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**Bariatric surgery outcomes following organ transplantation: A review study**

Kheirvari M *et al*. Bariatric surgery and organ transplantation

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**Abstract**

Weight gain is a frequent postoperative complication following a solid organ transplant which can be solved by bariatric surgery. The outcomes of bariatric surgery among patients with an organ transplant history are always a challengeable subject for surgeons and surgery candidates. In this review article, we aim to investigate the existence literature about the rates of morbidity and mortality, frequent complications in terms of graft function, remission in diabetes, hypertension, pulmonary and cardiovascular disorders, hepatic and renal functions, and immunosuppressive stability, as well as the safety of bariatric surgery among patients.

**Key Words:** Bariatric surgery; Organ transplantation; Complications

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**Core Tip:** In this minireview article, we try to provide a broad introduction to the impacts of bariatric surgery on organ transplantation outcomes rather than as an exhaustive review. Moreover, this review will focus on major transplantations and type of bariatric surgery among morbidly obese patients. Within the broad categories of organ transplantation, we then conclude with remarks about the outcomes of bariatric surgery among patients with combined organ transplantation. Where possible, the readers are suggested to refer to the numerous comprehensive clinical studies reporting the predictors of adverse outcomes of organ transplantation following bariatric surgery.

**INTRODUCTION**

Obesity is a frequent complication among patients who underwent solid organ transplantation, and may consequently affect the transplant population at multiple levels[1,2]. Graft function depends not only on the management of immune processes but also on the optimal control of chronic diseases, especially obesity and metabolic syndrome, which may lead to a number of disorders exerting adverse effects, including to the transplanted organ[3]. Obesity in transplantation patients may also negatively impact preoperative and long-term outcomes after bariatric surgery[4,5]. Based on previous reports, obesity was linked to a higher odds of biopsy-proven acute rejection, mortality, allograft loss, and the development of diabetes[6]. Therefore, this study aims to compare the clinical outcomes of bariatric surgery among patients with prior organ transplantation. In this mini-review article, we tried to provide a broad introduction to the impacts of bariatric surgery on organ transplantation outcomes rather than as an exhaustive review. Moreover, this review will focus on major transplantations and type of bariatric surgery among morbidly obese patients including kidney transplantation, liver transplantation, heart transplantation, and sleeve gastrectomy (SG); pancreas transplantation and gastric banding surgery; lung transplantation and robotic Roux-en-Y gastric bypass (RYGB). Within the broad categories of organ transplantation, we then conclude with remarks about the outcomes of bariatric surgery among patients with combined organ transplantation. Where possible, the readers are suggested to refer to the numerous comprehensive clinical studies reporting the predictors of adverse outcomes of organ transplantation following bariatric surgery.

**Kidney Transplantation and Bariatric Surgery**

The problem of obesity in renal transplant recipients has been well documented. Based on previously published reports, kidney recipients with obesity demonstrated enhanced rate of comorbidities such as respiratory and cardiovascular diseases, diabetes mellitus or posttransplant diabetes mellitus, dyslipidemia, and even wound complications[7-9]. Elli *et al*[10] evaluated the outcomes of SG in six patients who had a kidney transplant. There were no significant differences in excess weight loss (EWL) or percent of weight loss (WL) between the renal recipient group and patients without a history of kidney transplant. In addition, no preoperative and serious postoperative complications were observed in the transplant group. In another study, four kidney transplant patients diagnosed with hypertension (all subjects) and type 2 diabetes (T2D) underwent SG and 45% of EWL was observed 12 to 24 mo after surgery[1]. The authors reported a significant reduction in antihypertensive medications and complete remission of T2D one year after SG[1]. Significant weight loss, improvement of obesity-related conditions, preservation of graft function, and the estimated glomerular filtration rate (eGFR) were enhanced significantly in the subjects[1]. Furthermore, five renal recipient patients underwent bariatric surgery[4] RYGB and one SG and experienced 50% of EWL at 2 years after procedure. Preoperative evaluation revealed five subjects with hypertension, two with T2D, and one with chronic heart failure among the patients. After surgery, no postoperative complications and no alteration to the dosage of the immunosuppressant drugs were recorded[11]. However, in another study among ten patients with a history of kidney transplants, just two cases needed higher doses of tacrolimus and one decreased based on serum level[7]. Gheith *et al*[12] in 2017 reported a study to shed light on the effects of bariatric surgery on the outcomes of renal transplant recipients among 22 bariatric patients with a history of kidney transplant and 44 nonbariatric control subjects with a kidney transplant history. The overweight nonbariatric control group received a more potent induction immunosuppression compared to bariatric patients. In addition, no differences in graft functions or new onset of T2D were recorded in 22 bariatric patients with a history of kidney transplant compared to the control group. In a well-designed study, the outcomes of bariatric surgery were evaluated among 26 patients with a history of kidney transplant. However, the patients experienced more than 50% of EWL improvement in comorbidities without serious graft rejection, and declined tacrolimus blood levels (but remained within the therapeutic range), but the surgical risk was higher than the regular bariatric surgery population[13]. Table 1 demonstrates more studies on the outcomes of bariatric surgery in patients with a history of organ transplantation. In the most recent study, among 38 patients with solid organ transplantation, eight had a kidney transplant. Comorbidity-related medications such as tacrolimus were declined in most patients, while two subjects experienced transplant organ rejection after bariatric surgery[14].

**Liver Transplantation and Gastric Bypass**

There is a positive correlation between body mass index (BMI) and nonalcoholic fatty liver disease (NAFLD), and individuals with obesity undergoing liver transplantation may be at enhanced risk for NAFLD recurrence[15,16]. Whereas some experts prefer to do the liver transplantation first, some others have suggested gastric bypass before liver transplant. In a study on seven patients with a history of orthotopic liver transplantation who underwent RYGB, two deaths in subjects with hepatitis C were reported 6 and 9 mo following bariatric surgery[17]. Gastric bypass may have contributed to the death of one case owing to multiple organ dysfunction syndrome. The other patients experienced improved gylcemic control, therapeutic weight loss, and balanced high-density lipoprotein levels with continued dyslipidemia in a long-time follow-up[17]. In another report, among five liver-recipient patients undergoing SG, five and four in preoperative assessment were diagnosed with hypertension and T2D, respectively. In postoperative screening, the patients illustrated a significant reduction in antihypertensive medications including mycophenolate 720 mg and tacrolimus 2 mg, and completed remission of T2D, and graft function remained preserved in subjects one year after SG[1]. Lin *et al*[18] reported the outcomes of SG in nine patients with prior liver transplant. In the first month after SG, three subjects were diagnosed with postoperative complications including dysphagia that required reoperation, bile leak from the liver surface requiring laparoscopic drainage, and mesh dehiscence after synchronous incisional hernia repair. Hepatic and renal functions remained stable and no graft rejection was reported after surgery. In a case report study on a 51-year-old male liver recipient, he was diagnosed with steatohepatitis of the graft, gained 30 kg after organ transplant, and was on an oral hypoglycemic agent with HbA1c of 8%. After laparoscopic SG, completed remission in diabetes, reduction in BMI from 42 to 34, and stable graft functions were reported[19]. In one of the most recent studies on 19 cases with prior liver transplant undergoing SG or robotic RYGB, one patient was readmitted for abdominal pain owing to gastric ulcer[14] and related comorbidities were decreased in most of patients[10,14]. There were no organ rejections in this study at the 12-mo follow-up[14]. The tacrolimus blood levels declined to 4-6 ng/mL 6 mo after operation[13].

**Heart Transplantation and Sleeve Gastrectomy**

In a previously mentioned study by Khoraki *et al*[1], one patient with a history of heart transplant was diagnosed with hypertension. The preferred surgery was SG and after the procedure, the subject experienced 45% of EWL and reduction in antihypertensive medications. Moreover, the left ventricular ejection fraction enhanced by 10% in the patient was reported after surgery. Significant weight loss, improvement of obesity-related conditions, and preservation of graft function were observed after SG[1]. In another study on six cases with heart transplant, three subjects underwent SG and three patients underwent robotic RYGB. One patient died 20 mo after robotic RYGB owing to the adverse effects of the tricuspid valve replacement, not directly related to bariatric surgery. One subject required early readmission due to abdominal pain and shortness of breath. No leaks were documented in either group[14]. The comorbidity-related medications were decreased in other cases[1,19].

**Pancreas Transplantation and Gastric Banding Surgery**

Regarding pancreas recipients, there are no technical modifications to be considered. RYGB is not performed in these patients because of bowel drainage[10]. In a report, two patients with pancreas transplant maintained normal glycemic serum levels with HbA1c levels of 5.8% and 5.3%, respectively, at the one-year follow-up[20]. Weight gain in these patients may induce insulin resistance and return to insulin therapy despite proper graft function. Furthermore, calcineurin inhibitors for maintenance immune suppression can cause insulin resistance, and they are also responsible for weight gain post-transplantation[10]. However, laparoscopic gastric banding surgery to treat insulin resistance in a pancreas transplant recipient yielded good short-term outcomes[20].

**Lung Transplantation and Robotic RYGB**

For patients with lung transplant, robotic RYGB seems a preferable method compared to other types of weight loss surgery due the high reported rate of postoperative reflux[21,22]. In a study on two patients with lung transplant, no organ rejection was reported and comorbidity conditions declined significantly after surgery[14].

**Outcomes of Bariatric Surgery Among Patients with Combined Organ Transplantation**

The outcomes of bariatric surgery in patients with combined transplantation are one of the principal studies that have been performed by some researchers, but more studies with a long-term follow-up period are required to conclude the efficiency of weight loss surgery in this population. For instance, combined kidney-pancreas transplantation is a treatment option for end-stage diabetic nephropathy. Post-transplant weight gain enhances the risk for posttransplant comorbidities and death caused by pulmonary and cardiovascular disorders. Gastric banding is an established treatment for moderate morbid obesity for this population[20]. Based on reports on kidney pancreas recipients, although no organ rejection, declined HbA1c levels and significant weight loss were reported[14,20,23], but no reduction in medication doses was reported postoperatively[23]. In another study on a 65-year-old patient with combined kidney-liver transplant, 30 kg weight gain with the risk of graft impairment was reported 4 years after transplant. It has been reported that, after weight loss surgery, although the surgical risk was higher than the regular bariatric patients[13], BMI declined significantly with stable graft functions[19] and no development of diabetes[14,19] in patients with a history of kidney-liver transplantation. Immunosuppressive stability was enhanced from 39% to 47% after bariatric surgery in this population[13]. Table 2 presents more details of studies related to the immunosuppressant changes following bariatric surgery in patients with a history of organ transplants.

**Predictors of Adverse Outcomes of organ transplantation following bariatric surgery**

Ethnicity and its impact on the outcomes of bariatric surgery among patients with a transplant history, are a remarkable issue that has been addressed by Edwards *et al*[24] in a recent report. In this survey on 335 patients from white and black races, preoperatively, black subjects were more likely to have hypertension and dialysis dependent chronic disease and be on chronic steroids. Nonetheless, mortality and morbidity rates were similar in both groups. Postoperatively, the black population were prone to have higher rates of renal failure, pulmonary disorders, and emergency readmissions, higher overall bariatric-related morbidity, and higher rates of pneumonia and progressive renal insufficiency compared to the white group. Nevertheless, race was not found to be an independent predictor of adverse outcomes following SG or RYGB in subjects with prior solid organ transplantation[24]. The same results can be seen in another cohort study with 610 patients with organ transplant and 320000 cases without organ transplant. While previous transplant subjects experienced a higher incidence of readmissions, surgical complications, and medical issues than the other group, but no difference in the incidence of death was observed[25]. On the other side, among patients with prior organ transplant, longer operative time and increased rates of morbidity, surgical site infection, acute and progressive renal failure, myocardial infarction, bleeding, and venous thromboembolism are undeniable after bariatric surgery[26]. Considering the potential for poorer outcomes in overweight people with prior solid organ transplant, there is significant interest in identifying optimal modalities to achieve significant and durable weight loss, including metabolic and bariatric surgery.

**CONCLUSION**

Cumulatively, reports suggested that bariatric surgery, regardless of the type of procedure (sleeve *vs* gastric bypass) and surgical approach (robotic assisted *vs* conventional laparoscopic), ensures significant weight loss and improvement of related conditions, together with good immunosuppressive maintenance, along with the absence of serious graft rejection or dysfunction and with a trivial mortality rate in this high surgical risk population. Due to the lack of a large size survey, we are unable to expand our analyses by bariatric procedure type and surgical approach. These are potential confounders that may have influenced results. Further studies to assess bariatric surgery outcomes by organ transplant subtype and risks of organ rejection are necessary to advance our knowledge on this issue. Obesity medicine experts may choose to use this review article to educate patients with organ transplant about bariatric surgery and the options for them to promote weight loss postoperatively.

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**REFERENCES**

1 **Khoraki J**, Katz MG, Funk LM, Greenberg JA, Fernandez LA, Campos GM. Feasibility and outcomes of laparoscopic sleeve gastrectomy after solid organ transplantation. *Surg Obes Relat Dis* 2016; **12**: 75-83 [PMID: 26048513 DOI: 10.1016/j.soard.2015.04.002]

2 **Beckmann S**, Drent G, Ruppar T, Nikolić N, De Geest S. Pre- and post-transplant factors associated with body weight parameters after liver transplantation - A systematic review and meta-analysis. *Transplant Rev (Orlando)* 2019; **33**: 39-47 [PMID: 30472154 DOI: 10.1016/j.trre.2018.10.002]

3 **Ziemiański P**, Lisik W, Marszałek RJ, Cieciura T, Domienik-Karłowicz J, Trzebicki J, Gryczewski T, Wierzbicki Z, Kosieradzki M, Durlik M, Pruszczyk P, Chmura A. Improvement of graft function following Roux-en-Y gastric bypass surgery in a morbidly obese kidney recipient: a case report and literature review. *Ann Transplant* 2014; **19**: 639-642 [PMID: 25483934 DOI: 10.12659/AOT.892954]

4 **Serrano OK**, Sengupta B, Bangdiwala A, Vock DM, Dunn TB, Finger EB, Pruett TL, Matas AJ, Kandaswamy R. Implications of excess weight on kidney donation: Long-term consequences of donor nephrectomy in obese donors. *Surgery* 2018; **164**: 1071-1076 [PMID: 30149934 DOI: 10.1016/j.surg.2018.07.015]

5 **Diwan TS**, Rice TC, Heimbach JK, Schauer DP. Liver Transplantation and Bariatric Surgery: Timing and Outcomes. *Liver Transpl* 2018; **24**: 1280-1287 [PMID: 30080949 DOI: 10.1002/lt.25303]

6 **Sood A**, Hakim DN, Hakim NS. Consequences of Recipient Obesity on Postoperative Outcomes in a Renal Transplant: A Systematic Review and Meta-Analysis. *Exp Clin Transplant* 2016; **14**: 121-128 [PMID: 27015529 DOI: 10.6002/ect.2013.ecte3b]

7 **Szomstein S**, Rojas R, Rosenthal RJ. Outcomes of laparoscopic bariatric surgery after renal transplant. *Obes Surg* 2010; **20**: 383-385 [PMID: 19779949 DOI: 10.1007/s11695-009-9969-5]

8 **Howard RJ**, Patton PR, Reed AI, Hemming AW, Van der Werf WJ, Pfaff WW, Srinivas TR, Scornik JC. The changing causes of graft loss and death after kidney transplantation. *Transplantation* 2002; **73**: 1923-1928 [PMID: 12131689 DOI: 10.1097/00007890-200206270-00013]

9 **Pischon T**, Sharma AM. Obesity as a risk factor in renal transplant patients. *Nephrol Dial Transplant* 2001; **16**: 14-17 [PMID: 11208986 DOI: 10.1093/ndt/16.1.14]

10 **Elli EF**, Gonzalez-Heredia R, Sanchez-Johnsen L, Patel N, Garcia-Roca R, Oberholzer J. Sleeve gastrectomy surgery in obese patients post-organ transplantation. *Surg Obes Relat Dis* 2016; **12**: 528-534 [PMID: 26823089 DOI: 10.1016/j.soard.2015.11.030]

11 **Arias RH**, Mesa L, Posada JG, Vélez JP. Kidney transplantation and gastric bypass: a better control of comorbidities. *Obes Surg* 2010; **20**: 851-854 [PMID: 20419504 DOI: 10.1007/s11695-010-0165-4]

12 **Gheith O**, Al-Otaibi T, Halim MA, Mahmoud T, Mosaad A, Yagan J, Zakaria Z, Rida S, Nair P, Hassan R. Bariatric Surgery in Renal Transplant Patients. *Exp Clin Transplant* 2017; **15**: 164-169 [PMID: 28260459 DOI: 10.6002/ect.mesot2018.p126]

13 **Yemini R**, Nesher E, Winkler J, Carmeli I, Azran C, Ben David M, Mor E, Keidar A. Bariatric surgery in solid organ transplant patients: Long-term follow-up results of outcome, safety, and effect on immunosuppression. *Am J Transplant* 2018; **18**: 2772-2780 [PMID: 29569341 DOI: 10.1111/ajt.14739]

14 **Cheng YL**, Elli EF. Outcomes of Bariatric Surgery After Solid Organ Transplantation. *Obes Surg* 2020; **30**: 4899-4904 [PMID: 32996103 DOI: 10.1007/s11695-020-05013-1]

15 **Patil DT**, Yerian LM. Evolution of nonalcoholic fatty liver disease recurrence after liver transplantation. *Liver Transpl* 2012; **18**: 1147-1153 [PMID: 22740341 DOI: 10.1002/lt.23499]

16 **Burra P**, Becchetti C, Germani G. NAFLD and liver transplantation: Disease burden, current management and future challenges. *JHEP Rep* 2020; **2**: 100192 [PMID: 33163950 DOI: 10.1016/j.jhepr.2020.100192]

17 **Al-Nowaylati AR**, Al-Haddad BJ, Dorman RB, Alsaied OA, Lake JR, Chinnakotla S, Slusarek BM, Sampson BK, Ikramuddin S, Buchwald H, Leslie DB. Gastric bypass after liver transplantation. *Liver Transpl* 2013; **19**: 1324-1329 [PMID: 24039124 DOI: 10.1002/lt.23734]

18 **Lin MY**, Tavakol MM, Sarin A, Amirkiai SM, Rogers SJ, Carter JT, Posselt AM. Safety and feasibility of sleeve gastrectomy in morbidly obese patients following liver transplantation. *Surg Endosc* 2013; **27**: 81-85 [PMID: 22752278 DOI: 10.1007/s00464-012-2410-5]

19 **Singhal V**, Dhampalwar S, Saigal S, Choudhary N, Saraf N, Chaudhary A, Soin A. Successful Outcome of Bariatric Surgery in Living Donor Liver Transplant Recipients With Multidisciplinary Approach: A Preliminary Experience. *J Clin Exp Hepatol* 2021; **11**: 144-148 [PMID: 33679051 DOI: 10.1016/j.jceh.2020.05.008]

20 **Bonatti H**, Schmitt T, Northup J, Schirmer B, Swenson BR, Pruett TL, Sawyer RG, Brayman K. Laparoscopic gastric banding in a kidney-pancreas transplant recipient with new onset type II diabetes mellitus associated with morbid obesity. *Clin Transplant* 2008; **22**: 829-832 [PMID: 18713268 DOI: 10.1111/j.1399-0012.2008.00873.x]

21 **Yeung KTD**, Penney N, Ashrafian L, Darzi A, Ashrafian H. Does Sleeve Gastrectomy Expose the Distal Esophagus to Severe Reflux?: A Systematic Review and Meta-analysis. *Ann Surg* 2020; **271**: 257-265 [PMID: 30921053 DOI: 10.1097/SLA.0000000000003275]

22 **Mandeville Y**, Van Looveren R, Vancoillie PJ, Verbeke X, Vandendriessche K, Vuylsteke P, Pattyn P, Smet B. Moderating the Enthusiasm of Sleeve Gastrectomy: Up to Fifty Percent of Reflux Symptoms After Ten Years in a Consecutive Series of One Hundred Laparoscopic Sleeve Gastrectomies. *Obes Surg* 2017; **27**: 1797-1803 [PMID: 28190216 DOI: 10.1007/s11695-017-2567-z]

23 **Zelones J**, Biswas O, Mehran A. Laparoscopic sleeve gastrectomy after simultaneous pancreas-kidney transplant. *Am Surg* 2012; **78**: 613-614 [PMID: 22546137]

24 **Edwards MA**, Fagenson AM, Mazzei M, Zhao H. Bariatric Surgery in Prior Solid Organ Transplantation Patients: Is Race a Predictor of Adverse Outcomes? *Obes Surg* 2020; **30**: 4381-4390 [PMID: 32617920 DOI: 10.1007/s11695-020-04813-9]

25 **Montgomery JR**, Cohen JA, Brown CS, Sheetz KH, Chao GF, Waits SA, Telem DA. Perioperative risks of bariatric surgery among patients with and without history of solid organ transplant. *Am J Transplant* 2020; **20**: 2530-2539 [PMID: 32243667 DOI: 10.1111/ajt.15883]

26 **Fagenson AM**, Mazzei MM, Zhao H, Lu X, Edwards MA. Bariatric Surgery Outcomes in Patients with Prior Solid Organ Transplantation: an MBSAQIP Analysis. *Obes Surg* 2020; **30**: 2313-2324 [PMID: 32096014 DOI: 10.1007/s11695-020-04490-8]

27 **Tsamalaidze L**, Stauffer JA, Arasi LC, Villacreses DE, Franco JSS, Bowers S, Elli EF. Laparoscopic Sleeve Gastrectomy for Morbid Obesity in Patients After Orthotopic Liver Transplant: a Matched Case-Control Study. *Obes Surg* 2018; **28**: 444-450 [PMID: 28766265 DOI: 10.1007/s11695-017-2847-7]

28 **Butte JM**, Devaud N, Jarufe NP, Boza C, Pérez G, Torres J, Pérez-Ayuso RM, Arrese M, Martínez J. Sleeve gastrectomy as treatment for severe obesity after orthotopic liver transplantation. *Obes Surg* 2007; **17**: 1517-1519 [PMID: 18219781 DOI: 10.1007/s11695-008-9432-z]

29 **Safwan M**, Collins KM, Abouljoud MS, Salgia R. Outcome of liver transplantation in patients with prior bariatric surgery. *Liver Transpl* 2017; **23**: 1415-1421 [PMID: 28752920 DOI: 10.1002/lt.24832]

30 **Golomb I**, Winkler J, Ben-Yakov A, Benitez CC, Keidar A. Laparoscopic sleeve gastrectomy as a weight reduction strategy in obese patients after kidney transplantation. *Am J Transplant* 2014; **14**: 2384-2390 [PMID: 25139661 DOI: 10.1111/ajt.12829]

31 **Gazzetta PG**, Bissolati M, Saibene A, Ghidini CGA, Guarneri G, Giannone F, Adamenko O, Secchi A, Rosati R, Socci C. Bariatric Surgery to Target Obesity in the Renal Transplant Population: Preliminary Experience in a Single Center. *Transplant Proc* 2017; **49**: 646-649 [PMID: 28457364 DOI: 10.1016/j.transproceed.2017.02.032]

32 **Tsamalaidze L**, Elli EF. Bariatric Surgery Is Gaining Ground as Treatment of Obesity After Heart Transplantation: Report of Two Cases. *Obes Surg* 2017; **27**: 3064-3067 [PMID: 28831661 DOI: 10.1007/s11695-017-2908-y]

33 **Rex IH**, Hull D, Trowbridge PE. Gastroplasty for Morbid Obesity after Cardiac and Renal Transplantation. *Obes Surg* 1991; **1**: 439-442 [PMID: 10775950 DOI: 10.1381/096089291765560890]

34 **Lazzati A**, Iannelli A, Schneck AS, Nelson AC, Katsahian S, Gugenheim J, Azoulay D. Bariatric surgery and liver transplantation: a systematic review a new frontier for bariatric surgery. *Obes Surg* 2015; **25**: 134-142 [PMID: 25337867 DOI: 10.1007/s11695-014-1430-8]

35 **Rogers CC**, Alloway RR, Alexander JW, Cardi M, Trofe J, Vinks AA. Pharmacokinetics of mycophenolic acid, tacrolimus and sirolimus after gastric bypass surgery in end-stage renal disease and transplant patients: a pilot study. *Clin Transplant* 2008; **22**: 281-291 [PMID: 18482049 DOI: 10.1111/j.1399-0012.2007.00783.x]

36 **López Deogracias M**, Domínguez-Diez A, Palomar-Fontanet R, González-Noriega M, Rodrigo E, Fernández-Fresnedo G, Zubimendi JA, Olmedo F, Gómez-Fleitas M, Arias M, Fernández-Escalante C. Biliopancreatic diversion in a renal transplant patient. *Obes Surg* 2007; **17**: 553-555 [PMID: 17608272 DOI: 10.1007/s11695-007-9097-z]

37 **Ablassmaier B**, Klaua S, Jacobi CA, Müller JM. Laparoscopic gastric banding after heart transplantation. *Obes Surg* 2002; **12**: 412-415 [PMID: 12082899 DOI: 10.1381/096089202321088273]

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**Table 1 Outcomes of bariatric surgery in patients with a history of organ transplants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Organ | Type of bariatric surgery | Patients (*n*) | Potential risks | Mean BMI or weight changes after BS | Comorbidities/improvements | Ref. |
| Liver | RYGB | 7 | Gastric staple line leakage, EWL | From 44.34 ± 6.08 kg/m2 to 26.47 ± 5.53 kg/m2 | DM, HTN, GERD, vascular disease, and OSA | Al-Nowaylati *et al*[17] |
| LSG | 12 | Infections and leaks | Mean BMI decrease 12.9 kg/m2 | Nine out of 12 patients had DM and metabolic syndrome  Four out of 12 patients showed a complete improvement after LSG | Tsamalaidze *et al*[27] |
| Open SG | 1 | - | From 47 kg/m2 to 29.8 kg/m2 | DM and arterial HTN | Butte *et al*[28] |
| RYGB, LSG, jejunoileal bypass SG | 11 | Organ insufficiency | Mean BMI 28.3 ± 5.8 kg/m2 | Early surgical site infection, and bleeding | Safwan *et al*[29] |
| Kidney | Gastric bypass | 5 | - | Mean WL of 33 kg | DM, HTN, and hyperlipidemia | Arias *et al*[11] |
| RYGB, LSG | 5 | - | 50% EWL at 2 yr | DM, HTN, hyperlipidemia, polycystic ovarian syndrome, peripheral vascular disease, and CHF | Szomstein *et al*[7] |
| LSG | 10 | Acute renal failure and sleeve stricture | 57% EWL at 6 mo, and 75% EWL at 12 mo | Not mentioned | Golomb *et al*[30] |
| 6 | - | 44.1% EWL at 3 mo, and 75.9% EWL at 12 mo | Morbid obesity | Gazzetta *et al*[31] |
| Liver and kidney | LSG | 9 | Mesh dehiscence after a synchronous incisional hernia repair, bile leakage, and dysphagia that required reoperation | 61% EWL | Mesh dehiscence after synchronous incisional hernia repair, bile leak, post-operative dysphagia | Lin *et al*[18] |
| Heart | RYGB and LSG | 2 | - | From 37.5 kg/m2 to 27.5 kg/m2 at 12 mo | HTN, hiperlipidemia, anemia, and hipomagnesemia | Tsamalaidze *et al*[32] |
| Heart and kidney | Vertical banded gastroplasty | 2 | Inadvertent laceration of the pancreas resulting in pseudocyst which may need percutaneous and then surgical drainage | Mean WL of 54 and 56 kg | Not mentioned | Rex *et al*[33] |

BMI: Body mass index; BS: Bariatric surgery; RYGB: Roux-en-Y gastric bypass; EWL: Excess weight loss; LSG: Laparoscopic sleeve gastrectomy; SG: Sleeve gastrectomy; WL: Weight loss; DM: Diabetes mellitus; HTN: Hypertension; GERD: Gastroesophageal reflux disease; OSA: Obstructive sleep apnea; CHF: Congestive heart failure.

**Table 2 Dose adjustment of immunosuppressive drugs following bariatric surgery in patients with a history of organ transplants**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Organ | Type of bariatric surgery | Patients (*n*) | Immunosuppressant adjustment compared to patients without organ transplants | Ref. |
| Liver | LSG | 12 | No changes | Tsamalaidze *et al*[27] |
| 9 | Lin *et al*[18] |
| Bariatric surgery | 56 | Lazzati *et al*[34] |
| Kidney | Gastric bypass | 2 | Increased doses of sirolimus, tacrolimus, and mycophenolate mofetil | Rogers *et al*[35] |
| Laparoscopic gastric bypass | 5 | No changes | Arias *et al*[11] |
| LSG | 10 | Two patients with increased doses of tacrolimus and one decreased | Golomb *et al*[30] |
| 6 | No changes | Gazzetta *et al*[31] |
| 5 | Decreased dose of cyclosporine | Szomstein *et al*[7] |
| Biliopancreatic diversion | 1 | No changes | López Deogracias *et al*[36] |
| Heart | Laparoscopic gastric banding, laparoscopic robotic-assisted RYGB, and LSG | 3 | No changes | Tsamalaidze *et al*[32], Ablassmaier *et al*[37] |
| Heart and kidney | Vertical banded gastroplasty | 1 | Changes based on serum level | Rex *et al*[33] |

LSG: Laparoscopic sleeve gastrectomy; RYGB: Roux-en-Y gastric bypass.



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