

Single-Incision Laparoscopic Surgery (SILS) Assisted Sigma Resection Via Pfannenstiel Incision for Complicated Diverticulitis

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Abstract

Background: Single-incision laparoscopic surgery (SILS) is frequently used for indications such as appendectomy, cholecystectomy or sigmoid surgery. Usually, an umbilical incision is used as access and for specimen retrieval. However, the umbilical access for SILS is linked with technical limitations in the pelvic area. Here we use a Pfannenstiel incision for SILS sigma or anterior rectum resection for complicated diverticulitis.

Methods: An SILS sigma or anterior resection was performed using a Pfannenstiel access to the abdominal cavity. A Gelport (Applied Medical) with three trocars was used. In one patient, an elective resection after initially conservative treatment for a covered perforation was performed, two patients underwent resection due to an abscess and fistula (into the urinary bladder or vagina), and in two patients an early resection was performed due to abdominal abscesses. All patients suffered from sigmoid diverticulitis, which was stage IIb according to Hansen and Stock.

Results: The operation time ranged from 89 to 280 min. There were no conversions, and no additional trocars were used. The postoperative hospital stay ranged from 5 to 14 days. All patients were discharged without any intraoperative or postoperative complications.

Conclusions: SILS sigma or anterior rectum resection for complicated diverticulitis can be performed via a Pfannenstiel incision. This approach provides direct visualization and access into the pelvis as well as the option to benefit from open surgery devices. The Pfannenstiel incision may generally be recommended for the favorable cosmetic effect and the very low rate of incisional hernias, as reported in the literature.

Key words: SILS, laparoscopic sigmoid resection, diverticulitis, Pfannenstiel incision

Introduction

Sigmoid diverticulitis is one of the most common diseases in the Western world with increasing incidence. The spectrum ranges from the asymptomatic diverticulosis to severe inflammation with perforation and peritonitis [1]. In patients presenting with clinical signs, a CT scan will usually confirm the diagnosis.

In the past, sigmoid resection was performed in case of complications or as elective surgery after a second episode [2,3].

Today, many authors recommend using

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Corresponding author: PD Dr. med. Arne Dietrich Chirurgische Klinik II Universität Leipzig Liebigstr. 18 04103 Leipzig, Germany arne.dietrich@medizin.uni-leipzig.de the staging according to Hansen and Stock for indicating surgery [4,5]. While conservative therapy is recommended in stage IIa, surgery is indicated after initial conservative antibiotic treatment in stage IIb. Whether sigmoid resection should be done in an early or late elective interval is still discussed controversially. Depending on the clinical course, surgery should either be performed early within 7 to 10 days or (technically less difficult) late after 4 to 6 weeks. Urgent surgery is necessary in case of free perforation and/or peritonitis [4,6].

Laparoscopic sigmoid resection is now considered the standard procedure for acute or recurrent sigmoid diverticulitis. Recently, the SILS technique (Single-incision laparoscopic surgery) has been extended to sigmoid resection. Usually, this procedure is performed via a "scarless" umbilical access [6-11].

For the SILS sigmoid resection, we used a Pfannenstiel incision for the following reasons: 1. improved intraoperative handling, 2. favorable cosmetic outcome, and 3. a comparably low rate of incisional hernias.

In addition, this approach facilitates direct visualization of and access to the lower abdomen and pelvis. Moreover, open surgery devices can be used if appropriate. The use of this technique for complicated diverticulitis has not been described yet in the literature.

Material and Methods

In a modified lithotomy position, SILS sigmoid or anterior rectum resection was performed using a Pfannenstiel access to the abdominal cavity (5 to 7cm horizontal skin and fascia incision and vertical middle line separation of the rectus muscles). The GelPort[™] Laparoscopic System (including the New Alexis[™] Retractor and the GelSeal[™] cap, Applied Medical, Rancho Santa Margarita, CA, USA) with three 10mm trocars placed in a triangular fashion was used, which is similar to the technique described by Ragupathi et al. [12]. For application of stapling devices, one 10mm trocar was substituted by a 12mm trocar.

A 30° 10mm laparoscopic camera and standard laparoscopic instruments were used. The patients were placed in a steep Trendelenburg position with their left side elevated. The small bowel was gently swept out of the pelvis, and the sigmoid and descending colon were mobilized on the avascular gerota plane in a lateral-to-medial fashion. The pelvic splanchnic nerves, left ureter

and left gonadal vessels were kept in distance (not visualized) and preserved.

After tunneling the mesorectum at the posterior bowel wall, the upper rectum was divided, as described below for the individual patients. Then, close to the bowel wall, the mesocolon was divided using Ultracision (Ethicon EndoSurgery, Norderstedt, Germany).

The mobilized sigmoid was extracorporalized through the New Alexis[®] wound retractor, divided a few centimeters orally of the diseased segment, and prepared with a purse-string suture. According to the measurement, the anvil of an ECS29 or 33 circular stapling device (Proximate[®] ILS, Ethicon Endo-Surgery, Norderstedt, Germany) was inserted and fixed. The bowel was returned into the abdomen, the pneumoperitoneum reestablished, and an end-to-end colorectal anastomosis fashioned. The donuts were inspected, with an air insufflation test being performed to confirm anastomosic integrity. Following port removal, the incision was closed with single layer running sutures in a layered fashion.

All patients suffered from sigmoid diverticulitis, which was stage IIb according to Hansen and Stock. No patient had relevant previous abdominal surgery in his/her history.

All specimens were sent for histopathological examination. Length was measured without tension.

Results

Patient 1 (elective late resection): A 62-year-old woman was admitted via accident and emergency with pain in the left lower abdomen and increased inflammatory parameters (WBC 19; CRP 200). A CT scan confirmed acute sigmoid diverticulitis with a covered perforation and free local fluid. A conservative treatment including antibiotics was started, and the patient recovered clinically and paraclinically soon. Four weeks later, she was readmitted for elective sigmoid resection.

As described above, SILS sigma resection was performed via a Pfannenstiel incision. Apart from adhesions of the sigmoid, there were no other pathological findings.

Following mobilization, the rectosigmoid was divided with an Echelon[™] Flex 60 Endopath[®] stapler (Ethicon Endo-Surgery, Norderstedt, Germany) about 4 cm below the sacral promontory. The resected sigmoid measured 12.5 cm and corresponded to the inflammatory affections. Descendorectostomy was performed using a 29mm circular stapler in a double stapling technique. The operation time was 89 min.

Postoperatively, there were no complications at all, with the patient being discharged on day 6.

Patients 2 and 3 (fistulae): An 86-year-old male patient was admitted into trauma surgery due to a complex ankle fracture, and underwent internal fixation. In the postoperative course, he developed signs of a severe urinary tract infection. An antibiotic treatment was started, with the further diagnostic work-up showing acute sigmoid diverticulitis with an abscess formation and fistula into the bladder (Figure 1).

The patient was transferred to our clinic and underwent SILS sigma via a Pfannenstiel incision. Following digital release of inflammatory adhesions involving the abdominal wall, small bowel and omentum, the port was inserted. The highly inflamed sigmoid was released from the bladder. As known from the CT scan, we found an abscess formation in the bladder wall and a fistula. The next steps were performed via the open port as an "open" procedure. The inflamed and perforated bladder wall area (4.5 x 3.5 cm) was resected, and the bladder



Figure 1. CT scan of an 86-year-old male patient suffering from acute complicated sigmoid diverticulitis (arrow: abscess formation and fistula into the bladder).

was closed with a double layer running suture.

About 3 cm below the promontory and below the bladder suture, the rectosigmoid was divided over a purse-string suture. Again, laparoscopy was performed, and as described above, the sigmoid was mobilized close to the bowel wall, externalized, and a 23cm sigmoid was resected. Descendorectostomy was performed using a 33mm circular stapler. A local drain was placed. The operation time was 120 min. Two weeks after the operation, a cystography was performed with a normal result and no leakage. The urinary catheter was removed and the patient discharged.

A 61-year-old female was admitted for elective sigma resection for a fistula from the sigmoid into the vagina (Figure 2), which was diagnosed 3 weeks prior. The operation was performed as above, with the vagina instead being oversewn. The length of the resected sigmoid was 15 cm.

The operation time was 134 min. The patient was discharged on day 6; there were no complications.

Patients 4 and 5 (abscess formation): In an outpatient abdominal ultrasound scan for lower abdominal pain in a 71-year-old male, an abscess due to suspected perforated sigmoid diverticulitis was diagnosed, with the patient being sent to our emergency room. A CT scan proved the diagnosis, a 9x5.5x4cm abscess formation of the left lower abdomen in addition to two smaller lesions, also suspicious of an abscess (Figure 3). For



Figure 2. CT scan of a 61-year-old female suffering from complicated sigmoid diverticulitis (filling of the sigmoid following a vaginal contrast medium application).



Figures 3 and 4. CT scan of a 71-year-old male patient, showing acute covered perforated sigmoid diverticulitis with a 9x5.5x4cm abscess formation (arrow) of the left lower abdomen on the plain scan (Figure 3) and following CT-guided drain application (arrow) with contrast medium application via the drain (Figure 4).

further therapy, he was admitted. Relevant comorbidity was a BMI of 34.

The patient had suffered from little pain only. Relevant serum parameters were: WBC 15.4; CRP 523 and Quick 7% (marcumar overdosing).

Following substitution of clotting factors, a drain was placed into the huge abscess guided by a CT scan (Figure 4). The abscess was flushed continuously, and antibiotics were given. The patient was clinically fine, with the inflammatory parameters being dropped.

Eight days after draining the abscess, laparoscopic SILS sigma rectum resection was performed. The Pfannenstiel incision was performed, and the abdominal wall was digitally freed from the adherent small bowel to place the port.

The former abscess cavity was opened; there was no further pus. The omentum, small bowel and sigmoid were completely fixed by adhesions, which had to be freed step by step. During this procedure, 5 interenteric abscesses were opened. Two small bowel serosa defects were oversewn. The rectosigmoid was dissected until non-inflamed rectal tissue was exposed; about 2 cm below the promontory, the rectum was divided with a stapler and further mobilized, as described above. Finally, the sigmoid was externalized, with a 20cm segment being resected. Still in the fashion of an open device, the descendorectostomy was performed with a 33mm circular stapler by using the open surgery head grasper. Again, laparoscopy was performed, the abdomen flushed with NaCl 0.9%, and two local abdominal drains and a subcutaneous redon drain were placed. Here, mainly due to the extensive adhesiolysis, the operation time was 280 min.

The drains were removed in time, with i.v. antibiotics being continued for another 7 days. On day 11 after the operation, the patient was discharged after an uneventful course.

A 53-year-old woman was admitted via accident and emergency with pain in the left lower abdomen. A CT scan confirmed acute sigmoid diverticulitis with a small abscess toward the uterus. Drainage was not indicated. A conservative treatment including antibiotics was started, with the patient recovering clinically and paraclinically soon, and 5 days later the sigma resection was performed as above. As known from the CT scan, the covered perforation toward the uterus with a little abscess was found. The operation time was 120 min, and the length of the resected bowel was 15 cm. Five days after the operation, the patient was discharged and there were no complications.

In summary, five consecutive patients underwent successful SILS anterior rectosigmoid resection for complicated diverticulitis through a Pfannenstiel incision. All patients were operated and discharged without any intraoperative or postoperative complications. There was no relevant blood loss. Besides the Gelport, no additional trocars were used.

The descendorectostomy was performed using a circular stapler device in all cases. To discontinue the rectosigmoid aborally and for anastomosis preparation,

different technical methods were used. A diverting loop ileostomy was not necessary.

Discussion

SILS surgery is a safe and feasible approach for various diseases, including colorectal resections. Promoters of the SILS technique argue mainly with the beneficial cosmetic effect. Usually, a so-called "scarless" (trans-) umbilical incision is used. However, there are also clear disadvantages of the single-incision access, such as the loss of instrument triangulation or less space for the surgical team. Here the handling improves with the number of performed operations in terms of a learning curve. Using a Pfannenstiel incision, there is a certain lower distance from the port to the area of operation, but we had no difficulties when using the laparoscopic approach, and very beneficial is the opportunity to use open surgery devices, such as described for the anastomosis (see below). The SILS operation from an umbilical incision leads to technical limitations, especially in the pelvic area, and so we used the Pfannenstiel incision for better access into this area, as described by Ragupathi et al. [12].

We also used this approach for cosmetical aspects, the very low rate of incisional hernias, and the option to use different (established standard) techniques for the anastomosis.

Here, for the descendorectostomy we used a circular stapler in all five patients. However, for dividing the rectum and distal anastomosis preparation, we used different techniques because different approaches appeared to be the most practical, safe and also less expensive option. Thus, an advantage of the Pfannenstiel incision is that open surgery devices for dividing the rectum and for anastomosis can be used. This approach is likely to reduce operation time and expenses, with the latter being mainly for not using any (laparoscopic) cutter to divide the bowel.

In addition, as in patients 2 and 3, there is an excellent access to the urinary bladder or vagina.

Compared to open surgery, one of the significant benefits of minimally invasive surgery is the lower rate of incisional hernias. However, to rescue the specimen and to prepare the anastomosis, at least one extended incision is necessary. There are only little data on the optimum access site with respect to the incidence of incisional hernias. In obstetrics the Pfannenstiel incision is commonly performed for a Caesarean section. In spite of an even larger incision, incisional hernias are a rare complication, which are found in case reports only and also in larger series not reported [13, 14].

In a prospective study, DeSouza et al. found the lowest rate after a Pfannenstiel incision and concluded that in laparoscopic colorectal surgery, this should be the incision of choice for specimen extraction or hand assistance [14].

Moreover, urologists favor the Pfannenstiel incision for specimen extraction, due to a lower rate of complications (including incisional hernias), when compared to expanded port-site incision [15].

Using this approach, we found no need to use other instruments than standard instruments, as others also do not do in SILS [12, 16]. In our experience, the mobilization of the splenic flexure is usually not necessary in case of non-oncological sigma resection for diverticulitis. However, to mobilize the splenic flexure, additional trocars or, in length, oversized bariatric instruments will be needed [12].

Further evaluation through increased experience and comparative studies is necessary to evaluate advantages and limitations of the SILS Pfannenstiel approach, especially for colectomy or colorectal cancer.

Conclusion

For complicated diverticulitis, the SILS technique through a Pfannenstiel incision is an excellent approach, due to a direct access to the diseased area, the option to save time and expenses by using open surgery devices and methods, a favorable cosmetic outcome, and a reportedly very low rate of incisional hernias.

Conflict of interest statement

The authors have no conflicts of interest to declare. **References**

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