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ROLE OF MODIFIED APACHE II SCORE FOR ASSESSMENT OF PERITONITIS DUE TO HOLLOW VISCUS PERFORATION

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Abstract:

Background: APACHE II is one of the most commonly used scoring system to know the severity of the disease. There is very limited study regarding the importance of APACHE II score in the prediction of outcomes arising from hollow viscus perforation and peritonitis. The mortality and morbidity in patients with perforative peritonitis remain high. APACHE II is considered to be a better scoring system for predicting the outcome of abdominal sepsis.

Objective: To understand the importance of the APACHE II score in predicting the severity and outcome of patients with hollow viscus perforation.

Material and methods: This was a prospective, observational study done over a period from October 2017 to October 2019 at the dept. of surgery, SCB medical college, Cuttack. Sixty patients of perforation peritonitis who had undergone laparotomy were included in the study. APACHE II scores were assessed and recorded for all patients. The accuracy of outcome prediction by the APACHE II scoring system was estimated by using the ROC curve and Pearson correlation test**.**

Results: Performative peritonitis was more common within the age bracket of 31-40 years with a male to female ratio of 5:1. Duodenum constituted the most common site of GI perforation followed by the ileum and appendix. Surgical site infection (SSI) was the most common postoperative complication which was encountered in 20 patients. All the patients having an APACHE II score of more than 15 developed systemic complications. The highest deaths (63.6%) were seen in a patient with an APACHE II score of 15-20. The mean APACHE II score between the survivors and non-survivors (8.9 vs 17.6) showed a statistical significance.

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Conclusions: From this study, it can be better concluded that the modified APACHE II score can be used for the prediction of the outcomes in patients with peritonitis due to hollow viscus perforation. A modified APACHE II score of more than 15 is associated with a very high risk of systemic complications in the post-operative period which results in increased morbidity and mortality.

Keywords: APACHE II, Gastrointestinal perforation, Peritonitis, Mortality and Morbidity

Introduction

Perforation of hollow viscera may be a potentially life-threatening condition and frequently leads to acute generalised peritonitis. It is a standard surgical emergency and is related to high morbidity and mortality [1,2]. Peritonitis is either localised or generalised and reckoning on the source of contamination, it is classified as primary, secondary or tertiary. Secondary peritonitis is the commonest among the three categories and it is due to the perforation of hollow viscera. The mortality and morbidity of those cases remain high even after the advances in surgical techniques, antibiotics, ICU care and anaesthesia [3]. It is necessary to diagnose and treat sepsis as early as possible to have a better outcome. Surgery is often required to seal the perforation and drain the abdominal cavity.

Various scoring systems have been used in the last three decades to assess the prognosis of perforative peritonitis like APACHE II, MPI, and POSSUM [4]. APACHE II is considered to be a better scoring system for predicting the outcome of abdominal sepsis [5,6]. This study aims to understand the importance of the APACHE II score in predicting the severity and outcome of patients with hollow viscus perforation.

Material and methods

This was a prospective observational study of 60 patients conducted at the department of surgery, SCB Medical College, Cuttack during the period from October 2017 to October 2019. Ethical clearance was obtained from the institute ethics panel.

Inclusion criteria:

1. All the patients admitted with features of perforative peritonitis detected clinically, radiologically or during laparotomy

Exclusion criteria:

1. The patient was admitted with features of peritonitis but had no evidence of perforation radiologically or per operatively.
2. Patients of postoperative peritonitis who had undergone surgery for causes other than perforation.
3. Iatrogenic perforations.

After thorough clinical examination and radiological investigations, the diagnosis of gastrointestinal perforation was made. Routine haematological and biochemical investigations were done. Acute physiological parameters of APACHE II score were assessed and recorded for all patients undergoing surgery. The parameters included Temperature, Mean Arterial blood pressure, Heart rate, Respiratory rate, Serum Sodium, S. Potassium, S. Creatinine, Hematocrits, White blood

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count, and HCO3. Arterial pH or partial pressure of oxygen (Po2) couldn't be monitored due to lack of facility. Patients were resuscitated with intravenous fluid and antibiotics. Correction of electrolytes and management of shock was done with vasopressors as per requirement**.**

For each parameter, the scores ranged from 0 to 4 on both sides of the normal value. Zero represents normal values and increases to 4 indicating the extreme end of high or low abnormal values. These parameters represent the acute physiological scores (APS). Age points are as follows for adult patients (44=0, 45-54 = 2, 55-64 = 3, 65-74 = 5, 75=6). Chronic ill health value was added if the patient has a history of any organ system insufficiency or immunocompromised. The aggregation of the APS, Age point and chronic health values is the total modified APACHE II Score.

The statistical analysis was done in SPSS version 24. An unpaired t-test was used to compare the mean and standard deviations of two independent variables. The accuracy of outcome prediction by the APACHE II system was assessed by using the ROC curve and Pearson correlation test.

Results

In our study, 60 patients of hollow viscus perforation were included those who had undergone laparotomy. The mean age was 45.3±7.6 years. Perforative peritonitis was more common within the age bracket of 31-40 years with a male to female ratio of 5:1 (table 1).

Duodenum constituted the most common site of GI perforation (51.67%) followed by ileal perforation (16.67%) and appendicular perforation (15 %). Gastric perforation was seen in 8.3% of cases, whereas colonic and jejunal perforation was found in 5% and 3.3% of cases respectively (Table 2).

Duodenal ulcer constitutes the most common cause of gastrointestinal perforations. 75% of duodenal ulcer patients give a history of previous peptic ulceration diseases. Out of the 5 gastric perforations, two had malignant perforation and underwent gastrectomy later. Ileal perforations were mostly because of typhoid fever origin except for 4 cases which were due to trauma. For all the jejunal perforation in this study, trauma was the contributing factor. Malignancy was the predominant pathology in gastric and colonic perforation.

Postoperative complications:

Surgical site infection (SSI) was the most common postoperative complication which was encountered in 20 patients. A total of 21 patients developed local complications. Systemic complications were recorded in 16 patients following surgery. Sepsis and acute respiratory distress syndrome (ARDS) were the leading systemic complications. Table 3 represents the detailed postoperative complication data of our study population.

When the modified APACHE II score data were analysed, the maximum number of patients (33.3%) belonged to the score of 10-14 followed by a score group of 5-9 (31.6%). The score group of 15-20 constituted 18.3% and the 0-4 group had 16.6% of the total patients (table 4). All the patients having an APACHE II score of more than 15 developed systemic complications. In the patients' group having a score of 0-4, only one patient developed a local complication, none of them had any systemic complications and no mortality was recorded.

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In our study, the mean hospital stay and ICU stays were 13.35 days and 2.8 days respectively in the patients having an APACHE II score of 10-14 whereas it was 7.4 days and 3.2 days in the patients with an APACHE II score of 15-20. In those groups of patients where the APACHE II score was 0-4 the mean hospital stay was 9.7 days and none of them required ICU support. However, the patients having the score range of 5-9 had a mean hospital stay of 10.5 days with a minimal ICU occupancy of 1.6 days (table 5).

There was no mortality in the APACHE II score of 0- 4 and 5-9. The highest deaths (63.6%) were seen in patients with APACHE II scores of 15-20. Only 2 deaths were noticed in the group of patients having the APACHE II score of 10-14 (table 5).

While comparing the data of survivors vs non-survivors, we found that the mean age of survivors was 40.5 years whereas for non-survivors it was 56.4 years which showed a statistical significance (p =0.012). The mean hospital stay for survivors was 12.29 days and for non-survivors was 5.67 days. This has a p-value of 0.004 which was statistically significant. The mean APACHE II score between the survivors and non-survivors (8.9 vs 17.6) also showed statistical significance (table 6).

Discussion:

Table 1: Age distribution

Age group (years)	No. of patients	Percentage
10-20	8	13.3
21-30	8	13.3
31-40	19	31.67
41-50	11	18.3
51-60	8	14
>61	6	10

Table 2: Site of perforation

Site of perforation	Numbers of cases	Percentages
Duodenum	31	51.67%
Stomach	5	8.3%
Jejunum	2	3.3%
Ileum	10	16.67%

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Appendix	9	15%
Colon	3	5%

Table 3: Post operative complications:

No	Etiology	ARDS	SSI	Intra-peritoeal abscess	Anastomot-ic leak	ARF	
1	Duodenal	8	10	1	0	1	20
2	Stomach	2	2	0	1	0	5
3	Jejunum	1	0	0	0	1	2
4	Ileum	0	3	2	2	0	7
5	Appendix	0	4	1	0	0	5
6	Colon	0	1	0	1	0	2
7	Total	11	20	4	4	2	41

Table 4: Modified APACHE II Scores observed

No.	Etiology	0-4	5-9	10-14	15-20	Total
1	Duodenal	9	12	6	4	31
2	Stomach	0	1	3	1	5
3	Jejunum	0	0	1	1	2
4	Ileum	0	1	6	3	10
5	Appendix	1	5	3	1	9
6	Colon	0	0	1	1	3
7	Total	10(16.6%)	19 (31.6%)	20 (33.3%)	11 (18.3%)	60

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Table 5: Comparison of various parameters with APACHE II scores

APACHE II score	0-4	5-9	10-15	15-20
Local compli-cations	1	3	10	7
Systemic complications	0	1	4	11
Duration of hospital stay (mean ± SD)	9.7 ± 3.8	10.5 ± 4.9	13 ± 4.9	7.4 ± 2.8
Duration of ICU stay Mean ± SD	0	1.6	2.8 ± 1.09	3.2 ± 1.7
Mortality [N(%)]	0(0)	0(0)	2 (10%)	7 (63.6%)

Table 6: Comparison of various parameters between survivors and non-survivors

Parameters	Survivors	Non-survivors	P value
Age (mean± SD)	40.5± 12.67	56.4± 10.5	0.014
Duration of hospital stay(mean± SD)	12.29± 5.4	5.67± 4.2	0.004
APACHE II score	8.9± 2.8	17.6± 2.1	<0.001

Discussion

In this present study, the mean age was 45.3 ± 7.6years, which is closely similar to 40.4 years in the study done by Kitara et al. [7]. The diseases showed a male dominant pattern with a ratio of 5:1 which was comparable to Huttunen et al study [8].

Cause of perforation

Duodenal ulcer was the most common cause of perforation peritonitis in our study which was seen in 51.67% of the patients. Peptic ulcer perforations are most commonly present in the first part of the duodenum [9-11]. It was followed by ileal perforation (16.67%) and appendicular perforation (15%) respectively. In the studies by Afridi et al. and Khan et al., tubercular perforation peritonitis reported the incidence to be 21% and 22%, respectively [9,11].

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Post-op complications

We noticed that the postoperative complications were significantly higher in the patient having an APACHE II score of more than 10 at the time of admission. SSI was the most common complication and was seen in 33.3% of the cases. The incidence of SSI is higher following surgeries for gastrointestinal perforation and peritonitis compared to any other surgery as the surgical wound was contaminated during laparotomy with infected peritoneal fluid [12]. It is one of the major contributing factors to increased morbidity and hospital stay. Systemic complications were recorded in 16 patients. Sepsis and ARDS were the leading complications accounting for 26.6% and 18.3%, respectively. As the APACHE II score includes chronic health evaluation into account, vulnerable patients can be detected earlier and managed appropriately.

The study revealed a significant statistical difference between the survivors and non-survivors in relation to mean hospital stay and the mean ICU stay. In Bohnen et al. study, the mean duration of hospital stay following treatment in survivors was 11.02 days as compared to 18 days in non-survivors [2].

The prime aim of this study was to assess the prediction of the outcome of perforation peritonitis using the APACHE II score. In our study, 29 patients were in the low-risk category with an APACHE score of 0-9, 20 patients belonged to the medium-risk group with an APACHE score of 10-14, and eleven patients were having high-risk APACHE II score of more than 15. A high mortality rate (63.6%) was recorded in the groups of patients with an APACHE II score of more than 15 and no death was noticed when the score fell below 10. Medium risk group patients (APACHE II score 10-14) has also a low mortality rate (10%), but a prolonged hospital stay.

When we analysed the complications in these patients, this study revealed that all the patients having APACHE II scores> 15 developed systemic complications, whereas none of the patients in the groups having scores below 5 had systemic complications. In this latter group, only one patient had local complications of SSI and no mortality was recorded.

The studies conducted by Bohnen et al. and Adesunkanmi et al. showed that the mean APACHE II score among survivors was 8 (low-risk group) and among non-survivors, it was 22.4 (high-risk group). These studies opined that there is a positive correlation between mortality and higher APACHE II scores [2,13].

The area under the ROC curve was found to be 98.7%. It showed a positive correlation between the APACHE-II score and the predicted death rate with r = 0.715. Kulkarni et al. also analysed the APACHE II score in perforative peritonitis and they reported an area under the curve using ROC to be 98.4% [14]. Similarly, the study by Bylapudi S K et al also revealed that the area under the ROC curve was 99.5% with an r-value of 0.729 [15]. The mean score for survivors was 8.9±2.8 in comparison to non-survivors which was 17.6±2.1. This data was comparable to the study conducted by Adesunkanmi et al on adult African patients [13]. So it can be concluded that the APACHE-II scoring system was found to be accurate in predicting the group outcome of peritonitis due to hollow viscous perforation.

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However, this study had a few limitations as it was a single-centre based study with less study population which actually doesn't represent the whole population. It requires a multicentric study to know the actual correlation between APACHE II SCORE and outcomes in patients with peritonitis.

Conclusions

From this study, it can be better concluded that the modified APACHE II score can be used for the prediction of the outcomes in patients with peritonitis due to hollow viscus perforation. A modified APACHE II score of more than 15 is associated with a very high risk of systemic complications in the post-operative period which results in increased morbidity and mortality. Apart from this it also gives an idea about the hospital and ICU stay. This scoring system also provides a useful tool in designing the patient's management strategy thereby improving the quality of treatment.

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