

# Pure laparoscopic right hepatectomy in a patient with situs inversus totalis

## A case report

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### Abstract

**Rationale:** Hepatectomy in a patient with situs inversus totalis (SIT) is technically challenging, and pure laparoscopic major hepatectomy has not been previously described.

**Patient concerns:** A 70-year-old male with SIT was referred to our hospital for investigation and treatment of a liver mass in segment 5/6.

**Diagnosis:** Computed tomography (CT) and magnetic resonance imaging (MRI) showed features of chronic liver disease and a 5-cm sized mass with a bulging contour at segment 5/6.

**Interventions:** Pure laparoscopic right hepatectomy was performed.

**Outcomes:** There was no intraoperative complication and the procedure was completed without a transfusion. The patient recovered well and was discharged on postoperative day 8.

**Lessons:** Considering the position of the port sites and the assistant, and the operator's hand for the working port, a pure laparoscopic right hepatectomy can be a feasible procedure, even in a patient with SIT.

**Abbreviations:** CT = computed tomography, IVC = inferior vena cava, MRI = magnetic resonance imaging, RHA = right hepatic artery, RHV = right hepatic vein, RPV = right portal vein, SIT = situs inversus totalis.

**Keywords:** laparoscopy, right hepatectomy, situs inversus

## 1. Introduction

Situs inversus totalis (SIT) is a rare congenital condition in which the abdominal and thoracic organs are located in a mirror image of the normal position in the sagittal plane. There are a very few case reports on people with SIT who underwent hepatectomy.<sup>[1]</sup> Hepatectomy in a patient with SIT is technically challenging because of the mirror-image anatomy. This is especially so for laparoscopic approaches, where the port sites and the positions of the surgeons are an important matter. To our knowledge, only a few cases of open hepatectomies and one case of laparoscopic

subsegmentectomy have been reported.<sup>[1–3]</sup> However, we are unaware of any reports of pure laparoscopic major hepatectomy, including right hepatectomy, in patients with SIT. We herein present a case of pure laparoscopic right hepatectomy in a SIT patient with intrahepatic cholangiocarcinoma.

## 2. Case report

The institutional review board of Seoul National University Hospital approved this study (IRB No. 1704-178-850). A 70-year-old male with SIT was referred to our hospital for investigation and treatment of a liver mass in segment 5/6. He was a social drinker and had a smoking history of 20 pack years. He was on medication for hypertension and diabetes mellitus, which were being well controlled well. HBs-Ag and HCV-Ab were negative. His liver function was fine, with a platelet count of 163 000/ $\mu$ L. The preoperative indocyanine green retention rate at 15 minutes was 3.6%. Preoperative levels of AFP, PIVKA, and CA19-9 were 4.6 ng/mL, 20 mAU/mL, and 17 U/mL, respectively, which were within normal limits. Computed tomography (CT) and magnetic resonance imaging (MRI) showed features of chronic liver disease and a 5-cm sized mass with a bulging contour at segment 5/6. This mass showed peripheral rim enhancement and delayed central enhancement (Fig. 1).

The patient was placed in a supine position, with his legs apart, in the reversed Trendelenburg position (Fig. 2). The operator stood between the patient's legs. Four 12-mm trocars and one 5-mm trocar were used (Fig. 3). The lesion was identified with intraoperative ultrasonography. Under flexible 3-dimensional laparoscopy, cholecystectomy and careful hilar dissection were

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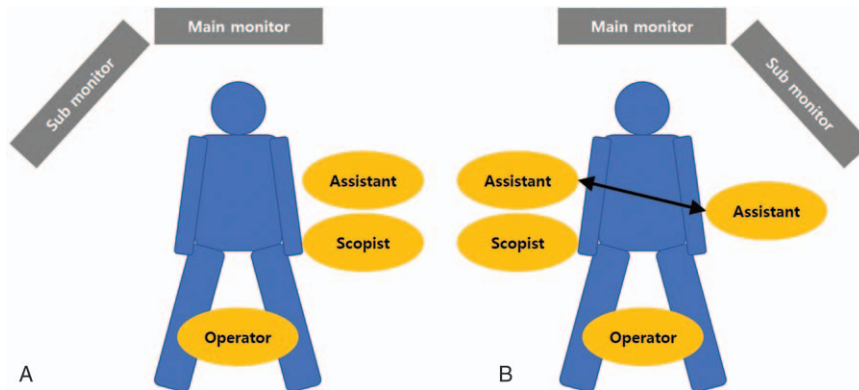
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**Figure 1.** Computed tomography (CT) on admission. A, Arterial phase, (B) portal phase, and (C) delayed phase. Enhanced CT shows a 5-cm sized mass with a bulging contour at segment 5/6, with peripheral rim enhancement and delayed central enhancement.

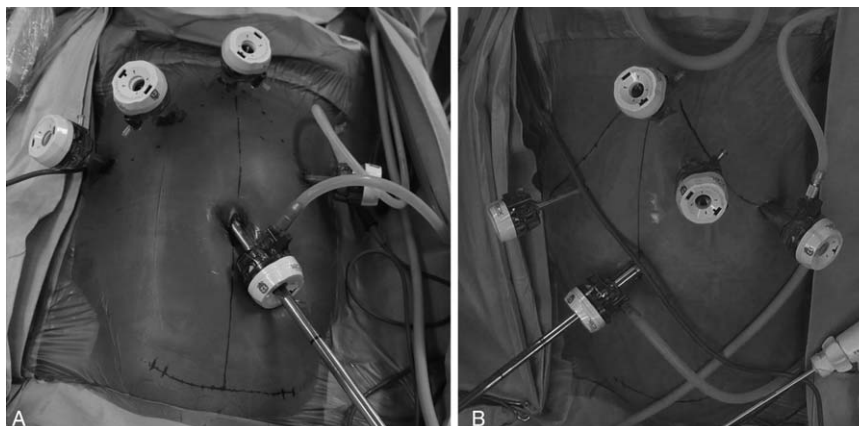


**Figure 2.** Representation of the operating room. A, Typical right hepatectomy, (B) right hepatectomy in a SIT patient: the positions of the assistant, scopist, and monitors are symmetrical to those in the typical right hepatectomy.

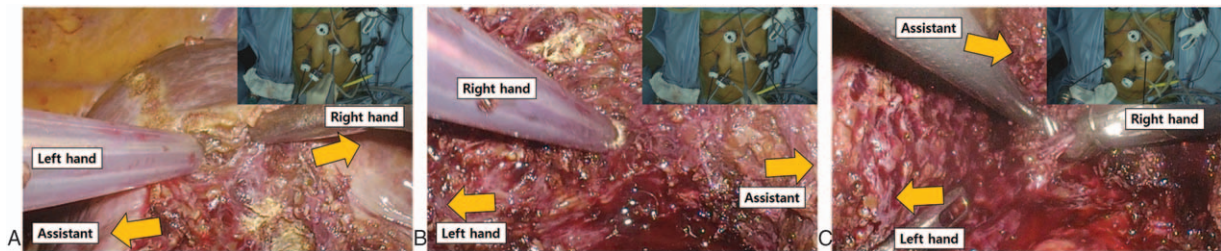
performed using an anterior approach. The right hepatic artery (RHA) was identified and divided, followed by the right portal vein (RPV). The right liver was then mobilized by dividing the right coronary ligament and triangular ligament, which were actually located on the patient’s left side. The ischemic demarcation line on the liver was marked with electrocautery. The liver was transected using a Thunderbeat system (Olympus, Tokyo, Japan) and a laparoscopic ultrasonic aspirator (CUSA Excel, Valleylab Corp. Boulder, CO). The right Glissonean

pedicle was divided with an automatic suturing device. Further parenchyma transection was completed after placing a nelaton tube into the anterior portion of the retrohepatic inferior vena cava (IVC). The right hepatic vein (RHV) was divided with an automatic suturing device. The right liver was placed in an end-bag and extracted through a suprapubic incision site.

The total operation time was 220 minutes and the estimated blood loss was 450 m. There was no intraoperative complication and the procedure was completed without a transfusion. The



**Figure 3.** Trocar positions. A, Typical right hepatectomy, (B) right hepatectomy in a SIT patient: the trocars are positioned symmetrically to those in the typical right hepatectomy.



**Figure 4.** Three ways of using the port sites. A, The operator's left hand is used for the main working port and their right hand and an assistant spread both sides for tension, (B) the operator's right hand is used for the main working port and their left hand and an assistant spread both sides for tension, and (C) the operator either crosses their hands, or the assistant's instrument crosses the operation field, to push the opposite side for tension.

patient was discharged on postoperative day 8 with no postoperative complication.

### 3. Discussion

Recently, laparoscopic surgery has been widely accepted in many fields, and has benefits in terms of quality of life, immunological aspects, length of hospital stay, and postoperative morbidity.<sup>[4,5]</sup> For laparoscopic liver resection, the Louisville consensus conference held in 2008 lead to the conclusion that laparoscopic liver resection is a feasible and safe procedure with surgical and oncological results similar to open resection.<sup>[6]</sup> The results from recent large series also demonstrate the technical feasibility, postoperative benefit, and oncological safety of laparoscopic liver resection in comparison with open resection.<sup>[7,8]</sup> Since the introduction of a flexible 3-dimensional laparoscope for liver surgery in 2015, pure laparoscopic liver resection has been increasingly performed in our center.<sup>[9-11]</sup> Recently, more than 90% of live donor hepatectomies have been performed under a purely laparoscopic procedure, and as of April 2017, we have performed 100 cases of pure laparoscopic live donor right hepatectomy.

Because of the unusual anatomy with a mirror-image view, laparoscopic liver resection in a SIT patient can be very challenging.<sup>[2]</sup> To our knowledge, details on laparoscopic major liver resection in a SIT patient, including right hepatectomy, have not been published. With consideration of the mirror image, the port sites and the positions of the surgeons become an important matter. The patient was placed in a reversed Trendelenburg position with the left side up, and five trocars were positioned at points symmetrical to those used in a right hepatectomy in a patient with normal anatomy (Figs. 2 and 3). The first assistant and the scopist stood on the right side of the patient. In this way, the whole procedure can be performed in a manner symmetrical to that of a typical right hepatectomy. However, a problem occurs here; in a complete symmetrical setting, the operator would use their left hand for the main working port. This is not easy for a right-handed operator. We used three methods to solve this problem. Firstly, the operator used their left hand for the main working port, while using their right hand and an assistant to spread both sides for tension (Fig. 4A). This method would be favorable for an ambidextrous operator. Secondly, the assistant moved to the left side of the patient (Fig. 4B). The operator then used their right hand for the main working port with their left hand and the assistant spreading both sides for tension. As the position of the assistant may be inconvenient, this method is difficult to maintain for a long time. Thirdly, either the operator

crossed their hands, or the assistant's instrument crossed the field of operation, to push the opposite side for tension (Fig. 4C). This method may interfere with the operative view, or cause injury to tissues by pushing them instead of gently pulling them. By using these three methods together, a pure laparoscopic right hepatectomy was successfully performed in a patient with SIT.

### 4. Conclusion

The position of the port sites and the assistant, and the operator's hand for the main working port should be considered differently in a SIT patient because of the mirror-image. With these considerations, and when performed by an experienced surgeon, a pure laparoscopic right hepatectomy can be a feasible procedure, even in a patient with SIT.

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