Laparoscopic cholecystectomy in a patient with situs inversus totalis: a case report on how to obtain a critical view of safety?

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Received 18 May 2015
Accepted 22 June 2015

The Egyptian Journal of Surgery
2015, 34:293–298

Laparscopic cholecystectomy is considered the procedure of choice in the operative management of cholelithiasis. But despite the maturation of this procedure in surgical practice, bile duct injuries (BDI) still occur at a higher rate than in the open cholecystectomy era. The incidence of BDI post- laparoscopic cholecystectomy approximately 3/1,000 cases. Different recommendations were provided in the recent years to minimize such risks, with special emphasis on the use of the critical view of safety (CVS) to identify the cystic duct and cystic artery before clipping for safe laprscopic cholcystectomy. But when right becomes left and left becomes right, the procedure becomes more demanding & needs special attention to deliver safe procedure. This is the so in patient with SIT.
SIT is a rare autosomal recessive anomaly, characterized by transposition of organs to the opposite site of the body as in Fig 1. It was first reported by Fabricius in 1600, and occur in an incidence of about 1:10 000 to 1:20 000. In such patient, different scenarios should be in mind to achieve CVS and compensate less skilled non dominant left hand for safe procedure.

Keywords:
laparoscopic cholecystectomy, rare laparoscopic cases, situs inversus totalis

Egyptian J Surgery 34:293–298

1110-1121

Introduction

Laparoscopic cholecystectomy is considered the procedure of choice in the operative management of cholelithiasis [1]. But despite the maturation of this procedure in surgical practice, bile duct injuries still occur at a higher rate than in the open cholecystectomy era [2]. The incidence of bile duct injury postlaparoscopic cholecystectomy is ~3/1000 cases [3]. Different recommendations were provided in the recent years to minimize such risks, with special emphasis on the use of the critical view of safety (CVS) to identify the cystic duct and cystic artery before clipping for safe laparoscopic cholecystectomy [4]. But when right becomes left and left becomes right, the procedure becomes more demanding and needs special attention to deliver a safe procedure [5]. This is so in a patient with situs inversus totalis (SIT).

SIT is a rare autosomal recessive anomaly [6], characterized by transposition of organs to the opposite site of the body [7] as shown in Fig. 1. It was first reported by Fabricius in 1600 [8], and occur in an incidence of about 1 : 10 000 to 1 : 20 000 [9]. In such patients, different scenarios should be kept in mind to achieve CVS and compensate for a less-skilled nondominant left hand for a safe procedure.

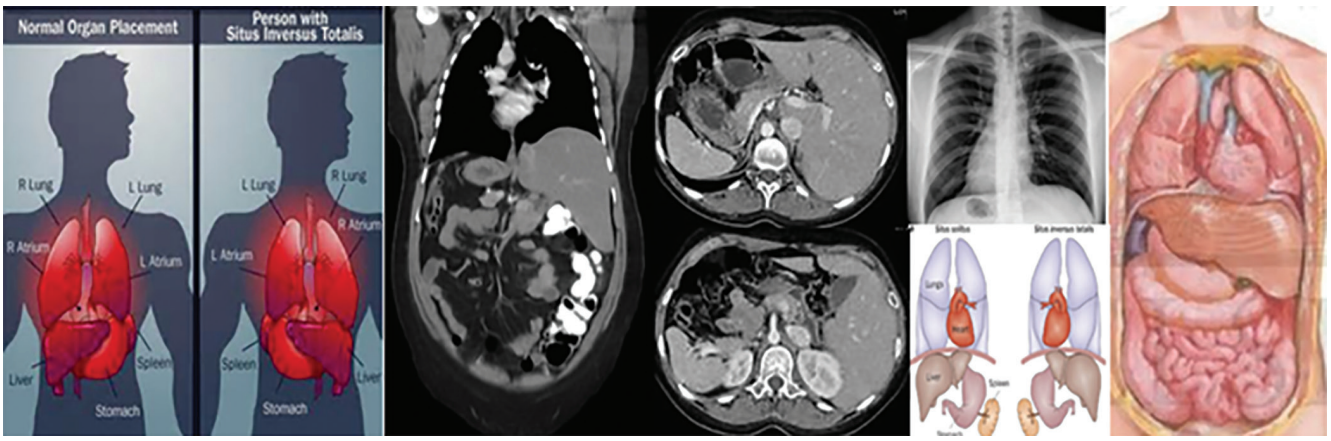
Case report

A female patient aged 52 years presented with chronic calcular cholecystits with multiple gall bladder stones on ultrasound. She had confirmed diagnosis of SIT. Also, she suffered from Parkinsonism 6 years back. Two months back, one of her close relatives suffered from complete transaction of the common hepatic duct postlaparoscopic cholecystectomy, which made a fatal imprint in the patient's mind towards the laparoscopic approach. However, after discussion, she accepted the laparoscopic approach, and the procedure was delivered safely. All patients gave their formal consent. The protocol was approved by the Ethical Committee of the Kafr El Sheikh General Hospital.

Technique

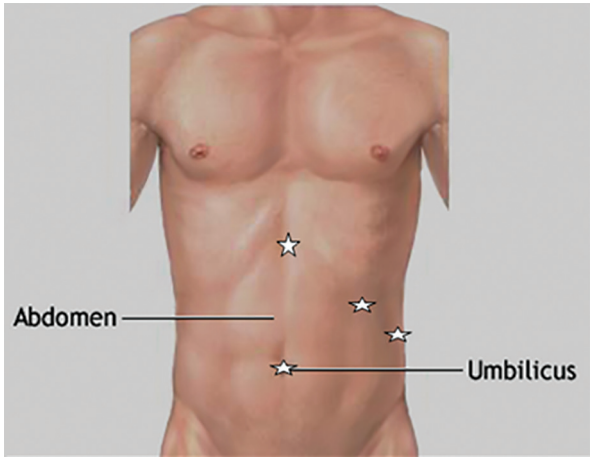
Laparoscopic cholecystectomy was performed using four trocars with the operative team and laparoscopic devices located in the opposite site as a mirror image configuration of laparoscopic cholecystectomy in normally positioned gall bladder as shown in Fig. 2. The surgeon and the monitor assistant were positioned on the patient's right-hand side. The Hasson technique was used to introduce a 10 mm trocar through the umbilicus. The pneumoperitoneum (CO_2) was created with a pressure of 14 mmHg. Another 10 mm trocar was inserted into the abdominal cavity, through the epigastrium in the

Figure 1



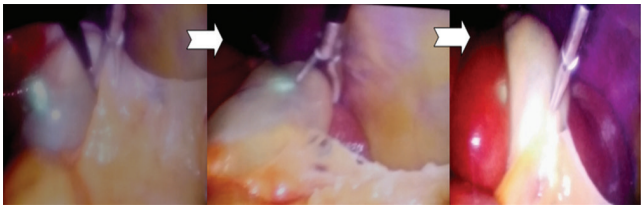
Situs inversus totalis with complete transposition of organs and viscera.

Figure 2



Position of trocars for laparoscopic cholecystectomy in a patient with situs inversus totalis (mirror image).

Figure 3



Adhesions to the gall bladder with adhesiolysis.

subxiphoid location (slightly lower than usual). A 5 mm trocar was inserted at the left midclavicular line. Some adhesions were found to gall bladder as well as the left-hand side of the abdominal wall (Figs 3 and 4). Adhesiolysis was started at the line of attachment of the adhesions, which is the least vascular site. Careful use of diathermy was done on dealing with adhesions. Then 5 mm trocar was inserted in the left anterior axillary line under the view of laparoscope after adhesiolysis. Then we tried to obtain a CVS and expose the hepatocystic triangle (HCT). Fundus of the gall bladder was grasped and pulled upward and to the left by the assistant through the fourth axillary trocar, while the Hartmann's pouch was pushed downward and laterally through the second subxiphoid trocar by the left hand of the surgeon as shown in (Fig. 5) and we started to remove the peritoneal covering of the HCT anteriorly and then change the position and dissect posteriorly as shown in Fig. 6. Dissection of HCT was continued until skeletonization of cystic duct and artery as the only two structures entered the gall bladder within the triangle as shown in Fig. 7. Dissection was performed above the plane of Rouviene's sulcus. Both cystic duct and cystic arteries were clipped and then divided by scissors. The remaining part of gall bladder was separated from its attachment to the liver bed by using electrocautry. Gall bladder was then extracted through the 10 mm umbilical port. Closure of torcars sites was done after putting a drain. The postoperative period was uneventful, and the patient was discharged on the first day of postoperative period after removal of the drain with re-visit 1 week later where she did well.

Discussion

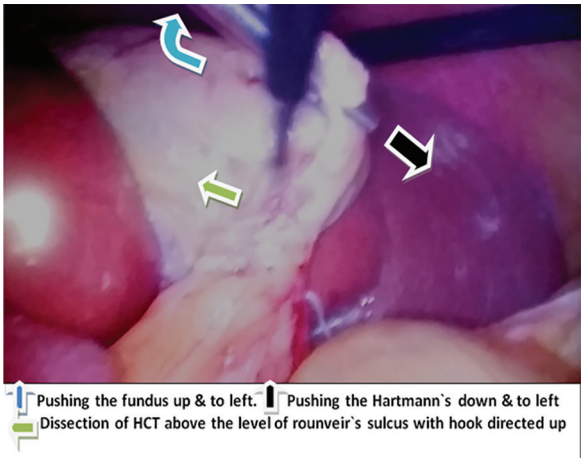
SIT is a rare autosomal recessive anomaly characterized by general transposition of organs and viscera. Actually, SIT does not predispose to gall bladder disease. But pain is exhibited on right-hand side of the abdomen in about 10% of patients, which may lead to some diagnostic confusion [10].

Laparoscopic cholecystectomy is the procedure of choice in the management of cholelithiasis, with achievement of CVS being mandatory for a safe procedure [4]. Several reports emphasized the feasibility of the safe laparoscopic

Figure 4

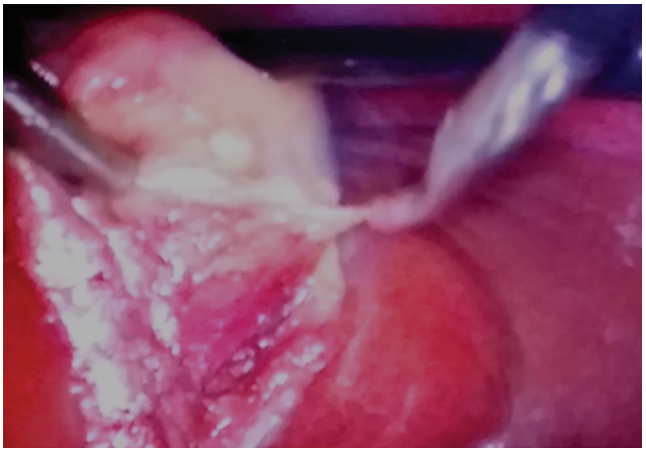
Adhesions to the left side of the abdomen with adhesiolysis to introduce the fourth axillary trocar.

Figure 5



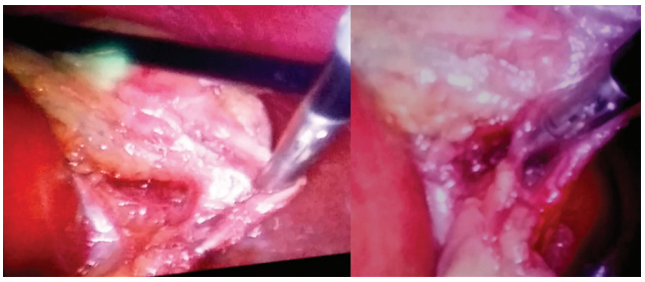
Directions of tractions and dissection to achieve the critical view of safety.

Figure 6



Dissection of the posterior (lateral) aspect of hepatocystic triangle.

Figure 7



Dissection of hepatocystic triangle with the identification of cystic duct and cystic artery as the only two structures entering gall bladder.

cholecystectomy in SIT [11], with CVS being still mandatory for a safe procedure in these patients. But to achieve it, the procedure is more demanding.

In right-sided gall bladder, the fundus is pushed upward and to the right by the assistant (through the fourth axillary trocar), while Hartmann's pouch is pulled down and to the right by the surgeon's left hand (through third midclavicular trocar) as in Figure 9 while he manipulated and dissected the HCT by his right hand through the second subxiphoid trocar, with exposure of the cystic plate (liver bed of the gall bladder) leaving only structures entering gall bladder; cystic duct and cystic artery [2] as shown in Fig. 8.

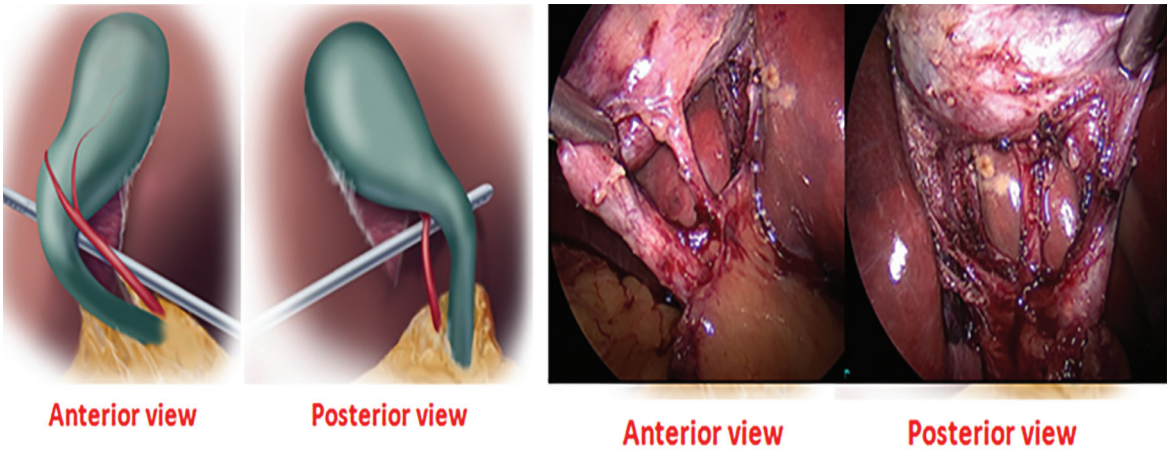
To apply this maneuver in SIT a mirror image is needed, including directions of tractions. The problem as in Figure 10 is the dominant hand of surgery. When the surgeon uses his hands well there is no great problem, but if the surgeon is only right handed, the manipulation may be cumbersome and not precise with some technical difficulties arising, for example, crossing of the hands [12]. This in addition to the need of reorientation of the field and redirection of the visual-motor skills of the surgeon and the camera man to the left upper quadrant usually consumes extra time and may add more difficulties [13].

Many suggested alternatives could be used to compensate for the surgeon's unskilled nondominant left hand, including:

(1) Pushing the Hartmann's pouch down and to the left by his left hand through the second epigastric trocar where the HCT is dissected by his right hand through the third midclavicular trocar as in Figure 11.
(2) Another approach is to pull the Hartmann's pouch down and to the left (by the third midclavicular trocar grasped by the assistant's hand) where the HCT is dissected by the right hand of the surgeon through the second epigastric trocar [14] (which is better to be down in position than usual).

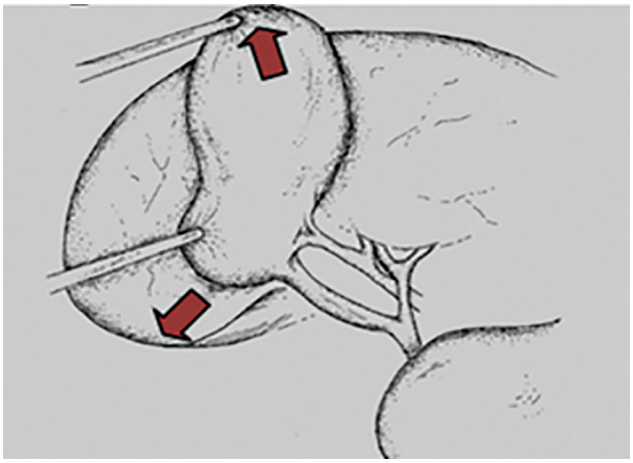
Also, the exposure of HCT can be achieved by adding a trocar in left hypochondruim (or even replacing the second epigastric trocar) as in Figure 12 especially in the wide abdomen. Hartmann's pouch down and lateral by the assistant, while the surgeon uses his right hand to dissect HCT (specially the medial aspect of the triangle);

Figure 8



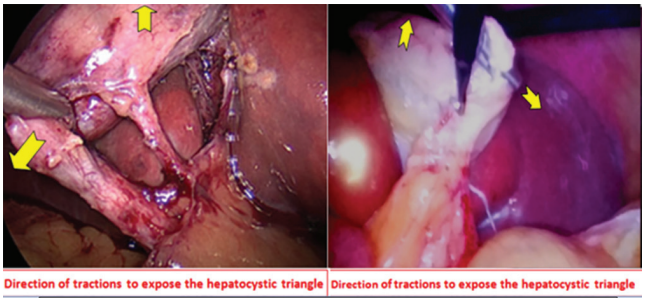
Documentation of the doublet view to confirm critical view of safety.

Figure 9



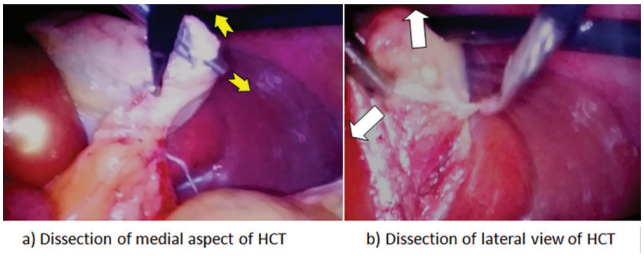
Direction of traction to identify the hepatocystic triangle and disalignment of the cystic duct from common bile duct.

Figure 10



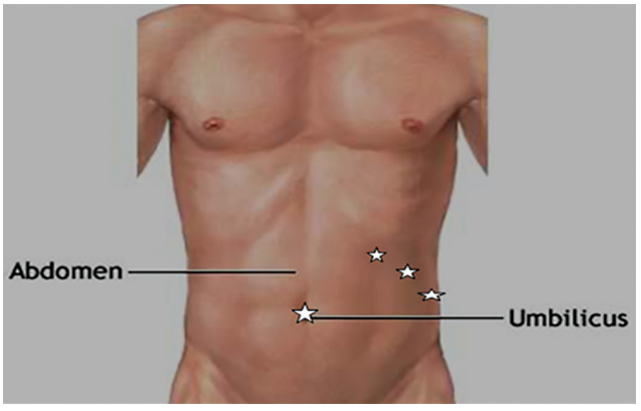
Direction of tractions to expose the hepatocystic triangle in right-sided gall bladder and gall bladder in situs inversus totalis (mirror image).

Figure 11



Dissection of hepatocystic triangle by right hand, while manipulating the Hartmann's pouch by the left hand.

Figure 12



Alternative sites of trocars to compensate for the less-skilled nondominant left hand.

on dealing with the lateral aspect, the surgeon can use both hands through the second and third trocars.

Apart from mirror image transposition, patients with SIT usually do not have associated extrahepatic biliary, venous, and arterial anomalies [15]. Hence, it appears that the surgeon should not be discouraged from performing laparoscopic cholecystectomy for situs inversus on the ground of unexpected associated biliary tract anomalies [16].

Since the first case reported by Campos and Sipes [17], many additional cases have been reported in the literature.

Table 1 Laparoscopic cholecystectomy in patients with situs inversus totalis reported in the literature

Puplished cases number	Series	Year of publication	Diagnosis
1	Campos and Sipes [16]	1991	CC
2	Takei *et al.* [19]	1992	Biliary colic
3	Lipschutz *et al.* [20]	1992	Cholangitis/CBD calculi
4	Goh [21]	1992	Empyema
5	Drover *et al.* [22]	1992	CC
6	Huang *et al.* [23]	1992	CC
7	Schiffino *et al.* [24]	1993	CC
8	Mc Dermott and Caushaj [25]	1994	Cholangitis/CBD calculi
9	Elhomsy *et al.* [26]	1996	AC
10	Malatani [27]	1996	AC
11	Crosher *et al.* [28]	1996	Biliary colic
12	D'Agata and Boncompagni [29]	1997	CC
13	Habib *et al.* [30]	1998	CC
14/15	Demetriades *et al.* [31]	1999	AC/CC
16	Djohan *et al.* [32]	2000	CC/appendectomy
17	Wong [33]	2001	CC/CBD calculi
18	Dorthi *et al.* [34]	2001	CC
19	Nursal *et al.* [35]	2001	CC
20/21	Yaghan *et al.* [36]	2001	CC/CC
22	Al Jumaily and Hoche	2001	CC
23	Singh and Dhir [37]	2002	CC
24	Trongue *et al.* [38]	2002	CC
25	Polychronidis *et al.* [39]	2002	CC
26	Oms and Badia	2003	AC
27	Jesudason *et al.*	2004	CC
28	Kang and Han [40]	2004	CC/CBD calculi
29	Docimo *et al.* [41]	2004	CC
30	Antal *et al.* [42]	2004	CC
31	Pitiakoudis *et al.* [43]	2005	CC
32	McKayand Blake	2005	AC
33	Kamitani *et al.* [44]	2005	CC
34	Puglisi *et al.* [45]	2006	CC
35	Bedioui *et al.*	2006	CC
36	Aydin *et al.* [46]	2006	CC
37	Machado and Chopra [12]	2006	CC
38	Kumar and Fusai [47]	2007	CC
39	Fernandes *et al.* [48]	2008	CC
40	Hamdi and Abu hamdan [49]	2008	AC
41	Pavlidis *et al.* [50]	2008	AC
42	Taskin *et al.* [51]	2009	CC/gastric banding
43	Masood *et al.* [52]	2009	CC
44	Pereira-Graterol *et al.* [53]	2009	CC
45	Romano *et al.* [54]	2009	Biliary colic
46	Pataki *et al.* [55]	2010	CC
47	Hall *et al.* [56]	2010	CC
48	Gonzalez Valverde *et al.* [57]	2010	CC
49	Sanduc and Toma [58]	2010	CC
50	Han *et al.* [59]	2011	CC
51	Suleyman Bozkurt *et al.* [11]	2012	CC
52	Ibrahim Salama *et al.* [13]	2013	CC
53	Elbert Khiangte *et al.* [7]	2013	CC
54	Raghuveer MN *et al.* [17]	2014	CC

AC, acute cholecystitis; CC, chronic cholecystitis; CBD, common bile duct.

Salama *et al.* [14] enumerated 52 cases, while Raghuveer *et al.* [15] enumerated 54 cases, as shown in Table 1.

Four-port, three-port, and more recently a single-port laparoscopic cholecystectomy approach have been reported in the literature [14]. The theoretical assumption of increased rate of conversion to open cholecystectomy in SIT or increased complications is actually not present in the reported cases, which may be attributable to the extra precautions taken before and during the procedure [14].

Conclusion

Although laparoscopic cholecystectomy in patients with SIT may consume extra time, it should be considered the procedure of choice in the management of cholelithiasis as the normally positioned gall bladder. Different scenarios should be kept in mind to compensate for the unskilled nondominant left hand for achieving the CVS, which is mandatory for a safe procedure. The surgeon should not forget training and gaining skills for his nondominant hands. Also, he should gain skills in dealing with all instruments well (e.g. hook, grasper) and not stick to only one in his dissection. Extra precautions taken before and during the procedure usually safeguard against complications in these cases with no increase in rate of conversion.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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