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How is the impact of bariatric surgery on ultra-sonographic findings of non-alcoholic fatty liver disease among morbidly obese patients?

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ABSTRACT

Introduction: Obesity is a great concern of twenty-first century. Non-alcoholic fatty liver disease (NAFLD) is among most serious complications of obesity which can lead to liver fibrosis in progressed conditions. Bariatric surgery is now the most obvious

treatment of obesity. The aim of this study is to assess impact of bariatric surgery on hepatic steatosis through ultrasonography and patients' lipid profile change postoperatively. *Material and Methods:* This is a clinical-trial conducted on 50 patients underwent gastric bypass surgery in 2017-18. Serum levels of triglyceride and total cholesterol were measured and also ultrasonography considering NAFLD was performed for all patients preoperatively and within six months after bariatric surgery. NAFLD was graded from 0-3 based on ultra-sonographic findings. Obtained data were analyzed and compared. *Results:* Mean age of studied participants was 36.6±9.2 years old and forty-three (86%) of them were females. Significant decrease in rate of hepatic steatosis was detected postoperatively (P-value=0.03). NAFLD grading, serum triglyceride and total cholesterol level significantly improved postoperatively (P-value<0.001). *Conclusion:* Findings of this study were in correlation with previous studies regarding improvement of hepatic steatosis in ultrasonography assessments pre- and postoperatively. In addition, lipid profile including triglyceride and total cholesterol changed into better statuses within six months after bariatric surgery.

Keywords: Non-alcoholic Fatty Liver Disease; Bariatric Surgery; Obesity; Ultrasonography.

1. INTRODUCTION

Obesity is a great concern of twenty-first century. This worldwide health problem for both developed and developing countries has posed significant burden on health care systems (Jafari-Adli et al., 2014) as this condition is in direct association with comorbidities including cardiovascular diseases, diabetes type 2, dyslipidemia, hepatic steatosis and also numerous malignant conditions (Schauer et al., 2014 and Schauer et al., 2017). Non-alcoholic fatty liver disease (NAFLD) is recently of great concern worldwide that is characterized with fat deposition into hepatocytes causing cell degeneration and moreover fibrosis (McCarty et al., 2018). NAFLD can cause liver injury, cirrhosis and even malignancies in progressed patterns. Metabolic syndrome and furthermore obesity are currently known as the most obvious etiology of fatty liver change. Studies have presented that over 10% reductions in body weight can reverse pattern of steatosis and steatohepatitis (Kumar, 2013 and Vilar-Gomez et al., 2015).

Dis-lipidemia including hypertriglyceridemia, hypercholesterolemia, high levels of low density lipoprotein (LDL) and decreased levels of high density lipoprotein (HDL) is in significant association with metabolic syndrome, obesity in special. In fact, inappropriate metabolism of lipids in adipose tissue and liver are responsible for dis-lipidemia occurs because of cells inappropriate response to enzymes metabolizing lipids. In addition, obese cases generally consume high calories-low value diets that are accompanied with higher production of lipids, triglycerides in special (Lu et al., 2014).

Bariatric surgery is now considered as the obvious approach of weight loss comparing with diets and exercising. Studies have shown that this surgical procedure can induce weight loss in practical trend (Angrisani et al., 2015). The aim our study is to assess impact of bariatric surgery on hepatic steatosis through ultrasonography that its specificity and sensitivity has been declared previously and thought to be as effective as liver biopsy (de Moura et al., 2008). In addition, patients' lipid profile change postoperatively was assessed as well.

2. MATERIAL AND METHODS

This is a clinical-trial conducted on 50 patients who were candidate of gastric bypass surgery referred to Kashani Hospital affiliated to Isfahan University of Medical Sciences in 2017-18. Inclusion criteria were age of over 18 years and presence of indications for gastric bypass surgery (BMI≥40 or ≥35 plus comorbidities) (Pentin and Nashelsky, 2005). Patients with history of hepatic surgery, liver cirrhosis and portal hypertension were excluded from the study.

After study protocol approval by Isfahan University of Medical Sciences Ethics Committee, all information about study was presented to patients and they were requested present their written consent of participation in the study. There after patients' demographics including age and gender were recorded in a checklist. Then blood sample was taken from participants to measure serum levels of triglyceride, total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL). These measurements all were performed in a target laboratory of Kashani Hospital to eliminate device associated bias.

In addition, all patients underwent ultrasonography preoperatively. The presence or absence of hepatic steatosis was assessed and in case of its presence following grading based on liver echogenicity was recorded. This procedure was performed using 3.5 MGHz transducer:

0: Normal Echogenisity

1: Diffuse increase in fine echoes in liver parenchyma with normal visualization of diaphragm and intrahepatic vessel border

2: Moderate diffuse increase in the fine echoes with slightly impaired visualization of intrahepatic vessels

3: Marked increase in fine echoes with poor or non-visualization of the intrahepatic vessel borders and diaphragm (Saadeh et al., 2002).

Ultra-sonographies were performed by a target radiologist to eliminate inter-observer bias. Participant underwent bariatric surgery and lipid profile and ultrasonography were performed for them within six months after surgery again. The follow-up ultrasonography was performed by the radiologist who performed it preoperatively as well.

Then obtained data were analyzed using SPSS-20 (IBM SPSS®; The United States). Descriptive data were presented in mean and percentages. For analytics, McNemar test, Wilcoxon signed ranks test and Paired samples t-test were used. P-value of less than 0.05 was considered as significant level.

Ethical committee approval number

This article was approved by ethical committee of Isfahan University of medical science with ethic code IR.MUI.REC.1396.3.737.

3. RESULTS

In the current study 50 patients with mean age of 36.6±9.2 years old (range: 20-65 years old) were assessed. The most common age range of assessed patients was 31-40 years that 44% of cases were in this group. Forty-three (86%) of patients were females and rater 7 cases (14%) were males. Table-1 presents further information.

Table 1 Age and gender distribution of study population

Variable		Number	Percent
Gender	Female	43	86
	Male	7	14
Age group	20-30 years	13	26
	31-40 years	22	44
	> 40 years	15	30

Prior to bariatric surgery, hepatic steatosis was detected in 38 patients (76%) through ultrasonography. Further evaluation of patients within 6 months after surgery showed hepatic steatosis in 27 (54%) patients. Significant decrease in rate of hepatic steatosis was detected postoperatively (P-value=0.03). Prior to the surgery most of patients (54%) presented grade 2 or 3 of hepatic steatosis while this rate decreased to 16% for grade 2 and zero for grade 3 postoperatively (P-value<0.001) (Table-2).

Table 2 Distribution of fatty liver grade among study population prior to and within six months after bariatric surgery

Grade of fatty liver	Prior to surgery		Within six months after surgery		P-value
	Number	Percent	Number	Percent	
No fatty liver	12	24	23	46	<0.001
Grade 1	11	22	19	38	
Grade 2	22	44	8	16	
Grade 3	5	10	0	0	

Mean of serum triglycerides and total cholesterol decreased significantly following bariatric surgery as compared with their statuses prior to the surgery (Table-3 & Figure 1).

Table 3 Comparison of lipid status prior to and after bariatric surgery

Variable	Prior to the surgery		Within six months after surgery		P-value
	Mean	Standard deviation	Mean	Standard deviation	
Triglycerides	154.6	57.7	135.7	46.5	<0.001
Total cholesterol	209.3	68.7	182.6	53.4	<0.001

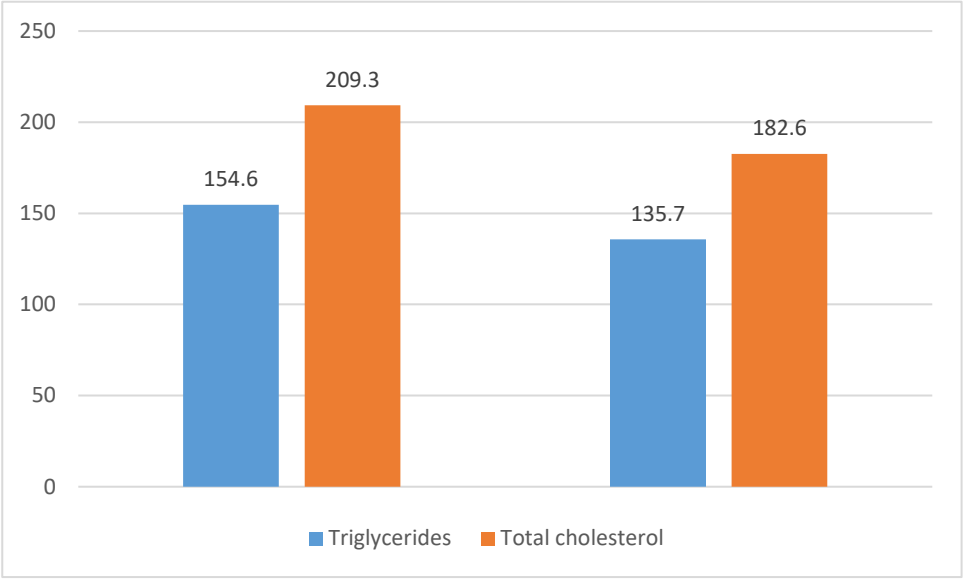

Figure 1 Comparison of TG and Cholesterol status prior to and within six months after surgery

4. DISCUSSION

Non-alcoholic fatty liver disease is now in great interest of research as its adverse effects have been better clarified. Obesity poses great concern and also burden on health quality and furthermore is known as one of the most impressive etiologies of NAFLD. Bariatric surgeries are among most common and absolute strategies for achieving better anthropometric status. Studies regarding effectiveness of bariatric surgery on improvement of NAFLD are in progress (McCarty et al., 2018).

In the current study, we observed that patients NAFLD improved following surgery. In this regard, most of patients who were resenting from grade 2 and 3 of hepatic steatosis changed in to normal and grade one. Moreover, though 10% of patients presented grade 3 of NAFLD, none of the cases had this high grade within six months after surgical procedure. A meta-analysis by Mummadi et al. showed that hepatic steatosis improvement was detected in over 90% of patients following all kinds of bariatric surgery, in addition steatoheptitis improved in more than 81% of patients and interestingly, liver fibrosis rehabilitated among 65% of patients (Mummadi et al., 2008). Lassailly et al. in their study conducted in 2015 assessed effectiveness of Roux-en-Y gastric bypass surgery of 70 patients. Then they followed their patients for 12 months and took liver biopsies to find liver steatosis improvement. They declared 85% of improvement among their patients (Lassailly et al., 2015). Other study by Caiazzo on 147 patients presented this fatty liver change rehabilitation among 74% of their patients following 60 months of follow-ups (Lassailly et al., 2014). Other studies by Vargas (Pardina et al., 2012), Barker (Platz et al., 2006) and Weiner (Makary et al., 2010) reported hepatic steatosis change into better healthier conditions in over 80% of their patients. All of mentioned scientists detected their findings through liver biopsy. Major et al in a study utilized ultrasonography (Sheriff-Saadeh scale) for assessment of fatty liver change in patients prior to and following bariatric surgery. They declared improvement of liver ultrasonographic status from 1.85 to 0.15 based on Sheriff-Saadeh scale (Major et al., 2017). Camila Ortiz Gomez et al. assessed effectiveness of bariatric surgery using ultrasonography preoperatively and then postoperatively. They presented similar outcomes of other studies about significant reverse trend of hepatic steatosis to better state following surgery (Gomez et al., 2018).

The rater assessment of the current study was about lipid profile change following bariatric surgery. In this order we measured serum level of triglyceride and total cholesterol preoperatively and then within six months after surgical procedure. Findings of this study showed that both lipid statuses improved significantly. A Sasaki et al. conducted their study on cases underwent bariatric surgery to assess their fatty liver status change following sugery. Similarly to our study they assessed patients' lipid profile as well and presented significant health status considering lipid profile change following surgical procedure (Sasaki et al., 2014). In another study D. Benaiges et al. tried to compare outcomes of sleeve gasterectomy versus Roux-en-Y gastric bypass considering lipid profile. They declared that bot techniques could effectively reduce triglyceride and low density lipoprotein cholesterol while outcomes of Roux-en-Y gastric bypass technique were superior to sleeve gasterectomy within a year after surgery regarding patients' lipid statuses (Benaiges et al., 2012). In another study by Sean P. Heffron et al. lipid profile improvement following various types of bariatric surgery were evaluated and all were accompanied with significant reduction in total cholesterol, low density lipoprotein, triglyceride and increase in high density lipoproteins (Heffron et al., 2016). Five-year following of patients underwent Roux-en-Y gastric bypass and sleeve gasterectomy showed significant reduction of triglycerides and cholesterol. It should be mentioned that

outcomes were in favor of Roux-en-Y gastric bypass, for low density lipoprotein in special (Elisenda et al., 2018) the study of P. Praveen Raj et al. in India assessed lipid profile changes following Roux-en-Y gastric bypass and sleeve gasterectomy. Interestingly, triglyceride and high density lipoprotein improved significantly while none of the techniques presented any significant change in low density lipoprotein serum levels (Raj et al., 2017). Of great limitations of the current study it's lacking of measuring detailed cholesterol profiles.

5. CONCLUSION

Findings of this study were in correlation with previous studies regarding improvement of hepatic steatosis in ultrasonography assessments pre- and postoperatively. In addition, lipid profile including triglyceride and total cholesterol changed into better statuses within six months after bariatric surgery.

Conflicts of Interest

The authors declare no conflict of interest.

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