

The importance of routine bedside biliary ultrasonography in the management of patients admitted to the emergency department with isolated acute epigastric pain

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Background/aim: The aim of our study was to emphasize the importance of routine bedside biliary ultrasonography (USG) for the differential diagnosis of biliary tract disorders in patients admitted with acute isolated epigastric pain.

Materials and methods: Adult patients who were admitted to the emergency department with acute isolated epigastric pain were included in the study. Emergency residents (ERs) were asked whether they planned to perform biliary USG during the initial evaluation and following diagnosis/treatment (secondary evaluation) of these patients. Bedside biliary USG examinations were performed by a sonologist and a radiologist evaluated the video recordings.

Results: A total of 103 patients were enrolled, 29 of whom were diagnosed with biliary tract disease (BTD). In the 29 patients diagnosed with BTD, 27 had gallstones (biliary colic, 18; acute cholecystitis, 7; acute pancreatitis, 2) and two had biliary sludge. USG was not ordered by the ERs for 44.8% of the 29 patients with a final diagnosis of BTD, 58.8% of 17 patients with normal liver function tests and BTD, and 35.3% of the 17 hospitalized patients.

Conclusion: Emergency physicians should routinely use biliary USG along with clinical judgement and laboratory studies in order to rule out BTD in patients with acute isolated epigastric pain.

Key words: Biliary ultrasound, epigastric pain, cholelithiasis, cholecystitis, bedside ultrasound

1. Introduction

Acute abdominal pain is one of the most common complaints of patients presenting to emergency departments (EDs) and it constitutes approximately 5%–10% of ED admissions. Biliary tract disease (BTD) has a significant proportion among patients admitted with acute abdominal pain and is found in approximately 3%–10% of patients hospitalized for acute abdominal pain (1–3). Patients with BTD may present with epigastric pain as often as right upper quadrant pain. Nausea, vomiting, abdominal distention, belching, chills, shivering, and acid regurgitation may accompany it (1,4).

Since upper gastrointestinal diseases (GIDs) (i.e. reflux esophagitis, gastritis, peptic ulcer disease, and pancreatitis) may present with symptoms similar to cholelithiasis, the differential diagnosis of BTD may be challenging for emergency physicians. Infectious diseases such as acute appendicitis, pyelonephritis, hepatitis, and pneumonia may be confused with acute cholecystitis (1). Furthermore, myocardial ischemia, renal diseases, and some disorders of

the colon should also be kept in mind during differential diagnosis. In order to make the diagnosis rapidly and effectively, emergency physicians should narrow the range of diagnoses by utilizing history, physical examination and laboratory investigations, and appropriate imaging techniques to lead to definitive diagnosis (1,4,5).

Ultrasonography (USG) is a noninvasive and rapid diagnostic imaging technique that is reproducible and mobile, has relatively lower costs, and causes no radiation exposure. Therefore, it is the preferred choice of imaging technique by emergency physicians for the evaluation of upper abdominal pain (6–8). The use of bedside biliary USG has recently increased due to advantages such as being readily available for 24 h, eliminating the out-of-ED transfer of the patient, and no need for additional employees (9–11). Ross et al. (12) reported that the sensitivity and the specificity of emergency bedside USG performed by emergency physicians for cholelithiasis was determined to be 89.8% and 88%, respectively, and it was determined to be 91.3% and 99.3%, respectively, and 87%

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and 82%, respectively, in two separate studies by Katirci et al. (13) and Summer et al. (9) for cholecystitis.

Although patients whose complaints are relieved by symptomatic upper gastrointestinal treatment are mostly thought to have non-BTD pathologies, various studies proved that neither symptomatic relief nor symptoms or laboratory tests have good predictive value in terms of presence or absence of cholelithiasis, especially in elderly patients (14–19).

The aim of our study is to emphasize the importance of routine use of bedside biliary USG for determining BTD in patients admitted to the ED with acute isolated epigastric pain.

2. Materials and methods

2.1. Study design and setting

Our study is a single-center, prospective, observational study, designed to assess the role of emergency bedside biliary USG in evaluating isolated acute nontraumatic epigastric pain. The study was conducted over a 6-month

period. Before patient enrollment, local ethics committee approval and written consent from the patients were obtained.

We conducted the study in a teaching and research hospital ED that supports a residency program, having an annual patient census of 190,000.

2.2. Study protocol

Adult patients ≥ 18 years of age who were admitted for acute, isolated nontraumatic epigastric pain within the working hours of the attending emergency physician (sonologist) were included in the study (Figure 1).

The exclusion criteria for the study were as follows: 1) patients who did not want to participate in the study, 2) patients who had abdominal pain in any location other than the epigastric region, 3) history of cholecystectomy (due to the fact that the presence of common bile duct stones is difficult to diagnose in the ED), 4) chronic abdominal pain, 5) altered mental status, 6) pregnancy, 7) trauma, 8) acute myocardial infarction, 9) hemodynamic instability as evidenced by abnormal vital signs.

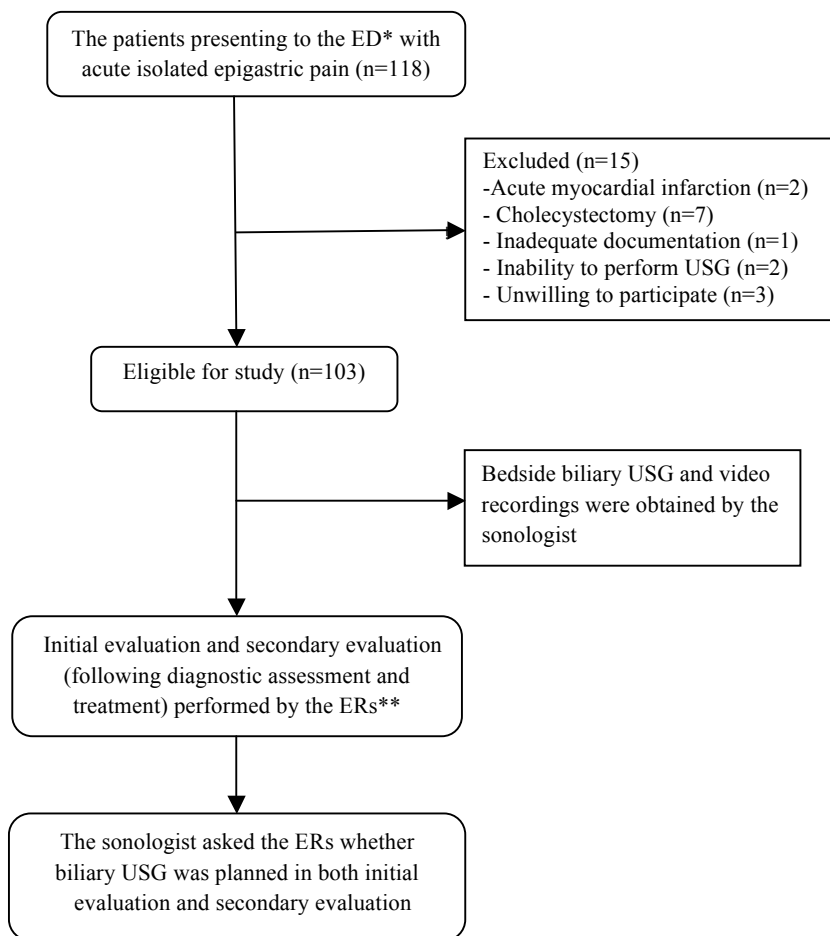


Figure 1. Flow chart.

Bedside USG was performed by a well-trained sonologist who was the attending emergency physician and has over 10 years of experience in emergency medicine and over 5 years of experience in emergency USG. All USG examinations were performed with the SonoScape S6 (SonoScape S6; Guangdong, China). A curved linear array was used with frequency ranges from 2.5 to 5.0 MHz.

The demographic and clinical data of all patients who met the inclusion criteria were recorded by the sonologist and then bedside biliary USG was performed and video recordings were obtained. The complaints of patients, admission to a medical facility with similar complaints within the last month, and their diagnoses were recorded as clinical data.

The clinical management of patients was primarily performed by emergency residents (ERs) with at least 1 year of residency training fulfilling the minimal requirements of the standardized curriculum of the Emergency Medicine Association of Turkey. Symptomatic treatment was initiated for patients as indicated by the ERs. The sonologist asked the ERs whether biliary USG was planned in both the initial evaluation and following diagnostic assessment and treatment (secondary evaluation). The initial diagnoses (GID, BTB, or undecided), secondary diagnoses following investigation and treatment (GID, BTB, and others) of the ERs, and discharge diagnoses of the attending emergency physician acting as the supervisor [BTB (biliary colic, acute cholecystitis, pancreatitis, etc.), GID, and others] were recorded. The secondary diagnostic decisions of the ERs were determined before consulting the attending emergency physician according to medical history, physical examination findings, laboratory results, and USG results, if ordered by the ER. The decision for further patient management (admission or discharge with outpatient follow-up) was made under the supervision of the attending emergency physician. Laboratory tests including complete blood count, liver function tests (LFTs), serum amylase, and bilirubin were ordered for patients with acute isolated epigastric pain. A radiologist who was blinded to the study evaluated the USG video images that were recorded by the sonologist. The presence of any findings such as gallstones, biliary sludge, thickened gallbladder wall (>3 mm), pericholecystic fluid, and increased choledochal width (>6 mm) was considered as positive USG regarding BTB. The evaluation of the recorded videos by the radiologist was considered the gold standard for the biliary USG.

Normal laboratory values were based on our hospital's laboratory values and were as follows: leukocyte count 4–10 mm³, serum amylase 22–80 IU/L, total bilirubin 0.3–1.2 mg/dL, and LFTs of aspartate aminotransferase (AST) 0–50 IU/L and alanine transaminase (ALT) 0–50 IU/L.

One month later, patients were reached by telephone to inquire about the presence or absence of epigastric pain and whether they had undergone endoscopy and/or cholecystectomy.

2.3. Statistical analysis

SPSS 17.0 for Windows (SPSS Inc., Chicago, IL) was used for the statistical analyses. Regarding digital data obtained by measurements, data that conformed to normal distribution were shown as mean and standard deviation, and data that did not conform to normal distribution were shown as median and standard error. The categorical data obtained by counting were shown as number (n) and percentage (%). In order to evaluate the difference between the groups in terms of frequency of categorical data, the chi-square test was used. $P < 0.05$ was considered to be significant. Regarding the sample size calculation, the prevalence of cholelithiasis among patients with isolated acute nontraumatic epigastric pain was estimated to be 20%. The number of patients needed for a confidence interval of 95% and SE ± 8 was 97.

3. Results

During the study period, 118 patients were admitted to the ED with acute nontraumatic isolated epigastric pain. Of these, 15 patients (12.7%) were excluded. The reasons for exclusion were acute myocardial infarction (n = 2), cholecystectomy (n = 7), inadequate documentation (n = 1), inability to perform sonographic examination (n = 2), and patients unwilling to participate in the study (n = 3). The remaining 103 patients constituted the study group (the (mean age: 46.6 \pm 17.2 years; range: 19 to 84 years; 68% female, n = 70).

The most common symptom accompanying the pain was found to be nausea and all symptoms were found to be present in 15 patients (14.6%). However, in patients with BTB, bloating/belching was at the forefront. No significant relationship was found between the symptoms of the patients and their discharge diagnoses (Figure 2). There were 7 (6.8%) patients with previously diagnosed cholelithiasis, 30 (29.1%) patients who had undergone upper gastrointestinal endoscopy, and 63 (61.2%) patients who previously suffered from similar complaints of epigastric pain. Among 26 (25.2%) patients who presented to a health facility with the same complaint within the last month, 18 were diagnosed with GID, seven were diagnosed with BTB [biliary colic (n = 4), acute cholecystitis (n = 3)], and one was diagnosed with hydatid cyst and free intraabdominal fluid.

At the initial evaluation performed by ERs, the preliminary diagnosis was GID in 86 (83.5%) of the patients (Figure 3). While USG was planned in only six (5.8%) patients at the initial evaluation, it was ordered in 17 (16.5%) patients after the secondary evaluation (n = 103).

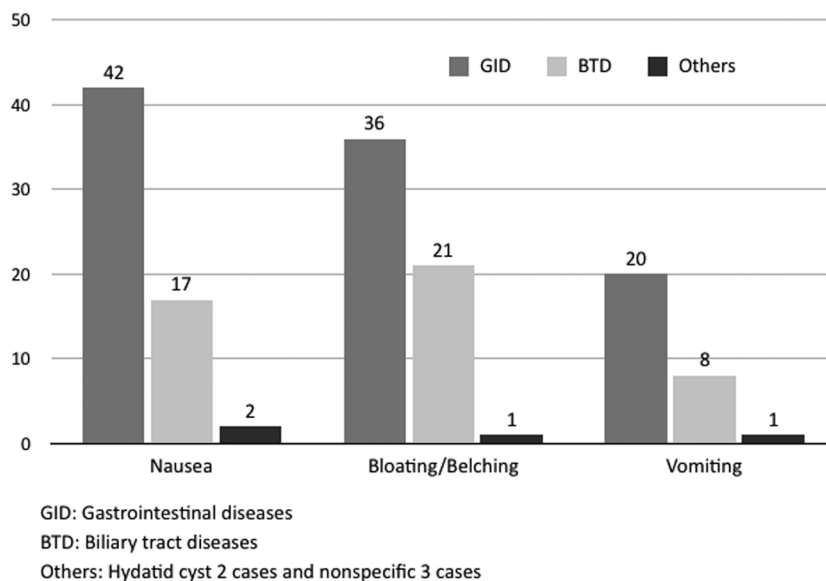


Figure 2. The distribution of symptoms of the patients.

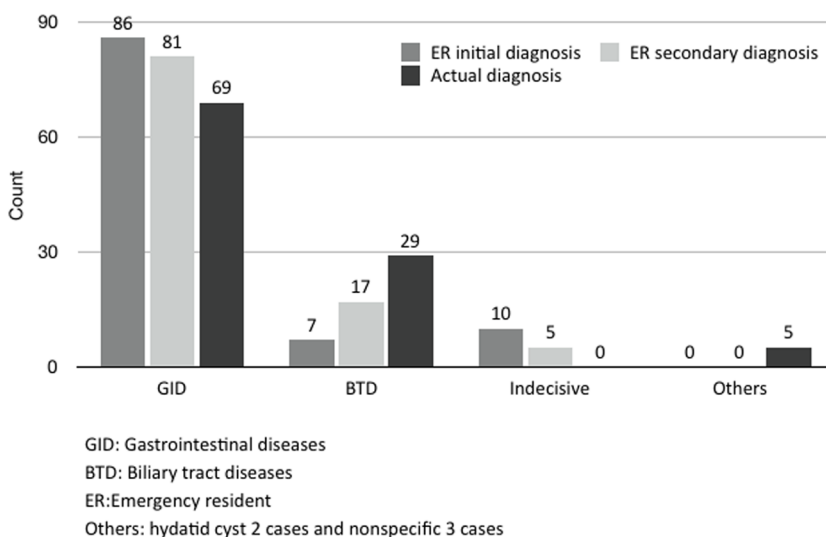


Figure 3. The distribution of the diagnostic groups of physicians.

In 29 patients diagnosed with BTD, 27 had gallstones (biliary colic, 18; acute cholecystitis, 7; acute pancreatitis, 2) and two had biliary sludge. It was determined that USG was planned in only three of these patients at the initial evaluation and in 13 patients at the secondary evaluation; thus, USG was not planned in 13 (44.8%) patients by the ERs (Table 1).

Leukocytosis and elevated amylase levels were found not to affect the decision for USG orders, whereas elevations of bilirubin and LFT levels increased the demand for biliary USG (P = 0.008, P = 0.0001, respectively) (Table 2). Among 17 patients with gallstones whose LFT levels were

normal, it was determined that USG was planned only for seven patients at the end of the secondary evaluation (two at initial evaluation and five at the secondary evaluation). Of these 10 (58.8%) patients with normal LFT levels for whom USG was not planned, seven had biliary colic and three had acute cholecystitis and the diagnoses were initially missed because USG was not ordered. The actual diagnoses of the patients with altered biochemical parameters are presented in Table 3.

The agreement in ultrasound interpretations between the sonologist and the radiologist, who was blinded to the study, was 100%. Hospitalization was planned for 17

Table 1. Distribution of the decisions of emergency residents for planning ultrasonography.

Actual diagnosis	Decision for planning ultrasonography					
	Initial evaluation (n)			Secondary evaluation (n)		
	Yes	No	Total	Yes	No	Total
Biliary diseases*	3	26	29	13	13	26
Gastrointestinal diseases	3	66	69	4	62	66
Others**	0	5	5	0	5	5
Total	6	97	103	17	80	97

* Biliary tract diseases: biliary colic-19 cases, cholecystitis-7 cases, pancreatitis-3 cases.

** Others: hydatid cyst-2 cases, nonspecific-3 cases.

Table 2. Distribution of the biochemical parameters for planning ultrasonography.

Biochemical parameters	Decision for planning ultrasonography					
	Initial evaluation (n)			Secondary evaluation (n)		
	Yes	No	Total	Yes	No	Total
Leukocytosis	2	36	38	10	26	36
Abnormal LFTs*	2	11	13	7	4	11
Abnormal amylase	0	9	9	4	5	9
Abnormal bilirubin	0	6	6	4	2	6
Total	4	62	66	25	37	62

*LFTs: Liver function tests.

Table 3. Actual diagnosis of patients with altered biochemical parameters.

Actual diagnosis	Biochemical parameters			
	Leukocytosis	Abnormal LFTs*	Abnormal amylase	Abnormal bilirubin
Cholelithiasis	9	7	2	-
Cholecystitis	3	2	2	1
GID**	24	2	3	2
Pancreatitis	1	2	2	2
Non-specific	-	-	-	1
Other***	1	-	-	-
Total	38	13	9	6

*LFTs: Liver function tests.

**GID: Gastrointestinal disease.

***Other: Hydatid cyst.

(16.5%) of 103 patients. However, four patients refused to be hospitalized (three biliary colic cases and one pancreatitis case). Thirteen patients (seven cases of cholecystitis, three of biliary colic, two of pancreatitis, and one of hydatid cyst and free intraabdominal fluid) were hospitalized in the general surgery clinic. USG was planned for none in the primary and only 11 (64.7%) in the secondary evaluation of the 17 patients who were planned to be hospitalized; therefore, 6 patients (35.3%) were to be misdiagnosed if USG were not performed.

Patients were contacted by telephone after 30 days. It was determined that recurrent episodes of epigastric pain were present in 36 (35%) patients and absent in 40 (38.8%) patients, 16 (15.5%) patients had undergone cholecystectomy, one (1.0%) patient had undergone endoscopic retrograde cholangiopancreatography, and one (1.0%) patient had died due to complications related to a hydatid cyst and free intraabdominal fluid. Nine (8.7%) patients could not be contacted by telephone. It was learned that 25 (24.3%) patients had undergone upper gastrointestinal endoscopy following discharge. Sixteen patients were diagnosed with gastritis, four patients were diagnosed with peptic ulcer, one had normal findings, and the results of four patients could not be obtained.

4. Discussion

Acute nontraumatic epigastric pain accounts for 2%–4% of presentations to the ED and constitutes 25% of admissions among the entire abdominal pain spectrum; 20%–40% of patients with acute nontraumatic epigastric pain require hospitalization (6).

Asymptomatic cholelithiasis carries a significant risk of becoming symptomatic and complicating the biliary and gastrointestinal tract (4,20). Identification of uncomplicated cholelithiasis at ED admission via bedside USG is an invaluable contribution to patient care (4).

In a study of geriatric patients with acute cholecystitis in the ED, it was determined that, although the most common presentation was right upper quadrant pain, epigastric pain was present in approximately 20% of cases. Additionally, the most frequent symptom was reported to be nausea (19). The most frequent symptom accompanying epigastric pain in our study was determined as nausea as well. In a study conducted by Berger et al. (14), none of the dyspeptic complaints allowed discrimination between BTM and GID. Similar results were obtained in our study.

The majority of ERs considered GID as the preliminary diagnosis at the initial evaluation and they planned USG in only three patients. If ERs had performed point-of-care biliary USG, they would have identified BTM in a total of 29 patients and they would have performed the ED

management of these patients more rapidly, efficiently, and cost-effectively. They also might have had increased patient satisfaction, along with their own job satisfaction.

Since it is not reliable and may delay the correct diagnosis, the clinical response to symptomatic treatment, as well as the laboratory workup alone, should never be used for evaluation of patients admitted to the ED with epigastric pain. In most of the patients with uncomplicated biliary colic and in one-third of patients with acute cholecystitis, laboratory data including white blood cell count and LFT results were reported to be within the normal ranges (5). In the study by Adhikari et al. (7), while elevation of LFTs was observed in none of the patients with acute cholecystitis, leukocytosis was identified in only two patients. In our study, it was observed that only the elevation of LFTs affected the USG orders.

Adhikari et al. (7) denoted that USG was not planned in 17 of 20 patients with gallstones at the initial evaluation. In our study, we determined that ERs did not plan USG for 44.8% of the cases in which BTMs were finally identified or in 35.3% of patients who were hospitalized.

As shown in various studies, it is not possible to determine the presence or absence of BTM by the help of medical history, physical examination, and standard laboratory tests alone without performing USG (5,15–18). The standardized utilization of USG by emergency physicians may decrease the time period until diagnosis is made and may reduce the excessive use of ancillary radiological techniques such as CT. In our study, although exact time measurements were not performed, it is obvious that the BTM diagnosis would have been made much earlier if bedside biliary USG had been performed in the initial evaluation.

There were several limitations to our study. Since only the patients during the working hours of the sonologist were included, all patients who had met the inclusion criteria could not be included in the study. This raises the possibility of selection bias. Another limitation of this study was the inability to acquire the ultimate medical diagnoses of all patients who were discharged. The determination of cholelithiasis, which might be coincidental, does not necessarily make BTM the main cause of epigastric pain.

In conclusion, it was observed that ERs primarily considered GID at the forefront in patients with epigastric pain, and since they did not plan USG, they missed the diagnosis of BTM in a significant minority of the patients. Bedside biliary USG can avoid misdiagnosis and expedite management in these patients. Thus, emergency physicians should routinely use bedside biliary USG in order to rule out BTM in patients with acute isolated epigastric pain.

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