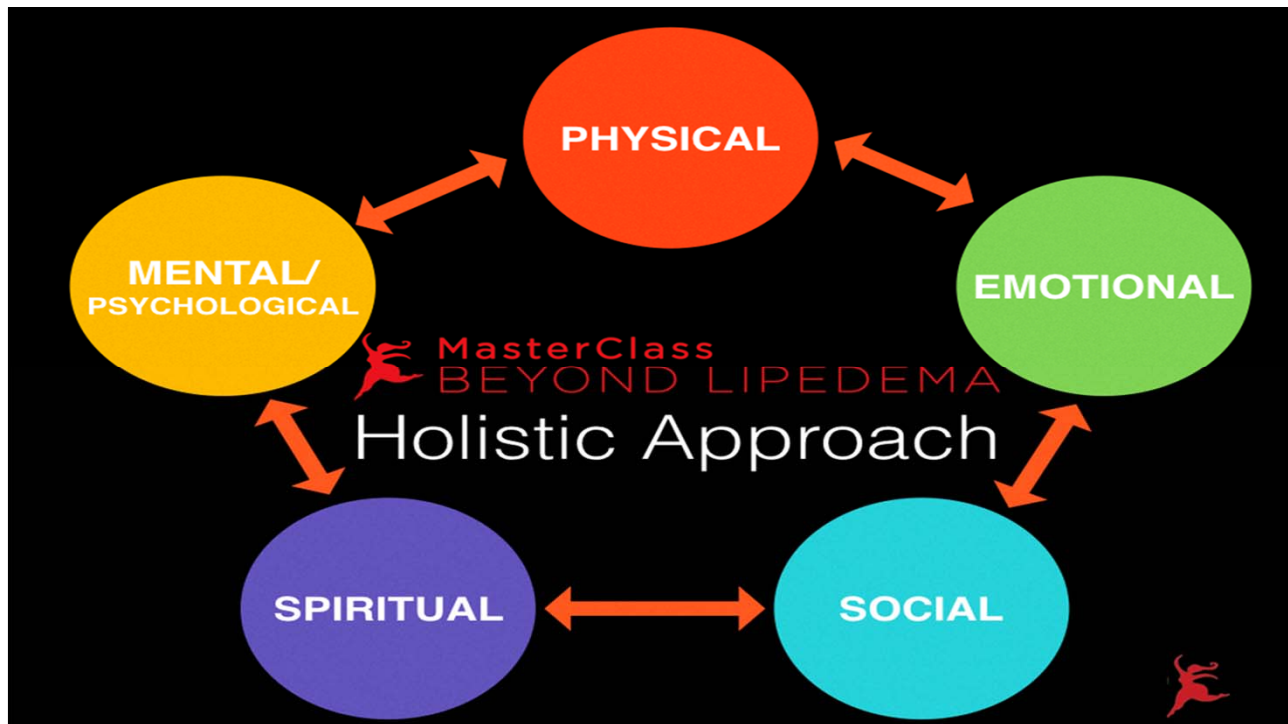
Migraines have resolved  
 Swelling & pain well controlled  
 PCOS well-managed  
 Lowered blood pressure



## Improved Lipid Profile

	11/30/2016	10/26/2018	5/3/2019
Total Cholesterol	<b>206</b>	185	<b>178</b>
Triglycerides	<b>105</b>	53	<b>80</b>
HDL Cholesterol	<b>52</b>	72	<b>54</b>
LDL Cholesterol	<b>133</b>	102	<b>108</b>
Tg/HDL ratio	<b>2.01</b>	0.73	<b>1.48</b>





**Ketogenic Solution for Lymphatic/Fat Disorders Conference**  
November 6-8, 2020  
Charlotte NC USA

*The most current research and information in keto way of eating for lipedema, lymphedema, and lymphatic/fat disorders.*

*"I started Keto because the pain in my legs was unbearable. Extra strength Tylenol was not touching it at all. In three days, my level of pain has dropped from 9 to a 1 or less. Keto for Lipedema has given me hope." -Theresa D, TX, USA*

**EARLY BIRD SPECIAL:** <https://lipedema-simplified.org/ketolympcon2020/>

lipedema  simplified  
IT'S NOT OUR FAULT

the  lipedema project  
THE DISEASE THEY CALL FAT

## Resources

- <https://www.leslynkeith.com/>
- Lymphatic Education & Resource Network (LE&RN) Symposium Series (Dr. Eric Westman, Dr. Leslyn Keith) <https://lymphaticnetwork.org/>
- Lipedema Simplified (keto for lipedema page)  
<https://lipedema-simplified.org/keto/>
- Facebook groups:
  - Keto and Fasting for Lymphedema
  - Keto WOE for Lipedema

## Thank you!



[leslynkeithot@gmail.com](mailto:leslynkeithot@gmail.com)  
<https://www.leslynkeith.com/>