

# Endoscopy Used as Provocative Testing in Bariatric Surgery: An Analysis of the Texas Public Use Data File

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## ABSTRACT

**Background:** Many bariatric surgeons test the anastomosis and staple lines with some sort of provocative test. This can take the form of an air leak test with a nasogastric tube with methylene blue dye or with an endoscopy. The State Department of Health Statistics in Texas tracks outcomes using the Texas Public Use Data File (PUDF).

**Methods:** We queried the Texas Inpatient and Outpatient PUDFs for 2013 to 2017 to examine the number of bariatric surgeries with endoscopy performed at the same time. We used the International Classification of Diseases Clinical Modification Version 9 (ICD-9-CM) and ICD-10 procedure codes and Current Procedural Terminology for Sleeve Gastrectomy (SG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) and endoscopy, and the ICD-9-CM and ICD-10 diagnosis codes for morbid obesity.

**Results:** There were 74,075 SG reported in the Texas Inpatient and Outpatient PUDF for the years 2013–2017. Of the SG performed, 5,521 (7.4%) had an intraoperative endoscopy. For the 19,192 LRYGB reported, 1640 (8.6%) underwent LRYGB + endoscopy. This was broken down by SG only vs SG + endoscopy and LRYGB only vs LRYGB + endoscopy. Overall, SG + endoscopy had a significantly shorter length of stay (LOS) vs LRYGB + endoscopy at 1.74 d vs 2.34 d ( $P < .001$ ) and a significantly less cost of \$71,685 vs \$91,093 ( $P < .001$ ).

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**Conclusions:** A small percentage of SG and LRYGB patients underwent endoscopy for provocative testing over the study period. Provocative testing with endoscopy costs more for SG and LRYGB and was associated with a shorter LOS.

**Key Words:** Bariatric surgery, Intraoperative endoscopy, Leak test, Roux-en-Y gastric bypass, Sleeve gastrectomy.

## INTRODUCTION

Many bariatric surgeons will test the anastomosis and staple lines with some sort of provocative test. This can take the form of an air leak test with an orogastric tube, with methylene blue dye, or with endoscopy. The intraoperative leak test is commonly performed, but its usefulness has been called into question as leaks have become very rare events in metabolic and bariatric surgery (MBS). Sleeve gastrectomies (SG) are even more unlikely than laparoscopic Roux-en-Y gastric bypass (RYGB) to have a leak intraoperatively.<sup>1,2</sup> In a review of more than 300 patients who underwent SG with intraoperative endoscopy, only a single leak was reported.<sup>3</sup> But proponents of intraoperative endoscopy point to its effectiveness in detecting leaks intraoperatively, which can be immediately addressed.<sup>4</sup>

The State Department of Health Statistics in Texas tracks outcomes using the Texas Public Use Data File (PUDF). We used the Inpatient PUDF (IPUDF) and Outpatient PUDF (OPUDF) to determine the incidence of endoscopy as a provocative test at the time of MBS. The primary outcome of interest was the number of bariatric cases with intraoperative endoscopy. Secondary outcomes of interest included length of stay, inpatient versus outpatient status, cost, demographics, discharge status, and ancillary diagnoses.

## METHODS

The Texas Inpatient PUDF and Outpatient PUDF for 2013 to 2017 was queried to examine the number of bariatric surgeries that had an endoscopy performed at the same time.<sup>5,6</sup> We used the International Classification of Disease

Version 9 Clinical Modification (ICD-9-CM) and ICD-10 procedure codes and Current Procedural Terminology (CPT) codes for SG and RYGB and endoscopy, and the ICD-9-CM and ICD-10 diagnosis codes for severe obesity. We used the ICD-9-CM diagnosis for obesity (278.01, 278.03, 278.8), bariatric surgery status (V45.86), and body mass index (BMI) (V85.41, V85.42, V85.43, V85.44, V45.86, V85.45, V85.30, V85.31, V85.32, V85.33, V85.34, V85.35, V85.36, V85.37, V85.38, V85.39). For the time period beginning with the third quarter 2015, ICD-10 codes were used including: E66.01 (obesity), Z98.84 (bariatric surgery status); and Z68.35, Z68.36, Z68.37, Z68.38, Z68.39, Z68.4, Z68.41, Z68.42, Z68.43, Z68.44, Z68.45 (BMI codes). For ICD-9-CM procedure codes we used 43.82 (SG), 44.38 (LRYGB), 44.39 (distal LRYGB), and 42.23 (endoscopy). CPT codes are used in the OPUDF. The included codes were 43,235 (endoscopy), 43,775 (SG), 43,644 (LRYGB), and 43,645 (distal LRYGB). The ICD-10 procedure codes were 0D164ZA (LRYGB), 0DB64Z3 (SG), and 0DJ08ZZ (endoscopy). A data use agreement was obtained from the Texas Department of State Health Services.

Multiple outcomes were examined. For continuous outcomes, such as length of stay (LOS) in days, initial analyses involved the performance of t-tests using an  $\alpha$  of 0.05. Multiple linear regression with LOS as the outcome variable was performed. Fisher's exact test was used if an expected value was less than five. Statistical significance was set at a  $p$ -value of 0.05. We conducted a one-way analysis of variables (ANOVA) for patients who underwent SG and endoscopies (SG + endoscopy) from those who underwent GB and endoscopies (GB + endoscopy). Similar one-way ANOVAs were conducted for SG and

compared SG + endoscopy to SG only. The same was done for GB + endoscopy vs GB only.

## RESULTS

There were 74,075 SG reported in the Texas IPUDF and OPUDF from 2013 to 2017. Of the SG performed, 5,521 (7.4%) cases had an intraoperative endoscopy. For the 19,192 LRYGB reported, 1,640 (8.6%) underwent LRYGB + endoscopy. **Table 1** shows the differences in LOS and cost. This is broken down by SG only vs SG + endoscopy and LRYGB only vs LRYGB + endoscopy. SG patients had a shorter LOS than LRYGB, 1.81 d vs 2.36 d. Overall, SG + endoscopy had a significantly shorter LOS vs LRYGB + endoscopy at 1.74 d versus 2.34 ( $P < .001$ ) and a significantly less cost of \$71,685 vs \$91,093 ( $P < .001$ ).

In the OPUDF, 52.9% of the patients were white, 9.5% Hispanic, and 81.2% were female. In the IPUDF, 61% of the patients were white patients, 21.2% Hispanic, and 81.4% were female. The most common age range in both groups was 40–44 y.

## DISCUSSION

Our results from a large administrative database differ from other published results. We found a much lower rate of endoscopic provocative testing at the time of MBS. The largest study to date on this question was by Yolsuriyanwong et al. using the Metabolic and Bariatric Surgery Quality Improvement Program (MBSAQIP) database for 2015–2016.<sup>7</sup> They included testing such as methylene blue

**Table 1.**  
Comparison of Intraoperative Endoscopy by Procedure

Factor	Sleeve Gastrectomy Cohort	Intraoperative Endoscopy?		<i>p</i> -value
		Yes	No	
<b>N</b>	<b>74075</b>	<b>5512</b>	<b>68537</b>	
Length of Stay, mean (SD)	1.81 (2.79)	1.74 (1.83)	1.81 (2.86)	<b>0.006</b>
Total Charges, mean (SD)	67390.06 (53767.34)	71685.76 (42322.62)	67044.65 (54569.02)	<b>&lt;0.001</b>
Factor	Gastric Bypass Cohort	Yes	No	<i>p</i> -value
<b>N</b>	<b>19192</b>	<b>1640</b>	<b>17552</b>	
Length of Stay, mean (SD)	2.36 (3.63)	2.34 (2.71)	2.36 (3.69)	0.798
Total Charges, mean (SD)	84338.57 (80409.38)	91093.77 (65571.68)	83707.39 (81631.18)	<b>&lt;0.001</b>

N, number; SD, standard deviation

and orogastric tubes used for insufflation. Our study did not include those methods as administrative databases rely solely on coding. Since endoscopy has specific CPT codes, they are reported in administrative databases, while other types of provocative testing performed at the time of MBS will be missed. Out of 265,309 patients in the MBSAQIP who underwent SG (69.6%), RYGB (29.7%), or BPDDS (0.8%), intraoperative leak testing (IOLT) was performed in 81.9% of all patients. Endoscopy was used for 27.9% of the IOLTs and nonendoscopic methods (naso/orogastric tube insertion) were used for the remaining patients. In the MBSAQIP, SG had a lower rate of endoscopic testing than RYGB patients. We found similar results of a lower rate of endoscopy in SG patients. There was no statistical difference in leak rate between patients who underwent IOLT with endoscopy compared to non-endoscopic methods. We also found that there was a slightly increased length of operative time with endoscopic testing. Our study was not designed to look at outcomes such as operative times, as that data is not available in this administrative database.

It is difficult to fully determine the cause of this discrepancy between the reported use of intraoperative endoscopy in MBS nationally from what we found in the state of Texas. What is clear is that there is ongoing controversy regarding the utility of intraoperative endoscopy to find intraoperative leaks or prevent them postoperatively. Some authors have found no correlation with the use of IOLT leading to a decrease in the rate of postoperative leaks.<sup>8</sup> In addition, it is possible that the use of endoscopic IOLT may be underreported or under coded/billed in the state of Texas. This is plausible given that the Center for Medicare & Medicaid Services does not recognize intraoperative endoscopy as separate procedure, thus it is not reimbursed, decreasing the incentive for surgeons to code for the procedure.

There have been many single institutional series that have reported the efficacy of IOLT by endoscopy in detecting anastomotic leaks. A review of 342 LRYGB + endo cases by Al Hadad et al. found that IOLT by endoscopy carried a positive predictive value of 75% and a negative predictive value of 99.5%.<sup>9</sup> Of the 6 patients (1.75%) with a positive air leak test, 5 were repaired intraoperatively and 1 had a persistent leak requiring drain placement and continued conservative postoperative management. In the same study, Al Hadad et al. found that out of 336 patients with a negative air leak test, 2 (0.59%) were diagnosed postoperatively with a leak and required reoperation. Another study involving a randomized controlled trial of 100 RYGB patients found patients undergoing IOLT by endos-

copy (n = 50) had a significantly lower rate of postoperative anastomotic leak and reoperation as compared to the control (0 vs. 8%,  $P = 0.04$ ).<sup>10</sup> They also reported that IOLT by endoscopy was associated with a shorter LOS (2.44 vs. 3.46 d,  $P = .03$ ) and longer operative time (194.10 vs. 159 min,  $P < .001$ ). In an earlier paper using the MBSAQIP, we found that in the total population of patients who had a drain placed, there was an increased PR of 2.24 (95% confidence interval (CI): 2.2 – 2.29,  $P < .001$ ) of undergoing a provocative test to check the anastomosis/staple line.<sup>11</sup> This finding may indicate that the surgeon who performed the provocative test felt uncomfortable with the anastomosis/staple line and left the drain as an early warning.

Due to the anatomic differences in SG vs. LRYGB (i.e., no anastomosis), the utility of IOLT in SG has been questioned. Staple line leak is the most common cause of major morbidity in SG, but is usually seen within the first week. Sakran et al. found an incidence of leak of 1.5% in an evaluation of 2,834 patients, with the most common location being close to the gastroesophageal junction.<sup>12</sup> Importantly, they found the average time to leak to be 7 d and reoperation was required in 61% of patients. Bingham et al. reported the lack of actionable information given from IOLT, as they reported a 2.4% leak rate in SG with none of the leaks being identified on IOLT.<sup>13</sup> Of note, methylene blue was not utilized in this study, as the IOLT testing performed utilized orogastric or endoscopic insufflation. One multicenter study reported a leak incidence of <1% when using air insufflation to diagnose an intraoperative leak; the IOLT was negative in 91% of these patients with only 24% utilizing endoscopy for testing.<sup>14</sup> Since most leaks are not manifest on IOLT and there is incidence of staple line leak is low, the efficacy of routine IOLT has been questioned. This view is supported by other large studies showing no correlation between IOLT and postoperative staple line leak.<sup>8,14</sup> The use of endoscopy during SG may decrease secondary findings such as these.

This study examined the rate of IOLT by endoscopy in a large administrative database and we were able to evaluate our outcome of interest with confidence. We feel this is an important way to both check our clinical databases, such as the MBSAQIP, and possibly validate (or not) the findings. This also gives a glimpse of what really happens in clinical practice. Although administrative databases are not the right medium to delve into clinical detail, they can be used to evaluate common surgical practices.

### Strengths and Limitations

This paper has all the usual limitations of a descriptive retrospective review. Administrative databases rely heavily on coding of diagnoses and procedures. If the coding is incorrect, then they are susceptible to the “garbage in, garbage out” effect that is common in database management and analysis. The state of Texas has statutory requirements for maintenance of this database, but how the data is reported is left to each individual hospital. Another weakness of this study, also related to the database, is that patients whose surgery was performed at ambulatory surgery centers that are exempt from reporting will not be included, which could be a significant number of SG patients.

### CONCLUSIONS

Provocative testing with endoscopy is a common method of reviewing the integrity of an anastomosis or staple line in bariatric surgery. In a large state administrative database, a small percentage of SG and LRYGB patients underwent endoscopy for provocative testing over the study period. These findings were significantly different from findings reported in the MBSAQIP. Furthermore, provocative testing with endoscopy costs more for SG and LRYGB and was associated with a shorter LOS.

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