

The Use of C-Reactive Protein (CRP) as a Marker of the Surgical Stress in Gastrointestinal Surgery



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Abstract

Being able to predict the complications that can arise after a surgical intervention is essential to accelerate the recovery of patients, minimize pain or save their lives in the most crucial cases. Different markers of surgical aggression [1-3] have been studied, being to use C-reactive protein (CRP) measurement during the postoperative period the current trend to predict the evolution of the patients [4-6]. A brief review of the utility of CRP measurement is showed to assess its use as the choice marker of the surgical injury.

Keywords: CRP; Gastrointestinal surgery; Inflammation marker; Surgical injury

Abbreviations: CRP: C-Reactive Protein; SIRS: Systemic Inflammatory Response Syndrome; OS: Open Surgery; LS: Laparoscopic Surgery; WBC: White Blood Cells

Introduction

After surgery, it is necessary to establish a series of markers that tell us the patient prognosis and allow a prompt action whether it is not favourable. CRP is a tissue aggression marker. Multiple studies incorporate it to see the immune response of the patients after the surgical aggression and then study the degree of inflammatory response (7-10). The higher its value, the higher the probability of systemic inflammatory response syndrome (SIRS). CRP measurement is done just before surgery and in the postoperative days to see its evolution. Whether its values increase with time, it is indicative of a greater inflammatory response, and therefore, of a possible complication during recovery.

Open Surgery and Laparoscopic Surgery

Within the gastrointestinal surgery there are two fundamental surgical procedures, open surgery (OS) and laparoscopic surgery (LS). Although evidence-based medicine shows that the laparoscopic approach is more beneficial for the patient and its recovery [11-13], there are still some doubts about its use since discrepancies have been obtained in studies to observe the immune response of patients [14-16], especially in certain surgical resections or when their performance cannot be carried out by properly trained surgeons. CRP is the usual marker used among others to compare both surgical approaches and justify that approach produces a lower inflammatory response, and therefore would be the most beneficial for the patient recovery. Most studies indicate lower

values of CRP in LS compared to OS in the postoperative days [17-20]. Few studies find no significant differences between OS and LS groups [21,22], characterized by having a low number of study subjects or because the clinical and surgical characteristics (body mass index, duration of surgery, blood loss) have differed between the two comparison groups. These facts would indicate that CRP is a good marker of the inflammatory response, since its value increases taking into account all the factors of study and is not only affected by the surgical approach. In fact, several studies have observed there are no significant differences in CRP values when comparing OS and LS in patients who have suffered complications [4], even comparing patients included in ERAS protocols versus standard care protocols [6].

Complications and ERAS Protocols

CRP use as an early complications marker is increasingly widespread. CRP levels rise after the surgical act observing a peak at 48h, after which time its values decrease in patients who do not suffer complications. In this way, it is used as a discharge criterion whether the elevation of its values is not observed throughout the postoperative period [23]. In addition, CRP measurement is a good candidate to observe which ERAS parameters have more influence on the recovery of the patient. Since the application of these protocols, countless benefits have been reported [24]. However, its implementation is complex and requires great coordination among

all the health personnel involved. Measures to take through the CRP marker assessment, reducing them to the minimum necessary, could help to extend ERAS protocols implementation.

Other Markers

Other markers have been studied for the degree of inflammatory response after the surgical act [25]. In addition to CRP, the main inflammatory markers studied have been IL-6, cortisol and white blood cells (WBC) count [26]. IL-6 seems to show similar results to CRP [15,27]. Furthermore, the time of peak response is earlier than CRP, between 12 and 24 hours. However, its measurement is not within clinical routine laboratory worldwide, being its use less widespread. Regarding cortisol, it has been reported an early time of peak response, from 0 to 4 hours. However, cortisol concentrations have not been associated clearly with the magnitude of the surgical injury [28]. The same happens with the WBC. In spite of detecting its response peak before than CRP, at 24 hours, the variable range of values obtained does not allow to assess the magnitude of the surgical damage and, therefore, of the inflammatory response and the possibility of SIRS [29]. Other studies have made measurements of parameters such as alarmins, serum cytokines, alpha defensins and TNF- α among others in the search for a more specific marker [21,30-32]. However, their measurements are more complex and the results obtained do not provide much additional information. CRP values increase according to the magnitude of the surgical trauma, its measurement is simple and is established as routine in most hospitals, being therefore the marker usually chosen.

CRP in the Future

In general, CRP seems to be a good marker of the inflammatory response and its use is increasingly widespread. However, there are several disadvantages in its use. On the one hand, it is a nonspecific inflammatory marker. It would be necessary to work in the search of more specific or complementary markers that would orient on the type of complication to appear, or at least, on the degree of complication according to the Clavien Dindo complications scale. On the other hand, until roughly 48 hours CRP peak response cannot be clearly detected, being usual to observe high values up to 4 days later. Thus, reaction time before a serious complication is reduced. A marker that indicated earlier the beginning of a complication would be more appropriate. And finally, there is still no standardization on its use. The times in which CRP measurements are made depend on the organizational structure of each hospital. In general, measurements are made between prior to surgery and 72 hours post-surgery, being variable the number and times of measurement. Most studies perform CRP measurements preoperatively and in the first, second and third postoperative day. Working on a standardization of its use and the establishment of alarm reference values should be a priority task to be used as an early marker of surgical complications and as an indicator of a lesser inflammatory process when comparing different techniques or procedures.

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