Systemic inflammatory response syndrome outcome in surgical patients

Simrandeep Singh · Pradeep Singh · Gurjit Singh

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Abstract

Introduction The problems of inflammation and infection as a leading cause of organ dysfunction and failure is a major problem after injury or operations. When systemic inflammatory response syndrome (SIRS) progress to multiple organ failure (MOF), the mortality reach up to 30–80% depending on the number of failed organs. Recent discoveries and improvement in patient care, a reasonable question then arises, are the incidence of MOF decreasing? The literature suggests a decrease in mortality of patients with severe organ failure and a decrease in elective surgical mortality in patients.

Methods This is prospective study of 50 patients who underwent surgical procedure. They were followed up till date of termination with daily SIRS monitoring, development of MODS and MOF. Risk factors for MOF are addressed.

Results There are total 31 patients who develop SIRS, of whom 7 patients develop severe sepsis and 4 went into MOF.

Conclusion Early detection of SIRS helps us to prevent multiple organ dysfunction syndrome (MODS)/MOF, leading to lesser hospital stay and better outcome.

Keywords SIRS · MODS · MOF

Introduction

The problems of inflammation and infection leading to organ dysfunction and failure continue to be a major problem after injury or operations. When systemic inflammatory response syndrome (SIRS) progress to multiple organ failure (MOF), the mortality becomes high, ranging from 30–80% depending on the number of failed organs [1, 2]. There have been recent discoveries and contributions to patient care. The literature comparing care over some years suggests a decrease in intensive care unit (ICU) mortality in patients with severe organ failure and a decrease in elective surgical mortality in patients [3]. Certain problems are decreasing in frequency, such as renal failure, acute respiratory distress syndrome (ARDS), stress gastrointestinal bleeding, and abdominal abscesses, and thus should improve outcome [4].

To achieve an improved outcome, it is felt that SIRS attributable to surgery or resuscitation can be quantified, and a failure of this score to decrease after 1–2 days would focus on early detection of septic focus/foci and thus early intervention. The aim of this being to prevent MODS/MOF, leading to lesser hospital stay and better outcome. This was also the recommendation of the consensus conference held in 1991 [2].

This study is therefore a critical evaluation of SIRS in surgical/resuscitative patients reporting to our hospital.

Patients and methods

This is a prospective study conducted over a period of 2 years. Total of 50 cases were studied. SIRS was noted which include: Two or more of the following variables

Pulse rate (PR): >90 beats/min

Respiratory rate (RR): >20 breaths/min or a PaCO₂ level < 32 mmHg

S. Singh · P. Singh · G. Singh
Department of General Surgery,
Dr D.Y. Patil Medical College, Hospital & Research Centre,
Pimpri, Pune,
Maharashtra, India

S. Singh (✉)
E-mail: dr_simrandeep@yahoo.co.in

Temperature: $> 38^{\circ}\text{C}$ or $< 36^{\circ}\text{C}$

Total leucocytes count (TLC): $> 12,000/\mu\text{l}$ or $< 4,000/\mu\text{l}$ or $> 10\%$ bands

Pulse rate, respiratory rate, temperature were recorded daily manually. TLC done on admission and alternate day with 25 cases on day odd dates and other 25 cases on even dates till patient recovered or expired. Type of operation, type of anaesthesia, untoward incident during surgery and duration of surgery recorded. Co-morbid condition present or second hit noted. Focus of sepsis looked for and ventilator support was considered as a positive SIRS criteria for respiration.

Observation and result

Total 50 patients, 34 are male and 16 female. Age of patients admitted was from 15–82 years. Maximum numbers of patients were in age group 21–30 years. Elective surgery was done on 22 patients and emergency surgery on 28 patients. Thirty-seven patients were given general anaesthesia, 12 patients spinal anaesthesia and 1 patient short GA. Peritoneum was opened in 30 patients. Shortest duration of surgery was 40 minutes and longest duration 5 hours. Maximum surgeries were done in one and half hours to 3 hours 36 cases. Ventilator support was given to 8 patients. SIRS noted in 31 patients. Twenty-four patients went into sepsis, 7 patients went into severe sepsis, 4 patients into septic shock and MOF with four mortality. Co-morbid conditions like hypertension, diabetes mellitus, chronic alcoholism, malnutrition, anaemia and cachexia were noted in patients. Two patients also suffer multihits. Total 4 patients died on 6th, 8th, 11th and 15th postoperative day respectively.

Discussion

The natural history of SIRS showed that more male patients showed evidence of SIRS and were admitted to surgical intensive care unit (SICU) [5]. We found a similar trend with 68% (34 out of 50) of our patients being male. Females tend to have less inflammation for the same degree of proinflammatory stimuli because of the mitigation aspect of oestrogen [6]. Even though our study did not measure the levels of inflammatory mediators but by inference our study also this seems to be true as was evidenced by a lesser number of female patients with SIRS. Studies have shown that mortality increases with increasing age when SIRS is evident [7]. In this study 21 patients were in age group less than 30 years with one mortality, 20 patients were in age group less than 60 years with 3 mortality and 9 patients above 60 years had no mortality. Though this seems to contradict, no conclusion can be drawn. Young people may be able to mount a more exuberant inflammatory response to a challenge than older people and yet may be able to better modify the

inflammatory state via counter anti-inflammatory response syndrome (CARS). Young people have better outcomes of equivalent diagnoses. In this study we had 15 patients with three SIRS criteria and 10 patients with four SIRS criteria, a total of 25 patients. Of these mortality occurred in 1 patient of 20 years age while the rest were 35, 45 and 53 years of age. This observation though indirect by supports the observation that CARS is more effective in young people. Mean SIRS score in elective surgery to be lower than emergency surgery [4]. Total 50 surgeries were done, emergency surgery 28 (male 23, female 5) and elective 22 (male 11, female 11). All patients in emergency surgery had more than two SIRS criteria positive and no patients for elective surgery had SIRS criteria positive preoperatively. All patients who expired had under gone emergency surgery with exploratory laparotomy. Normal response to injury or insult the peak effect of inflammatory response occurs with in 3–5 days after the initial stimulus and abates by 7–10 days [8]. In this study however the, postoperative SIRS criteria in emergency patient usually settled by 3–5 postoperative day, while those undergoing elective surgery showed this by 2–3 postoperative day. The exceptions were in the 4 patients who progressed to sepsis/MOF.

There were a total of 13 cases in whom we found that either SIRS which was not settled by postoperative day 3 or reappearance after that. These cases were closely observed and source of sepsis looked for and in 5 patient we found wound infection (two elective and three emergency surgery) which was drained. Following this SIRS settled within next 48 hours. In an additional four cases SIRS settled by day 6. Of the remaining four cases two died on 7th and 8th postoperative day of MOF(ARDS/DIC/ARF) (Fig. 1). In two there was second hit and progress to MOF and death. Though we found that the majority SIRS response tapers earlier than that seen by the above authors, in two cases it was the same. Also failure of the SIRS to settle pointed towards additional insult in the form of infection, gangrene of gut and gut perforation. In those in whom no obvious focus of sepsis was found went into severe sepsis and ultimately MOF. Mortality for the MOF group was 66% and the lung was the predominant organ to fail [9]. Eight patients who underwent surgery required ventilatory support. Of these four progressed to MOF and expired giving a mortality rate of 50%.

The mortality rate and their relationship with number of SIRS criteria and or presence of MOF have been extensively studied. The presence of an organ dysfunction was a better predictor of mortality than counting number of SIRS criteria [5]. Concentrating on number of SIRS criteria found that with two SIRS criteria mortality was 7%, with three SIRS criteria mortality was 10%, with four SIRS criteria mortality was 17%, with sepsis mortality was 16%, with severe sepsis mortality was 57%, and with septic shock mortality was 66% (Fig. 2). Similar mortality figure of 0%, 13%, 20%, 18%, 57%, 66% with two SIRS, three SIRS, four SIRS,

Fig. 1 SIRS at admission and afterward

Fig. 2 Mortality in SIRS

sepsis, severe sepsis and septic shock respectively were noted [10]. This study seems to indicate that presence of an organ dysfunction is more closely related to mortality.

Presence of concomitant comorbidities probably negatively affect the outcome of SIRS [7]. All patients who had co-morbid condition had prolonged SIRS and out of four mortality 2 patients had co-morbid condition, example hypertension, chronic alcoholic, malnutrition, diabetes, and anaemia.

Multihit theory behind the progression of SIRS to organ dysfunction and possibly MODS [11]. Two patients underwent re-exploration of peritoneal cavity. In one a progress of gangrene of small gut had occurred and in second the patient developed a sigmoid colon perforation with peritonitis. Both these patient died of MOF.

The study on the influence of sepsis on MOF in SICU found that 78% of the patients died of sepsis and MOF [12].

The main source of infection was either the respiratory or gastrointestinal tract. Skin contamination and catheter sepsis were identified in 13% of patients as the main source of infection. All patients who expired developed MOF (ARDS in three cases, ARF in two cases, DIC in one case). ARDS remain leading cause of mortality. In all patients who expired the source of sepsis was in the gastrointestinal tract.

Patients who did not develop SIRS had the shortest hospital stay; while those patients with SIRS, sepsis, and severe sepsis, respectively, required progressively longer hospital stays [13]. In this study both hospital and SICU stay increase with progression of SIRS to MOF. There was no clear cut pattern, importance of occurrence of any one of SIRS criteria over the other.

In 2004 Dellinger et al. give guideline in management for patient with sepsis [14]. In January 2008 these were revised by Dellinger et al. at a consensus conference of 55 international experts, independent of any industry funding [15]. They strongly recommended early goal-directed resuscitation of the septic patient. The monitoring of SIRS therefore assumes importance because when it is present, it alerts to look for septic foci or second hit.

Conclusions

We could not attribute any particular importance to any of the SIRS criteria individually, but it was easy to say if SIRS was present or absent with simple bed side/laboratory tests. We found that SIRS routinely abated by the 3–5 post-operative days. When SIRS is present it prompted us to look for additional foci of infection (e.g. wound, UTI, lungs) or a second hit as early as possible and suggested that one should not wait for the normal duration of response before initiating this search. In cases with abdominal sepsis and SIRS were positive, we found that progression to MOF was more common when this response was prolonged. Mortality rates increased in the presence of any organ dysfunction especially respiratory system. Therefore these should be looked for early and appropriately supported by antibiotics, oxygen and ventilatory support. Other factors that we found associated with higher mortality were:

- 1) Co-morbid conditions like hypertension, diabetes, malnutrition and chronic alcoholism.
- 2) A second hit for example gangrenous bowel after initial resection and case like sigmoid perforation in case of hysterectomy.

Hospital and surgical ICU stay increased with progress of SIRS to MOF. SIRS if present should prompt us to initiate early goal directed investigation and therapy. We recommend SIRS monitoring as a must in all postoperative/emergency surgical cases.

Conflict of interest The authors do not have any disclosable interest

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