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ORIGINAL ARTICLE

The severity grading of acute cholecystitis following the Tokyo Guidelines is the most powerful predictive factor for conversion from laparoscopic cholecystectomy to open cholecystectomy



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KEYWORDS

Acute cholecystitis;
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Summary

Background: The relationship between the severity assessment of acute cholecystitis based on the Tokyo Guidelines and the risk for conversion from laparoscopic surgery to open surgery has been assessed in few previous reports, with conflicting results.

Methods: A retrospective review of patients with acute cholecystitis within a single system from 2010 to 2013 was performed. The diagnosis and severity of acute cholecystitis were assigned by the Tokyo Guidelines 2013 (TG13). The primary outcome measure was conversion to open cholecystectomy.

Results: During the period of study, 493 patients were operated by laparoscopy for acute cholecystitis. Laparoscopic cholecystectomy was intraoperatively converted to open surgery in 56 cases (11.4%). The multivariate analysis showed that the risk factors for conversion to open surgery included male gender (OR: 2.15; IC_{95%} [1.18–3.9]), diabetes (OR: 2.22; IC_{95%} [1.13–4.33]), total bilirubin levels (OR: 1.02; IC_{95%} [1–1.05]), and the TG13 severity classification (OR: 4.44; IC_{95%} [2.25–8.75]).

Conclusions: The independent risk factors for conversion to open surgery included male sex, diabetes mellitus, total bilirubin level, and TG13 grade. TG13 grade was found to be the most powerful predictive factor for conversion as it had the highest OR.

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Introduction

Laparoscopic cholecystectomy (LC) is considered the gold standard for the management of acute cholecystitis (AC) [1]. Comparing early and delayed cholecystectomy, randomized controlled trials and meta-analyses had shown that the first is more economical for reducing hospital stay and cost, yet no significant differences between both approaches with respect to morbidity and mortality had been suggested [2–5].

For acute cholecystitis, the conversion rate of the early cholecystectomy from laparoscopic to open operation ranges from 11 to 31% (5 times the conversion rate for chronic cholecystitis) [6,7]. In light of the above percentages/rates, interest arises in studying the predictive factors for such conversion.

Previous studies have revealed several risk factors for conversion to open surgery in patients undergoing LC for AC [8,9]. However, the relationship between severity characteristics based on the Tokyo Guidelines [10,11] and the risk for conversion to open surgery has been only assessed in two previous reports, with conflicting results [12,13]. The aim of this retrospective study was to identify the risk factors for conversion to open surgery in patients with AC who underwent LC focusing on the Tokyo Guidelines 2013 (TG13) severity characteristics.

Materials and methods

Between January 2010 and January 2013, 493 patients underwent laparoscopic cholecystectomies for AC at the Department of Surgery, Mohamed Tahar Maamouri Hospital of Nabeul (137 males and 356 females; age range: 19–93 years, with a median age of 53 years). Patients with alternate diagnoses of choledocholithiasis or gallstone pancreatitis were excluded (33 patients). A definitive diagnosis of AC was made in accordance with the Tokyo Guidelines [10,11]:

- A. Local signs of inflammation: (1) Murphy's sign, (2) mass/pain/tenderness.
- B. Systemic signs of inflammation: (1) fever, (2) elevated CRP, (3) elevated WBC count.
- C. Imaging findings: imaging findings characteristic of acute cholecystitis.

Suspected diagnosis: one item in A + one item in B.

Definite diagnosis: one item in A + one item in B + C.

Chronic cholecystitis was excluded from this study. The diagnosis of AC was preoperatively confirmed using ultrasonography, CT scan was not performed for our patients.

AC was classified into three stages: mild, moderate, and severe. Pathologic diagnoses were made using current standard definitions and criteria used in surgical pathology literature, with similar definitions described by Fitzgibbons et al. in their review [14]. The patients were classified into two groups: a conversion (to open surgery) and a no-conversion (to open surgery) group. These patients were retrospectively analyzed and the analysis included their preoperative characteristics. The strategies included early laparoscopic cholecystectomy (within 24 hours of admission if possible, otherwise within 72 hours of admission in few cases) performed by specialist hepatobiliary surgeons. After the cholecystectomy, the gallbladder was removed through a plastic bag. There were no patients treated with antibiotic and operated on 6 weeks later. Our patients received

2 g of amoxicillin plus clavulanic acid 3 times a day while in the hospital before and once at the time of surgery. After surgery, no antibiotics were given to our patients. Percutaneous transhepatic gallbladder drainage (PTGBD) was not performed in our surgical center. Patients with severe acute cholecystitis (six patients) were operated by laparotomy after resuscitation so they were excluded from this study.

The criteria for moderate AC, such as a WBC count > 18,000 cells/mm³, symptoms for > 72 h and marked local inflammation were included as risk factors for conversion to open surgery [15]. Defined as the presence of severe local inflammation and as described in the TG13, marked local inflammation included biliary peritonitis, pericholecystic abscess, hepatic abscess, gangrenous cholecystitis, suppurative cholecystitis, and emphysematous cholecystitis [15]. Severe acute cholecystitis includes organ dysfunction due to shock.

Statistical analysis was conducted using Fisher's exact test and the χ^2 test for categorical data while the independent t test was computed for continuous data. Results are expressed as the mean \pm standard deviation (SD). Variables associated with conversion with a *P* value < 0.05 in the univariate analysis were included in a multivariate logistic regression analysis. A backward stepwise method was used to identify independent risk factors for conversion to open surgery, with significance set at a 5% level. All statistical analyses were performed using SPSS for Windows, version 19.0 (SPSS, Chicago, IL, USA).

Results

During the period of study, 493 patients were operated by laparoscopy for acute cholecystitis, there were 137 men (27.8%) and 358 women (72.2%). Hypertension was the most frequent co-morbidity (139 patients: 28.2%), followed by diabetes (80 patients: 16 patients had type 1 diabetes and 64 patients had type 2 diabetes). Sixteen patients had cardiac disease (3.2%). The median age was 52.87 years (19–93 years).

The distribution of the severity in the 493 patients with AC was as follows: mild in 258 cases (52.33%) and moderate in 235 cases (47.67%). There were no cases of severe AC (patients with severe acute cholecystitis were excluded as they were operated by laparotomy).

LC was intraoperatively converted to open surgery in 56 cases (11.4%) including 12 patients (4.65%) with mild AC and 44 patients (18.72%) with moderate AC.

Conversion was most frequently needed for local inflammation (40 cases: four patients with mild AC and 36 patients with moderate AC). The site of inflammation that necessitated conversion was the Calot's triangle in 30 cases and the gallbladder in ten cases. Intraoperative bleeding that was difficult to control was the reason for the conversion in 11 patients (five cases with mild AC and six cases with moderate AC); the site of bleeding was the cystic artery in six cases and oozing around the gallbladder in five cases. Conversion was needed due to dense pericholecystic omental and bowel adhesions in five cases (three patients with mild AC and two patients with moderate AC). There were no cases of bile duct injury (Table 1).

The interval time between skin incision and conversion to open was 48 min (15–115 min). In case of conversion, subcostal incision was used in all cases.

A univariate analysis showed that the risk factors for conversion to open surgery included male gender (*P* = 0.003),

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