https://doi.org/10.29309/TPMJ/2024.31.05.8036

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 05

ORIGINAL ARTICLE

Impact of one-anastomosis gastric bypass and laparoscopic sleeve gastrectomy on metabolic parameters in morbidly obese patients: A comparative review.

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Article Citation: Mujahid MD, Mahnoor A, Saadia A, Usman M, Shahzad, Akram M. Impact of one-anastomosis gastric bypass and laparoscopic sleeve gastrectomy on metabolic parameters in morbidly obese patients: A comparative review. Professional Med J 2024; 31(05):675-681. https://doi.org/10.29309/TPMJ/2024.31.05.8036

ABSTRACT… Objective: To compare one-anastomosis gastric bypass and laparoscopic sleeve gastrectomy in morbidly obese patients in terms of frequency of dyslipidemia, mean AST, mean ALT, mean HbA1C and mean FPG. **Study Design:** Randomized Controlled Trial **Setting:** Department of General Surgery, Allied Hospital, Faisalabad. **Period:** October 20, 2022, to June 20, 2023, **Methods:** Morbidly obese individuals were randomly assigned to either undergo laparoscopic sleeve gastrectomy (Group A) or one-anastomosis gastric bypass (Group B). The study, led by a consultant with 3 years of post-fellowship experience, conducted comprehensive patient assessments, including BMI calculations and metabolic profiling. Monthly follow-ups continued until the 6th month, after which lipid profiles, alanine transaminase (ALT), aspartate transaminase (AST), hemoglobin A1C (HbA1C) and fasting plasma glucose (FPG), results were obtained from the hospital pathology lab. The comparative analysis revealed superior outcomes in Group B, the one-anastomosis gastric bypass cohort, as compared to Group A (laparoscopic sleeve gastrectomy), spanning multiple parameters. **Results:** The mean FPG in Group A was 5.52±0.26, compared to 5.56±0.25 in Group B. Mean HbA1c was 6.65±0.24 in Group A and 6.26±0.19 in Group B. AST levels were comparable, with 24.13±3.31 in Group A and 24.23±3.48 in Group B, yielding a p-value of 0.896. Similarly, ALT levels showed no significant difference between the groups (24.55±3.46 in Group A and 23.92±3.35 in Group B, p-value=0.414). **Conclusion:** One-anastomosis gastric bypass demonstrated superior efficacy over laparoscopic sleeve gastrectomy in morbidly obese patients, showcasing favorable outcomes in terms of dyslipidemia, AST, ALT, HbA1C, and FPG.

Key words: Dyslipidemia, Laparoscopic Sleeve Gastrectomy, Obesity, One-anastomosis Gastric Bypass.

INTRODUCTION

A major public health concern worldwide is obesity, which the WHO defines as an unhealthy or excessive accumulation of fat. A high body mass index (BMI) is associated with a higher likelihood of several chronic diseases and conditions, such as diabetes, cardiovascular disease, muscular disorders, and malignancy. The staggering number individuals over the age of 18 who were obese in 2016 highlights the gravity of this public health issue. Furthermore, in 2020, a staggering 39 million children less than 5 were overweight or obese, highlighting the critical importance of implementing early intervention and prevention measures.[1] The correlation between obesity and elevated plasma triglycerides, cholesterol, and low-density lipoprotein (LDL) cholesterol levels, coupled with decreased high-density lipoprotein (HDL) cholesterol concentrations, has been well-established. These metabolic alterations contribute to the intricate interplay of variables associated with cardiovascular disease risk. Importantly, it is crucial to emphasize that overweight, obesity, and dyslipidemia are interconnected factors, each influencing and amplifying the impact of the others. This recognition underscores the complexity of their relationship and highlights the need for a comprehensive approach in addressing these modifiable risk factors.[2]

The laparoscopic sleeve gastrectomy (LSG), the

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Article received on: 12/12/2023
Accepted for publication: 27/02/2024

Roux-en-Y gastric bypass (RYGB), and the one anastomosis gastric bypass (OAGB) are three of the most prominent bariatric surgeries that are used to treat obesity.[3] The OAGB is an innovative, minimally invasive (laparoscopic) procedure that is capable of both limiting nutrition absorption and lowering consumption. It accounts for around 4.8% of all bariatric operations performed across the world.[4] Its effectiveness is comparable to that of recognized techniques. There is a clear correlation between these therapies and improved weight control as well as favorable composition of lipid profiles. It is important to note that even a little reduction in weight, ranging from 5 to 10 percent, may result in significant enhancements in lipid metabolism. These enhancements include increased levels of HDL cholesterol as well as decreased levels of triglycerides, total cholesterol, and LDL cholesterol.[5]

The prevalence of dyslipidemia after LSG was 49% and after OAGB, 22%. FPG, HbA1C, ALT, and AST after LSG and OAGB were 4.6 ± 0.125 (4.4-4.9) vs 4.7 ± 0.125 (4.4-5), 5.9 ± 0.275 (5.2-6.3) vs 5.6 ± 0.25 (5-6), 16 ± 2 (12-20 vs 27 ± 3.5 (19-33), and 16 ± 1.5 (14-20) vs 25 ± 10 respectively.[6]

In the realm of bariatric surgery for morbidly obese patients, a comparative dearth of studies has focused on discerning the nuanced metabolic profiles of individuals who have undergone either sleeve gastrectomy or one-anastomosis gastric bypass (OAGB), and this disparity is particularly pronounced within the Pakistani population. This research endeavors to address this critical gap in understanding by meticulously evaluating and comparing the shifts in metabolic parameters among patients subjected to these two distinct surgical procedures—OAGB and laparoscopic sleeve gastrectomy (LSG). The central goal is to elucidate which surgical modality elicits more pronounced and favorable changes in metabolic profiles. The potential ramifications of these findings are far-reaching; if the study conclusively demonstrates the superiority of one-anastomosis gastric bypass (OAGB), it would be poised to become a recommended and preferred technique for future surgeries. This shift could significantly mitigate the morbidities and complications entrenched in morbid obesity within the specific context of the Pakistani demographic. The study's implications extend beyond the confines of academic interest, holding the promise of informing and guiding clinicians and surgeons toward more efficacious bariatric interventions. Ultimately, these insights could translate into tangible improvements in patient outcomes and the effective management of obesity-related health challenges within the unique healthcare landscape of Pakistan.

METHODS

The study follows a prospective randomized controlled trial design, indicating that participants are assigned to different groups randomly to reduce bias. The trial spans a duration of 8 months, beginning from October 20, 2022, and concluding on June 20, 2023. This timeframe outlines the period during which the researchers collect data, implement interventions, or conduct observations, providing a clear timeline for the study's activities. The study, employing a sample size of 80 (40 in each group) determined by the WHO sample size calculator for two proportions, utilizes a non-probability consecutive sampling technique. Inclusion criteria involve adults aged 18-60, diagnosed with morbid obesity, undergoing either one-anastomosis gastric bypass (OAGB) or laparoscopic sleeve gastrectomy. Exclusion criteria include patients with severe comorbidities (American Society of Anesthesiologists [ASA] score 3 or more). Following ethical approval (48.ERC/FMU/2021-22/215) (29-01-2022), informed consent, detailed history, and BMI measurements, patients are randomly assigned to Group A (laparoscopic sleeve gastrectomy) or Group B (OAGB) through computer-generated random number tables. All surgeries, performed by a consultant with 3 years post-fellowship experience, are followed up monthly until the 6th month. Following the designated timeframe, blood samples are systematically obtained for the purpose of assessing lipid profile, fasting plasma glucose (FPG), alanine transaminase (ALT), aspartate transaminase (AST), and hemoglobin A1C (HbA1C). Dyslipidemia is meticulously evaluated, adhering to predefined operational

definitions. The ensuing statistical analysis, conducted through SPSS software (version 24.0), employs chi-square tests and independent sample t-tests to facilitate a comprehensive comparison of dyslipidemia, HbA1C, FPG, ALT, and AST parameters between the two study groups. The analytical approach includes stratification to control for potential effect modifiers, and statistical significance is established at a p-value ≤ 0.05. This methodological rigor ensures a robust exploration of the influence of surgical interventions on metabolic parameters in the specific cohort of morbidly obese patients under investigation.

RESULTS

In this study of 80 morbidly obese patients, equally distributed between two cohorts, rigorous selection criteria were applied to ensure the robustness of the investigation. Predominantly, individuals aged 18 to 40 years were included, with 82.55% in Group A and 92.5% in Group B. The mean age for Group A was 34.95 years, slightly higher than Group B's 33.05 years, and both groups were predominantly male (82.5% in Group A and 92.5% in Group B). Mean BMI demonstrated comparability between the groups, with Group A at 43.70 and Group B at 43.80. This meticulous selection laid the foundation for a comprehensive exploration of one-anastomosis gastric bypass (OAGB) and laparoscopic sleeve gastrectomy outcomes in morbidly obese individuals.

The analysis of metabolic parameters revealed nuanced distinctions between the groups. Mean FPG values were 5.52±0.26 in Group A and 5.56±0.25 in Group B, and mean HbA1c levels were 6.65±0.24 in Group A and 6.26±0.19 in Group B. Descriptive statistics for AST and ALT showed no significant inter-group differences. In lipid profiles, statistically significant variations were observed in Total Cholesterol (p=0.039), Triglycerides (p=0.004), and HDL (p=0.003), while LDL levels remained unaffected. Dyslipidemia frequency was substantially higher in Group A (55%) compared to Group B (25%), with a significant p-value of 0.006. This thorough examination enriches our understanding of the comparative outcomes, offering valuable insights for clinical decision-making in managing morbidly obese patients.

	Characteristics	Group A(n=40)	Group B(n=40)	P-Value
Gender	Male	33(82.5%)	37(92.5%)	0.176
	Female	7(17.5%)	3(7.5%)	
Age(years)	18-40	33(82.5%)	37(92.5%)	0.816
	41-60	7(17.5%)	3(7.5%)	
Dyslipidemia	Yes	22(55%)	10(25%)	0.006
	No	18(45%)	30(75%)	
BMI(mean+sd)		43.70+2.04	43.80+1.92	
FPG		5.52+0.26	5.56+0.25	0.405
HbA1c		6.65+0.24	6.26+0.19	0.000
AST		24.13+3.31	24.23+3.48	0.896
ALT		24.55+3.46	23.92+3.35	0.414
TC		187.13+33.11	171.85+32.07	0.039
TG		144.70+20.54	131.40+19.94	0.004
HDL		40.13+13.11	48.90+12.19	0.003
LDL		102.53+29.88	91.58+29.81	0.105

Table-I. Summary of case distribution and outcomes

Variables			Dyslipidemia		P-Value
			Group A	Group B	
Age (in years)	18-40	Yes	17(65.4%)	9(34.6%)	0.019
		No	16(36.4%)	28(63.6%)	
	41-60	Yes	5(83.3%)	1(16.7%)	0.260
		No	2(50%)	5(50%)	
Gender	Male	Yes	7(70%)	3(30%)	0.153
		No	8(42.1%)	11(57.9%)	
	Female	Yes	15(68.2%)	7(31.8%)	0.017
		No	10(34.5%)	19(65.5%)	
BMI	40-45	Yes	16(66.7%)	8(33.3%)	0.037
		No	15(39.5%)	23(60.5%)	
	>45	Yes	6(75%)	2(25%)	0.058
		No	3(30%)	7(70%)	

Table-II. Stratification of outcome according to age, gender and BMI

DISCUSSION

The existing body of literature lacks comprehensive investigations into the metabolic profiles of morbidly obese patients undergoing either sleeve gastrectomy or one-anastomosis gastric bypass (OAGB), particularly within the Pakistani population. Given this significant gap in knowledge, the primary objective of our study was to address this void and rigorously compare the changes in metabolic profiles among individuals who had undergone OAGB or laparoscopic sleeve gastrectomy (LSG). The fundamental aim was to discern which surgical procedure brings about a substantial improvement in metabolic outcomes.

In this study, on comparison of FPG in Group A was 5.52+0.26 and in Group B 5.56+0.25, mean HbA1c in Group A was 6.65+0.24 and in Group B 6.26+0.19. AST in Group A was 24.13+3.31 in Group A and 24.23+3.48 in Group B, p-value was 0.896 and AST in was 24.55+3.46 and 23.92+3.35 in Group A & B respectively, p-value=0.414. Comparison of lipid profile of the patients shows that Total Cholesterol in Group A was 187.13+33.11 and in Group B 171.85+32.07, p-value 0.039, Triglycerides in Group A was 144.70+20.54 and in Group B 131.40+19.94, p-value 0.004, HDL in Group A was 40.13+13.11 and in Group B 48.90+12.19, p-value 0.003, the LDL was 102.53+29.88 and 91.58+29.81, p-value was 0.105 in both groups respectively. Comparison of dyslipidemia of the patients in both groups shows that 22(55%) cases in Group A and 10(25) in Group B had dyslipidemia, p-value=0.006.

Bettini and colleagues[6] conducted a comprehensive study comparing the impact of laparoscopic sleeve gastrectomy (LSG) and one-anastomosis gastric bypass (OAGB) on weight loss and lipid profiles in severe obesity patients 18 months post-surgery. Analyzing 46 OAGB patients and matching them with 88 LSG counterparts, the study revealed significant differences. OAGB patients experienced more substantial weight loss (33.2%) compared to LSG (29.6%), a statistically significant discrepancy ($p = 0.024$). Furthermore, dyslipidemia prevalence significantly dropped in OAGB patients from 61% to 22% ($p < 0.001$), whereas LSG's reduction lacked statistical significance. Adjusting for variables, including BMI, age, and sex, sustained statistical significance in changes (delta Δ) before and after surgery for both procedures was noted. OAGB patients with severe obesity exhibited greater lipid profile improvements independent of BMI changes, age, and sex. In conclusion, while both procedures effectively promote weight loss and improve lipid profiles, OAGB demonstrated superior efficacy in reducing dyslipidemia prevalence. The independent improvements in lipid plasma values underscore the metabolic advantages of bariatric surgery, with OAGB particularly promising in managing severe obesity and related metabolic conditions.

Limited studies have compared the outcomes of

laparoscopic sleeve gastrectomy (LSG) versus one-anastomosis gastric bypass (OAGB). In a 12-month post-surgery assessment, participants in the OAGB group exhibited significantly lower blood lipid levels than those in the LSG group[7], as indicated by a study evaluating the effectiveness of OAGB and LSG in managing diabetes. Over a five-year period, comparing weight loss, regain, complications, and resolution of comorbidities for LSG and OAGB, dyslipidemia remission rates were notable.[8] Specifically, dyslipidemia remission was reported as 72% after LSG and notably higher at 90% after OAGB, emphasizing the potential advantages of the latter procedure.

A subsequent 7-year follow-up study[9] further supported these findings, reporting a greater remission of dyslipidemia in the OAGB group (74%) compared to the LSG group (52%), reaching a consensus on the enduring benefits of OAGB. These results underscore the importance of long-term assessments, portraying OAGB as a more favorable option for achieving sustained improvements in dyslipidemia, a critical consideration in the management of severe obesity and associated metabolic conditions.

In a comprehensive study[6] comparing the outcomes of one-anastomosis gastric bypass (OAGB) and laparoscopic sleeve gastrectomy (LSG), a particular focus on dyslipidemia revealed significant improvements in the metabolic profiles of patients, accompanied by a reduction in the prevalence of prediabetes and diabetes following both procedures. Notably, both fasting plasma glucose (FPG) and Hb1Ac levels exhibited considerable decreases. In addressing hypertension, the LSG procedure demonstrated a statistically significant reduction in the overall prevalence of the condition, whereas no discernible difference was observed after OAGB. The study also reported that transaminase levels improved exclusively after the LSG procedure. Considering the absence of liver ultrasonography post-surgery, the fatty liver index (FLI) was proposed as a suitable indicator, emphasizing the efficacy of LSG in ameliorating liver steatosis. These nuanced findings contribute to the understanding of the distinct impacts of OAGB and LSG on metabolic parameters, offering valuable insights for clinicians navigating the complexities of bariatric interventions in patients with severe obesity and associated comorbidities.[10]

Significantly, dyslipidemia prevalence notably decreased exclusively in the OAGB group, despite reduced lipid profile values in both groups. Noteworthy is the finding that, although both groups exhibited lower total cholesterol levels, the OAGB group demonstrated a more substantial reduction in total cholesterol, low-density lipoprotein cholesterol, non-HDL cholesterol, and overall cholesterol levels compared to the LSG group. Furthermore, the increase in HDL levels following OAGB surpassed that after LSG, albeit not reaching statistical significance. These results diverge from prior research, which reported equal success for both LSG and OAGB in improving dyslipidemia 12 months post-surgery.[11-14] This unique insight into lipid profile dynamics post-bariatric surgery in the Pakistani context underscores the nuanced impacts of different procedures, offering valuable considerations for clinicians addressing dyslipidemia in the local population.

Conversely, these findings found support in two earlier studies[7,8], and notably, it is uncommon in the existing literature to elucidate such disparities independent of age, gender, or the magnitude of individuals' weight fluctuations. In essence, our research suggests that the enhancement in lipid profile could be attributed directly to the surgical intervention rather than merely the reduction in body weight.

In the study[6], significant weight loss was observed in patients from both categories, and notably, OAGB patients exhibited a greater reduction in body mass. Importantly, our findings demonstrated that the improvements in lipid plasma levels among OAGB patients occurred independently of their achieved BMI.

The extended gastric tube resulting from OAGB surgery facilitates the swift passage of recently chewed but undigested food through an intestinal segment unaccustomed to this form and texture.

This modification contributes to a reduction in the emulsification and absorption of lipids in the ileum.

It is conceivable that the reduction in cholesterol absorption, a phenomenon established after RYGB[14], may similarly occur post-OAGB. Due to the altered route of fats, bypassing the duodenum, there could be a decline in bile acids secretion following OAGB. This could be attributed to diminished appetite, early satiety, and alterations in gut hormones. Additionally, the decrease in food intake, influenced by these factors, contributes to the decline in plasma lipids after OAGB. Success in bariatric surgery for obesity-related comorbidities is not solely dependent on restriction and malabsorption; other mechanisms related to weight-independent variables, including gut hormones, the neurological system, bile acids, and the gut microbiota, play crucial roles. These interrelated processes have been extensively studied, particularly concerning the remission of type 2 diabetes.[15]

Carbajo et al. (2020)[16] demonstrated that while the most substantial weight loss occurred in the initial six months post-surgery, low-density lipoprotein (LDL) levels exhibited a consistent reduction over a two-year period subsequent to the operation. Notably, the resolution of dyslipidemia has been a relatively underexplored facet within the extant research literature. The findings of this investigation indicate that LDL levels at the termination of the follow-up duration remain uninfluenced by the individual's weight status.

CONCLUSION

The investigation yielded compelling evidence supporting the favorable outcomes of one-anastomosis gastric bypass (OAGB) over laparoscopic sleeve gastrectomy (LSG) in patients presenting with morbid obesity. Specifically, OAGB demonstrated superior efficacy in reducing the frequency of dyslipidemia, along with notable improvements in mean levels of key metabolic indicators such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), glycated hemoglobin (HbA1C), and fasting plasma glucose (FPG). These findings carry significant implications for highly educated general surgeons, offering valuable insights into the optimal choice of bariatric procedures for enhanced metabolic outcomes in morbidly obese individuals.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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