Retrospective Review of Staple Line Leak in Sleeve Gastrectomy

Aman Ali, MD[1-3]; Jeffrey Hodges, MD[1,2]; Farshad Amirkosravi, MD[1,2]; Sara Yasrebi[1,4]; Rukan Huq[1,4]; John Paek, DO[1]; Patrick Reardon, MD, FACS[1,2]
[1]Department of Surgery, Division of Foregut and Minimally Invasive Surgery, Houston Methodist Hospital, Texas Medical Center, Houston, Texas, USA
[2]Department of Surgery, Weill Cornell Medical College, Houston Methodist Hospital, Houston, TX, USA
[3]Division of Minimally Invasive Surgery, Department of Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA
[4]Department of Surgery, College of Medicine, Texas A&M University, Houston, Texas, USA

ABSTRACT

Staple line leak remains a rare, but one of the most feared complications of laparoscopic sleeve gastrectomy. We sought to identify which patient-specific and procedural factors influenced patient likelihood of postoperative staple line leak. Our study did not find any patient-specific factors, which increased likelihood of staple line leak, nor did we identify any specific operative intervention, which reduced or increased risk of staple line leak.

Background

Over 100,000 laparoscopic sleeve gastrectomy procedures are performed annually in the United States. One of the rare, but most feared postoperative complications of sleeve gastrectomy is gastric staple line leak. Staple line leak rate has been reported between 0.7 and 7% in recent literature. Multiple operative interventions, including energy devices, staple height, reinforcement, and oversewing have been proposed to prevent staple line leak, however data regarding the efficacy of these interventions remains sparse.

Objectives

This study sought to identify patient-specific and procedural factors contributing to or preventing staple line leak including use of different energy devices, staple types, staple heights, number of staples, staple reinforcement, and over-sewing of staple line.

Methods

We performed retrospective cohort analysis of data on patient who underwent laparoscopic sleeve gastrectomy between 2005 and 2019 at our center. Patient demographics, comorbidities, procedure details including type of energy device (LigaSure, Ethicon Enseal, Ethicon Harmonic, other vessel sealer), staple type (Ethicon, Covidien, da Vinci Sureform, GORE Seamguard), open staple height (range 2.5mm to 4.8mm), staple line suturing (none, complete, selective), and staple line clipping were compared for postoperative staple line leak. Postoperative leak was confirmed radiographically with extravasation of contrast. Differences across groups were determined by Fisher's exact test for categorical variables and multiple logistic regression analysis was performed to determine if any factors contributed to postoperative staple line leak.

Results

1213 patients who underwent sleeve gastrectomy. All patients had bougie size of 36 French or larger (median 40 Fr). Only two patients (0.2%) had postoperative staple line leak. There was no observed difference in staple line leak with respect to age, gender, height, weight, BMI, or comorbidities . There was also no significant difference in gastric staple line leak between various energy devices (p = 0.72), staple type (p = 1.00), staple height (p = 0.82), number of staples (p = 0.07), staple suturing or clipping (p = 1.00).

	Total	No leak	Leak	p-value
	(N=1213)	(n=1211)	(n=2)	
Age (years), median (IQR)	43.0 (35.0, 53.0)	43.0 (35.5, 53.0)	42.0 (33.0, 51.0)	0.79
Gender				0.39
Female	947 (78.1)	946 (78.1)	1 (50.0)	
Male	266 (21.9)	265 (21.9)	1 (50.0)	
Height (inches), median (IQR)	65.0 (63.0, 68.0)	65.0 (63.0, 68.0)	38.5 (5.0, 72.0)	0.84
Weight (lbs), median (IQR)	260.0 (230.0, 308.0)	260.0 (230.0, 307.6)	279.4 (248.8, 310.0)	0.70
Body mass index, median (IQR)	43.5 (40.0, 49.1)	43.5 (40.0, 49.2)	41.7 (41.4, 42.0)	0.53
ESRD on dilaysis				1.00
No	1182 (97.6)	1180 (97.6)	2 (100.0)	
Yes	29 (2.4)	29 (2.4)	0 (0.0)	
Cirrhosis				1.00
No	1190 (98.3)	1188 (98.3)	2 (100.0)	
Yes	21 (1.7)	21 (1.7)	0 (0.0)	
Liver transplantation				1.00
No	1204 (99.6)	1202 (99.6)	2 (100.0)	
Yes	5 (0.4)	5 (0.4)	0 (0.0)	
Left ventricular assist device (LVAD)				1.00
No	1199 (99.2)	1197 (99.2)	2 (100.0)	
Yes	10 (0.8)	10 (0.8)	0 (0.0)	

	Total	No Leak	Leak	p-value
Energy Device				0.72
Ligasure	329 (27.1)	329 (27.2)	0 (0.0)	
Enseal	227 (18.7)	227 (18.7)	0 (0.0)	
Harmonic	627 (51.7)	625 (51.6)	2 (100.0)	
Vessel sealer	15 (1.2)	15 (1.2)	0 (0.0)	
Unknown	15 (1.2)	15 (1.2)	0 (0.0)	
Staple type				1.00
Ethicon	835 (68.8)	833 (68.8)	2 (100.0)	
Covidien	353 (29.1)	353 (29.1)	0 (0.0)	
Sureform	11 (0.9)	11 (0.9)	0 (0.0)	
Seamguard	4 (0.3)	4 (0.3)	0 (0.0)	
Unknown	10 (0.8)	10 (0.8)	0 (0.0)	
First Staple height				0.82
Blue Ethicon	33 (2.8)	33 (2.8)	0 (0.0)	
Gold Ethicon	253 (21.2)	252 (21.2)	1 (50.0)	
Green Ethicon	510 (42.7)	509 (42.7)	1 (50.0)	
Black Ethicon	37 (3.1)	37 (3.1)	0 (0.0)	
Gold Covidien	3 (0.3)	3 (0.3)	0 (0.0)	
Purple Covidien	113 (9.5)	113 (9.5)	0 (0.0)	
Black Covidien	234 (19.6)	234 (19.6)	0 (0.0)	
Green Sureform (robotic)	5 (0.4)	5 (0.4)	0 (0.0)	
Blue Gore Seamguard	1 (0.1)	1 (0.1)	0 (0.0)	
Black Seamguard	4 (0.3)	4 (0.3)	0 (0.0)	

Results Continued

	Total	Leak	No Leak	P-value
Number of staples	6.0 (5.0, 6.0)	6.0 (5.0, 6.0)	6.5 (6.0, 7.0)	0.07
Suture				1.00
Nothing	274 (22.6)	274 (22.6)	0 (0.0)	
Selective suturing	100 (8.2)	100 (8.3)	0 (0.0)	
Entire suturing	746 (61.5)	744 (61.4)	2 (100.0)	
Clip placement	71 (5.9)	71 (5.9)	0 (0.0)	
Selective suturing+clip placement	1 (0.1)	1 (0.1)	0 (0.0)	
Entire suturing+clip placement	13 (1.1)	13 (1.1)	0 (0.0)	
Unknown	8 (0.7)	8 (0.7)	0 (0.0)	

Conclusion

In this study there was no observed benefit in reducing gastric staple line leak by using larger staple height, staple reinforcement, or over-sewing the staple line. We also acknowledge that a larger study may be needed to find a statistical difference for a rare postoperative complication such as staple line leak.

References

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