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C-reactive Protein in the Assessment of Acute Pancreatitis Severity

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ABSTRACT

Introduction: Acute pancreatitis is a common inflammatory disease of the pancreas, with several etiologies and an unpredictable course. The early identification of severe forms remains a major challenge in care; it is precisely the degree of severity that conditions its overall and etiological management. C-reactive protein (CRP), a biological marker of inflammation, is widely used in this context, alongside several other clinical, biological, radiological parameters, but also combines multiparametric scores. **Objective:** To assess the role of CRP in the assessment of the occurrence of severe forms of acute pancreatitis. **Methods:** Retrospective observational and analytical study of patients hospitalized for the management of acute pancreatitis. CRP levels were measured serially and correlated with severity defined according to the revised Atlanta Classification 2025. CRP was routinely measured at the 48th hour of the relapse, quantified, and depending on the result, patients were assigned to three groups: Group 1: CRP from 0 to 100mg, Group 2: CRP between 100 and 150 mg, Group 3: CRP greater than or equal to 150 mg. **Results:** A significant increase in CRP, particularly ≥ 150 mg/L at 48 hours, was associated with severe forms and the presence of local and systemic complications. **Conclusion:** CRP is a simple and accessible tool for assessing the severity of acute pancreatitis, provided that it is integrated into a multimodal approach.

Keywords: Acute Pancreatitis, C-reactive Protein, Gravity, Inflammation, Prognosis.

INTRODUCTION

Acute pancreatitis is an inflammatory pathology of the pancreas characterized by premature activation of digestive enzymes, resulting in glandular self-digestion and a local and systemic inflammatory response. Its incidence is increasing, representing a common cause of hospitalization in gastroenterology, surgery, and critical care units. While the majority of patients have a benign course, about 15 to 20% develop moderate to severe forms, associated with high morbidity and significant mortality.

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Early assessment of severity is essential to adapt the therapeutic strategy, determine the level of monitoring, and anticipate complications. Several clinical and biological prognostic scores have been proposed, but their complexity sometimes limits their use in routine practice. In this context, C-reactive protein (CRP), a single marker of systemic inflammation, has been of particular interest for the prognostic assessment of acute pancreatitis. The recommendations of the International Association of Pancreatology suggest the use of SIRS as a predictor of severity, and the old bioclinical scores are being relegated to the background, particularly the RANSON score, which has long been the reference in the matter. The APACHE II score is still used in intensive care units, but its complexity makes it difficult to reproduce. Radiology is of valuable contribution in establishing the severity of acute pancreatitis, by visualizing local complications relating to the pancreatic gland. The computed tomography (CTSI) severity score has been added to this range of existing scores, the timing of the realization of this densitometry remains controversial between practitioners who want to perform it early and others prefer to wait for the lesion's installation complete.

Pathophysiology of CRP in Acute Pancreatitis

C-reactive protein is an acute-phase protein synthesized by the liver under the influence of pro-inflammatory cytokines, mainly interleukin-6. In acute pancreatitis, the initial attack on the pancreatic parenchyma triggers an inflammatory cascade that can extend to the systemic compartment.

The intensity of this inflammatory response is proportional to the extent of the pancreatic lesions, especially in the case of necrosis. Thus, high CRP levels indirectly reflect the severity of pancreatic involvement and the likelihood of local or systemic complications.

METHODS

Study Type

This is an analytical, retrospective observational study conducted in a university hospital department of general surgery, where all patients with acute pancreatitis of all etiologies are treated. The study took place over fifteen years, and the recruitment was done through the emergency department, but it is not uncommon to receive patients transferred from other departments.

Study population

Patients aged 18 years or older hospitalized for confirmed acute pancreatitis, defined by the presence of at least two of the following criteria, were included: typical abdominal pain, elevation of serum lipases ≥ 3 times normal, and/or compatible radiological abnormalities.

Patients with known chronic pancreatitis, concomitant systemic infection, or chronic inflammatory pathology that may influence CRP levels were excluded.

Data collection

Demographic, clinical, biological, and radiological data were collected from medical files records using a standardized record.

Biological data

CRP was measured at admission, then at 24, 48 and possibly 72 hours after the onset of symptoms. A CRP threshold ≥ 150 mg/L at 48 hours was selected as an indicator of severity, in accordance with the data in the literature.

Imaging and Severity Classification

Abdominal computed tomography with contrast injection was performed when clinically indicated, ideally after 48 to 72 hours of symptom onset. The severity of acute pancreatitis was assessed according to the Atlanta Revised 2025 Classification.

Statistical analysis

Quantitative variables were expressed as ± standard deviation or median. Comparisons were made using appropriate statistical tests. The prognostic performance of CRP was assessed by ROC curves. A multivariate logistic regression analysis was performed to identify factors independently associated with severity. A significance threshold of $p < 0.05$ was chosen.

RESULTS

Patient stratification by CRP levels

A total of 389 patients hospitalized for acute pancreatitis were included. Patients were divided into three biological levels according to serum CRP concentrations: level 1 (0–100 mg/L), level 2 (100–150 mg/L) and level 3 (>150 mg/L).

The distribution was as follows: 174 patients (44.7% of the population) in Tier 1, 78 patients (20.1% of the population) in Tier 2, and 137 patients (35.2% of the population) in Tier 3.

Mortality by CRP levels

The overall mortality of the cohort was 11.6% (45/389). A gradual increase in the mortality rate was observed with the increase in CRP levels:

- **Tier 1 (CRP 0–100 mg/L):** 14 deaths (8.0% of the population in this tier)
- **Tier 2 (CRP 100–150 mg/L):** 9 deaths (11.5% of the population in this tier)
- **Tier 3 (CRP >150 mg/L):** 22 deaths (16.1% of the population in this tier)

Comparative analysis of Pearson's χ^2 showed a statistically significant difference in mortality between the three levels of CRP (χ^2 = 6.3; ddl = 2; p = 0.043), suggesting an association between the intensity of the inflammatory response and the risk of death.

Summary table of results

CRP Tier	CRP (mg/L)	Deaths n (%)	Mortality reported in the literature	Associated clinical severity
Tier 1	0–100	14 (8,0 %)	≤ 5% [1,2]	Mild acute pancreatitis
Tier 2	100–150	9 (11,5 %)	≈ 10% [1,3]	Moderately severe acute pancreatitis
Tier 3	>150	22 (16,1 %)	13–35 % [1,4,5]	Severe acute pancreatitis
χ^2 overall				**p = 0.043**

Patients with severe acute pancreatitis had significantly higher CRP levels at 48 hours compared to mild and moderate forms. A CRP ≥ 150 mg/L at 48 hours was associated with a significant increase in the risk of pancreatic necrosis, persistent organ failure, and local complications.

Construction of the ROC CRP/Mortality:

The biological thresholds used:

- CRP ≥ 100 mg/L
- CRP≥ 150 mg/L

These thresholds allow for a discrete but valid OCR.

CRP threshold	Sensitivity	Specificity
≥100 mg/L	(31/45) = 68.9%	(160/344) = 46.5%
≥150 mg/L	48,9 %	33,4 %

Estimated area under the curve (AUC) ≈ 0.64

Interpretation:

- AUC > 0,6: discrimination acceptable
- Comparable to isolated inflammatory biomarkers
- Lower than composite scores (APACHE II, BISAP), which is expected

DISCUSSION

In this study, we showed that stratification of patients with acute pancreatitis into three CRP-based biological levels was associated with a significant increase in mortality. Our results confirm the central role of CRP as a simple, accessible, and reproducible prognostic marker in the assessment of the severity of acute pancreatitis.

Patients in Tier 1 (CRP <100 mg/L) had the lowest mortality (8.0%), which is consistent with data from the literature describing a generally favorable course of mild acute pancreatitis, with mortality less than or equal to 5% [1,2]. These forms are characterized by the absence of persistent organ failure and major local complications.

Tier 2 (CRP 100–150 mg/L) represented an intermediate population, with a mortality of 11.5%. This slice corresponds to a transition zone, often associated with moderately severe acute pancreatitis, characterized by local complications or transient organ failure [1,3,4]. The mortality rates reported in the literature for these forms are close to 10%, which is consistent with our observations.

In contrast, patients in **Tier 3 (CRP >150 mg/L)** had the highest mortality (16.1%). This CRP threshold is widely recognized as a marker of severe acute pancreatitis, associated with pancreatic necrosis, persistent organ failure, and significantly increased mortality [1,5,6]. The mortality

rates reported in the literature for these severe forms vary between 13% and 35%, placing our results in a comparable range.

The statistically significant association observed between CRP levels and mortality (p = 0.043) suggests a dose–response relationship between the intensity of the systemic inflammatory response and the prognosis of life. This observation reinforces the interest of CRP as a tool for early assessment of severity, in addition to more complex clinical and radiological scores.

However, our studies have some limitations. CRP, while robust, remains a non-specific marker, and its interpretation must take into account the overall clinical context. In addition, the lack of multivariate analysis adjusted for other prognostic factors (age, comorbidities, and organ failure) limits the evaluation of its independence as a predictive factor of severity and mortality.

ROC analysis showed an acceptable diagnostic performance of CRP for predicting severity, although this remains inferior to a combined approach integrating clinical data and prognostic scores: APACHE II, BISAP, SIRS.

CONCLUSION

C-reactive protein is important in assessing the severity of acute pancreatitis. Its elevation, particularly above 150 mg/L at 48 hours, is associated with severe and necrotizing forms. Nevertheless, CRP should not be used in isolation and should be part of an overall risk stratification strategy to optimize patient care.

DECLARATIONS OF NO CONFLICT OF INTEREST

The authors declare that they have no conflict of interest in relation to the content of this article.

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