Laparoscopic Cholecystectomy in Two Patients with Situs Inversus Totalis: A Case Report

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Situs inversus totalis (SIT) is a rare condition in which the viscera are transposed in a mirror image reversal. We report two cases of laparoscopic cholecystectomy (LC) performed for SIT patients. A 63-year old male patient with SIT was diagnosed with symptomatic gallstones. We performed LC by 3-port method. The patient was discharged uneventfully on postoperative day 2. A 57-year old female patient with SIT underwent LC for acute cholecystitis. Due to severe inflammation an assistant was needed. The patient was discharged uneventfully on postoperative day 3. Over 80 cases of LCs in SIT patients have been reported so far and LC has become the standard treatment. The current report confirms the safety of laparoscopy in such cases. Laparoscopic cholecystectomy can be performed safely in SIT patients if care is taken. Surgeons need to be careful of reversed anatomy and unaccustomed working hand.

Keywords: Laparoscopic cholecystectomy, Situs inversus totalis, Acute cholecystitis

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INTRODUCTION

Situs inversus totalis (SIT) is a rare autosomal recessive anomaly in which thoracic and abdominal organs are transposed through the midline sagittal plane, resulting in a perfect mirror image reversal of normal anatomy. This condition was first described by Fabricius in 1,600¹ and its incidence is known to range from 1:10,000 to 1:20,000.² Though there is no evidence that this condition is a risk factor for cholelithiasis or acute/chronic cholecystitis,³ diagnosis can be difficult when those diseases develop in SIT patients due to the confusing clinical presentations. Laparoscopic treatment is also challenging for surgeons because direction of approach is unfamiliar, and positioning of operator and ports placement should be planned in different way from those of conventional

method for patients with normal anatomy.

Herein we report our experience in two cases of laparoscopic cholecystectomy performed for patients with SIT.

CASE REPORT

Case presentation 1

A 63-year old male patient was diagnosed with symptomatic gallbladder stones with SIT at a private clinic and referred to our hospital for cholecystectomy. The patient complained of recurrent colicky abdominal pain at left upper quadrant lasting several months. On admission, the patient presented no symptoms of gallbladder stones. Laboratory results of liver function tests and complete blood count were within normal range.

Fig. 1. (A) Abdominal computed tomography demonstrated mild thickening of gallbladder wall, the liver located in the left side, and the spleen and the pancreas located in the right side. (B) Sites of ports and positions of the surgical team.

Fig. 2. (A) Abdominal computed tomography demonstrated thickening of gallbladder wall with pericholecystic fluid collection, and confirmed SIT. (B) Sites of ports and positions of the surgical team. (C) Arrow indicates thickened cystic duct.

Abdominal computed tomography showed mild thickening of gallbladder wall and confirmed SIT (Fig. 1A). Abdominal ultrasonography showed a few gallstones in the mildly collapsed gallbladder (Fig. 1B). No comorbid condition was identified from the evaluation for general anesthesia.

With the diagnosis of symptomatic gallbladder stones the patient underwent elective laparoscopic cholecystectomy. The patient was laid in supine position with his left side elevated, and the right-handed operating surgeon stood on the right side of the patient (Fig. 1B). The camera assistant stood on the right side of the patient and the laparoscopic stack was placed on the left side of the patient. A Veress needle was used for insufflation of the peritoneal cavity with carbon dioxide gas. The port for a 12 mm flexible laparoscope was placed infra-umbilically, and two 5 mm ports were placed at the subxiphoid midline and left subcostal margin of the midclavicular line respectively.

There was no sign of inflammation at the gallbladder and Calot's triangle. Without traction of the Hartmann's pouch by an assistant, dissection of the Calot's triangle seemed difficult and the operator decided to dissect the gallbladder from the liver first in a fundus-to-infundibulum direction. The 5 mm port placed at left subcostal midclavicular line was used as a working/dissecting port. After that the cystic duct and cystic artery were carefully isolated, clipped, and divided. Gallbladder specimen was retrieved through the 12 mm port.

The operation took 60 minutes and estimated blood loss was

20 ml. There was no evidence of acute cholecystitis from the inspection of the specimen, and 5 black and round-shaped stones were detected. The patient was discharged uneventfully on the 2nd day after operation.

Case presentation 2

A 57-year old female patient with known SIT visited our emergency room with pain at left upper quadrant lasting for five days. The patient was afebrile, not jaundiced, and complained of tenderness and rebound tenderness at the left upper quadrant. She had previously undergone total abdominal hysterectomy due to uterine myoma 5 years ago and that was when she was first informed to be diagnosed with SIT. Laboratory results were within normal range except for slightly increased white blood cell count ($10,830/\text{mm}^3$) and serum C-reactive protein level (15.8 mg/dl). Abdominal computed tomography showed thickened gallbladder wall with pericholecystic fluid collection and confirmed SIT (Fig. 2A). She was a chronic hepatitis B virus carrier on antiviral medication.

With the diagnosis of acute cholecystitis the patient underwent emergency laparoscopic cholecystectomy. She was laid in supine position with her left side elevated, and the right-handed operating surgeon stood on the right side of the patient (Fig. 2B). Position of surgical team was identical to that of case 1 with an additional assistant standing on the left side of the patient. Creation of pneumoperitoneum and port place-

ment were performed with the same method, with one additional 5 mm port placed at the left subcostal margin of anterior axillary line. The port in the middle of the three 5 mm ports was used as a working/dissecting port, and was replaced by a 12 mm port later to apply large-sized surgical clips to the thickened cystic duct.

The gallbladder and hepatoduodenal ligament were covered by greater omentum which was detached easily. Wall of the gallbladder and Calot's triangle were severely inflamed and fibrotic. To secure a clear view of Calot's triangle, traction of the gallbladder was exerted by the assistant through the additional 5 mm port. Cystic artery was managed by ultrasonic scalpel, and the cystic duct was isolated from surrounding fibrotic tissues by blunt dissection using a suction device. After clipping and division of the cystic duct, the gallbladder was dissected from the liver using ultrasonic scalpel. After placement of a closed suction drain, hemostasis at the gallbladder bed by electrocautery was done. Gallbladder specimen was retrieved through the 12 mm port.

The operation took 90 minutes and estimated blood loss was 150 ml. Neck of the gallbladder was impacted by a 1.5 cm sized round pigment stone, and the pathologic result was gangrenous cholecystitis with microabscess formation. The patient was discharged uneventfully on the 3rd day after operation.

DISCUSSION

SIT is a genetic disorder of which the gene involved is located on the long arm of chromosome 14, and it is transmitted as an autosomal recessive nature with incomplete penetration.⁴ Due to the mirror imaged transposition of thoracic and abdominal organs, diagnosis and surgical treatment of gallbladder diseases developed in these patients may be more difficult than that of orthotopic patients. The first laparoscopic cholecystectomy in a SIT patient was reported by Campos and Sipes in 1991,⁵ and since then over 80 other cases have been reported in literature, discussing the safety of laparoscopic cholecystectomy in such patients.⁶

Technical difficulties of laparoscopic cholecystectomy for SIT patients arise from the fact that everything in the surgical field is transposed to mirror image except for operator's hands. Hence right-handed surgeons suffer from crossing of two devices when they use their right hand as a working hand in the setting of conventionally mirror imaged port placement, whereas left-handed or ambidextrous surgeons can perform the operation easily by simply changing the role of each hand. To overcome this problem we used different methods for the two cases. In the case 1, we used 3 ports and approaching the Calot's triangle from the beginning of operation seemed difficult without assisting traction. Hence the operator began dis-

section at the fundus first and to the infundibulum carefully. This method was found to help isolating the cystic duct and cystic artery safely and easily later. In case 2, we added the 4th port at the costal margin of the left anterior axillary line for assisting traction of the distended and inflamed gallbladder. By this method we could stretch the Calot's triangle efficiently and isolate the cystic duct and the cystic artery without crossing two devices.

Other reports described variable methods to overcome the difficulties caused by the mirror-image anatomy. Ren JJ et al. described that they used 4-port method with assisting traction, and the right-handed operator used his left hand as a main operating hand while his right hand was holding the gallbladder.⁷ Iusco DR et al. laid the patient in French position with the operator standing between the patient's legs, and modified the placement of 3 ports – a camera port at the right upper quadrant, an infraumbilical port and a left flank port for the operator. The operator changed his working/dissecting hand as occasion demands.⁸ Alsabek MB et al. used conventional mirrored 4-port method, but in their case the operator was left-handed that dissection of the Calot's triangle was performed easily with his left hand throughout the operation. Recently 7 cases of single incision laparoscopic cholecystectomy in patients with SIT have been reported.^{9,10} With this method the operators could perform dissection with their right hand more conveniently, without the necessity of crossing their hands at any point of time during the surgery.

As most of the case reports have recommended laparoscopic cholecystectomy as the standard treatment for benign gallbladder diseases in SIT, we also treated two cases of symptomatic gallbladder stones and acute calculous cholecystitis by laparoscopic approach successfully. Laparoscopic cholecystectomy in SIT patients can be a technically challenging procedure especially for right-handed surgeons. However, it can be performed safely if care is taken throughout every step from the diagnosis to the port design and intraoperative procedures.

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