Fasting Insulin Level Changes after Large Volume Liposuction

Thesis

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قالوا
سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
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صدق الله العظيم
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Nermin Abdalazeem Abdelaziz

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List of Abbreviations

Abbr.	Full-term
ASA	: American society of anasethelogists
BAT	: Brown adipose tissue
BMI	: Body mass index
CIGMA	: Continous infusion of glucose with model assessment
CRP	: C-reactive protein
CVD	: Cardiovascular disease
DM	: Diabetes mellitus
DVT	: Deep venous thrombosis
FFA	: Free fatty acid
G6P	: Glucose-6-phosphate
GIP	: Glucose-dependent insulinotropic polypeptide
GLP-1	: Glucagon-like peptide-1
HOMA	: Homeostasis Assessment Model
IL-6	: Interlukin 6
KLFS	: Kruppel-like factor
LVL	: Large volume liposuction
MODY	: Maturity onset diabetes mellitus
NEFA	: Non esterified fatty acid
NIDDM	: Non-insulin dependent diabetes mellitus
PACAP	: Pituitary adenylate cyclase-activating polypeptide
PK	: Pyruvate kinase

PPARγ : Peroxisome proliferator-activated receptor γ

PREF1 : Pre-adipocyte factor 1

QUICKI : Quantitative Insulin Sensitivity Check Index

REE : Resting metabolic rate

RL : Ringer lactate

SCAT : Subcutaneous adipose tissue

T2D : Type 2 diabetes

TG : Triglyceride

TGF-β : Transforming growth factor beta

TNF-α : Tumor necrosis factor α

UCP-1 : Uncoupling protein -1

VAT : Visceral adipose tissue

WAT : White adipose tissue

WHR : Waist _to_hip ratio

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Abstract

Background: Obesity is a disabling disease which has gained greater attention worldwide. It significantly increases the risk for other diseases such as insulin independent diabetes mellitus also known as diabetes type 2. The most common surgical procedure for obesity is liposuction. It is traditionally performed either as small-volume liposuction or large-volume liposuction. **Aim of the Work:** to spot the light on the effect of large volume liposuction on fasting insulin level changes after 3 months postoperative And to find if LVL may obtain any improvement in metabolic variables. This study will provide the clinician with a more valid basis on which to advise patients undergoing body-contouring procedures, particularly to ensure realistic expectations regarding the effects of body-reshaping procedures on general health. **Patients and Mehtods:** This is prospective study was conducted on a total of 15 overweight and obese (BMI 26–35 kg/m^2) premenopausal women (age 21–40years). All subjects were at their maximum body weight and weight stable for at least 3 months. The study took place at Ain Shams University hospitals and other authorized hospitals under supervision of thesis supervisors studying fasting insulin changes after 3 months following large volume liposuction. **Results:** The present study demonstrate that large-volume abdominal liposuction should, by itself, be considered a clinical therapy for obesity and its metabolic sequelae. Aspiration of large amounts of subcutaneous abdominal fat in women with abdominal obesity, besides having cosmetic benefits, does significantly improve fasting insulin levels. Therefore, the procedure is safe and could successfully help obese subjects to reduce their potential metabolic risks. **Conclusion:** The analysis of the study suggests that plastic surgery could play a role in metabolism. The surgical removal of fat is not detrimental with regard to variation of metabolic indices.

Key words: Fasting insulin, large volume liposuction, body contouring, obesity

Introduction

Obesity is increasingly frequent in our society and is associated closely with cardiovascular risk factors and metabolic disorders ***(Coleman W.P. et al., 2001).***

It has been proposed that the lifestyle of the modern human is detrimental for our health. Easy access to energy-rich food, combined with a sedentary lifestyle has led to obesity. Obesity is the most common nutritional disorder worldwide and associated with co-morbidities, such as diabetes, cardiovascular disease and certain cancers like brain cancer, multiple myeloma, cancer of the esophagus, postmenopausal breast cancer, cancers of the thyroid, gallbladder, stomach, liver, pancreas, kidney, ovaries, uterus and colon . The World Health Organization (WHO) calls this global increase in prevalence of overweight and obesity 'globesity' ***(Lifshitz F., 2014).***

Complications of obesity depend not only on the degree of obesity but also on the pattern of body fat distribution. An abdominal, visceral, or upper-body type of fat distribution (apple-shaped) is now a confirmed risk factor for metabolic disturbances, diabetes, hypertension, and atherosclerosis, independent of body weight ***(Illouz Y.G., 1996).***

Abdominal obesity, manifested by increased waist circumference, increased abdominal subcutaneous fat and increased visceral fat, is associated with insulin resistance and other metabolic risk factors ***(Esposito K. et al., 2006).***

Data from the Diabetes Prevention Program II and the Finnish Diabetes Prevention Study show that modest weight loss (5–7%) with lifestyle intervention significantly decreases the progression to diabetes in high-risk groups ***(Balague´ N. et al., 2013).***

Liposuction has become one of the most popular cosmetic procedures performed. The vast number of potential candidates, the relative ease of performance, the safety, and the high patient satisfaction rate with suction lipectomy are the primary reasons for its popularity.The goal of the liposuction is to remove "target" fat, leaving the desired body contour and smooth transitions between suctioned and nonsuctioned areas ***(Matarasso A., 2011).***

Given that the procedure is traditionally performed for cosmetic reasons, there are no specific recommendations with respect to appropriate degree of obesity for the procedure, and suction lipectomy is often performed on individuals with a BMI in the normal or overweight categories (***Cárdenas-Camarena et al., 2017).***

Liposuction is done by several techniques including introduction of tumescent, ultrasonic liposuction, power-assisted liposuction, and, more recently, laser-assisted liposuction) ***(Iverson et al., 2004).***

Liposuction is classified into two types according to the volume of solution aspirated: High volume or low volume (<4,000 ml aspirated) ***(Stephan et al., 2010).***

The definition of "large volume liposuction" varies in the plastic surgery literature. In fact, no strict definition exists. The most common definitions refer to either total fat removed during the procedure (e.g; 4 L of fat removal) or total volume removed during the procedure (fat plus wetting solution, eg, 5 L of total volume removal (fat plus wetting solution) ***(Iverson RE., 2004).***

As adipose tissue is a complex organ that both regionally and systemically affects metabolism, there is reason to consider the effect of its removal by lipectomy on metabolism. Traditionally, the visceral adipose tissue depot that is not impacted by suction lipectomy, has been thought to be the most metabolically active. Insulin sensitivity is highly negatively correlated with the amount of visceral adipose tissue ***(Lalinde et al., 1995).***

However, abdominal subcutaneous adipose tissue might also play a significant metabolic role.Subcutaneous adipose tissue can be divided into a superficial layer with a compact fascia (Camper's fascia), and a deep layer of less organized fascia (Scarpa's fascia) ***(Moore KLet al., 2006).***

Major complications following large volume liposuction tend to be rare and can be minimized by adhering to the 5 pillars of safety (ie, safe surgeon, safe anesthesiologist, safe facility, safe coworkers, properly selected patient) ***(Ozmen S et al., 2009).***

This complication include blood loss which is reduced when the "super-wet" or "tumescent" technique is used, compared with the reported amount lost by authors who used the "dry" or classic "wet" techniques ***(Samdal Fet al., 1995)***.

Other complications include electrolytes and hematocrit changes, skin irregularities and depressions, unrealistic expectations, focal excessive liposuction, hematomas, seromas, full thickness skin necrosis, hyperpigmentation of incision sites, post-Liposuction syncope at home, wrong areas treated ***(Illouz Y.G.,1996).***

Insulin is an anabolic hormone that regulates plasma glucose by promoting glucose uptake, glycogenesis, lipogenesis, and protein synthesis of skeletal muscle and fat tissue through the tyrosine kinase receptor pathway. Fasting

insulin levels provide the most utility as a clinical tool because the highest ratios suggest insulin resistance and significantly greater likelihood of identifying risk for type II diabete (***Johnson J et al., 2010).***

Fasting insulin level can be determined by a simple blood test after fasting 8 hours. A normal fasting blood insulin level is below 8.4 microU/m, but some studies consider it safe below 5 microU/ml ***(Harris MI et al., 2002).***

Insulin sensitivity which describes how sensitive the body to the effects of insulin has been shown to be negatively correlated with the amount of deep subcutaneous adipose tissue. The deeper subcutaneous adipose tissue has also been shown to be metabolically active, Up to 50% of the subcutaneous adipose tissue is in the deep compartment, and this tissue is removed with liposuction. That is why if we do liposuction to deep adipose layer we suspect positively influenced fasting plasma insulin and insulin sensitivity, subsequently liability to have future risk for type II diabetes is decreased ***(González-Ortiz M et al., 2002).***