

## Special Article – Laparoscopic Gastrectomy

# Modified Laparoscopic Gastrectomy Approach using Pfannestiel Incision

Goldes Y\*, Ram E\*, Shwaarts C, Zillka N, Aharoni M, Gutman M and Rosin D

Department of Surgery B, Chaim Sheba Medical Center, Tel Aviv University, Israel

\*These authors equally contributed to this work

**\*Corresponding author:** Edward Ram and Goldes Y, Department of Surgery B' Sheba Medical Center at Tel Hashomer, Tel Aviv University, Israel

**Received:** August 20, 2019; **Accepted:** October 01, 2019; **Published:** October 08, 2019

## Abstract

**Background:** D2 gastrectomy for gastric carcinoma is a well-established procedure and is the standard of care in our institution for early gastric cancer. However, incisional hernias occur in at least 10% of patients undergoing midline laparotomies.

In general surgery, the Pfannenstiel incision has been described mainly in the context of sigmoidectomy, appendectomy, prostatectomy and inguinal hernia repair. In numerous studies, the Pfannenstiel group showed significantly lower rates of wound disruption, wound complications and superficial surgical site infection.

**Methods:** This was a single-center, retrospective review of prospectively collected clinicopathological characteristics of patients, surgical performance, postoperative outcomes and pathological data from 66 D2 subtotal/total gastrectomies performed *via* a Pfannenstiel incision, between November 2011 and January 2017, by a single surgeon at Sheba Medical Center, a tertiary center for foregut cancer.

**Results:** Of the 66 procedures, 40 were subtotal gastrectomy and 26 were total gastrectomy. The median age was 66 years. The average of 26 lymph nodes were dissected. The mean operative time was 245 minutes. Median length of hospital stay was 5 (5-30) days. Median time to basic alimentation was 2 (2-5) days and no patient had alimentation restored later than POD6. The rate of severe postoperative complications, classified using the Clavien-Dindo classification (> CD IIIa), was 11%. During the follow up period (18-84 months), one (1.5%) patient developed an incisional hernia.

**Conclusions:** During laparoscopic D2 gastrectomy, operative specimens can be extracted *via* a low transverse Pfannenstiel incision. This incision ensures the extraction of large specimens while preserving the aesthetic and functional advantages of laparoscopy without increasing the cancer risk. Avoidance of muscle cutting maintains the integrity of the abdominal wall and elicits minimal pain.

**Keywords:** Gastric carcinoma; Laparoscopic gastrectomy; Pfannestiel incision; Extraction site; Intact specimen

## Introduction

Gastric cancer is the fourth most commonly diagnosed malignancy worldwide, with nearly 990,000 cases per year, and is the second leading cause of cancer mortality, with an estimated 738,000 deaths per year [1]. In the United States, there are approximately 21,300 cases diagnosed and more than 10,300 deaths yearly [2]. In Israel, the disease is more common in men than women, estimated at 387 cases per 100,000 and 254 cases per 100,000, respectively. In addition, it is more common among Jewish than Arab citizens, with a rate of 641 cases per 100,000 versus 71 cases per 100,000, respectively [3].

Laparoscopic surgery is gaining popularity among minimally invasive surgeons and is now being applied to a broad number of surgical procedures. The benefits of small trocar site incisions versus large, muscle-cutting, open incisions are well documented. Laparoscopic D2 gastrectomy (LG) for gastric cancer was pioneered

in Eastern Asia. The first laparoscopy-assisted distal gastrectomy with lymph node dissection for gastric cancer, was performed in 1994 by Kitano and colleagues [4]. The advantages of LG include minimal degree of pain, improved quality of life, early return to social activity, shorter hospital stay, early rehabilitation, earlier return of bowel function and equivalent lymph node harvest [5-7]. The cost of these benefits includes longer operating and learning curve times for laparoscopic resections [8-10]. Numerous retrospective and prospective, randomized studies showed that laparoscopic gastric resection for cancer is both feasible and safe, with no increased morbidity when compared with open resection [11-13]. These studies also demonstrated no difference in postoperative complication rates [14].

Incisional hernias occur in at least 10% of patients with midline laparotomies. Moreover, after the first incisional hernia repair, recurrence rates of up to 53%, have been reported [15]. Incisional hernia often leads to undesirable aesthetic appearance, discomfort,

pain, and intestinal obstruction [16]. Port site hernia is a type of incisional hernia that occurs at port or trocar sites after laparoscopic surgeries; it is a rare complication and usually occurs through the larger ports or incision used during the laparoscopy. The incidence of port site hernia varies between 1% and 6% [17].

In 1900, Hermann Johannes Pfannenstiel described a low transverse abdominal incision to prevent incisional hernia [18]. This incision, that now bears his name, is of choice for a variety of surgical and gynecologic operations. Aesthetic scars and fewer post-operative complications are some of the advantages of this technique; nerve entrapment, can be a disadvantage of this approach [19]. In general surgery, the Pfannenstiel incision has been described mainly in the context of sigmoidectomy, appendectomy, prostatectomy and inguinal hernia repair [20] and is commonly chosen as it provides for good cosmetic results with potentially less pain compared with incisions of other orientations. However, only several reports have described its use in laparoscopic gastrectomy, all of which involved a very small sample size, and failed to detail long-term morbidity.

In the past few years, laparoscopic gastrectomy has become standard of care in our department at Sheba Medical Center. We primarily perform LG for gastric cancer, using the Pfannenstiel incision for specimen extraction. The aim of this study was to present our experience and the long-term outcomes of laparoscopic gastrectomy using the Pfannenstiel incision.

## Materials and Methods

### Patient selection

All adult patients who underwent laparoscopic gastrectomy for gastric cancer in Sheba Medical Center between 2010 and 2017 were included in this retrospective analysis. After discharge, the patients was followed up in out-patient surgical and oncological clinics. At each visit, a senior surgeon examined the abdomen and scar and potential incisional hernia, defined as any palpable fascial defect of the abdominal wall.

### Opérative technique

The patient was placed in a supine position, with spread legs. A total of 6 trocars were inserted: one 5mm trocar at the umbilicus, for the camera, one 5mm trocar on both sides of the subcostal-anterior axillary line, one 5mm (right) and one 10mm (left) trocar in midclavicular line between the umbilicus and the subcostal trocars, and finally, one 12mm trocar which was inserted suprapubically. This port was used for stapler insertion, and was later extended to a Pfannenstiel incision for specimen extraction. After extraction of the specimen, the incision was closed and the 12mm trocar was re-inserted for further use.

## Results

In total, 66 patients (32 males and 24 females) with gastric cancer underwent LG. Median age was 66 years (range: 43-89) and median Body Mass Index (BMI) was 26 (24-28). The majority of patients (n=65; 98.5%) had an American Society of Anesthesiologists (ASA) score of 2 or 3. Only 1 (1.5%) patient had an ASA score of 4. There were three cases (7%) of conversion to laparotomy. Subtotal gastrectomy was performed in 40 (60.6%) patients and total gastrectomy in 26 (39.4%) patients.

The mean operative time was 245 minutes. The average of 26 lymph nodes were dissected.

The Naso-Gastric (NG) tube was removed on Post-Operative Day (POD) 1 in 54 (81.8%) patients, on POD2 in 11 (16.6%) patients, and on POD5 in 1 (1.6%) patient. Median time to basic alimentation was 2 days (2-5) and no patient had alimentation restored later than POD6. Operation-related complications included duodenal stump leak in 3 patients, anastomotic bleeding in 4 patients, and delayed gastric emptying in 1 patient. The rate of severe postoperative complications, classified using the Clavien-Dindo classification (> CD IIIa), was 11%. Median length of hospital stay was 5 (5-30) days. During the follow up period (18-84 months), one (1.5%) patient developed an incisional hernia.

## Discussion

Surgery is the cornerstone treatment of gastric cancer, with the goals of laparoscopic surgery for gastric cancer being to minimize surgical insult and to maximize patient quality of life. In general surgery, different incisions are used to access the abdomen; the vertical incisions are the most used by surgeon for open abdominal surgery. Among these, paramedian incisions, which are made to one side of the midline, result in a scar that is stronger than a midline scar, but has no cosmetic advantage, while the vertical subumbilical midline incision provides for rapid abdominal entry and less bleeding. These incisions can be extended up or downwards as needed. Complications of vertical midline incisions include wound dehiscence, incisional hernia and fewer cosmetic scars [21]. Laparoscopy has become the preferred surgical technique for almost all abdominal surgeries, due to associated shorter hospital stays, simpler recovery and improved cosmetic results, depending on factors including surgical technique and surgeon experience. Adequate training for laparoscopy and instruments reduce the avoidable complications, especially hernia [21]. In our study, incidence of port-site hernia or incisional hernia was documented in one patient (1.5%). In the medical literature, laparoscopic site hernia incidence ranges from 0.08-3.6% [22,23].

Samia et al. [24] reported on an overall incisional hernia rate of 7% after 480 colorectal laparoscopic surgery; of these, 84% were midline incisional hernias. The hernia rates for ostomy site extraction, Pfannenstiel incision and muscle splitting were 4.8% 3.8% and 2.3%, respectively. In another study, Orcutt et al. [25] retrospectively analyzed 171 patients who had laparoscopic colorectal cancer surgery, and compared the complications rates of the Pfannenstiel versus the midline incision for specimen extraction. The Pfannenstiel group had significantly lower rates of wound disruption (0% vs. 13%, p=0.02), wound complications (13% vs. 30%, p=0.04) and superficial surgical site infection (7% vs. 22%, p=0.03). In a multivariate analysis of risk factors for surgical site infection and incisional hernia after laparoscopic colorectal surgery, Drosdeck et al. [26] found that the use of a Pfannenstiel extraction site was associated with lower infection rates; however, the association was not statistically significant.

Most laparoscopic surgeons use an incision in the upper abdomen to extract the specimen. When considering cosmesis, some surgeons may be reluctant or may feel it unwarranted to make a "new" incision during laparoscopic surgery for intact specimen removal. In many studies, the Pfannenstiel incision showed fewer post-operative complications, such as incisional hernia and aesthetic scar [18-20].

The results of our study suggest that the Pfannenstiel incision in laparoscopic gastrectomy for gastric cancer is associated with favorable long-term outcomes, with low risk of post-operative ventral hernia.

Patients undergoing gastric cancer-related surgery are exposed to potential operative risks and may experience post-operative morbidity and mortality. The operative specimen can be extracted via a low transverse Pfannenstiel incision during laparoscopic D2 gastrectomy. This incision ensures the extraction of large specimens while preserving the aesthetic and functional advantages of laparoscopy without increasing the cancer risk. To our knowledge, this is the first study that describes a large number of patients undergoing laparoscopic gastrectomy using the Pfannenstiel incision for specimen extraction site. Further studies are needed to further establish this surgical approach.

## References

- Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. *CA Cancer J Clin*. 2011.
- American Cancer Society. What Are the Key Statistics About Stomach Cancer? 2011 stomach-cancer-key-statistics. 2019.
- National Gastric Registry Israel Ministry of health. 2019.
- Kitano S, Iso Y, Moriyama M, Sugimachi K. Laparoscopy-assisted Billroth I gastrectomy. *Surg Laparosc Endosc*. 1994; 4: 146-148.
- Buunen M, Veldkamp R, Hop WC, Kuhry E, Jeekel J, Haglund E, et al. Survival after laparoscopic surgery versus open surgery for colon cancer: long-term outcome of a randomised clinical trial. *Lancet Oncol*. 2009.
- Angst E, Hiatt JR, Gloor B, Reber HA, Hines OJ. Laparoscopic surgery for cancer: a systematic review and a way forward. *J Am Coll Surg*. 2010.
- Gotoda T, Yanagisawa A, Sasako M, Ono H, Nakanishi Y, Shimoda T, et al. Incidence of lymph node metastasis from early gastric cancer: estimation with a large number of cases at two large centers. *Gastric Cancer*. 2000; 3: 219-225.
- Sica GS, Iaculli E, Biancone L, Di Carlo S, Scaramuzza R, Fiorani C, et al. Comparative study of laparoscopic vs open gastrectomy in gastric cancer management. *World J Gastroenterol*. 2011.
- Scatizzi M, Kroning KC, Lenzi E, Moraldi L, Cantafio S, Feroci F. Laparoscopic versus open distal gastrectomy for locally advanced gastric cancer: a case-control study. *Updates Surg*. 2011.
- Orsenigo E, Di Palo S, Tamburini A, Staudacher C. Laparoscopy-assisted gastrectomy versus open gastrectomy for gastric cancer: a monoinstitutional Western center experience. *Surg Endosc*. 2011.
- Huscher CG, Mingoli A, Sgarzini G, Sansonetti A, Di Paola M, Recher A, et al. Laparoscopic versus open subtotal gastrectomy for distal gastric cancer: five-year results of a randomized prospective trial. *Ann Surg*. 2005; 241: 232-237.
- Kim YW, Baik YH, Yun YH, Nam Bh, Kim DH, Choi JJ, et al. Improved quality of life outcomes after laparoscopy-assisted distal gastrectomy for early gastric cancer: results of a prospective randomized clinical trial. *Ann Surg*. 2008; 248: 721-727.
- Kim HH, Hyung WJ, Cho GS, Kim MC, Han SU, Kim W, et al. Morbidity and mortality of laparoscopic gastrectomy versus open gastrectomy for gastric cancer: an interim report - a phase III multicenter, prospective, randomized trial (KLASS Trial). *Ann Surg*. 2010; 251: 417-420.
- Cai J, Wei D, Gao CF, Zhang CS, Zhang H, Zhao T. A prospective randomized study comparing open versus laparoscopy-assisted D2 radical gastrectomy in advanced gastric cancer. *Dig Surg*. 2011.
- Cahalane MJ, Shapiro ME, Silen W. Abdominal incision: decision or indecision? *Lancet*. 1989; 21: 146-148.
- Mudge M, Hughes LE. Incisional hernia: a 10 year prospective study of incidence and attitudes. *Br J Surg*. 1985; 72: 70-71.
- Di Lorenzo N, Coscarcella G, Lirosi F, Pietrantuono M, Suanna F, Gaspari A. Trocars and hernias: a simple, cheap remedy. *Chir Ital*. 2005; 57: 87-90.
- Easton L. Hermann Johannes Pfannenstiel (1862-1909). *Br J Obstet Gynaecol*. 1984; 91: 538-541.
- Tollefson DG, Russell KP. The transverse incision in pelvic surgery. *Am J Obstet Gynecol*. 1954; 68: 411-422.
- Sippo WC, Captain MC, Burghardt A, Gomez A. Nerve entrapment after Pfannenstiel incision. *Am J Obstet Gynecol*. 1987; 157: 420-421.
- Bruyere F, Sun J, Cosson JP, Kouri G. Incarceration of bowel through opening of a 5mm port. *J Endourol*. 2004; 18: 675-676.
- Bergermann JL, Hibbert ML, Harkins G, Narvaez, Asato A. Omental herniation through a 3-mm umbilical trocar site: unmasking a hidden umbilical hernia. *J Laparoendosc. Adv Surg Tech A*. 2001; 11: 171-173.
- Voiculescu S, Jitea N, Burcos T, Cristian D, Angelescu N. Incidents, accidents and complications in laparoscopic surgery. *Chirurgia (Bucur)*. 2000; 95: 397-399.
- Samia H, Lawrence J, Nobel T, Stein S, Champagne BJ, Delaney CP. Extraction site location and incisional hernias after laparoscopic colorectal surgery: should we be avoiding the midline. *Am J Surg*. 2013.
- Orcutt ST, Balentine CJ, Marshall CL, Robinson CN, Anaya DA, Artinyan A, et al. Use of a Pfannenstiel incision in minimally invasive colorectal cancer surgery is associated with a lower risk of wound complications. *Tech Coloproctol*. 2012.
- Drosdeck J, Harzman A, Suzo A, Arnold M, Abdel-Rasoul M, Husain S. Multivariate analysis of risk factors for surgical site infection after laparoscopic colorectal surgery. *Surg Endosc*. 2013.