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## Verification of Our Therapeutic Criterion for Acute Cholecystitis : “ Perform a Subemergency Laparoscopic Cholecystectomy when a Patient is Judged to be able to Tolerate General Anesthesia” -The Experience in a Single Community Hospital

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### Abstract

Background : Our current therapeutic criterion for acute cholecystitis is : Perform a subemergency laparoscopic cholecystectomy (LC) when a patient is judged to be able to tolerate general anesthesia. The aim of the current study was to verify whether this criterion is justified. Methods : The outcomes of 21 cases of LC for acute cholecystitis performed between April 2011 and September 2013 were retrospectively analyzed. Subemergency LC was performed according to the aforementioned criterion (Subemergency group ; n = 16). Patient who was judged to be unable to tolerate general anesthesia underwent percutaneous transhepatic gallbladder drainage (PTGBD) first, then LC after the patients' condition became stable (PTGBD group ; n = 5). Results : There is no conversion to open surgery throughout the study period. The mean of the total hospital stays in the Subemergency group was significantly shorter than that in the PTGBD group ( $11.5 \pm 5.3$  vs.  $30.4 \pm 8.5$  days). Although two patients in the Subemergency group, who had already needed oxygen administration preoperatively, suffered postoperative respiratory failure, they completely recovered. On the other hand, there is no postoperative complication in the PTGBD group. Discussion : Subemergency LC could be safely performed when surgeons as well as anesthesiologists judged a patient to be able to tolerate general anesthesia, which significantly shorten hospital stays compared to elective LC after PTGBD. However, elective LC after PTGBD is an absolutely safer therapeutic option in treating unstable patients.

**Key words :** Laparoscopic cholecystectomy · Acute cholecystitis · Percutaneous transhepatic gallbladder drainage

### Introduction

According to the Tokyo Guidelines 2013, a subemergency cholecystectomy, preferably laparoscopic cholecystectomy (LC), is recommended for acute cholecystitis<sup>1</sup>. However, it is not always feasible to perform a subemergency LC because patients with acute cholecystitis often have

severe comorbidities and unstable organ functions resulted from severe inflammatory responses<sup>2</sup>. Our current therapeutic criterion for acute cholecystitis is : “Perform a subemergency LC when a patient is judged to be able to tolerate general anesthesia.” In order to verify this criterion, we conducted a retrospective analyses using data of 21 patients who recently underwent

an LC for acute cholecystitis.

### Patients and Methods

Data from 21 patients who underwent an LC for acute cholecystitis between April 2011 and September 2013 were retrospectively analyzed. There was no open cholecystectomy for acute cholecystitis in the same study period. Sixteen patients were judged to be able to safely undergo general anesthesia and underwent a subemergency LC (Subemergency group). We defined "sub-emergency surgery" as performing an operation as soon as preoperative evaluations, such as evaluating cardiopulmonary functions and ruling out the presence of common bile duct stones by magnetic resonance cholangiopancreatography, were done. Out of the 16 patients, fourteen were classified as moderate acute cholecystitis<sup>2)</sup>. The other two patients were classified as severe acute cholecystitis because of the presence of respiratory dysfunction. Five patients were judged to be unable to tolerate general anesthesia and underwent a percutaneous transhepatic gallbladder drainage (PTGBD) first, then underwent an elective LC after their general condition became stable (PTGBD group). The reasons why they could not undergo a subemergency LC were respiratory failure caused by systemic inflammatory response syndrome in four patients and paroxysmal atrial fibrillation as well as acute renal failure in one patient. All the 5 patients in the PTGBD group were classified as severe acute cholecystitis. Data of 115 patients who underwent an elective LC between the same study period were also analyzed as data of a control group. Total hospital stays, postoperative hospital stays, postoperative complications, operation time, and intraoperative blood losses were compared among the three groups. Postoperative complications were graded according to the Clavien's classification<sup>3)</sup>.

Student t test or one way ANOVA was used for comparing numerical variables. Proportions were compared using  $\chi^2$  test. Statistical significance

was defined as having a *P*-value of less than 0.05. All statistical analyses were performed using the NCSS 2007 software package (Hintze JL, KeySVille, UT, USA).

### Results

There was no conversion to open cholecystectomy throughout the study period. The median length between admission and subemergency LC was 2 days (range ; 0-7). One patients with severe cholecystitis, who suffered bile peritonitis, underwent LC on the day of admission, and the other with severe cholecystitis, who suffered emphysematous cholecystitis, underwent LC one day after the admission. The patient characteristics and operative results are summarized in Table 1. The mean total hospital stay in the Subemergency group was significantly shorter than that in the PTGBD group ( $11.5 \pm 5.3$  vs.  $30.4 \pm 8.5$  days,  $P < 0.01$ ). The mean postoperative hospital stays in the Control group, the Sub-emergency group, and the PTGBD group were  $5.6 \pm 2.9$ ,  $8.0 \pm 5.6$ ,  $7.8 \pm 2.3$  days, respectively. The mean postoperative stay in the Subemergency group was significantly longer than that in the Control group ( $P < 0.05$ ). The means of operation time in the Subemergency group and the PTGBD group were significantly longer than that in the Control group ( $170.9 \pm 57.0$ ,  $192.0 \pm 47.1$ ,  $126.5 \pm 38.6$  min., respectively,  $P < 0.01$ ). Moreover, the means of the intraoperative blood losses in the Subemergency group and the PTGBD group were significantly larger than that in the Control group ( $94.8 \pm 170.4$ ,  $49.0 \pm 44.2$ ,  $8.3 \pm 31.1$  gram, respectively,  $P < 0.01$ ).

The postoperative complications are summarized in Table 2. Severe complications (Clavien's grade 3 or more) occurred only in the Sub-emergency group. Two patients in the Sub-emergency group, who had already had respiratory dysfunction preoperatively, suffered respiratory failure. Respiratory failures in both patients were caused by systemic inflammatory response syndrome and lung edema caused by massive

**Table 1** Patient characteristics and operative results

Factor	Subemergency group (n = 16)	PTGBD group (n = 5)	Control group (n = 115)
Age	54.6 ± 17.6	70.6 ± 15.2	61.6 ± 14.6
Gender male/female	11/5	4/1	60/55
Total hospital stay (days)	11.5 ± 5.3	30.4 ± 8.5	N/D*
Postoperative hospital stay (day)	8.0 ± 5.6	7.8 ± 2.3	5.6 ± 2.9
Operation time (min.)	170.9 ± 57.0	192.0 ± 47.1	126.5 ± 38.6
Intraoperative blood loss (gram)	94.8 ± 170.4	49.0 ± 44.2	8.3 ± 31.1

Values are expressed as a mean ± S.D.

\*Most patients in the Control group admitted one day before operation.

**Table 2** Summary of postoperative complications

Group	Clavien grade	Complication	Number
Subemergency	1	wound infection	1
	1	increased transaminases	1
	4a	respiratory failure	2
Control	1	wound infection	4
	1	increased transaminases	2
	1	port site bleeding	2
	2	cholangitis	1

volume resuscitation during operation. Both patients fully recovered within 7 days postoperatively.

## Discussion

The previous version of Tokyo Guidelines also had recommended an early cholecystectomy, preferably LC, for acute cholecystitis. Early LC for acute cholecystitis seems to reach a general consensus in the last decade<sup>4)5)</sup>. As a matter of fact, it largely depends on the availability of surgical staffs, anesthesiologists and operating rooms in a hospital whether a subemergency LC can be performed or not. It is not always feasible to perform a subemergency LC, especially in small community hospitals. In 16 patients who received a subemergency LC, the periods between admission and surgery ranged from 0 to 7 days. Some patients who were in a relatively stable condition waited for several days before the operation. The availabilities of operation staffs and operating rooms vary from hospital to hospital. Each individual hospital has to determine how to deal with patients with acute cholecystitis according to such availabilities.

LC is a minimally invasive surgery compared to open cholecystectomy. It makes patients recover early, which shortens the lengths of hospital stays. However, LC for acute cholecystitis is technically demanding because of enlarged gallbladders, bleeding tendency caused by severe inflammation, difficulty exposing the Calot's triangle and so on, especially in patients with gangrenous or emphysematous cholecystitis<sup>6)7)</sup>. There was neither conversion to open surgery nor complication inherent to surgical procedures in the 16 patients who underwent a subemergency LC in the current study. Expertise in laparoscopic cholecystectomy varies from surgeon to surgeon. When a surgeon who attends a patient with acute cholecystitis feels confident that an LC can be successfully performed, then he/she will perform a subemergency LC. In contrast, when a surgeon does not feel confident, he/she should perform a PTGBD first, then perform an elective LC after the patient's condition stabilizes. PTGBD is a safe procedure, and makes severe inflammation rapidly subside<sup>8)</sup>. There was no postoperative complication in the PTGBD group, which indicates that an elective LC after PTGBD is safer than a

subemergency LC for acute cholecystitis. The only drawback in an elective LC is to lengthen total hospital stays.

Two patient in the Subemergency group suffered postoperative respiratory failure necessitating ventilation assistance (Table 2). Both patients had already had respiratory dysfunction requiring oxygen administration preoperatively. According to the Tokyo Guidelines 2013,<sup>2)</sup> both patients were classified into severe acute cholecystitis and ideally would have undergone gallbladder drainage first. However, one patient had a bile peritonitis caused by the perforation of the gangrenous gallbladder and the other had an emphysematous cholecystitis, which made PTGBD seem less effective. We judged both patients would be able to tolerate general anesthesia and performed a subemergency LC. Although relatively large amounts of volume resuscitation was needed during operation, which made the respiratory functions of these patients deteriorate requiring ventilation support postoperatively, they completely recovered within 7 days postoperatively.

In conclusion, our therapeutic criterion for acute cholecystitis "Perform an emergency laparoscopic cholecystectomy" was verified. However, a criterion for acute cholecystitis should be modified according to surgeons' expertise in laparoscopic surgery and availabilities of operating staffs and facilities in individual hospitals.

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(和文抄録)

## 急性胆嚢炎に対する治療指針—全身麻酔可能と判断される場合には準緊急で腹腔鏡下胆嚢摘出術を施行する—の検討

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**【背景】** 急性胆嚢炎に対する現在の我々の治療方針は“全身麻酔可能と判断される場合には準緊急で腹腔鏡下胆嚢摘出術を行う”である。この治療方針の正当性を検証した。

**【方法】** 2011年4月から2013年9月までに行った急性胆嚢炎に対する腹腔鏡下胆嚢摘出術症例21例を対象とした。準緊急腹腔鏡下胆嚢摘出術は上記の治療指針に従って行った(準緊急群; n = 16)。全身麻酔が安全に施行できないと判断された場合には経皮経肝胆嚢ドレナージを行い、全身状態が安定した後に腹腔鏡下胆嚢摘出術を行った(PTGBD群; n = 5)。

**【結果】** 全症例に対して腹腔鏡で胆嚢摘出術を完遂した。平均総入院日数はPTGBD群と比較して準緊急群で有意に短かった(11.5 ± 5.3 対 30.4 ± 8.5 日)。準緊急群では術前に既に酸素投与を必要としていた2例に術後の呼吸不全を認め、術後に人工呼吸管理を必要とした。一方PTGBD群では術後合併症を1例も認めなかった。

**【結語】** 急性胆嚢炎に対する準緊急腹腔鏡下胆嚢摘出術は、全身麻酔が可能と判断される場合には安全に施行することができ、早期の退院が可能であった。状態が不安定で全身麻酔が安全に施行することが難しいと判断される患者においてはPTGBDを施行した後、状態が安定してから腹腔鏡下胆嚢摘出術を行うことが絶対的に安全と考えられた。