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Systemic Inflammatory Response Syndrome (SIRS) Outcome in Surgical Patients at Tertiary Care Hospital

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Abstract: ***Background**: Occurrence of a postoperative systemic inflammatory response can increase risk of adverse outcomes. Systemic inflammatory response syndrome is a simple bed side tool to assess the severity of the patient's disease process which gives the approximate idea about the outcome of the surgical patients. This study investigated the Systemic inflammatory response syndrome (SIRS) outcome in patients undergoing elective or emergency surgeries at tertiary care hospital. **Objectives**: Systemic inflammatory response syndrome (SIRS) outcome in surgical patients at tertiary care hospital. **Methods**: This was a prospective study conducted over a period of 2 years at GMC Amritsar. The total of 50 patients undergoing surgical procedures were studied. They were followed up till date of termination with daily SIRS monitoring, development of MODS and MOF. Statistical analysis was based on simple percentages among related variables. **Results**: Overall incidence of SIRS was 74%. Incidence of SIRS was more in patients undergoing emergency surgery than the patient who underwent elective surgery (43.47%). The difference was statistically significant. (p<0.05).Increased age was associated with reduced inflammatory response in the postoperative period and might explain the greater benefit of anti-inflammatory prophylaxis in younger patients undergoing surgery. SIRS was more in males(78.57%).Duration of SIRS was more in patients undergoing Emergency surgery(4-5 days) than in elective group (3-4 days). **Conclusion**: The problems of inflammation and infection as a leading cause of organ dysfunction and failure is a major problem after surgery. SIRS is key pathogenic factor in postoperative morbidity which gives the approximate idea about the outcome of the surgical patients.*

Keywords: Systemic inflammatory response syndrome, Multi organ dysfunction syndrome(MODS), Multi organ failure(MOF)

1. Introduction

Systemic inflammatory response syndrome is defined as two or more of the following conditions-

1) Temperature greater than 38º C or less than 36º C;
2) Heart rate greater than 90 beats/min;
3) Respiratory rate greater than 20 breaths/ min or PaCO2 less than 32 torr;
4) White blood cell (WBC) greater than 12,000/µl or less than 4000/µl or greater than 10% immature (band) forms.[1]

Despite continuous advances in anaesthesia, surgery and perioperative care, major surgery is associated with undesirable sequelae such as pain, cardiopulmonary, infective and thromboembolic complications, cerebral dysfunction, nausea and gastro-intestinal paralysis, fatigue and prolonged convalescence. Clearly, such morbidity may be related to the level of anaesthetic and surgical skill, but complications may occur regardless of skill and no single technique or drug regimen has been shown to eliminate postoperative morbidity and mortality. The key pathogenic factor in postoperative morbidity, excluding failures of surgical and anaesthetic techniques, is the surgical stress response with subsequent increased demands on organ function. This phenomenon is also called systemic inflammatory response syndrome[2]

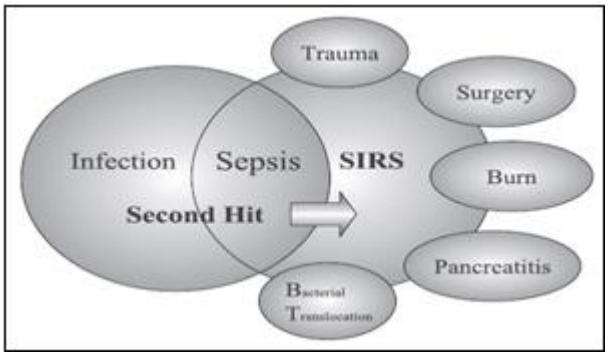

Figure 1: The interrelationship between SIRS, sepsis, and infection

SIRS leads to Multiorgan dysfunction which is mostly related to the kidneys, liver, lungs, central nervous system and heart[3]. Resuscitation should be started as soon as the syndrome is recognised. Goal of initial resuscitation should be to maintain central venous pressure of 8-12 mmHg, mean arterial pressure of ≥65mmHg, urine output ≥0.5mL/Kg/Hour and central venous oxygen saturation ≥70%. Intravenous fluids, packed red blood cells and dobutamine infusion can be used for resuscitation. Intravenous antibiotics should be started within first hour of recognition of severe sepsis. Crystalloids and colloids should be used to correct hypovolemia. Intravenous corticosteroids (Hydrocortisone 200-300 mg/day, for 7 days in three or four divided doses) are recommended in patients with septic shock who, despite adequate fluid replacement, require

vasopressor therapy to maintain blood pressure. Recombinant human activated protein C (rhAPC) is recommended in patients at high risk of death.[4]

This study is therefore a critical evaluation of SIRS in surgical patients reporting to our hospital at tertiary level.

2. Aims and Objectives

1) To study the incidence of Systemic inflammatory response syndrome outcome in surgical patients.
2) To examine the association of patient age and Gender with the occurrence of a postoperative systemic inflammatory response syndrome
3) Incidence of factors causing mortality and its relation with SIRS.
4) Duration of hospital stay in patients with SIRS
5) Comparison of duration of SIRS in patients undergoing emergency and elective surgery.

3. Material and Methods

This was a prospective study conducted over a period of 2 years at GMC Amritsar. The total of 50 patients undergoing surgical procedures were studied. They were followed up till date of termination with daily SIRS monitoring, development of MODS and MOF. Risk factors of MOF were addressed. Criteria for SIRS was kept as: Two or more of the following variables[2]

- Pulse rate (PR): >90beats/min
- Respiratory Rate (RR):>20 breaths/min or a Pa CO_2 level <32mm of Hg
- Temperature: >38º C or <36º C
- Total Leucocyte count (TLC): >12,000/µl or <4,000/µl or >10% bands.

The SIRS scores were calculated daily and maximum score were recorded. The SIRS score assigns 1 point for each parameter (temperature, white blood cell count, heart rate, and respiratory rate), so that a maximum of 4 points can be accrued. A maximal SIRS score was calculated by summing the individual worst value in each of the 4 parameters. Thus, a patient might have a maximal SIRS score of 4, even if the patient had scored 1 point in each different parameter at different points in the ICU admission. Pulse rate, Respiratory rate, temperature were recorded daily manually. TLC was done. Type of operation, type of anaesthesia, untoward incident during surgery and duration of surgery recorded. Co-morbid condition, Focus of sepsis was looked for and ventilator support was considered as a positive SIRS criteria for respiration.

4. Results

a) Age Distribution

Age group	No. of cases	Percentage
0-20	3	6%
21-40	19	38%
41-60	22	44%
61-80	6	12%
Total	50	100%

Table 1 shows the age distribution of patients taken in our study, 82 % of patients are within 21-60 years age group. Mean age of the patients in our study is 43.14 years ranging from 12 to 80 years. It shows that middle age group is most commonly involved.

b) Sex Distribution of Sirs

Gender	Total No. of Patients	Patients with SIRS	Percentage
Males	28	22	78.57%
Females	22	15	68.18%
Total	50	37	74%

Table 2 showing sex distribution of incidence of systemic inflammatory response syndrome. Overall incidence of systemic inflammatory response syndrome was 74%. Incidence of systemic inflammatory response syndrome in males was 78.57% and incidence of systemic inflammatory response syndrome in females was 68.18%. SIRS is more prevalent in males than females**. Females have lower inflammatory response as compared to males this is because estrogen has anti-inflammatory action.**

c) Incidence of Sirs in Elective and Emergency Surgery

Type of Surgery	Total No. of Patients	No. of Patients with SIRS	No. of Patients without SIRS
Elective	23	10	13
Emergency	27	27	0
Total	50	37	13

Table 3 showing incidence of systemic inflammatory response syndrome in elective and emergency surgery. **SIRS developed in 37 patients (74%).**All the patients in emergency surgery group had SIRS at some point of time during hospital stay. 10 patients (43.47%) from elective surgery group developed SIRS. Incidence of SIRS was more in patients undergoing emergency surgery than the patient who underwent elective surgery. The difference was statistically significant. ($p<0.05$).

d) Incidence of Mortality

Diagnosis	Incidence of Mortality
Overall Mortality	10%
SIRS	13.51%
Sepsis	45.45%
Severe Sepsis	83.33%
MODS	100%

Table 4 showing incidence of mortality. Overall mortality in our study was 10%. Rate of mortality in patients who developed systemic inflammatory response syndrome was 13.51%. Mortality rate increased to 45.45% in patients who developed sepsis. In case of patients with severe sepsis mortality rate was as high as 83.33%. The patients who developed multi organ dysfunction were having mortality rate of 100%. Mortality increased progressively from SIRS, sepsis, severe sepsis, MODS respectively.

e) Duration of Hospital Stay in Patients with Sirs and Patients without Sirs

	Patients with SIRS	Patients without SIRS
Mean	15.58	11.69
SD	4.77	1.65

't' test t=2.871, p=0.006

Table 5 showing mean duration of stay in hospital of patients with SIRS and patients without SIRS. Mean duration of stay in hospital of the patients with SIRS was 15.58±4.77 days. Mean duration of stay in hospital of the patients without SIRS was 11.69±1.65 days. Patients with systemic inflammatory response syndrome were having longer duration of stay in hospital than those without systemic inflammatory response syndrome. The difference was statistically significant ($p<0.05$).

f) Duration of Sirs in Elective and Emergency Surgery

Duration	No. of Patients in Emergency Surgery	No. of Patients in Elective Surgery	Total
0-1	0	15	15
2-3	16	5	21
4-5	5	1	6
6-7	2	1	3
8-9	2	1	3
≥10	2	0	2
Total	27	23	50

Table 6 showing duration of systemic inflammatory response syndrome in elective and emergency surgery. In most of the patients undergoing emergency surgery SIRS resolved by 4-5 days after surgery. In case of patients undergoing elective surgery SIRS resolved by 3-4 days in majority of the patients. Duration of SIRS was more in emergency surgery than those in elective surgery group.

5. Discussion

In our study most of the patients (44%) were in age group 41-60 years with mean age of 43.14 years ranging from 12 to 80 years. Mean age in study of Singh et al[6] included the patients in age group ranging from 15-82 years with most of the patients being in age group of 21-30 years. Chawla et al[7] included the patients age ranging from 0 to 19.9 years. Our finding of a relatively increased acute inflammatory response in younger patients. Most treatment benefit was observed in younger patients. With an increased immune response in these younger patients, the likelihood of an exaggerated inflammatory response might increase as well. Such an exaggerated response can set the stage for ongoing deregulated systemic immune and inflammatory cascade, with an associated risk of complications and adverse outcomes, and could explain why younger patients are more likely to receive benefit from anti-inflammatory therapy.

Our study included a total of 50 patients, out of which 28 (56%) were males and 22 (44%) were females. Similar observations were made in a study conducted by Singh et al[6] who included 34 males and 16 females. Similarly, Chawla et al[7] included 381 patients in his retrospective study out of which 220 were males and 161 were females.

In our study SIRS developed in 37 patients (74%). Similar observations were made in study conducted by Rangel-Frausto et al[5]who found that 85.7% patients in surgical intensive care units (SICU) had systemic inflammatory response syndrome.

Overall mortality in our study was 10%. Rate of mortality in patients who developed systemic inflammatory response syndrome was 13.51%. Mortality rate increased to 45.45% in patients who developed sepsis. In case of patients with severe sepsis mortality rate was as high as 83.33%. The patients who developed multi organ dysfunction were having mortality rate of 100%. Mortality increased progressively from SIRS, sepsis, severe sepsis, MODS respectively. Pittet et al[3] had made similar observations with 83 patients (49%) having sepsis; among them 28 developed severe sepsis. Rangel-Frausto et al[5]had seen that among patients with SIRS, 649 (26%) developed sepsis, 467 (18%) developed severe sepsis, and 110 (4%) developed septic shock and, there were also stepwise increases in mortality rates in the hierarchy from SIRS, sepsis, severe sepsis, and septic shock: 7%, 16%, 20%, and 46%, respectively.Duration of SIRS was more in patients undergoing Emergency surgery (4-5 days) than in elective group (3-4 days).

6. Summary and Conclusion

Systemic inflammatory response syndrome is a useful criterion for the recognition of postoperative complications and end-organ dysfunctions. Early recovery from systemic inflammatory response syndrome may arrest the progression of organ dysfunction, thus reducing the mortality. Increased age was associated with reduced inflammatory response in the postoperative period and might explain the greater benefit of anti-inflammatoryprophylaxis in younger patients undergoing surgery. Females have lower inflammatory response as compared to males this is because estrogen has anti-inflammatory action.

27 (54%) patients were operated as emergency surgical procedure and 23 (46%) patients were operated as elective surgical procedure. Overall incidence of SIRS was 74%.Patients undergoing emergency surgery were having higher incidence of SIRS than the patients undergoing elective surgery. Any particular importance could not be attributed to any of the SIRS criteria individually. SIRS criteria is a simple, easy to do bed side/laboratory. SIRS is an important response to surgical trauma with high mortality and morbidity. Mortality, duration of hospital, Multiorgan dysfunction and ICU stay increased significantly in the patients having SIRS. When SIRS is present always look for focus of infection like wound, urinary tract infections, lungs etc. SIRS therefore assumes importance, because when it is present, it alerts to look for septic foci or second hit.

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