Published in final edited form as:

J Gastrointest Surg. 2014 September ; 18(9): 1678–1682. doi:10.1007/s11605-014-2512-6.

A Novel Technique for Wound Protector Deployment and Efficient Specimen Extraction Following Laparoscopic Sleeve Gastrectomy

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Abstract

Challenges of specimen extraction during laparoscopic sleeve gastrectomy and other resectional laparoscopic procedures can often be proven to be time consuming and frustrating, and the risk of wound infection and port site tumor implantation increases. In this paper, we discuss our experience with an efficient approach to specimen extraction utilizing a novel technique for deployment of a very small self-expanding wound protector through a 12- or 15-mm port. We also report our observations with regard to the learning curve of this technique and the influence of BMI to retractor insertion times and specimen extraction times during laparoscopic sleeve gastrectomy.

Keywords

Wound protector; Laparoscopic sleeve gastrectomy; Specimen extraction

Introduction

Specimen extraction during laparoscopic surgery often offers significant challenges due to the size of the tissue being removed relative to the fascial defect. In obese patients with a large amount of fat between the skin and fascia, additional difficulties can be encountered. Whereas solid masses often require significant enlargement of the fascial defect of the port site, pliable structures such as the stomach, small intestine, or colon (depending upon the surgical pathology) will frequently mold in such a way that they can be extracted through a relatively small defect given the right conditions. Useful adjuncts to specimen removal include retrieval bags and self-expanding wound protectors which not only protect the wound from contamination but also provide a smooth, almost lubricated surface for the specimen to slide out more readily. However, in obese patients, it can be difficult to properly place the inner ring of the retractor through the small fascial defect when traversing a large amount of subcutaneous fat. The purpose of this paper is to describe a novel technique for insertion of a very small, self-expanding wound protection device for specimen extraction

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Conflict of interest: All authors declare that they have no conflict of interest.

during laparoscopic sleeve gastrectomy. In addition, we sought to make observations regarding the learning curve of this technique of device insertion and the relationship of patient BMI to insertion time, as well as the relationship of BMI to specimen extraction time.

Materials and Methods

The Applied Medical mini-Alexis wound retractor (Applied Medical, Rancho Santa Margarita, CA) was introduced into our laparoscopic sleeve gastrectomy (LSG) technique in August 2012. All patients in whom the device was used for LSG since this time were reviewed. Device insertion time and specimen extraction times (once the device had been inserted) were obtained for 16 nonconsecutive LSG patients starting about 7 months after the introduction of the product at our institution in a time period from August 2012 to March 2013. Patients were excluded if insertion and/or extraction was timed incorrectly or if times were not documented in the operative notes. All demographic information and data pertaining to patient outcomes for bariatric surgery patients are kept in an IRB-approved, prospectively maintained database with QA performed monthly for all complications.

For LSG, four 5-mm Applied trocars and one 15-mm applied trocar are used. The specimen is naturally extracted via the largest port site using the mini-Alexis wound retractor also made by Applied Medical. Placement of the device is accomplished in the following steps. First, the black tab attached to the string used for removal of the retractor is cut off (Fig. 1). Next, the small green ring (intracorporeal side) is grabbed with a laparoscopic grasper and collapsed so that it can be placed down the trocar (Figs. 2 and 3). After making sure that the ring is now through the trocar, the larger white ring (extracorporeal side) is collapsed and placed into the trocar until about two third of its length remains outside the skin when viewed through the port (Figs. 4 and 5). The backside of the white ring is then held in place with a laparoscopic grasper and the trocar withdrawn while steadying the white ring with the grasper. The white ring is then flipped down until tight with the skin where it will hold the fascial defect open to its maximal size (Figs. 6 and 7). Once the specimen is removed, the 12- or 15-mm port can be placed directly through the center of the wound protector for completion of the procedure (Fig. 8). The port site is then closed using the laparoscopic suture passing needle.

To determine if use of the device was associated with BMI, the correlation of insertion and extraction times with BMI was evaluated using Pearson's correlation coefficients with 95 % confidence intervals.

Results

We performed LSG on 63 patients from August 2012 until March 2013 after the introduction of the device into our technique. One minor wound complication was noted, though one patient was noted to have an intra-abdominal abscess in the periumbilical region (away from the specimen extraction site). Mean time for insertion of the device was 29.1 ± 15 s, and mean time for extraction of the specimen was 49.5 ± 41.1 s (Table 1). Seventy-five percent of the time, the device was inserted in less than 30 s. Almost 44 % of the timed

extractions took 30 s or less, 25 % took 31–60 s, and approximately 19 % took 61–90 s. In addition, 12.5 % took longer than 90 s, with the longest extraction time being 150 s. Scatterplots comparing BMI to extraction times indicate a trend toward increasing extraction times with higher BMI (Fig. 9; $r=0.48$, 95 % CI=[-0.016, 0.790], $p=0.058$). The correlation between BMI and insertion time was not significant ($r=-0.38$, 95 % CI=[-0.740, 0.136], $p=0.141$).

Discussion

Plastic ring wound protectors have been used for several years in general and colorectal surgery to aid in exposure and decrease the incidence of surgical site infection. Several studies have demonstrated decreases in wound infection rates in open appendectomy, colon resection, and nontraumatic gastrointestinal surgery with the use of wound protection devices.^{1–4} In contrast, Kercher found that plastic wound protectors did not affect wound infection rates following laparoscopically assisted colectomy in a retrospective study of 141 patients.⁵ A recent meta-analysis of six randomized controlled trials representing 1,008 patients evaluating whether these wound protectors reduce the risk of surgical site infection (SSI) after gastrointestinal and biliary tract surgery found a significant decrease in the SSI rate with the use of a wound protector with a relative risk of 0.55 compared to unprotected wounds.⁶ On a microscopic level, wound protectors seem to decrease exposure of the skin and subcutaneous tissue to enteric organisms during GI surgery by about 50 %.⁷ None of the literature, however, examines the use of these wound protectors in laparoscopic surgery. In this particular description, we use the wound protector for laparoscopic sleeve gastrectomy, which has a wound infection rate of about 1 %. Given the low incidence of SSI in this context, it would require approximately 5,000 patients in each group of a prospective trial to show a 50 % decrease in SSI following LSG. Although the utility of wound protection devices during laparoscopic surgery is not proven, their utility in aiding specimen extraction may be underappreciated.

We noted that insertion times remained remarkably consistent over the months the data was collected, indicating that either the learning curve was past when we started keeping track of the insertion times or that there really is not a significant learning curve to the technique. Based on our experience, we would make the argument that there really is not any appreciable learning curve effect beyond the first one or two cases.

With regard to extraction of the specimen, we did observe a trend line on the scatterplot of BMI vs. extraction time that indicated a trend toward increased extraction times with increasing BMI, though our longest extraction time occurred in a patient whose BMI was only 47. Our longest extraction times also seemed to be influenced by incomplete decompression of the stomach prior to stapling, leaving the resected specimen with retained air and fluid.

This through-the-trocar technique of deploying the mini-Alexis wound retractor has been found to be by far the easiest and most expeditious method of introducing this type of wound protector through a trocar site incision. Although we have not formally studied procedure times comparing them before and after incorporation of this technique,

subjectively, the technique saves time and physical effort in extracting the resected stomach during sleeve gastrectomy and is potentially useful in any laparoscopic operation where specimen extraction is necessary through as small a hole as possible. Tissue trauma is minimized by use of the trocar to guide the inner ring directly into the abdomen as opposed to trying to find the proper tract through the skin, subcutaneous tissues, and fascia of an obese patient. The wound retractor also provides a smooth, almost lubricated surface through which the specimen can be pulled, allowing safe and minimally traumatic removal through the smallest defect possible. Both 12- and 15-mm Applied ports can be used for insertion of the device, though the resected stomach from an LSG is subjectively more difficult to remove through the smaller fascial defect of the 12-mm Applied port. In addition to ease of placement and simplification of tissue extraction, the ability to then place the port back through the wound retractor without loss of pneumoperitoneum for the completion of the procedure is beneficial.

While this paper describes our preliminary experience with this technique and device in laparoscopic sleeve gastrectomy, we have also utilized it during other laparoscopic operations for benign disease requiring specimen retrieval such as partial gastrectomy, revision of gastric bypasses, and small bowel resections. In addition, we have used it for protection of the gastric port site wound when performing gastric remnant access for laparoscopically assisted ERCP. The overall case numbers for each of these other types of procedures were small at the time of this writing but will be sufficient for more meaningful reporting of outcomes at a later date.

Conclusion

Utilization of a through-the-trocar technique to place the mini-Alexis wound protector allows the device to be placed quickly with minimal tissue trauma and manipulation even in very thick abdominal walls. Specimen extraction during LSG is very smooth and efficient through the wound protection device. Studies comparing operative time and wound infection rates at the extraction sites before and after incorporation of this technique would be beneficial to see whether these subjective and logical benefits translate into definable clinical benefit, though the already low rate of wound infection in LSG would require extremely high numbers of patients in order to demonstrate superiority with regard to SSI prevention. We have found use of this device and this easy and novel method of insertion to have application to many operations beyond LSG.

Acknowledgments

The authors would like to thank the artists at Applied Medical for their drawings of our intraoperative photographs.

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Fig. 1.
Alexis XXS wound protector

Fig. 2.
Insertion of small ring with laparoscopic grasper

Fig. 3.
Intracorporeal view of small ring

Fig. 4.
Placement of large ring into trocar

Fig. 5.
Stabilization of large ring with laparoscopic grasper

Fig. 6.
Wound protector after trocar removal

Fig. 7.
Intracorporeal view of completed insertion

Fig. 8.
Replacement of port through wound protector

Fig. 9.
Relationship of BMI to extraction time

Table 1

Device insertion and specimen extraction times

Surgeon	Insertion time (s)	Extraction time (s)	BMI
AP	22	33	40.55
AI	75	62	37.69
AP	30	150	46.83
JG	30	16	38.31
AP	40	120	55.07
AP	20	45	45.64
JG	20	35	49.21
JG	20	46	45.67
AP	20	90	55.98
JG	20	12	47.15
JG	45	25	45.51
JG	27	17	39.81
JG	24	80	44.32
AP	30	25	42.22
AP	10	30	50.67
JG	33	6	42.13
Mean (s)	29.1±15	49.5±41.1	45.4

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