Surgical stress markers for postoperative complications

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ABSTRACT
Introduction: Post operative complication means deviation from the normal postoperative course Adverse postoperative outcomes are linked to a variety of variables as well as the complexity of the surgical treatment itself. Planning treatments for and making decisions for post-operative patients would be much easier if prognostic indicators were defined and readily available to help with prognosis. The study's goal was to evaluate surgical stress markers as possible predictors of postoperative complications.
Material & methods
 The prospective study was conducted in department of general surgery over a period of one year. A total of 100 patients were included in the study. Statistical analysis were done using statistical package for the social sciences (SPSS) version 23. Chi-square test was used. Logistic regression were applied and was calculated in 95% confidence interval.
Results :Serum ALB levels at 24 hours and C-reactive protein (CRP) levels done at 72 hours were most predictive postoperative levels compared to the other perioperative serum levels
Conclusion :Increased serum CRP and albumin levels were linked to both infectious and non-infectious complications as well as longer hospital stays and treatment times.
Keywords: Albumin, CRP, elective surgery, Lactate, postoperative complications.

INTRODUCTION
A prior definition of postoperative complications (POCs) was "deviation from the normal postoperative course."[1] Although improvements in surgery have over the previous few decades decreased postoperative mortality, postoperative morbidity has remained high. Severe postoperative complications have a detrimental impact on postoperative results, quality of life, financial burden, and long-term prognosis in addition to the morbidity that patients experience.[2] It has been established that a higher rate of POCs is caused by the restriction of microvascular blood flow both before and after major abdominal surgery.[3]
Surgical trauma has been proven to trigger systemic inflammatory reactions [4,5]. Additionally, the release of several cytokines is induced by surgical stress, which leads to postoperative morbidity such fever and discomfort as well as infectious problems and anastomotic leaks [6-8]. Albumin and C reactive protein have been regarded as crucial biomarkers for surgical stress [9,10]. They can specifically causes an acute phase reaction with local and systemic inflammation, whereas also functions as an anti-inflammatory that limits the production of proinflammatory cytokines and changes the immune response.[11,12].
 In patients who had pancreatectomy, it has been demonstrated that TNF- and IL-10 could predict the likelihood of postoperative problems [13]. The relationship between marker levels and postoperative infectious problems related to surgery, however, lacked significant data.

Planning treatments for and making decisions for post-operative patients would be much easier if prognostic indicators were defined and readily available to help with prognosis. Our study's objective is to determine whether the levels of the surgical stress marker might predict postoperative complications as potential prognostic indicators within in patients having elective procedures.

MATERIAL & METHODS

The prospective cohort study was conducted among 100 patients undergoing any type of elective surgery at department of general surgery in a tertiary care centre for the duration of one year. The ethical permission was taken from the institutional ethical committee before the commencement of study. Informed consent was obtained from each patient prior to research work started.

The patients were included on the basis of following eligibility criteria:

Inclusion criteria: Patients above 18 years of age; undergoing any type of elective surgery; and with operation time more than 2 hours.

Exclusion criteria:Patients who were on immunosuppressive therapy, with cognitive impairment or language comprehension problems, absence of the consent form prior to first blood sample, and orthopaedic and neurological surgeries.

Sex, age, hospital stay in days, length of the procedure, complications (fistulas, abscesses, general complications like cardiac, pulmonary, liver, wound dehiscence, wound infections), serum albumin, lactate, and CRP levels before surgery, on the first and third day after the operation—all of which were recorded for each patient—were all noted. Additionally, deaths that occurred in patients during their postoperative hospital stays were noted.

The data collected was ana lysed using SPSS version 23.0. The data was presented in proportions and percentages using bar charts and pie charts. Qualitative data were expressed as frequency and percentage. Chi-square ($\chi 2$) test of significance was used in order to compare proportions between 2 qualitative parameters. A p value less than or equal to 0.05 was considered statistically significant

RESULTS

Table 1 shows that 35% out of 100 patients experienced complications. 60% suffered from infective complications that includes wound infection, abscess and respiratory complications and 40 % suffered from non-infective complications which consists of wound dehiscence, urinary retention and ileus. When classified using Clavein -Dindo scale, 75% were grade 1-2 (i.e. required minor intervention), 25% were grade 3-4 (i.e. required major intervention). No mortality was seen.

Table 1: Post-operative complications by severity

Complication	Percentage
No complication	65
Any complication	35
Complication type	
Infective complication	60

Non infective complication	40
Clavein -Dindo scale	
0	65
1	25.5
2	49.5
3	18.5
4	6.5
5	0

Table 2 shows that longer hospital stay (p<0.05)and duration of the procedure (p<0.05) were significantly associated with postoperative complications while age and gender were not associated with the rise in post-operative complications.

Table 2: Patients characteristics contributing to post-operative complications

Characteristics	Total	With complications N (%)	Without complications N (%)	P value
Age				
20-40	30	10 (33.3)	20 (66.7)	0.567
40-60	60	20 (33.3)	40 (66.7)	
60-80	10	5 (50)	5 (50)	
Gender				
Male	65	24 (36.9)	41 (63.0)	0.887
Female	35	11 (31.4)	24 (68.5)	
Hospital days				
<8	68	25 (36.7)	43 (63.2)	0.003
>8	32	10 (31.2)	22 (68.7)	
Duration of procedure				
<180	69	22 (31.8)	47 (68.1)	0.010
>180	31	13 (41.9)	18 (58.0)	

Table 3 shows the highest prognostic markers for problems were evaluated using logistic regression analysis on data collected between 24 and 72 hours after surgery. It revealed CRP measured at 72 hours with highest predictive ability (p=0.030, CI=1.005-1.213). Albumin measured at 24 hours is found to be significant predictor for postoperative complications (p=0.005, CI= 0.00-0.278). Lactate is not found to be significant predictor.A decrease in albumin levels, or postoperatively within 24 hours, was reliable to rule out complications like wound infection, intra-abdominal abscess, wound leak, ileus, wound dehiscence, urinary retention, and some respiratory complications like pneumonia. Surgical stress markers like CRP levels at 72 hours predicted the post-operative infectious complications.

Parameters	Lower	Upper	P value	Exp (B)
CRP 72 HRS	1.005	1.213	0.030	1.140
ALB 24 HRS	0.000	0.278	0.005	0.020
CONSTANT			0.314	54.75

DISCUSSION

The most significant and potentially fatal clinical issues arise from postoperative complications following elective surgery [14-17]. For appropriate therapy to be started and clinical outcomes to be improved after surgery, early diagnosis of problems is crucial [18,19]. It would be very helpful to have markers that can anticipate postoperative problems. Surgery is well documented to cause significant surgical stress and to trigger both pro- and anti-inflammatory responses, which can contribute to postoperative morbidity and problems [20,21]. According to the available research, indicators like CRP and albumin may have a role

in the development of postoperative surgical stress [22]. The goal of the current investigation was to ascertain if the levels of the surgical stress marker may predict postoperative problems in individuals undergoing elective procedures as potential prognostic markers.

In the current study, postoperative problems occurred 35% of the time. No mortalitywas noted. The most widely utilized biomarker of infection in ICU patients and the most widely available vector for detecting postoperative inflammation following major abdominal surgery are both CRP, which is identical to our study.[23] The CRP level on postoperative day (POD) 3 or 4 is the strongest predictor of postoperative problems, according to a previous study that was supported by the current one.[24]

According to Meyer et al., an increase in CRP is a poor measure for identifying complications in postoperative patients who are critically unwell (odds ratio=0.983, 95% CI=0.932-1.036).[25] The findings by Rtqvist et al on CRP and interleukin-6 in community-acquired pneumonia can be used to validate the current study. They provide evidence that CRP was crucial for both diagnosis and prognosis in the identification of community-acquired pneumonia.[26]

Albumin is a protein having a negative acute phase that rapidly declines in cases of inflammation. According to a study by Labgaa et al, it is caused by redistribution into the third space in the hours immediately following different kinds of surgical procedures.[27]

Recently, some academics have suggested that the CRP/ALB ratio (CAR), which has a stronger predictive value than CRP alone, can indicate postoperative problems in colorectal cancer in a timely way.[28] This is in line with the findings of Ranzani et al., who looked at the potential of CRP/albumin to predict 90-day mortality in 334 patients.[39] The CRP/albumin ratio >2 in sepsis/septic shock patients showed the highest sensitivity and responsiveness in predicting 90-day death, according to these researchers. We did not test CAR in our investigation, but we did demonstrate that CRP and ALB were independently predictive.

In this investigation, even though all patients received equal postoperative treatment, greater serum levels of CRP, albumin, and lactate in the early postoperative period following elective major surgeries were linked to a higher risk of POCs and a lengthier hospital stay. We found out that the lactate levels measured at 12 hours after the operation had the highest predictive value of the negative outcomes, however lactate was not proven to be trustworthy on regression analysis. Therefore, we decided against using lactate levels as a POC prediction diagnostic. A retrospective study conducted by Bhat et al with 207 patients found that the ability to remove lactate is a predictor of mortality among emergency admissions.[30]

Despite the fact that their patients' stays were longer, other studies' findings that elevated serum lactate was associated with a longer hospital stay had a p value of 0.043.[31,32] CRP and albumin during the perioperative phase had been investigated, and the authors discovered that, reflecting the strong association between CRP and albumin, the preoperative CRP levels might, to some extent, predict future hypo albumin emia.[33]

CONCLUSION

Elevated serum CRP and albumin were linked to both infectious and non-infectious complications, as well as longer hospital stays and longer procedure times. Compared to the other perioperative blood levels, serum CRP levels at 72 hours and albumin levels at 24 hours were the most reliable predictors of postoperative levels. Lactate was not a predictor in this study, in contrast to earlier investigations.

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