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Gastric Emptying Time after Laparoscopic Sleeve Gastrectomy

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Abstract

Background : Bariatric surgery remains the only proven mechanism for inducing sustained and significant weight loss for morbidly obese patients. Glycemic control is better after the surgery. Changes in gastric emptying patterns which occurs in patients after surgical treatment may be contributing to weight loss and better glucose metabolism. The aim of the study is to see effect of Laparoscopic sleeve gastrectomy (LSG) on gastric emptying time.

Methods: This was a prospective observational study. 24 patients were recruited who underwent LSG. The patients were submitted to the Gastric emptying study preoperatively and at 3 months after LSG. Gastric emptying time for solids was done.

Results: At 3 months the Excess weight loss was 24 %. Five of the 7 patients with diabetes had complete resolution. There was a significant decrease in the mean T 1/2 of gastric empting at 3 months postoperatively (83.4 min vs 33.3 min). No correlation was found between Gastric emptying half time and %EWL at 3 months.

Conclusion: Gastric emptying after LSG is accelerated in the majority of patients as shown by significantly reduced gastric emptying time. A faster gastric emptying could be one of the mechanisms contributing to weight loss after LSG

Keywords: Sleeve gastrectomy, morbid obesity, bariatric surgery, Gastric emptying.

Introduction

The prevalence[1] of morbid obesity is increasing worldwide and presets a significant clinical problem. Laparoscopic sleeve gastrectomy (LSG)[2] is increasingly being used as a stand-alone procedure in bariatric surgery with long-term follow-up data emerging. The major advantages of this procedure appear to be a lower post-operative morbidity than laparoscopic roux-en-y gastric bypass (LRYGB) and biliopancreatic diversion, with superior weight loss compared with laparoscopic adjustable gastric banding (LAGB)[3].

Altered gastrointestinal motor function[4] has been observed in morbidly obese patients but its significance is incompletely understood.LSG is a restrictive procedure and thus should lead to slower gastric emptying but recent studies have shown a faster gastric emptying after sleeve gastrectomy. The changes in GLP-1[5], GIP and

Peptide YY seen after LSG are similar to LRYGB. An accelerated gastric emptying time could be responsible for it. Therefore gastric emptying could have a major role in glycemic control after this procedure. The data on gastric emptying is not consistent. Moreover, data of gastric emptying post LSG in Asian population is very scant.

This study was planned to study the effect of LSG on gastric emptying time and its possible role in weight loss and resolution of type 2 diabetes mellitus.

Materials and Methods

Patients: The Study was done at the Dept of General Surgery, All India Institute of Medical Sciences, New Delhi. Data was collected prospectively for all patients from June 2012 to June 2014. For this prospective study, we recruited 24 patients who underwent LSG. All LSGs were performed over a 36 Frbougie. Stapling was done using either ECHLON 60 or ENDO GIA 60.The study was given ethical clearance by the ethics subcommittee of the institute .The patients were submitted to the Gastric emptying study preoperatively and 3 months post operatively after LSG.

Seven of the patients in the study group were known diabetics, either on OHA or insulin.

Table1: Patient demographics Preoperatively

	Mean
Sex (F:M)	12:4
Age (years)	38.87 (19–62)
Weight (kg)	129.1
BMI (kg/m2)	49.8
Diabetes	7/16
HbA1c (%)	6.64
Fasting blood sugar (mg/dl)	134.43

Gastric emptying Scintigraphy: The study was performed in the morning after an overnight fast. Gastric emptying time for solids was done. 0.5 mCi of Tc 99 labelled sulfur colloid was mixed with rice cake (idli), around 100 gm in weight. The patient ingested the idli and was placed in lying down position under gamma camera. All subjects tolerated the study well and there were no adverse effects.

Data Acquisition: Scintigraphic imaging was performed with gamma camera (Seimen Double head gamma camera) equipped with a collimator. Left anterior oblique view was obtained. A sequential static acquisition was started after the patients ate the idli, obtaining 30 sec frame at 0, 15, 30, 45 and 60 min using a 128 x 128 matrix. Between each measurement the patients were allowed to sit.

Data Processing: Processing was done on Seimen Esoft workstation. Automatic processing software (gastric emptying static protocol) was used. Region of interest was drawn around the stomach in each image. A time activity curve was generated and gastric half time (T1/2) was calculated.

Statistics Analysis: The data was collected and stored using a Microsoft Office Excel program, and then analyzed with STATA (Data analysis and statistical software). We analyzed the data by using descriptive statistics (mean and SD). Differences were considered statistically significant for p values less than 0.05.

Results

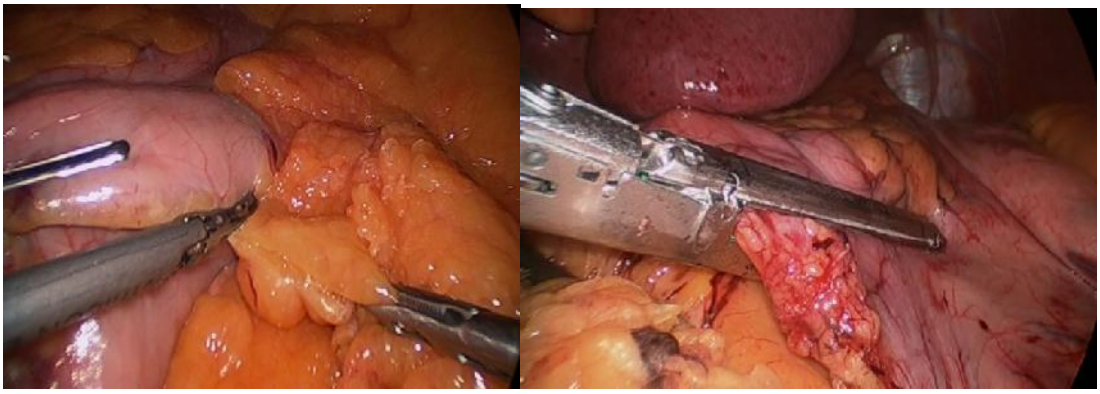
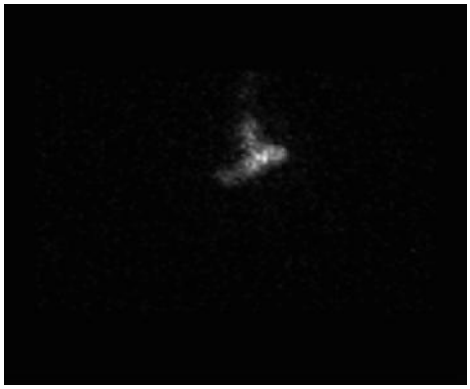
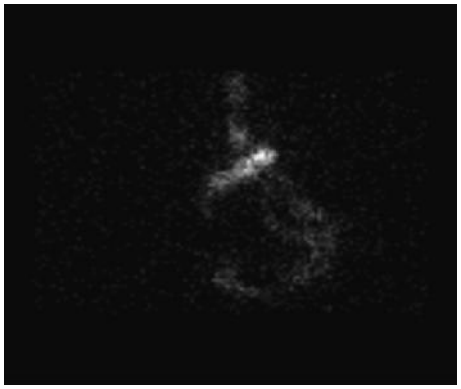


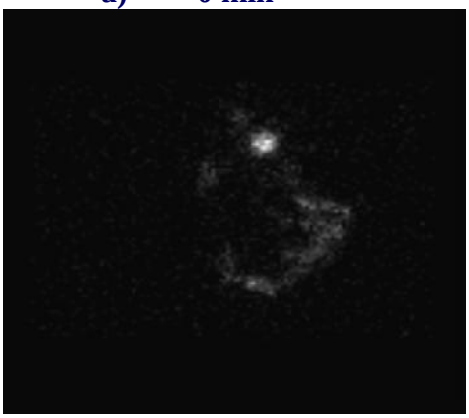
Figure 1: Sleeve Gastrectomy a) Division of Omentum b) Stapler firing to create sleeve (All India Institute of Medical Sciences, Department of General Surgery)



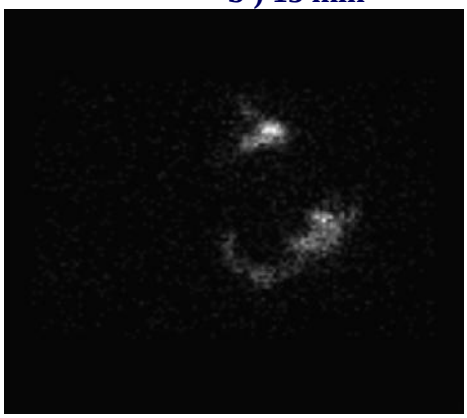
a) 0 min



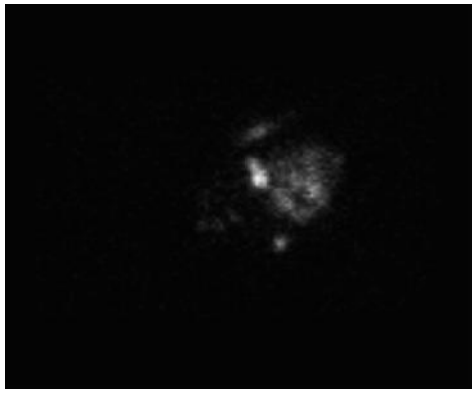
b) 15 min



c) 30 min

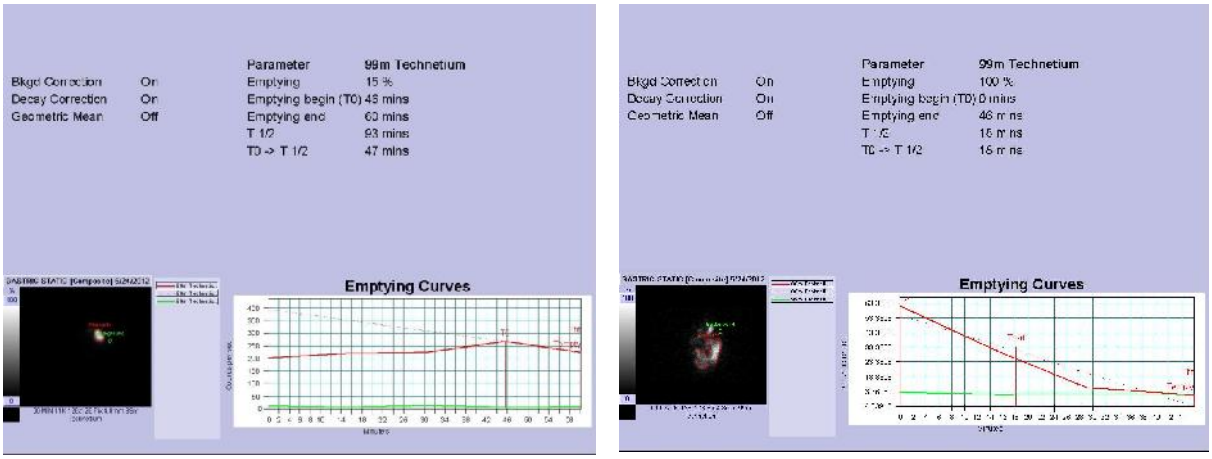


d) 45 min



e) 60 min

Figure 2 : ACQUIRED GET IMAGES POST OP 3 months Scan (Static images at 0min, 15min, 30min, 45min and 60 min of study)



a) **b)**

Figure 3: Curves generated after processing a) Pre op GET study b) post op 3 month GET study

At 3 months the Excess weight loss was 24 %. Five of the 7 patients with diabetes had complete resolution while the remaining 2 patients had marked improvement but were still on anti-diabetic drugs.

Gastric Emptying Time study was done in the preoperative period and 3 months after surgery.

As shown in table, mean T 1/2 of gastric empting was 83.4 min and 33.3 min before and 3 months after LSG, respectively. In each patient, solid emptying was characterized by a lag phase followed by a linear emptying.

The patients had a significantly reduced gastric emptying time in the postoperative scan.

Table 2: Impact of LSG on Gastric Emptying Half Time

	PREOP	3 Months	P value
GET T1/2 (min)	83.4±8.53	33.3±8.26	<0.05

P value <0.05 is significant

No correlation was found between Gastric emptying half time and %EWL at 3 months. Gastric emptying half time was not associated with any patient characteristics (e.g., BMI, age, gender).No patient reported dumping symptoms. One patient reported increased reflux symptoms.

Discussion

Normal gastric emptying is characterised by a lag phase, when the ingested meal remains in the stomach, and is followed by a linear emptying phase. The half-empting time is about 90 min in normal subjects and is not different in obese individuals. Diabetic patients can have gastropareisis and increased gastric emptying half time.

Gastric Emptying time was calculated for patients undergoing LSG. Our results indicate that gastric emptying for solids occurs significantly faster at 3 months following LSG. The time required for half of the solid meal to leave the stomach (*T*1/2) was significantly altered following LSG, indicating that the stomach empties solid foods rapidly and possibly incompletely processed, into the duodenum. The mean T1/2 before surgery was 83.4 min and at 3 months was 33.3 min.

Excision of the fundus and absence of receptive relaxation, as well as alterations in the contractile activity in the proximal stomach are possible explanations for the decreased *T*1/2 found in this study.

LSG induces weight loss by reducing food intake, but in accelerated gastric emptying, delivery of nutrients to the small intestine early in the eating cycle could activate small intestine satiety inducing chemoreceptors that could modify food ingestion periodicity. Increases in the response of gastrointestinal hormones, such as glucagon-like peptide-1 (GLP-1)[5,6] a meal-related satiation factor, have been reported after LSG. This type of response may be caused by the food quickly reaching the level of the small intestine due to accelerated gastric emptying. GLP-1 stimulates insulin secretion, inhibits glucagon secretion, bowel motility, and reduces appetite and food intake. Additionally, GLP-1 has trophic effects on the beta cell. Increased GLP-1 secretion can improve the glycemic control in diabetic patients. Thus faster gastric emptying could also lead to better glucose homeostasis and contribute to resolution of diabetes after sleeve gastrectomy.

A number of studies including this study have shown that gastric emptying after sleeve gastrectomy is accelerated. This raises the possibility of a potential association between accelerated gastric emptying and weight loss after LSG.

Melissas et al[7] showed that solid gastric emptying before and after LSG (with morbidly obese patients acting as their own controls) was accelerated. Braghetto et al[8] confirmed this in their subsequent study, showing acceleration for liquids and solids (78 – 38 min). Shah et al[9]showed acceleration of gastric emptying time and small bowel transit time by at least 25 % in diabetic patients undergoing LSG. However, a study by Bernstine et al[10] which measured gastric emptying in patients before and 3 months after LSG showed no effect on gastric emptying. Although faster gastric emptying is a mechanism for weight loss, there was no correlation found between the weight loss and the difference between the preoperative and postoperative gastric emptying half time.

No symptoms of dumping occurred in any patient despite an accelerated gastric emptying. This can be attributed to the fact that pylorus was preserved during LSG.

A drawback of our study is that it had both diabetics and non-diabetics. Diabetics have altered gastrointestinal motility and this could have influenced the results on gastric emptying. There could have been under-estimation in the acceleration of gastric emptying due to this.

Conclusion

Gastric emptying after LSG is accelerated in the majority of patients as shown by significantly reduced gastric emptying time. A faster gastric emptying could be one of the mechanisms contributing to weight loss after LSG.A decreased gastric emptying half-time after LSG can also possibly contribute to better glucose homeostasis in patients with T2DM.

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