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Risk factors for acute gangrenous cholecystitis in emergency general surgery patients

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Abstract

BACKGROUND: Acute gangrenous cholecystitis (AGC) is a medical emergency that carries high morbidity. The objective of this study is to define risk factors for this disease.

METHODS: A retrospective review of patients who underwent cholecystectomy while admitted to the Acute Care Surgery Service from January 2009 to April 2014 was performed. Specimen reports were evaluated to identify patients with AGC and cholecystitis without necrosis (CN). Preoperative factors as well as outcomes were compared between the groups.

RESULTS: A total of 483 patents underwent cholecystectomy. Four hundred fifty-nine patients were found to have CN and 24 patients were found to have AGC. Pre-existent factors such as diabetes, coronary artery disease, and systemic inflammatory response syndrome predicted AGC on a logistic regression. Patients with AGS were also more commonly older, male, and had a higher preoperative bilirubin. Mortality was significantly higher in patients with AGC (12.5% vs .9%, $P = .003$).

CONCLUSIONS: AGC carries an increased mortality rate compared with CN. Older patients with diabetes, coronary artery disease, and elevated bilirubin should be suspected of having AGC.

Acute gangrenous cholecystitis results from compromised perfusion of the gallbladder wall secondary to increased intraluminal pressure because of the persistent complete or partial obstruction of the cystic duct.[1] Compared with cholecystitis without necrosis (CN), development of acute gangrenous cholecystitis in patients can negatively impact outcome.[2] The presence of acute gangrenous cholecystitis results in increased morbidity and mortality especially in elderly patients.[3] Previous studies have suggested that early diagnosis and treatment could decrease the rate of complications.[1] To date, however, there are no defined guidelines available for triage of these patients to early surgical treatment.[4]

The purpose of this study is to identify risk factors for the early recognition of acute gangrenous cholecystitis in patients admitted to the Emergency General Surgery Service (EGS). We hypothesize that in the EGS Service risk factors such as diabetes and high bilirubin are important considerations for the early diagnosis of acute gangrenous cholecystitis.

Patients and Methods

Approval from the Institutional Review Board of Virginia Commonwealth University was obtained for this

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Table 1 Risk factors and outcomes

Parameter	Yes (n = 24)	No (n = 459)	*P* value	Test
Age (median, range)	56.3 (22.1–81.5)	39.7 (16.6–82.8)	<.0001	Wilcoxon rank test
Total bilirubin	1.2 (.2–5.9)	.6 (.1–8.3)	.0071	Wilcoxon rank test
Lactate	1.2 (.5–2.4)	1.2 (.3–6.2)	.8334	Wilcoxon rank test
Low SBP	121 (102–161)	126 (75–198)	.6028	Wilcoxon rank test
Hospital LOS (days)	6 (2–14)	3 (1–43)	<.0001	Wilcoxon rank test
Male sex (%)	58.3%	25.5%	.0013	Fisher's exact test
Mortality (%)	12.5%	.9%	.0033	Fisher's exact test
ICU (%)	8.3%	2.0%	.0990	Fisher's exact test
SBP < 100 (%)	.0%	2.4%	1.0000	Fisher's exact test
Diabetes (%)	33.3%	6.8%	.0002	Fisher's exact test
Obese (%)	53.3%	56.6%	.7975	Fisher's exact test
COPD (%)	5.0%	1.7%	.0835	Fisher's exact test
CAD (%)	41.7%	1.7%	<.0001	Fisher's exact test
CVA (%)	4.2%	.2%	.0970	Fisher's exact test
SIRS (%)	62.5%	3.9%	<.0001	Fisher's exact test
Conversion rate (lap to open)	75%	17.70%	<.0001	Fisher's exact test

CAD = coronary artery disease; COPD = chronic obstructive pulmonary disease; CVA = cardiovascular accident; ICU = intensive care unit; LOS = length of stay; SBP = systolic blood pressure; SIRS = systemic inflammatory response syndrome.

study. A retrospective chart review of all patients who underwent cholecystectomy while admitted to the EGS Service from January 2009 to April 2014 was performed. Operative notes and pathology reports were screened for the presence of acute gangrenous cholecystitis.

Acute gangrenous cholecystitis was defined pathologically by histological evidence of mural vascular thrombosis and occlusion with partial or complete involvement of the gallbladder wall. For the purpose of this study, acute gangrenous cholecystitis was a pathological diagnosis, regardless of the preoperative radiological findings or the description in the operative report.

Preoperative characteristics and outcomes of patients with acute gangrenous cholecystitis were compared with those patients with CN.

Preoperative risk factors evaluated included age, sex, diabetes, preoperative hypotension (defined as systolic blood pressure [SBP] less than 100), preoperative diagnosis of systemic inflammatory response syndrome (SIRS), weight, and admission laboratory work including serum lactate and total bilirubin. Outcomes compared included the following: need for conversion from laparoscopic to open procedure, length of stay (LOS), need for admission to the intensive care unit, and mortality.

The diagnosis of SIRS was made relying on a computerized early warning tool for sepsis available in our institution as a warning sign calculated by the electronic medical record system.

Additionally, we examined whether the patients received a preoperative computer tomography study, as well as if the diagnosis of acute gangrenous cholecystitis was considered on the final read of the preoperative ultrasound report.

Categorical variables were analyzed using Fisher's exact method, while continuous variables were analyzed using the *t* test. All analyses were performed using SAS 9.3 software (Cary, NC), with significance set at *P* less than .05.

Results

A total of 483 patients underwent cholecystectomy over the course of this study, with 459 patients found to have CN and 24 patients found to have acute gangrenous cholecystitis. Patients with acute gangrenous cholecystitis were on average older compared with those with CN (56.3 vs 39.7). Acute gangrenous cholecystitis was found to be significantly more common in male patients (58%) compared with CN (25%). Patients with acute gangrenous cholecystitis had a higher incidence of pre-existent coronary artery disease (CAD) and diabetes mellitus. Although hypotension at admission was not predictive of having a necrotic gallbladder, SIRS was statistically significant more commonly found in these patients (Table 1). Logistic regression factors such as diabetes, CAD, and SIRS are found to be predictive of acute gangrenous cholecystitis (Table 2).

As expected patients with acute gangrenous cholecystitis had an increased LOS and intensive care unit admission.

Table 2 Stepwise logistic regression of risk factors

Parameter	Odds ratio	95% CI	*P* value
SIRS	18.638	6.412–54.178	<.0001
CAD	13.017	3.571–47.661	.0001
Diabetes	3.392	1.056–10.900	.0402

Area under the ROC curve = .852.

CAD = coronary artery disease; CI = confidence interval; ROC = receiver operating characteristic curve; SIRS = systemic inflammatory response syndrome.