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Successful laparoscopic cholecystectomy for acute cholecystitis with kyphoscoliosis by the devised placement of trocar ports: A case report



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ABSTRACT

INTRODUCTION: Kyphoscoliosis, which is a deformity of the spine caused by aging and osteoporosis, results in various surgical difficulties for laparoscopic cholecystectomy (LC) due to low-lying costal arches, such as a small abdominal working space, disturbance of the surgical view and decreased controllability of the surgical instrument.

PRESENTATION OF CASE: We herein report the case of a 92-year old woman with severe kyphoscoliosis who was diagnosed with Grade II acute cholecystitis. Taking her general status into consideration, emergency percutaneous transhepatic gallbladder drainage (PTGBD) was initially performed. After PTGBD, the patient's physical status and systemic inflammation markedly improved. She then underwent interval LC. The surgical view of the upper abdomen including the gallbladder was entirely interrupted by bilateral low-lying costal arches with adhesion to the greater omentum. To access the gallbladder without interruption by the low-lying costal arch, the first umbilical port was changed to a multi-port with surgical glove and an additional port was added in the left abdomen. Consequently, LC was safely accomplished with the creation of the critical view.

DISCUSSION: A low-lying costal arch due to kyphoscoliosis can prevent surgeons from accessing the gallbladder. LC with the standard 4-port method could not be accomplished because of insufficient lifting of the low-lying costal arch. Devised placement of the ports is needed to access the gallbladder between bilateral low-lying costal arches.

CONCLUSION: A transumbilical multi-port and left abdominal port may be effective for successful LC of acute cholecystitis with kyphoscoliosis.

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1. Introduction

Kyphoscoliosis has various surgical difficulties during laparoscopic cholecystectomy (LC). LC has recently become the standard treatment for acute cholecystitis as well as gallbladder stones without inflammation. The updated Tokyo Guidelines 2013 (TG13) recommended LC over open cholecystectomy for acute cholecystitis due to a decreased postoperative hospital stay and incidence of complications [1]. We herein report a case of acute

cholecystitis with kyphoscoliosis that was successfully treated by interval LC following percutaneous transhepatic gallbladder drainage (PTGBD) and endoscopic retrograde cholangiography (ERC).

2. Presentation of case

A 92-year-old woman was taken by ambulance with symptoms of a fever, dyspnea and abdominal pain. At arrival on our hospital, her blood pressure was 140/75 mm Hg, her pulse rate was 101/min, her body temperature was 39.6 °C and her oxygen saturation of the peripheral artery was 80%. A physical examination showed marked pain and tenderness in the right upper abdominal region. The patient could not lie in a supine position because marked kyphoscoliosis was present. Consequently, Murphy's sign was not evident. Her height and weight were 140 cm and 48.2 kg, respectively. Results of a laboratory examination were as follows: white blood cell count, 10500/μl; hemoglobin, 13.5 g/dl; aspartate

Abbreviations: LC, laparoscopic cholecystectomy; TG13, updated Tokyo Guidelines 2013; PTGBD, percutaneous transhepatic gallbladder drainage; ERC, endoscopic retrograde cholangiography; CT, computed tomography; SILC, single incision laparoscopic cholecystectomy.

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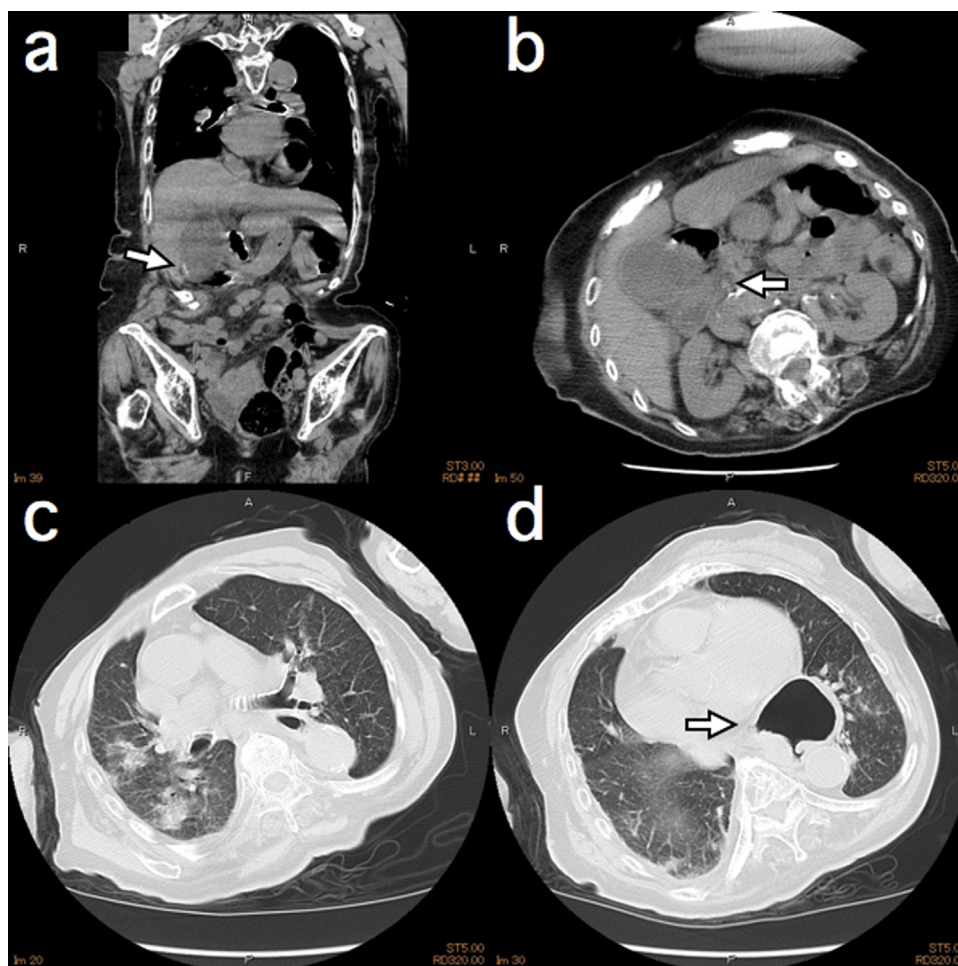


Fig. 1. Chest and abdominal CT (a) The gallbladder was entirely covered by the thoracic cage. The gallbladder presented marked swelling with small stones (arrow). (b) The common bile duct was dilated with a bile duct stone (arrow). (c) The left lung presented pneumonia. (d) Sliding esophageal hiatal hernia was detected (arrow).

aminotransferase, 76 IU/L; alanine aminotransferase, 54 IU/L; alkaline phosphatase, 460 IU/L; gamma-glutamyl transpeptidase, 37 IU/L; total bilirubin, 1.2 mg/dl; and C-reactive protein, 23.57 mg/dl. Chest and abdominal computed tomography (CT) revealed pneumonia, sliding esophageal hiatal hernia, wall thickening, edema and enlargement of the gallbladder with small stones, and a stone in the common bile duct (Fig. 1). Abdominal ultrasound revealed gallbladder wall thickening, enlargement of the gallbladder with small stones and dilatation of the common bile duct with some stones.

These findings were consistent with a diagnosis of acute cholecystitis and choledocholithiasis according to the TG13. After urgent hospitalization, piperacillin/tazobactam was administered as initial therapy. The following day, her white blood cell count was elevated to 22800/ μ l. The grade of severity was diagnosed as Grade II (moderate) acute cholecystitis according to the TG13 [2]. Taking her age, kyphoscoliosis and general condition into consideration, the patient underwent emergency PTGBD under local anesthesia. Approximately 45 ml of brown pus was aspirated from the gallbladder. A bacterial culture showed the presence of *Klebsiella pneumoniae*, *Escherichia coli*, *Enterococcus faecium*, *Bacteroides fragilis* and *Clostridium perfringens* in the pus, and two blood cultures revealed the presence of *Klebsiella pneumoniae* on another day. After PTGBD was performed, the patient's physical status and systemic inflammation rapidly improved. Waiting for the improvement of pneumonia, ERC was performed and showed some stones in the common bile duct on the 10th day after PTGBD, and those were removed. Contrast radiography of the biliary tract by PTGBD

performed again just before surgery revealed gallbladder stones and remnant stones in the common bile duct (Fig. 2), which were removed by ERC on the 20th day after first PTGBD.

Cholecystectomy was planned after the last ERC. However, severe kyphoscoliosis was presumed to complicate the operation. We attempted to perform LC by adopting the "rib-lifting method" [3]. Under general anesthesia, the patient was placed in Fowler's position with thick pillows beneath her head and body (Fig. 3). An initial 12 mm blunt-tip port was introduced at the umbilicus with the open method. A pneumoperitoneum was created using the injection of carbon dioxide to 8 mmHg, and a 30° angled laparoscope was inserted through this port. Bilateral low-lying costal arches with adhesion to the greater omentum interrupted the surgical view of the upper abdomen, thus the gallbladder was not visible. Only the edge of the liver was seen between bilateral costal arches (Fig. 4a). Next, a 5 mm port was added in the right abdomen and the adhesion was peeled off using this port. Then, the rib-lifting method was performed using a thick bladed silk suture placed across the 9th and 10th ribs with the abdominal wall. Consequently, the gallbladder appeared in the surgical field. However, the surgical instrument through the right abdominal port was interrupted by a right low-lying costal arch, which could not be sufficiently lifted using the rib-lifting method (Fig. 4b). We thus recognized that LC could not be accomplished using the standard 4-port method.

The first blunt port was subsequently changed to a wound protector (Alexis Wound Retractor XS; Applied Medical) and a surgical glove with two ports, and a 5 mm port was added in the left upper



Fig. 2. Contrast radiography of the biliary tract by PTGBD showed gallbladder stones (arrowhead) and common bile duct stones (arrow).



Fig. 3. The patients could be placed in Fowler's position under general anesthesia with thick pillows beneath her head and body.

abdomen. Namely, LC was continued using a transumbilical multi-port plus two additional ports. In the first stage of the dissection of Calot's triangle, the right abdominal port was barely usable for non-dominant side forceps because the surgical field was dorsal, therefore the forceps was not relatively affected by the right low-lying costal arch. To expose Calot's triangle, the fundus of the gallbladder was elevated using a grasper through the left abdominal port. Under a good surgical view, the critical view could be established using the transumbilical multi-port and the right abdominal port (Fig. 4c). In the next stage of dissection of the gallbladder from the liver, it was impossible to lift the gallbladder using the grasper through the right abdominal port due to restricted controllability. Thus, the laparoscope was inserted through the left abdominal port and the gallbladder was elevated using the grasper through the transumbilical multi-port. Retrograde dissection of the gallbladder

was performed using the transumbilical multi-port and the right abdominal port (Fig. 4d).

The operative time and estimated blood loss were 236 min and a little, respectively. The postoperative course was uneventful. Ambulation and ingestion was attained on the following day. The port site scars on the abdomen are shown in Fig. 5. The patient was discharged on the 9th postoperative day.

3. Discussion

As the aged population increases in Japan, the number of high-risk elderly patients with digestive disease has also increased. Kyphoscoliosis is a deformity of the spine caused by aging or osteoporosis. The prevalence of hyperkyphosis among elderly individuals was reported to be 20–40% [4]. Therefore, the number of patients with kyphoscoliosis requiring surgical treatment for digestive disease are expected to increase. In patients with severe kyphoscoliosis, a low-lying costal arch covers the organs of the upper abdominal by anteflexion of the thoracic cage. Severe kyphoscoliosis with fixed rigidity was considered to be an obstacle to laparoscopic surgery due to anatomical difficulty. However, several papers have recently shown that laparoscopic surgery for patients with kyphoscoliosis can be successfully achieved [3,5,6]. Those papers reported that kyphoscoliosis is associated with various surgical difficulties due to low-lying costal arches, including a small abdominal working space, disturbance of the surgical view and decreased controllability of the surgical instrument. In this report, we described the devised placement of trocar ports during LC for acute cholecystitis with severe kyphoscoliosis.

In a PubMed database search, a few case presentations were reported in which LC for patients with severe kyphoscoliosis was successfully achieved using improved laparoscopic procedures [3,5,7]. Kyphoscoliosis presents with a low-lying costal arch in the laparoscopic view. It can appear as if a thick and rigid wall, preventing laparoscopic surgeons from accessing the gallbladder. The rib-lifting method was invented to lift up the low-lying costal arch. This method leads to a suitable surgical field, which is required for cholecystectomy with the standard 4-port technique [3]. However, this method is not always effective. It was reported that three of seven cases with critical low-lying costal arch, who underwent LC using the rib-lifting method, required conversion to laparotomy [7]. On the other hand, Chowbey et al. reported that a 10 mm additional port was used for retraction of the costal margin and total of 6 ports allowed successful LC for patient with kyphosis [5]. The authors concluded that surgeons should not hesitate to add additional ports in order to facilitate a safe operation. In the present case, the rib-lifting method did not allow for the standard 4-port method because the grasper through the right abdominal port was interrupted by the right low-lying costal arch, which could not be adequately lifted. Moreover, the low-lying costal arch was too rigid to be retracted ventrally by a surgical instrument through the port. Therefore, the position of the other ports should be considered to access the gallbladder through the window between bilateral low-lying costal arches.

Single incision laparoscopic cholecystectomy (SILC) has been rapidly performed for patients with gallbladder stones since its introduction by Navarra et al. [8]. SILC is a suitable procedure for those without any inflammation because the soft gallbladder is easily lifted up even by a needle instrument. The critical view of safety described by Strasberg et al. [9] is the ultimate principle for preventing bile duct injury during LC [1]. To create the critical view, a good surgical view of Calot's triangle is required by sufficient lifting of the fundus of the gallbladder. However, it is difficult to lift the fundus using loop retractors and percutaneous sutures when the gallbladder wall is thick and hard with acute

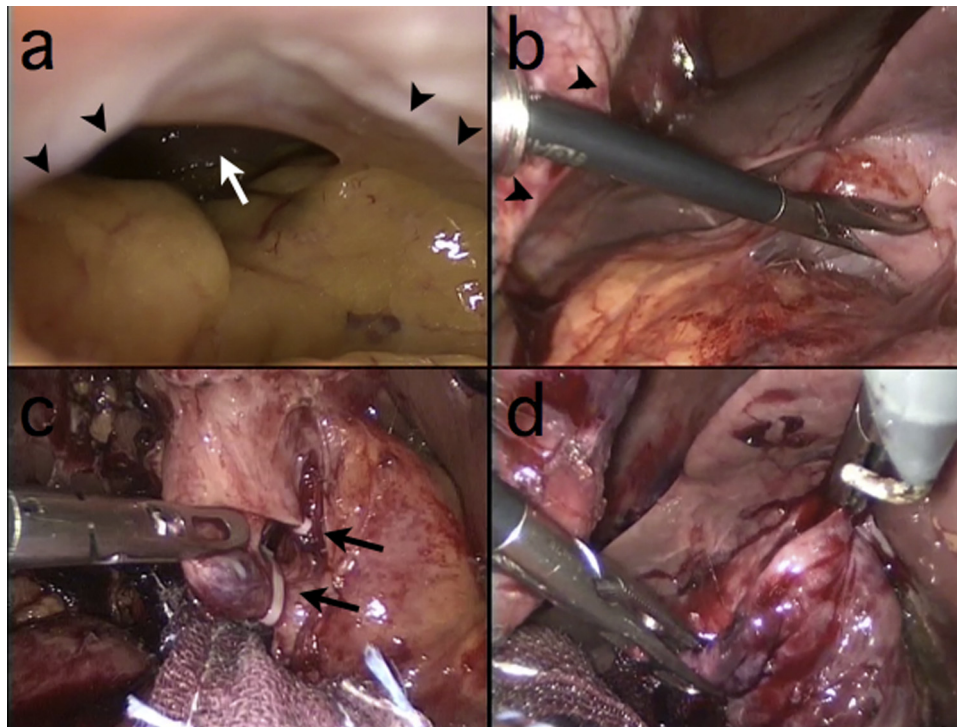


Fig. 4. Operative findings (a) Only the liver (white arrow) was observed between bilateral low-lying costal arches (arrowhead). The gallbladder was not visible. (b) The gallbladder was visualized in the surgical field using the rib-lifting method. However, a grasper through the right abdominal port prevented lifting of the fundus of the gallbladder by the right low-lying costal arch (arrowhead). (c) The critical view was established by lifting of the fundus using a grasper through the left abdominal ports. Arrows show the clips of the cystic duct and the cystic artery. (d) Retrograde dissection of the gallbladder was performed by lifting of the fundus using a grasper through the transumbilical multi-port. A good surgical view was created using a 5 mm angled laparoscope through the left abdominal port.

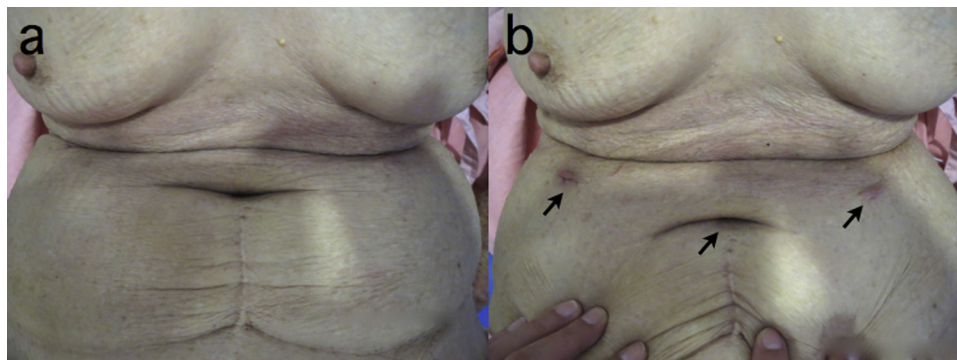


Fig. 5. Port site scars (a) Port site scars were hidden in the fold of the abdominal wall. (b) Arrows show three port site scars.

cholecystitis. When the critical view cannot be created, conversion to open cholecystectomy should be considered according to the TG13 [1]. Moreover, Yamazaki et al. reported a systematic review concerning operative indications for and outcomes of SILC. According to the literature, SILC should be avoided in patients with a poor overall physical status and potential abdominal adhesions [10]. Therefore, high-risk patients with acute cholecystitis are typically excluded from the SILC indication criteria. On the other hand, it was reported that SILC following PTGBD was successfully completed in ten patients with cholecystitis [11]. To lift the fundus of a hard gallbladder with inflammation, additional 5 mm forceps inserted through the umbilical incision outside the SILS-Port would be useful. In the present case, we adopted the transumbilical multi-port method using the glove technique because we found that the transumbilical port was most useful to access the gallbladder between bilateral low-lying costal arches. A grasper through the transumbilical multi-port could securely lift the fundus. Instead, an additional

port was inserted into the left abdomen to place a 5 mm angled laparoscope to obtain a good surgical view. Consequently, LC could be successfully performed with the creation of the critical view.

4. Conclusion

we encountered a case of acute cholecystitis with severe kyphoscoliosis. Kyphoscoliosis is associated with various surgical difficulties for LC due to the low-lying costal arches. A low-lying costal arch prevents surgeons from accessing the gallbladder by standard LC with the four-port method. A devised placement of the ports was needed to access the gallbladder between bilateral low-lying costal arches. The transumbilical multi-port and the left abdominal port were effective for successful LC of acute cholecystitis with kyphoscoliosis.

Conflicts of interest

All authors have no conflict of interests to declare.

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None.

Ethical approval

None.

Consent

Written informed consent was obtained from the patient's family for publication of this case reports and any accompanying images.

Author's contribution

Obana T and Yamasaki S carried out the initial treatment, PTBGD and ERC. Takayama T, Yamamura S and Nishio K carried out the surgery and postoperative management. All authors have read and approved this manuscript for publication.

Guarantor

Kazushi Nishio.

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