A simplified risk stratification in early cholecystectomy for acute cholecystitis based on age: A single-center retrospective study from an institution with no mortality

Yugo Matsui, MD; Kana Ishikawa, MD; Takashi Kumode, MD; Keisuke Tanino, MD; Ryosuke Mizuno, MD; Shusaku Homma, PhD; Teppei Murakami, PhD; Shinichi Hosokawa, PhD; Takatsugu Kan, PhD; Sanae Nakajima, PhD; Takehisa Harada, MD; Shigeki Arii, PhD

Department of Surgery, Kobe City Medical Center West Hospital, Kobe Japan

Background

- Useful risk prediction scores for surgical complications, such as the Chole-Risk Score (Di Martino, et al. *J Gastrointest Surg*, 2021), have been reported, but they involve many factors and are somewhat intricate.
- Could the risk stratification for early surgery of AC patients be simplified if analysis was done on a population with no mortality?

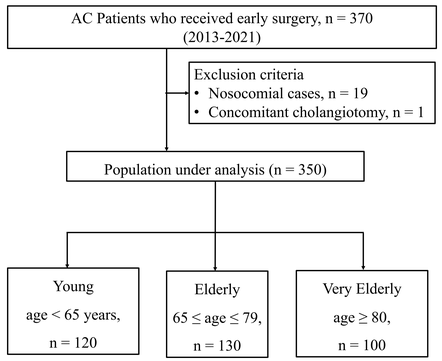
Purpose

To determine predictive risk factors for surgical complications according to the Clavien-Dindo (CD) classification based on age

Methods

- single-center retrospective observational study
- early surgery = surgery performed < 72 hours of diagnosis
- Risk factors for CD grade ≥II complications were identified through logistic regression analysis of the entire cohort + for each age group.

Study design



Results

Patient Background / Outcome

- median age of cohort: 72
- ASA-PS ≥3 :
  young 5.8% vs 17.7% elderly vs 41.0% very elderly, P<0.01
- prevalence of moderate to severe AC:
  young 45.0% vs elderly 63.1% vs 73.0% very elderly, P <0.01
- complication rate (CD grade ≥II): 12 % overall
  young 3.3% vs elderly 10.0% vs 22.0% very elderly, P <0.01
- complication details:
  1. intraabdominal abscess, n = 16 (4.6%)
  2. bile leak, n = 9 (2.6%)
  3. superficial surgical site infection, n = 6 (1.7%)
  4. pneumonia, n = 3 (0.8%)
  5. postoperative bleeding, n = 3 (0.8%)
  6. others, n = 8
- there was no 30-day mortality during the study period

Multivariable analysis of cohort (Table1): age, TG18 severity ≥moderate

Multivariable analysis of each age group (Table2):

- Young: no variables
- Elderly: age
- Very Elderly: TG18 severity ≥moderate

Table 1: Multivariable analysis of entire cohort

Variables	Risk factors for CD grade≥II complications			
	Univariable		Multivariable	
	OR [95% CI]	P value	OR [95% CI]	P value
Age, continuous	**1.06 [1.03-1.09]**	**<0.01**	**1.05 [1.01-1.09]**	**0.01**
Sex, Male	0.66 [0.32-1.35]	0.23		
ASA-PS ≥3E	3.22 [1.49-6.86]	<0.01	1.54 [0.68-3.53]	0.3
CCI ≥6	2.64 [1.28-5.53]	0.01	0.86 [0.36-2.05]	0.73
Duration of symptoms before surgery ≥3days	1.39 [0.65-2.92]	0.36		
Diabetes mellitus	0.71 [0.26-1.74]	0.55		
Chronic kidney disease	2.95 [0.89-8.47]	0.04	1.59 [0.52-4.87]	0.42
Heart disease	3.29 [1.47-7.18]	<0.01	1.93 [0.78-4.78]	0.16
Antithrombotic theraphy	2.24 [1.02-4.79]	0.04	0.78 [0.31-1.92]	0.59
White blood cell ≥15000/μL	1.35 [0.59-2.92]	0.44		
C-reactive protein ≥17.0mg/dL	2.11 [0.99-4.42]	0.04	0.99 [0.46-2.15]	0.98
TG18 Severity ≥moderate	**4.20 [1.67-12.63]**	**<0.01**	**3.08 [1.15-8.25]**	**0.03**
Laparoscopic cholecystectomy	0.39 [0.17-0.98]	0.02	0.79 [0.29-2.14]	0.65
Operating time ≥130min	1.76 [0.8-3.73]	0.12		
Blood loss ≥150g	2.55 [1.21-5.33]	0.01	1.17 [0.51-2.67]	0.71

Table 2: Multivariable analysis of each age group

Variables	Risk factor for CD grade≥II complications									
	Young (n=120)		Elderly (n=130)				Very Elderly (n=100)			
	Univariable		Univariable		Multivariable		Univariable		Multivariable	
	OR [95% CI]	P value	OR [95% CI]	P value	OR [95% CI]	P value	OR [95% CI]	P value	OR [95% CI]	P value
Age, continuous	0.96 [0.89-1.04]	0.33	1.21 [1.03-1.43]	0.02	**1.22 [1-1.47]**	**0.03**	1.08 [0.96-1.21]	0.2		
Sex, Male	0.23 [0.01-2.96]	0.31	0.68 [0.18-2.62]	0.55			0.90 [0.31-2.60]	1		
ASA-PS ≥3E	n.a.*	n.a.*	3.39 [0.78-13.42]	0.05	2.25 [0.5-10.2]	0.29	1.59 [0.55-4.62]	0.34		
CCI ≥6	n.a.*	n.a.*	1.48 [0.31-5.82]	0.51			1.25 [0.38-4.88]	0.79		
Duration of symptoms before surgery ≥3days	n.a.*	n.a.*	2.26 [0.58-8.54]	0.2			1.08 [0.35-3.18]	1		
Diabetes mellitus	n.a.*	n.a.*	1.08 [0..23-4.22]	1			0.38 [0.07-1.49]	0.17		
Chronic kidney disease	n.a.*	n.a.*	1.93 [0.18-10.98]	0.34			2.23 [0.43-9.98]	0.25		
Heart disease	n.a.*	n.a.*	2.02 [0.41-8.13]	0.49			2.24 [0.75-6.67]	0.12		
Antithrombotic theraphy	1.80 [0.03-23.97]	0.5	1 [0.17-4.27]	1			1.43 [0.50-4.15]	0.47		
C-reactive protein ≥17.0mg/dL	3.78 [0.3-203.5]	0.33	2.08 [0.54-7.83]	0.22			1.46 [0.48-4.29]	0.45		
TG18 Severity ≥moderate	n.a.*	n.a.*	2.07 [0.50-12.34]	0.37			4.66 [1.00-44.24]	0.03	4.72 [1.02-21.8]	0.04
Laparoscopic cholecystectomy	1.27 [0.02-16.71]	n.a.*	0.65 [0.15-4.01]	0.46			0.43 [0.13-1.51]	0.24		
Operating time ≥130min	n.a.*	n.a.*	1.29 [0.27-5.04]	0.74			1.87 [0.61-5.56]	0.29		
Blood loss ≥150g	0.96 [0.89-1.04]	0.33	2.26 [0.58-8.54]	0.2			1.63 [0.57-4.77]	0.34		

* analysis could not be done due to the lack of applicable patients

Discussion

- Patient selection for early surgery was based on the Tokyo Guidelines 2018. Patients with jaundice, neurological dysfunction and respiratory dysfunctions are associated with increased mortality rates, and thus early surgery was not considered for such patients.
- Very elderly patients had a higher proportion of high ASA-PS scores (P <0.01 for pairwise comparison between elderly/young and very elderly/young), which may account for the higher morbidity rates.
- Old patients with moderate to severe AC are at particular risk for significant complications, but if resources to treat morbid conditions (e.g. endoscopic retrograde cholangiopancreatography, interventional radiography, intensive care units) are available, they can recover from these conditions.
- With availability of resources and adequate selection of patients for surgical intervention, very elderly patients with advanced AC can benefit from early surgery.

Conclusion

Risk stratification for surgical complications of early cholecystectomy in AC patients could be simplified to age and TG18 severity.