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Laparoscopic Sleeve Gastrectomy in a Patient on Peritoneal Dialysis

Anthony Hoan Nguyen[1], Mihran Naljayan[1], Farshid Yazdi[1] and Efrain Reisin[1]

[1]Department of Medicine, Section of Nephrology and Hypertension, Louisiana State University Health New Orleans, New Orleans, Louisiana, USA

Correspondence: Mihran Naljayan, Department of Medicine, Section of Nephrology and Hypertension, Louisiana State University Health New Orleans, 1542 Tulane Ave, Suite 330, New Orleans, Louisiana 70112, USA. E-mail: mnalj1@lsuhsc.edu

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INTRODUCTION

The high prevalence of obesity along with its potential resulting conditions make obesity a major public health concern. Its prevalence among patients with end-stage renal disease (ESRD) is similar to that of the general population such that this population is just as susceptible to the comorbidities involved with the obesity epidemic.[1] The ultimate objective of a patient with ESRD is to obtain a kidney transplant. However, poorer transplant outcomes have been seen in obese patients.[2] An increased body mass index (BMI) in a patient indicates a higher risk for complications such as graft failure and patient death.

An obese patient on dialysis may elect to undergo bariatric surgery to induce weight loss to be considered for a kidney transplant. This poses another problem, because there are few data to support bariatric surgery procedures in dialysis patients regarding safety, the risk for complications, and the effectiveness of weight loss. A 2015 study found that although complication rates in dialysis patients were slightly higher than the general bariatric population, those patients still had effective weight loss with an acceptable risk–benefit ratio.[3] For a patient on peritoneal dialysis (PD), however, there is the issue of performing the bariatric surgery without disrupting the dialysis treatment and having to switch patients temporarily to hemodialysis (HD).

After searching on PubMed for successful bariatric surgeries on PD patients, we found only 2 previous reports. Valle *et al.*[4] in 2012 summarized 5 morbidly obese patients who successfully underwent either laparoscopic gastric banding or laparoscopic Roux-en-Y with postoperative reinitiation of PD. The second report was a letter to the editor by *Imam et al.*[5] that discussed a successfully performed laparoscopic sleeve gastrectomy; the patient eventually resumed a presurgical PD regimen after surgery. To our knowledge, there has been no other report of a patient successfully maintained on PD immediately after bariatric surgery without requiring a temporary transition to HD. We present a patient with ESRD on PD who successfully underwent laparoscopic gastric sleeve surgery while being maintained on PD.

CASE PRESENTATION

A 66-year-old, morbidly obese (BMI, 43.9 kg/m^2) female patient with ESRD on PD underwent laparoscopic gastric sleeve surgery. The patient was denied placement on the transplant list because of her obesity. Before surgery, she weighed 127 kg and was on continuous cyclic PD for 9 hours with 4 cycles of 3000 ml and 2.5% dextrose solution with 500 ml icodextrin in the last fill. She cycled the night before the surgery and did not do a last fill. The patient received clindamycin 600 mg i.v. during surgery (owing to an allergy to cefazolin). The operative approach involved the insertion of a Veress needle in the left upper quadrant with 3 additional 5-mm trocar ports. The stomach was divided and the staple line was reinforced with 2-0 polydioxanone suture; a 2-0 silk suture was used to tack the sleeve edge to the omentum. Finally, the fascia of the specimen extraction site was closed with 0 Vicryl suture (polyglactin 910, Ethicon Inc., a subsidiary of Johnson and Johnson, Bridgewater Township, NJ); all other sites were closed with 4-0 Vicryl.

After surgery, the patient held PD the first night. Then, 1000 ml 2.5% dextrose was initiated for 6 cycles over 12 hours. On day 5 after surgery, it was increased to 1500 ml for 6 cycles over 12 hours owing to low drain alarms; 3 weeks later, it was increased to 2500 ml,

Table 1. Laboratory parameters 3 months before surgery and 2 weeks and 3 months after surgery after laparoscopic sleeve gastrectomy

Lab measurements	3 months before surgery	2 weeks after surgery	3 months after surgery
Blood pressure, mm Hg	158/104	Not available	117/82
Glucose, mg/dl	426 (high)	103	168 (high)
Hemoglobin A1C (%)	9.9 (high)	7.3 (high)	7.7 (high)
Cholesterol, mg/dl	226 (high)	189	162
High-density lipoprotein, mg/dl	49	47	54
Low-density lipoprotein, mg/dl	123	113	86
Triglycerides, mg/dl	268 (high)	146	109

alternating at 1.5% and 2.5% dextrose for 4 cycles over 9 hours. Two months after surgery, the patient's weight was 113 kg (BMI, 39.0 kg/m^2). She discontinued the 3 antihypertensive medications (furosemide 160 mg twice daily, amlodipine 10 mg daily, and losartan 50 mg daily). Two years after surgery, her weight was 80 kg (BMI, 27.6 kg/m^2). The patient's adequacy immediately after surgery did not decrease, but over the 2-year time frame, she had diminished residual renal function. Therefore, she received 2.7 l 2.5% dextrose for 4 cycles over 11 hours and 1 l icodextrin last fill with a total Kt/V of 2.11 with no relative risk Kt/V. The patient was placed on the transplant list after 3 months and remained active on the transplant list until she unfortunately died of unrelated causes at 24 months after the procedure.

DISCUSSION

For 24 months after the bariatric surgery procedure, the patient in this report was active on the transplant list. This procedure was a success because the patient achieved a lower BMI, was kept on PD rather than having to switch to HD, and initially did not lose any immediate residual kidney function (RKF) as a result of the surgery. Over time, as expected, she did lose RKF. The outcome of the RKF was a slight increase initially, which theoretically allowed her to have better clearance on PD after surgery as opposed to lower RKF values. However, over time, she lost all renal function, as expected.

Bariatric surgery is also beneficial in that with proper long-term follow-up, it is known to be associated with the remission of diabetes in a large proportion of patients.[6] A kidney transplant has always been the reference standard to treat patients with ESRD. For most patients on dialysis, a kidney transplant offers a better quality of life, increased survival benefit, and greater life expectancy regardless of BMI, age, race, or diabetes status.[7]

This patient's laboratory data both before and after laparoscopic sleeve gastrectomy showed a decrease in glucose and glycosylated hemoglobin values as well as improved lipid values after surgery (Table 1). We also performed a Kidney Disease Quality of Life survey containing the Medical Outcomes Study-36 before and soon after the surgery to assess the patient's quality of life in the context of kidney disease (Table 2). There was a decrease in the physical and mental component summary scores indicating a drop in the patient's energy level, ability to accomplish tasks, and general health. However, there was also an increase in the scores of disease effect, burden, and symptoms. These categories suggest that the patient feels a decreased negative impact from kidney disease with less interference in daily life and fewer symptoms as a result. Overall, there are mixed results on the impact of the surgery and the immediate continuation of PD on the patient's quality of life. This will inevitably require additional well-designed studies and investigations to clarify further the benefits of bariatric surgery in PD patients.

Supplementary Figure S1 illustrates the steps of managing a patient's PD regimen before, during, and after bariatric surgery. The day before surgery, the patient would follow the prescription as normal but would withhold the last fill to have a dry abdomen for the day of surgery. The PD is held the day of surgery and low volume is reinitiated overnight on day 1 after surgery. The volume is gradually increased over the next few weeks with eventual toleration of full volume. Without the requirement to switch to HD, a PD patient would be allowed to remain on the chosen modality while still achieving adequate dialysis. There would also be no need for the insertion of a HD catheter, and therefore no risk for infections or other complications related to HD.

When a patient is started on PD, the dialysis prescription is typically based on the total body volume. Therefore, a patient who has lost weight after bariatric surgery would consequently have a decrease in total body volume. With a lower total body volume, the PD prescriptions can be modified to a lower volume dialysis prescription. As a result, there would be less exposure and stress to the peritoneal membrane by

Table 2. Kidney Disease Quality of Life survey containing Medical Outcomes Study-36 scores 18 months before and 6 months after laparoscopic sleeve gastrectomy

Subtest score category	18 months before surgery	6 months after surgery
Physical component summary	31.46	0
Mental component summary	49.11	0
Effect of kidney disease on daily life	84.38	96.43
Burden of kidney disease	37.50	75.00
Symptoms and problems	72.92	97.92

decreased dextrose exposure. With a lower total body volume, it may be possible for a previously morbidly obese patient still to be able to achieve adequate dialysis with PD despite a loss of RKF.

Although there are benefits for a PD patient to undergo bariatric surgery, there are minimal data published on this procedure. However, there are published data regarding abdominal or gastrourological surgeries in general in this patient population. For minor abdominal surgeries such as a hernia repair or laparoscopic cholecystectomy, there are reports of the safe initiation or continuation of PD for these patients with no major increase in risk or adverse events. In more complex surgeries, various measures may be taken to minimize complications in PD patients. This includes using a retroperitoneal approach for a radical nephrectomy to preserve the peritoneal membrane, or changing the exit site of a PD catheter in a patient with an ostomy placement to minimize the infection risk.[8] As a result, it is not necessary to terminate or disrupt a patient's PD in most instances, provided there is a careful assessment of the risks of the surgery and with appropriate adjustment of PD prescriptions.

The primary concern of performing abdominal surgery in a patient on PD is the development of intra-abdominal adhesions and loss of peritoneal membrane integrity leading to the inability to continue this dialysis modality effectively. However, a laparoscopic approach involves minimal breaching of the abdominal wall, reduced abdominal adhesions, and a decreased risk for postoperative leakage of dialysate.[9] Certain precautions can be taken to minimize this risk for postoperative leakage, such as an awareness by the surgeon of the presence of the PD catheter and being conscious of the peritoneal space. Starting with a modified dialysis prescription early after surgery and using conservative measures such as positioning and dietary restriction can help lower intraabdominal pressure, thus lowering the risk for a leak.[S1] Compared with an open abdominal procedure, a laparoscopic approach also dramatically reduces the risk for wound infection by 79% because it involves a smaller incision and decreased exposure to microorganisms.[S2] Adding perioperative antibiotics also decreases the risk for peritonitis. Laparoscopic abdominal surgery is an overall less invasive surgical approach with fewer postoperative complications.

The publication by Valle *et al.*[4] demonstrated the immediate postoperative continuation of PD, observing 1 patient who underwent laparoscopic gastric banding and 4 who underwent laparoscopic Roux-en-Y gastric bypass. The 2013 letter by Imam *et al.*[5] also illustrated this point in a patient who had a laparoscopic sleeve gastrectomy. Laparoscopic sleeve gastrectomy, laparoscopic Roux-en-Y, and laparoscopic gastric banding are 3 widely popular and effective weight loss surgeries. Comparatively, laparoscopic gastric banding has been associated with relatively less effective weight loss results; the highest failure and complication rate commonly result from band erosion, band slippage, or esophageal dilation requiring reexploration.[S3]

Laparoscopic sleeve gastrectomy has historically been compared with laparoscopic Roux-en-Y. Most data show no clinically significant difference between the 2 in terms of morbidity, mortality, or weight loss. Many studies showed that the 2 surgeries had equivalently low complications and readmission rates and similar degrees of weight loss.[S4–S6] Others reports, such as a study by Melissas *et al.*,[S7] showed that patients who underwent laparoscopic Roux-en-Y experienced greater weight loss but also had a greater percentage of long-term complications within 5 years. Laparoscopic sleeve gastrectomy is an especially safe and effective option for a PD patient with the ultimate goal of achieving an appropriate BMI to obtain a kidney transplant. The patient was able to resume the PD regimen immediately after surgery.

Table 3. Teaching points: considerations for obese end-stage renal disease patients for transplant

1. Transplantation is associated with better outcomes than continuing dialysis for end-stage renal disease patients.
2. PD patients who convert to HD with a central venous catheter have increased risk for infection and other complications.
3. Bariatric surgery can be safely performed in PD patients without needing backup HD.
4. After gastric sleeve surgery, patients may be maintained on PD safely using low-volume supine dialysis.

HD, hemodialysis; PD, peritoneal dialysis.

CONCLUSION

This case illustrates how PD patients undergoing bariatric surgery can be maintained successfully on PD after surgery without having to transition temporarily to HD. Providing the option to continue PD as opposed to HD allows the patient to avoid potential complications involved with a central venous catheter and leads to a goal weight suitable for transplantation. The purposes of this case report were to serve as a guide for how gastric sleeve surgery was performed on this patient without disrupting her existing PD modality and to advise physicians to continue PD in patients after bariatric surgery (Table 3).

DISCLOSURE

All the authors declared no competing interests.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Supplementary References.

Figure S1. Sample PD prescription during and after bariatric surgery.

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