

Use of qSOFA criteria in prediction of poor prognosis in acute pancreatitis

Use of qSOFA in acute pancreatitis

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Abstract

Aim: In this study, we aimed to investigate the usability of SOFA and qSOFA criteria in predicting the conditions by which the poor prognosis such as hospitalization in the intensive care unit, long length of hospital stay and death was observed for the patients receiving a diagnosis of acute pancreatitis in the emergency department. **Material and Method:** The data of 98 patients with acute pancreatitis diagnosis which was verified by the computerized abdominal tomography in the university hospital emergency department between 2013 and 2018 were used in our study. that was designed as monocentric retrospective study. The SOFA and qSOFA criteria of the patients were calculated during the application to the emergency department. **Results:** Fifty-three percent (n=52) of the patients were female. Their age averages were 57.5±18.57/year. Forty-eight (%49.0) patients were detected to have any of the poor prognostic criteria. It was also detected that the qSOFA score of 17 (517.3) patients were 1 and above and the qSOFA score of 81 (582.7) patients was 0 during the application to the emergency department. The SOFA (p<0.001) and qSOFA (p=0.004) values were significantly different for the patients having the good prognosis and poor prognosis. When we take the Cut-off as > 0 for the qSOFA criteria, we determined the AUC as 0.641, Sensitivity as %39.58, Specificity as %86, and CI% as 0.538 to 0.735, and p=0.001, respectively. **Discussion:** The SOFA and qSOFA criteria used in order to predict the organ failure in the sepsis can be a scoring system that will be able to be used in predicting the poor prognosis in acute pancreatitis in the emergency department.

Keywords

Acute Pancreatitis; Emergency Department;- Quick SOFA

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Introduction

Acute pancreatitis (AP) is an inflammatory disease containing various clinical features varying from slight cases having only the temporary abdominal symptoms to the severe fatal cases. The AP's annual incidence is 13 to 45 new cases in per 100.000. The clinical picture varies from the slight form responding to the medical treatment in a short time to the severe form in which the sepsis and multiple organ failure developed [1]. The most frequent two reasons of acute pancreatitis are the gallstones and alcohol. The other reasons are the Endoscopic Retrograde Cholangiopancreatography, surgical, drugs, HIV infection, hyperlipidemia, and biliary anomalies. Idiopathic AP defines the conditions in which the reason is not revealed [2]. Generally, the death from the serious acute pancreatitis occurs depending on the multiple organ dysfunction syndromes and seems as 2 peaks. While the first one is the premature death caused by the systemic inflammatory response syndrome (SIRS) and multiple organ dysfunction syndromes (MODS) developing within the first two weeks and depending on the release of various cytokines, the other one is the late death caused by the MODS developing depending on the secondary reasons such as peripancreatic necrosis and infection. The late deaths occur approximately two weeks later [3].

Various scoring systems were developed to predict the prognosis in the AP patients. The Ranson, Acute Physiology and Chronic Health Evaluation (APACHE) II and III, and the Sequential Organ Failure Assessment (SOFA) scoring systems are some of these [4]. Most of these scoring systems contain the complex and multiple calculation parameters and is required a long length of hospital stay [5]. Therefore, its use is limited in the emergency department. The SOFA score was implemented in the intensive care unit and emergency department for the sepsis and a few different critical diseases and it was notified that it would be useful in evaluating the patients [6-8]. The sepsis and septic shock definition was modified in the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). qSOFA (the Quick Sepsis-related Organ Failure Assessment), a new scanning tool, was suggested to be evaluated in accordance with the sepsis's new definition. The qSOFA criteria contain Glasgow Coma Scale score of less than or equal to 13, systolic blood pressure less than or equal to 100 mm Hg, and respiratory rate greater than or equal to 22 per minute for the sepsis [9]. Many studies were performed for the usability of qSOFA defined after the Sepsis-3, especially in sepsis patients [10-12]. Since the qSOFA score reflects the multiple organ dysfunctions, it can show better performance in the diseases such as sepsis infectious and in the diseases such as multiple traumas in which the multiple organ dysfunctions are seen. Seymour CW et al. notified that the qSOFA's prediction value for the in-hospital mortality was statistically higher than the SOFA and SIRS values except for the intensive care unit [13,14].

In our study, we aimed to detect the relationship between the qSOFA scoring and poor prognosis for the patients whose AP diagnosis was made in the emergency department.

Material and Method

The data of 98 patients who receive the AP diagnosis in the university hospital emergency department between 2013 and 2018 were used in our study that was designed as monocenteric retrospective study. The data of patients whose AP diagnosis was verified by the computerized abdominal tomography and

who are above 18 years of age were used. The patients whose abdominal CT was not taken, who received the diagnosis of chronic pancreatitis and had the traumatic pancreatitis were excluded from the study. The patients were divided into two groups as those having the poor prognosis and as those having the good prognosis. In addition to their demographic data, the patients' SOFA and qSOFA criteria were determined during the application to the emergency department. The poor prognosis criteria accepted in previous studies were used in our study. These criteria, death, transfer to the intensive care unit (ICU), and hospitalization period more than 5 days were taken as the poor prognostic indicators [5].

The Statistical Package for the Social Sciences (SPSS 21, Chicago, IL, USA) program was used for the data analysis in the statistical analysis. The numeric variables were expressed as the mean \pm standard deviation and categorical variables percentage. The continuous variables' distribution was detected by the Kolmogorov-Smirnov test and the Shapiro-Wilk normality test in the data analysis. The Man-Whitney-U test was used in detecting the relationship between the dual groups not conforming to the normal distribution. The Chi-Square test or Fisher's exact test were used in the analysis of categorical variables. In addition, ROC Curve analysis results were presented as % specificity and % sensitivity [Area under the ROC curve (AUC), p, 95% Confidence Interval (CI)]. $P < 0.05$ was accepted as significant in all of the analyses.

Results

Ninety-eight patients who received the AP diagnosis were included in our study. While 53% of the patients ($n=52$) were female, 46.9% of them ($n=46$) were male. Their ages were between 21 and 90 years; their age averages were 57.5 ± 18.57 / year. While the etiology of acute pancreatitis was biliary in 56 (57.2%) patients, 42 patients (42.8%) were non-biliary causes. The patients mean length of hospital stay was 7 ± 5.47 / day. Forty-eight (49.0%) patients were detected to have any of the poor prognostic criteria. During the application, the pancreatic necrosis was detected in none of the patients in our study. While the qSOFA score of 26 (26.5%) patients was 1 and above during the application to the emergency department, the qSOFA score of 72 (73.5%) patients were detected as 0. The poor prognosis criteria and qSOFA scores were given in Table 1.

Table 1. Patient data and qSOFA scorings

	Total n (%)
F/M (n %)	52 (53.1)/46(46.9)
Age (mean \pm Sd)	57.50 \pm 18.572
Death n (%)	5 (5.1)
>5/day Hospitalization n (%)	45(45.9)
Intensive Care Unit n (%)	11 (11.2)
SOFA	1.45 \pm 2.081
<2	66(67,3)
\geq 2	32 (32,7)
qSOFA	0.32 \pm 0.807
0	72 (73.5)
\geq 1	26 (26,5)

The SOFA criteria means were significantly higher in the patients having the poor prognosis ($p < 0.001$) (Table 2).

Table 2. The comparison of Good and Poor prognosis in SOFA

	Good prognosis	Poor prognosis	p
n (%)	50 (51.0%)	48 (49.0%)	0.919607
SOFA	0.78±2.601	2.15±2.081	<0.001

The qSOFA criteria were detected to be significantly different in the patients having the good and poor prognosis (p=0.004) (Table 3).

Table 3. Predictability of qSOFA for poor prognosis

	Good prognosis n (%)	Poor prognosis n (%)	OR (95% CI)	p
qSOFA 0	43 (43.9%)	29 (29.6%)	4.025	0.004
≥1	7 (7.1%)	19 (19.4%)		

It was detected that when the SOFA was ≥2 it had 45.83% sensitivity and 80% specificity and when the qSOFA was ≥1 it had 39.58% sensitivity and 86% specificity in the ROC analysis results of the SOFA and qSOFA criteria (Table 4, Figure 1)

Table 4. ROC analysis results of SOFA and qSOFA criteria

	Cut-off	AUC	Sensitivity (%)	Specificity (%)	p	95 % CI
SOFA	≥2	0.649	45.83	80.00	0.005	0.546 to 0.743
qSOFA	≥1	0.641	39.58	86.00	0.001	0.538 to 0.735

AUC: Area under the curve, CI: Confidence interval,

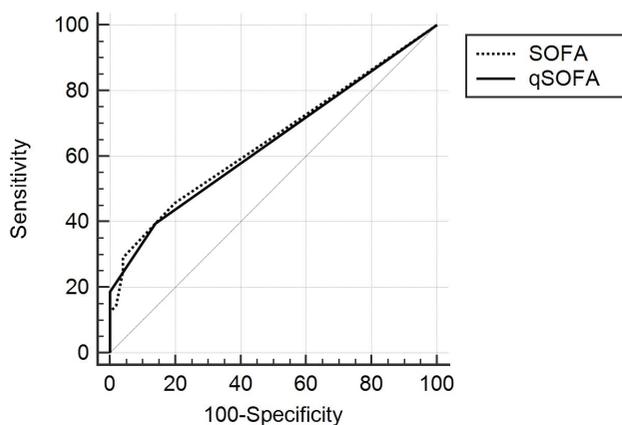


Figure 1. ROC analysis of SOFA and qSOFA criteria

Discussion

The AP reveals itself generally with acute persistent epigastralgia, nausea, and vomiting. The most prevalent two etiological factors are the gallbladder stones and alcohol consumption for the AP. Although the AP is a generally treatable disease, the local complications such as pseudocyst, abscess, and necrosis can be seen and can even progress to the multiple organ dysfunctions. In general, most of the patients are clinically mild and prognosis is good. However, in 20% of the patients the clinical deterioration, organ failure, and death can be seen [15]. Therefore, determining the AP clinical severity in the early period provides an effective treatment approach. The organ failure related to acute pancreatitis and/or existence of the pancreas's

local complications such as necrosis, abscess or pseudocyst is defined as severe pancreatitis [15]. Progressing to the organ failure leads to increase in the mortality. The APACHE II and SOFA scores were used especially in the intensive care units in order to determine the organ dysfunction in the AP [16]. The SOFA and qSOFA values were detected to make a significant difference in the patients having the poor prognosis during the application to the emergency department.

Performed repetitiously the SOFA and other score systems used to detect the organ failure especially in the intensive care units were notified to be more reliable in the prediction [17,18], because the organ failure is not a static condition but shows continuous variation. Similarly, the repetitive measurements were also performed in the mortality studies. Since the mortality and progression to the poor prognosis are a rapidly-developing condition in the pancreatitis patients, evaluating the organ failure with the Evaluation, scale and scorings give more reliable results. In the study by Adam F et al., related to using the APACHE II, SOFA, and modified Ranson's scores in the mortality prediction for 39 patients admitted to the intensive care unit by the reason of severe AP, the patients' SOFA scores were weekly recorded and the mortality SOFA score was detected to be > 11 anytime during their hospitalization periods in the intensive care unit [19]. The SOFA scores of AP patients admitted to the intensive care unit were checked at the time of admission, 48th hour, 7th day, 14th day, and 21st day in the studies performed by Tee YS et al., they compared the patients who died and did not die and detected that the SOFA scores were significantly different in all of the groups. The repetitive SOFA scores were concluded to be more reliable in predicting the mortality. The 7th day of hospitalization was indicated to be a convenient time in reevaluating the SOFA score while predicting the late mortality in acute serious pancreatitis [20]. Juneja et al. evaluated 55 severe AP patients admitted to the intensive care unit in a two-year period and notified that the SOFA score would be able to be used in predicting 30-day mortality. In the mortality prediction, they detected that when the SOFA score was > 4, the sensitivity and specificity were 76.2% and 69%, respectively, and when the SOFA score was >8, the sensitivity and specificity were 86.7% and 90%, respectively [21]. However, in our study, we determined the specificity as 80% when the SOFA score was ≥2 in the ROC analysis performed on the SOFA criteria and poor prognosis during the application to the emergency department. There are studies expressing the different opinions on the subject of using qSOFA criteria such as SOFA criteria in predicting organ failure or poor prognosis, especially in sepsis patients. In some studies, it was shown that there was a significant correlation between the hospitalization to the intensive care unit and qSOFA score [14,22]. However, some studies did not verify this correlation [12,23].

Some studies showed that the qSOFA's prognostic value was a bit low according to the SOFA's but similar to the SIRS's for in-hospital mortality prediction in the intensive care units and notified according to qSOFA score was useful in predicting the in-hospital mortality rate [11]. The publications were performed informing that the qSOFA criteria would be able to be used in in-hospital mortality prediction without discriminating the diseases in the emergency department. Kwak H et al. concluded

that using the ESI + qSOFA together was more valuable and significant than only the ESI use in their in-hospital mortality prediction study performed according to the Emergency Severity Index (ESI) and qSOFA criteria of 43,748 patients applied to the emergency department. Moreover, the mortality was notified to be more in those whose qSOFA was positive rather than those whose qSOFA was negative [24]. However, more verification was not yet made in the related subgroups of the emergency department patients having high mortality. Müller M et al. detected that the qSOFA did not predict in-hospital mortality, intensive care unit or hospitalization period in the patients with decompensated liver cirrhosis in the study performed on 186 patients with liver cirrhosis [25]. In our study, it was detected that positive result of one of the qSOFA criteria increased the specificity by 86.00% in predicting the poor prognosis in the AP. The hospitalization to the intensive care unit is one of the poor prognostic criteria in the AP patients.

In conclusion, the SOFA and qSOFA criteria used in order to predict the organ failure in the sepsis is a scoring system that could be used in predicting organ failure or poor prognosis in the emergency department for acute pancreatitis which was one of the diseases causing organ failure.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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