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To Avoid Complications during Laparoscopic Cholecystectomy

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Abstract

Laparoscopic cholecystectomy is now becoming a safe procedure for the benign cholecystic diseases. But the differences, for example in the method of access to peritoneal cavity, visual field, and tools, between laparoscopic surgery and open surgery results in different complications. The purpose of this paper is to discuss how to avoid complications during laparoscopic cholecystectomy.

A hundred consecutive patients were expected to receive an elective laparoscopic cholecystectomy from April 1991 to November 1992 in our clinic. Two patients were converted to open cholecystectomy. The reasons for conversion were uncontrollable bleeding from cystic artery and common-bile duct injury. Two other patients were obliged to undergo laparotomy due to postoperative bile leakage. Arterial bleeding from abdominal wall caused by inserting trocar was experienced in one case.

Improvement of the equipment and surgical technique have got rid of these complications. We think it is still necessary to do intra-operative examinations such as cholangiography or ultrasonography. The previous two cases with complication of biliary injury underwent laparoscopic cholecystectomy without intraoperative examinations. We could have avoided these complications if intraoperative examinations were used.

To prevent the complication of bleeding from abdominal wall, we have been carrying out a unique method. After the introduction of these procedures, we have never experienced any of theses complications.

Introduction

Laparoscopic cholecystectomy has been considered a safe procedure for the benign cholecystic diseases worldwide in the last several years. In Japan, as in other countries, patients prefer it over open cholecystectomy because of a shorter hospital stay, less pain, rapid recovery, a better post-

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operative cosmetic result, and the perception that it is less invasive and carries a lower risk than the traditional procedure. But the differences, for example in the method of access to peritoneal cavity, visual field, and instruments, between laparoscopic surgery and open surgery result in different complications[1]. The reported complications include those from laparoscopic procedure[2] and cholecystectomy[3]. The former are abdominal wall bleeding, omental bleeding, abdominal vessel injury, retroperitoneal vessel injury, gastrointestinal perforation, solid visceral injury, and infection. The latter are gallbladder fossa bleeding, bile duct injury, and bile leakage. The literature suggests that the total complication rate of the laparoscopic procedure compares favorably with that of the open procedure. But once a complication should happen, the patient would suffer from severer condition[4]. The purpose of this paper is to discuss the techniques to avoid complications during laparoscopic cholecystectomy, most of which could be avoidable.

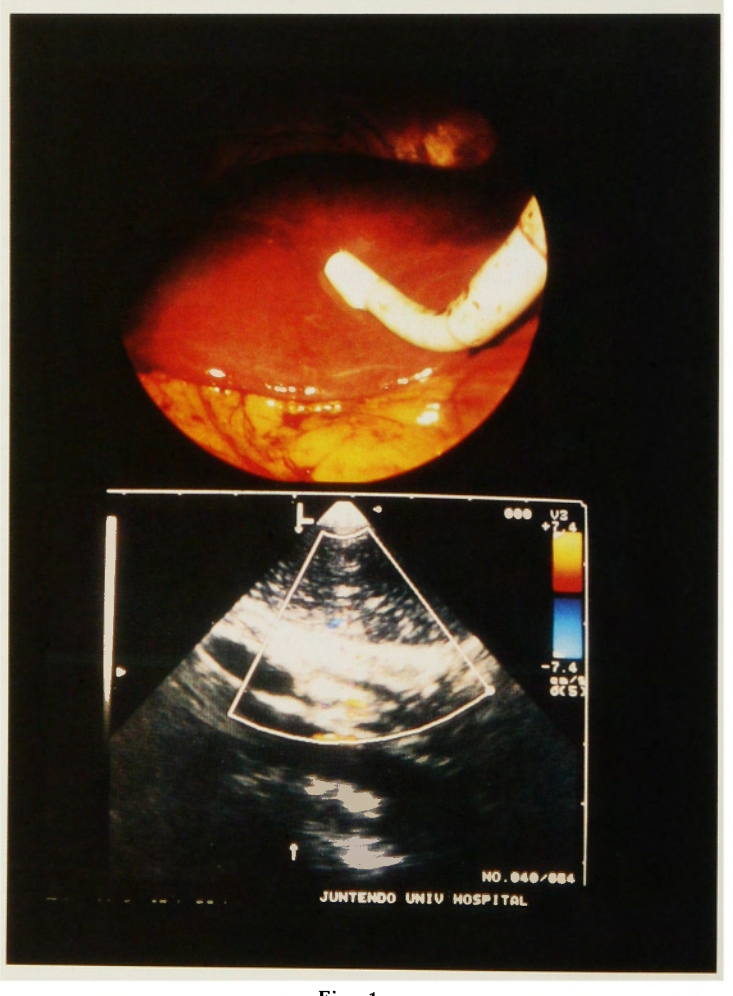

Fig. 1

Materials and methods

A hundred consecutive patients had been expected to receive an elective laparoscopic cholecystectomy from April 1991 to November 1992 in our clinic.

Eligibility for this procedure include symptomatic gallbladder stones, biliary symptoms with demonstrable polyps, adenomyomatosis in the gallbladder, and chronic cholecystitis. Acute cholecystitis, previous upper abdominal incision, and obesity were not contra-indicated.

Conditions such as common bile duct stones and coexistence of another malignant diseases are usual contra-indications.

The hundred consecutive patients were divided into two groups. One group consisted of the initial 40 patients, another group consisted of the following 60 patients. The differences between two groups were implementation of routine intraoperative examinations, introduction of specially designed laparoscopic CUSA equipment and a certain procedure for inserting trocars.

Among the latter 60 patients, 13 patients underwent intraoperative cholangiography, 32 patients underwent intraoperative ultrasonography, 12 patients underwent both of the examinations, and 3 patients didn't undergo the examinations.

Pre-operative Endoscopic Retrograde Cholangiopancreatography (ERCP) was expected to be applied to all patients of the two groups in order to recognize the anatomy of the biliary tract. One case underwent laparoscopic cholecystectomy after endoscopic lithotripsy due to common bile duct stones. Intraoperative cholangiography and/or ultrasonography were routinely applied to the patients of the latter group (Fig. 1).

When inflammation around cystic duct was recognized, the CUSA equipment was utilized to dissect the gallbladder safely to the 6 patients of the latter group (Fig. 2). All 6 patients suffered from wall thickening of the gall bladder and operating time were more than 100 minutes.

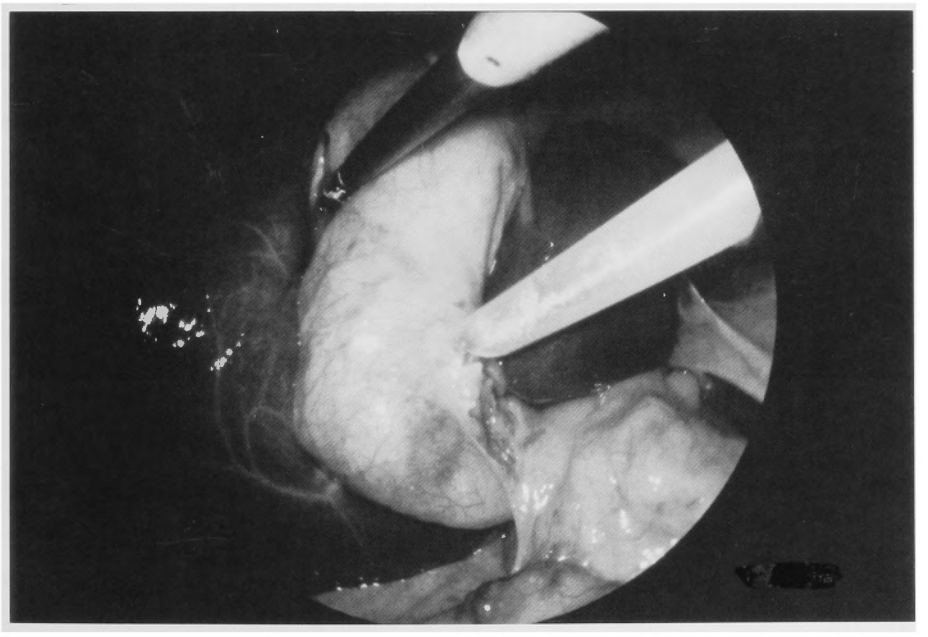

Fig. 2

To avoid bleeding from the abdominal wall, we have performed the following procedure for inserting trocars to the latter group. A VERESS needle was introduced via an incision of inferior umbilical rim while pinching up the abdominal wall. After the peritoneal cavity was filled up adequately with CO_2 gas, a 10 mm trocar was inserted through the same site. A 10 mm, 30° laparoscope was then introduced and the peritoneal cavity was scanned. The projected gallbladder,

Fig. 3

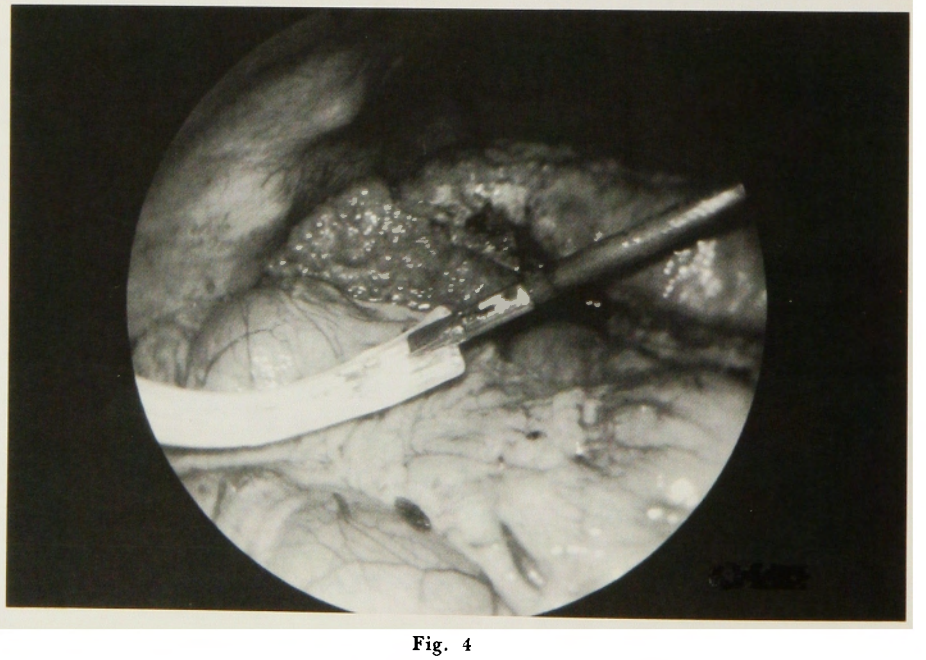

Fig. 4

Table 1 Complications

	Initial 40 cases	Latter 60 cases
bile duct injury	1	0
postoperative bile leakage	2	0
bleeding from cystic artery	1	0
bleeding from abdominal wall	1	0
Total	5	0

liver and hepato-umbilical ligament can be traced on the abdominal wall. Then approximate sites of three different trocars were fixed. First, a 10 mm trocar was placed in the epigastric region. Next, a 5 mm trocar was placed in the right hypochondric region. Then, another 5 mm trocar was in the outer rim of the right subcostal region as far as possible to prevent interfering with each other. The precise punctures were executed one by one in darkness when three fixed sites were lit up by the laparoscope light enabling the vasculars to be visible on the abdominal wall (Fig. 3).

We placed an intra-abdominal drainage device to all patients (Fig. 4).

Results

Among 100 patients, 5 patients suffered from the following complications. There were no death; one case of bile duct injury, two cases of postoperative bile leakage, one case of bleeding from cystic artery and one case of bleeding from the abdominal wall (Table 1).

Two patients were converted to open cholecystectomy. The reasons for the conversions were the common bile duct injury and uncontrollable bleeding from cystic artery respectively.

Two other patients were obliged to undergo the laparotomy due to postoperative bile leakage. One of them revealed the common bile duct injury caused by mal-location of a metal clip, another patient revealed laceration of the duodenal wall. They underwent biliary drainage.

The arterial bleeding from the abdominal wall caused by inserting trocar was experienced as a minor complication in one case. These complications occurred within the initial 40 cases. No further complications have been experienced.

Mean operating time was 109.1 ± 30.3 minutes (mean$\pm$S.D.) in the former group, and 90.5 ± 31.9 minutes in the latter group. In spite of introducing the intraoperative examinations, mean operating time was significantly shorter for the latter group ($p < 0.05$). No significant differ was recognized for the methods of the examination.

Discussion

Many surgeons suggest that the complication rates of laparoscopic cholecystectomy requiring some treatments are 1.2–5.1% and the rates become significantly lower at the institutions whose experiences were more than 100 cases. Half of the biliary injuries are encountered postoperatively[5,6,7].

In our clinic, in the cases with complications of bleeding from cystic artery and common bile duct injury, poor performance of the insufflator and lack of experience in this field of the operators attributed to accelerate difficulty to control the arterial bleeding and the bile duct injury. Improvements of the equipment and surgical technique have got rid of these complications.

The most common and noteworthy complication of laparoscopic cholecystectomy is the bile duct injury[8]. Although we attempt to make sure to comprehend the preoperative condition of the common bile duct (CBD) by ERCP, we think it still necessary to do intra-operative cholangiography[9] or ultrasonography[10]. Especially, in the complicated cases with severe inflammation or with dense adhesion around neck of the gallbladder, it is most important to precisely estimate the anatomy of the cystic-common bile duct junction by using intra-operative examinations[11]. LEE et al[12] advocated that routine cholangiography had not been conclusively demonstrated to prevent injury, and that there is no guarantee that the incidence of injury related to cholangiographic attempts in difficult situations can be reduced. The authors believe that intra-operative cholangiography is very useful to know the pathology of the CBDs. However, in some cases, cholangiographies can not be performed due to technical failure and allergic reaction to contrast media. The authors also think that the operation should be converted promptly to open cholecystectomy when the anatomy is obscured, excessive bleeding occurs, or other problems occur[13,14,15]. Thus a new echo probe was improved for intraoperative ultrasonography[15]. More than ten years ago, ARAMAKI et al[16] applied ultrasonography to diagnostic laparoscopy, and nowadays diagnostic ultrasonography is utilized to liver diseases[17]. Color doppler sonography was introduced in this probe, and it is so maneuvable that we can make the entire length of the CBDs and cystic-common bile duct junction visible. Color doppler sonography could distinguish vessels from the CBDs, but it could not distinguish arteries from veins. The newly improved laparoscopic ultrasonography can be considered a safe, fast and non-invasive alternative to intraoperative cholangiography. The previous two cases with complication of biliary injury were operated without intra-operative examinations. We could have avoided these complications if intra-operative examinations were used.

One case of the biliary injury was recognized at the laparoscopic cholecystectomy, whereas the other case was diagnosed postoperatively. We placed a drain tube into the abdominal cavity to all patients to see whether bile is mixed in the drained substance. It is the easiest and the most noteworthy information for us to recognize the biliary injury. Since in some cases, bile leakage becomes evident several days after the operation, at least an overnight placement of abdominal drainage device is necessary.

The CUSA was modificated so that it can be introduced through a trocar for laparoscopic surgery. The CUSA combines the functions of tissue fragmentation, irrigation and tissue aspiration, and allows to dissect water-dense tissue away from collagen rich structure such as blood vessels and bile ducts[18,19]. In the cases with inflammation around the cystic ducts, we have used the CUSA to remove edematous and frail tissue, because electrical cautery would possibly make minor burn to such bile ducts. However, in the cases without inflammation or adhesion formation, the CUSA is not useful to remove these tissues. So we have to select patients to be applied the CUSA. The result of using the CUSA was satisfactory.

The bleeding from abdominal wall into peritoneal cavity may not be a serious trouble but better off without. Abdominal vessels injuries have been reported[5]. Some of them were hematoperitoneum caused by bleeding from a vessel of the hepato-umbilical ligament. There are many other vessels which should be payed close attention; internal mammary arteries, superior epigastric arteries, anastomoses between the lower intercostal-subcostal and the lumber arteries, inferior epigastric arteries, and the ascending branch of deep circumflex iliac arteries. Using this method, severe obesities were not disadvantages to trace such vessels on the abdominal walls. We have never been troubled by these complications after the introduction of the method to avoid injuries of

vessels.

The operating time is influenced by a learning curve of the operating team and depend on the technical equipment[20]. One of the reasons for the decreased operating time and complications was the learning experience. It is also important to refine the surgical technique to avoid complications.

Conclusions

Since many complications are avoidable, these cases should be considered an invitation for analysis to avoid similar complications in the future and to keep unavoidable complications to a minimum.

We conclude that there are several important points in this operation; first of all, to use sufficient equipments; next, to have refine surgical technique; then, to assure the location of the biliary tract before and during operation; and finally, to pay close attention to abdominal wall approach for avoiding bleeding from abdominal wall. To keep unavoidable complications to a minimum, it is necessary to place a drainage device.

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和文抄録

腹腔鏡下胆嚢摘出術の合併症を予防するために

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腹腔鏡下胆嚢摘出術は良性胆嚢疾患に対し，安全な治療法の1つとなりつつある．開腹胆嚢摘出術と腹腔内操作は基本的に同じであるが，腹腔鏡下胆嚢摘出術では術中の視野や処置具の違いから術中合併症が生じることがある．教室でも，開腹術に移行あるいは術後に再開腹を行った症例を経験している．これら術中合併症を生じた各々の症例につきその原因と予防策を検討し報告したい．

1991年4月から1992年11月までに教室で腹腔鏡下胆嚢摘出術を受けた100症例のうち，合併症のため開腹手術に移行した症例は2例，術後再開腹を受けた症例は2例であった．また，術中腹壁血管の損傷のため腹腔内に出血した症例を1例経験した．これら5症例は，いずれも初期の40症例までにみられ，以後の60症例は開腹術移行例，術後再開腹例，腹壁血管損傷のいずれもみられていない．

開腹手術に移行した2症例は胆嚢動脈からの出血例と総胆管損傷であった．術後再開腹となった2症例は十二指腸損傷と総胆管損傷であった．これらの症例以後，われわれは，ほぼ全例に術中検査として胆道造影と超音波検査を行い胆管の確認を行っている．また，胆嚢壁の肥厚，胆嚢管周囲の炎症がみられる症例に対してはCUSAを用いて剝離を行っている．

手術時間は術中検査を行ったにもかかわらず後期の60症例の方が有意に短く，手技の習熟も合併症を防ぐうえで重要な要素の1つであった．

以上のことから，本術式で起り得る合併症を予防するためには，1)充分な性能を有する器械を用いること，2)処置具を安全に操作できるように手技を習熟すること，3)できる限り術中検査を行い確実に胆道の解剖学的位置関係を把握することが重要であると考えられた．