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A safe, reliable, and efficient robot-assisted port site closure for robot-assisted gastrectomy

Noriyuki Hirahara [a,*], Takeshi Matsubara [a], Shunsuke Kaji [b], Yuki Uchida [a], Tetsu Yamamoto [a], Ryoji Hyakudomi [a], Hitomi Zotani [a], Koki Kawakami [b], Yuhei Sasaki [b], Yoshitsugu Tajima [a]

[a] Department of Digestive and General Surgery, Shimane University Faculty of Medicine, Japan
[b] Department of Surgery, Matsue Red Cross Hospital, Japan

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ABSTRACT

Introduction: The overall incidence of port site hernias in laparoscopy and robot-assisted surgeries ranges from 0% to 5.2%. Sufficient port site closure is essential to reduce and prevent the occurrence of port site hernia. However, complete fascial closure of 8-mm robot-port site appears to be difficult. In this study, we propose a safe and reliable robot-assisted port-site closure for robot-assisted gastrectomy.

Materials and methods: The robotic arm was tilted 60–70° cranially or caudally to create a small gap between the port and the skin margin that was cut open for port insertion. While viewing through the robotic camera and grasping the polydioxanone (PDS) thread, the Lapa-Her-Closure was inserted into the peritoneal cavity through the gap. The Lapa-Her-Closure was removed after the PDS thread was grasped with robotic forceps. Subsequently, the Lapa-Her-Closure was inserted into the abdominal cavity by tilting the arm cranially or caudally, in contrast to the previous step. The PDS thread was inserted into the loop wire using robotic forceps. After tightening the loop wire and grasping the PDS thread, the Lapa-Her-Closure was removed, and the PDS thread was ligated to complete the abdominal wall closure, with total closure of the fascia and peritoneum.

Results and conclusions: We utilized this port site closure technique in 12 patients who underwent robot-assisted gastrectomy for gastric cancer. The procedure was accomplished safely and efficiently in all cases without any technical problems. In conclusion, our port site closure is safe, reliable, and efficient procedure that can be performed using basic surgical techniques.

1. Introduction

Since the first report of port site hernia following gynecologic laparoscopy in 1968, various efforts have been made to reduce the incidence of port site-related complications [1]. The overall incidence of port site hernia in laparoscopy and robot-assisted surgeries ranges from 0% to 5.2%, but the true incidence may be higher due to underdiagnosis or underreporting [2]. In many institutions around the world, regardless of the robotic or laparoscopic technique, fascial closure is usually performed for port sites larger than 10 mm, while it is uncommon for 5-mm trocar sites. In a retrospective review by Ramon et al. of 178 patients who underwent robotic general surgery, the incidence of robotic 8-mm port site hernia was 0.7%, while there was no occurrence of a 5-mm port site [3].

Routine closure of the fascia of robotic 8-mm port sites during robotic surgery is still debatable. In addition, complete fascial closure of an 8-mm port site appears to be difficult. In this study, we propose a safe and reliable robot-assisted port-site closure for robot-assisted gastrectomy.

2. Methods

For port placement: the camera port was inserted at the umbilicus, R2, using the open technique. An umbilical camera port was used for the 2nd robotic arm. For the 1st and 4th robotic arms, two ports were placed on the bilateral anterior axillary line at R1 and R4. For the 3rd robotic arm, an additional port was placed between the left midclavicular line and the midline, indicated by R3. In addition, an additional assist 12-mm port was placed between the umbilical port and the right port. These ports were placed approximately at the level of the umbilicus.

Port-site closure: The robotic arm was tilted 60–70° cranially or caudally to create a small gap between the port and the skin margin that

* Corresponding author. Department of Digestive and General Surgery, Shimane University Faculty of Medicin, 89-1 Enya-cho, Izumo, Shimane, 693-8501, Japan.
E-mail address: norinorihirahara@yahoo.co.jp (N. Hirahara).

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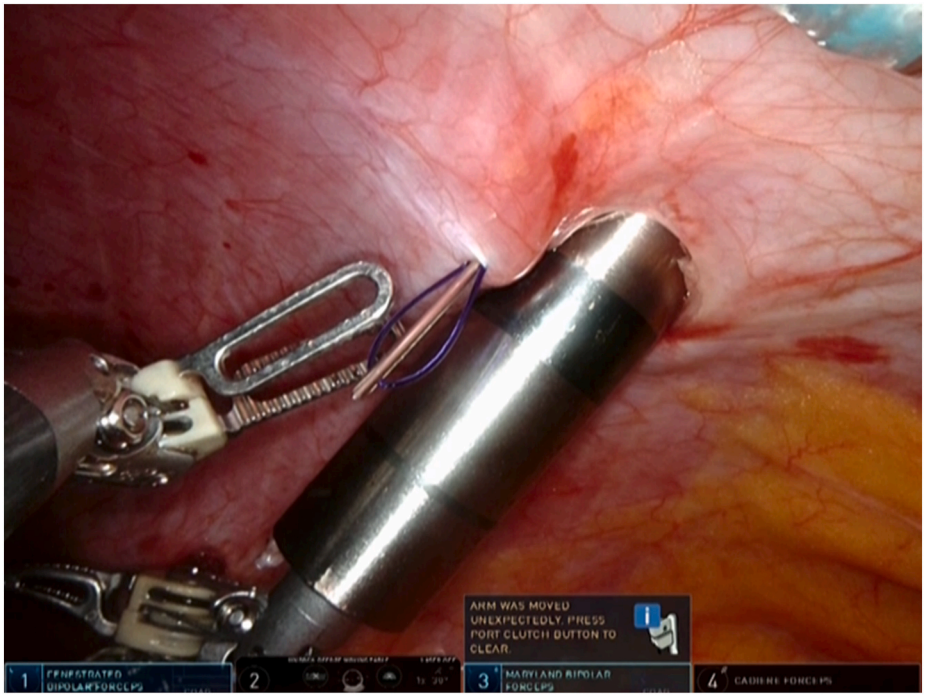

Fig. 1. The prepared Lapa-Her-Closure was inserted into the abdominal cavity.

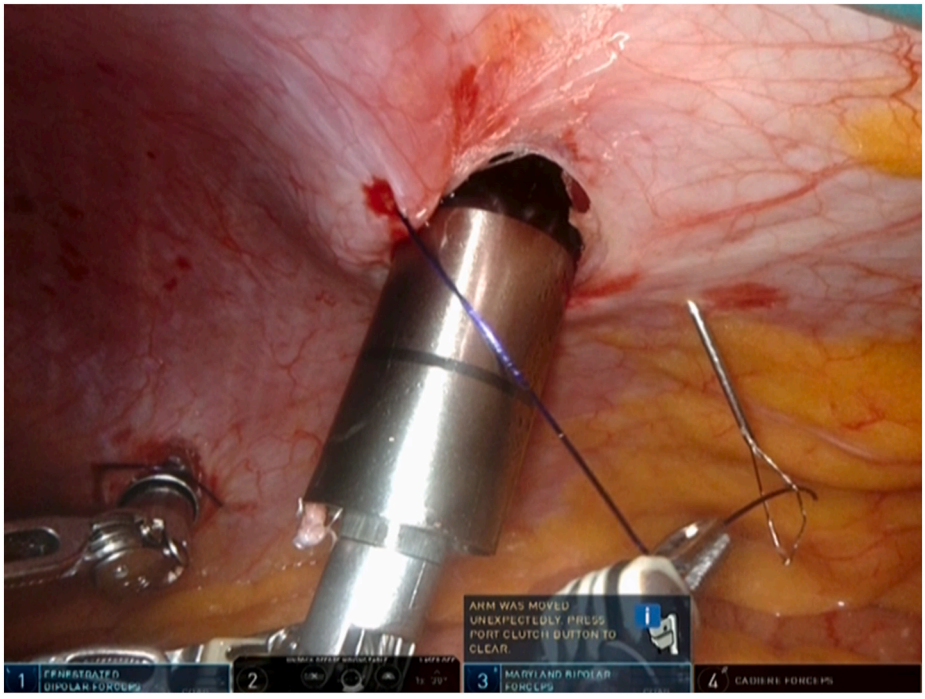

Fig. 2. PDS thread was inserted into the Lapa-Her-Closure loop wire, and grasped.

was cut open for port insertion. While viewing through the robotic camera and grasping the polydioxanone (PDS) thread, the Lapa-Her-Closure was inserted into the peritoneal cavity through the gap (Fig. 1). The Lapa-Her-Closure was removed after the PDS thread was grasped with robotic forceps. Subsequently, the Lapa-Her-Closure was inserted into the abdominal cavity by tilting the arm cranially or caudally, in contrast to the previous step. The PDS thread was inserted into the loop wire using robotic forceps (Fig. 2). After tightening the loop wire and grasping the PDS thread, the Lapa-Her-Closure was removed, and the PDS thread was ligated to complete the abdominal wall closure, with total closure of the fascia and peritoneum (Fig. 3). The camera and third arm port or assist port were difficult to visualize with the camera because they were near each other. The port wound can be easily visualized by rotating the 30° perspective mirror by 180° and changing it from a downward to an upward view.

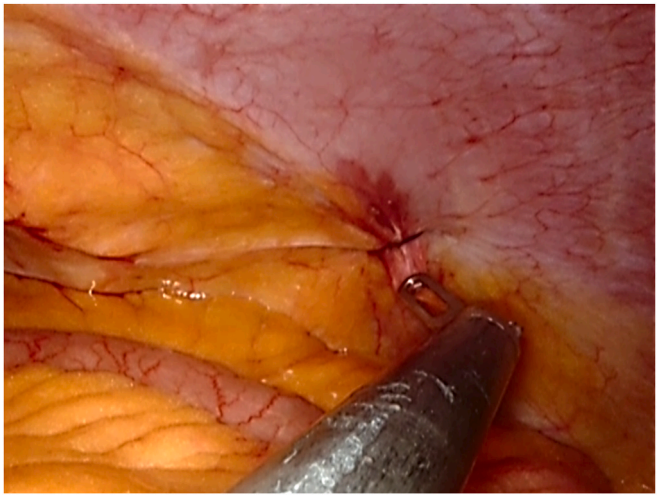

Fig. 3. Port-site peritoneum was grasped with a Maryland dissector to complete the abdominal wall closure.

3. Results

We utilized this port site closure technique in 12 patients who underwent robot-assisted gastrectomy for gastric cancer. The procedure was accomplished safely and efficiently in all cases without any technical problems.

4. Discussion

Risk factors associated with port site hernia are divided into patient-related and surgery-related factors. According to a systematic review, patient-related risk factors include age of 60 years or older, BMI of 28 kg/m^2 or higher, poor nutritional status, diabetes mellitus, chronic cough, and smoking. Surgery-related risk factors include a port size of 10 mm or greater, a bladed port, port location, operative time of more than 80 min, and fascial defect and disclosure.

Robotic surgery is gaining popularity across all surgical fields due to its advantages over standard laparoscopic surgery. Robotic surgery uses bladeless working ports, measuring 8 mm or greater in cross-sectional diameter. The blunt tip trocars have the theoretical advantage of decreased risk port-site hernias because the fascia and muscle are not cut but split on insertion. In addition, the port is movable around the remote center, so that the traumatic torque at the port site does not increase regardless of the direction of arm movements. However, if the remote center is either too shallow or too deep relative to the fascial layers, unexpected torque can potentially result in larger fascial damage, which may lead to an increase in port site damage. In any case, sufficient port site closure is essential to reduce and prevent the occurrence of port-site hernia [2,4,5]. We utilized this port site closure technique in all patients and the procedure was accomplished safely and efficiently without any technical problems.

In conclusion, our port site closure is a safe, reliable, and efficient procedure that can be performed using basic surgical techniques.

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Ethical approval

Not applicable.

Consent

Authors obtained written and signed consent to publish a case report from the patient (or, where applicable, the patient's guardian or next of kin) prior to submission.

Author contribution

Noriyuki Hirahara was the lead author and surgeon for all patients. Takeshi Matsubara, Shunsuke Kaji, Yuki Uchida, Ryoji Hyakudomi, Tetsu Yamamoto, Kiyoe Takai, Yohei Sasaki, Koki Kawakami were the co-surgeon on the cases. Yoshitsugu Tajima was reviewed the paper and surgical technique. All authors red and approved the final manuscript.

Registration of research studies

1. Name of the registry: Not applicable
2. Unique Identifying number or registration ID:
3. Hyperlink to your specific registration (must be publicly accessible and will be checked):

Guarantor

Noriyuki Hirahara.

Declaration of competing interest

The authors declare that they have no competing interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.103001.

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