

Comparison of POSSUM and SAPS II in Prediction of Postoperative Mortality in Hollow Viscus Perforation

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ABSTRACT

Background: There have been very few studies in the literature assessing various scoring systems to predict mortality in patients with hollow viscous perforation. Scoring systems like POSSUM and SAPS II are among the most widely validated risk predictors. Objective of the study was to compare POSSUM and SAPS II in prediction of mortality in patients undergoing surgery for hollow viscus perforation.

Methods: Prospective observational study was conducted at Department of Surgery, Tribhuvan University Teaching Hospital, Kathmandu, Nepal, over a period of 18 months. Ethical approval was obtained from the Institutional Review Board of Institute of Medicine. Informed consent was taken from all the patients. Patients aged less than 16 years, discharged on request and patients in whom no perforation found during surgery were excluded from the study.

Results: Among 121 patients enrolled in the study, in-hospital mortality was seen in 19 patients (17.0%). Mean POSSUM score in survivors was 39.7 ± 7.3 and in non-survivors was 52.8 ± 5.8 ($p < 0.001$). Similarly mean SAPS II score was 16.4 ± 9.7 in survivors and 41.8 ± 6.4 in non-survivors ($p < 0.001$). Area under ROC curve was higher for SAPS II (0.964) as compared to POSSUM (0.906) suggesting that SAPS was better.

Conclusions: Both POSSUM and SAPS II provided good discrimination between survivors and non survivors in patients undergoing surgery for hollow viscus perforation. SAPS II showed better sensitivity and specificity than POSSUM in predicting mortality.

Keywords: Hollow viscus; mortality; perforation; POSSUM SAPS II.

INTRODUCTION

Mortality associated with hollow viscus perforation ranges from 8.2-19.1%.¹⁻⁵ POSSUM was developed by Copeland in 1991.⁶ SAPS II was devised by LeGall in 1993.⁷

There are few studies assessing various scoring systems to predict mortality in hollow viscus perforation.⁸⁻¹¹ Studies of POSSUM score in hollow viscus perforation has been performed in many parts of the world. It needs to be validated in Nepalese population. SAPS II is simplified scoring system which does not include any operative parameters. The advantage of this scoring system is the possibility to prognosticate prior to surgery.

There was only one study which has compared POSSUM and SAPS II for prediction of mortality in patients with colorectal carcinoma undergoing resection.¹²

Objective of this study was to compare POSSUM and SAPS II in prediction of mortality in hollow viscus perforation and to calculate the sensitivity, specificity, positive predictive value and negative predictive value.

METHODS

Prospective observational study was conducted at the Surgical Gastroenterology Units of Department of Surgery, Tribhuvan University Teaching Hospital,

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Kathmandu, Nepal, over a period of 18 months (July 1, 2011 to November 30, 2012). Ethical approval was obtained from the Institutional Review Board of Institute of Medicine. Informed consent was taken from all the patients.

With prevalence of hollow viscus perforation taken as 7.7% of all surgical admissions in the year 2010, power of 80% and error of 0.05, sample size was calculated to be 110. Considering dropout rate of 10%, the total sample size was calculated to be 121. All patients undergoing surgery for suspected hollow viscus perforation were included in the study. Patients aged less than 16 years, discharged on request and patients in whom no perforation found during surgery were excluded from the study.

All patients with diagnosis hollow viscus perforation were recruited for the study after taking informed consent. Demographic, clinical and laboratory variables were collected prior to surgery. For clinical and laboratory data, the worst value prior to surgery was taken for analysis. During surgery, operative parameters were recorded. Results were expressed as mean \pm standard deviation. T-test was applied for continuous

variables and Chi square test applied for categorical variables. The confidence interval of 95% was taken and p value < 0.05 was considered as statistically significant. Sensitivity and specificity were calculated for various predicted cutoffs of POSSUM and SAPS II. ROC curves were obtained for POSSUM and SAPS II for comparison.

RESULTS

A total of 112 patients were included in the study. Mean age of the patients was 41.5 ± 18.9 years with range of 16 - 87 years. There was a male preponderance with male to female ratio of 2.9 : 1. In-hospital mortality was seen in 19 patients (17.0%). Among laboratory parameters, WBC count, urea and creatinine were significantly higher in non-survivors. Site of perforation was not significantly different between survivors and non-survivors. ($p=0.379$)

Mean POSSUM score was 39.7 ± 7.3 in survivors compared to 52.8 ± 5.8 in non survivors. ($p<0.001$). Mean SAPS II score was 16.4 ± 9.7 in survivors and 41.8 ± 6.4 in non survivors. ($p<0.001$) 39. In both the scoring systems, as the predicted risk of death increased, the proportion of patients who died also increased.

Table 1. Sensitivity, specificity, PPV and NPV of POSSUM at various cutoff levels.

Cutoff (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
35	94.7	73.1	41.9	98.6
40	89.5	80.6	48.6	97.4
45	84.2	82.8	50	96.3

Table 2. Sensitivity, specificity, PPV and NPV of SAPS II at various cutoff levels.

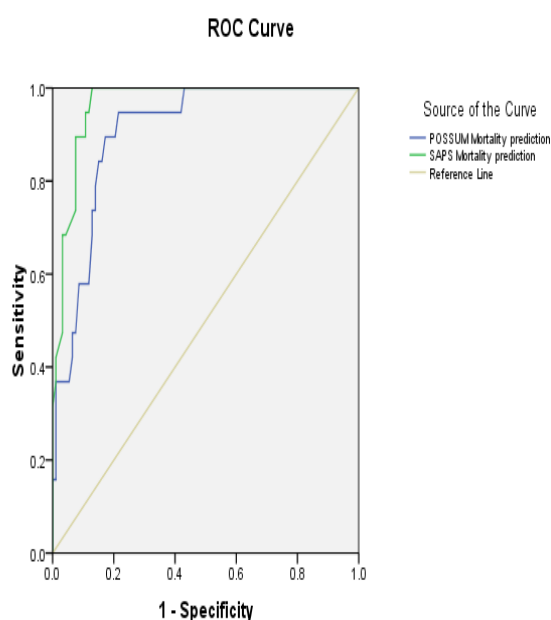
Cutoff (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
5	94.7	68.8	38.3	98.5
10	94.7	88.2	62.1	98.8
15	89.5	91.4	68.0	97.7

Table 3. Comparison of area under ROC for POSSUM.

Study	Sample size	Study population	Area under curve
Brooks, et al,	949	All surgical patients	0.92
Elias, et al,	416	All surgical patients	0.762
Can, et al,	224	Colorectal resection	0.793
Present study	112	Perforation	0.906

Table 4. Comparison of area under ROC curve for SAPS II.

Study	Sample size	Study population	Area under curve
Moreno, et al,	1904	ICU	0.817
Aegerter , et al,	33471	ICU	0.870
Sakr ,et al,	1851	ICU	0.830
Present study	112	Perforation	0.964



Diagonal segments are produced by ties.

Area under ROC curve for POSSUM - 0.906

Area under ROC curve for SAPS II - 0.964

Figure 2. Comparison of Area under ROC for POSSUM and SAPS in patients undergoing surgery for hollow viscus perforation.

Sensitivity, specificity, PPV and NPV at different cutoff values for SAPS II and POSSUM are shown in Tables 1 and 2 respectively. At cutoff value of 40% predicted mortality, sensitivity, specificity, PPV and NPV were 89.5%, 80.6%, 48.6% and 97.4%, respectively for POSSUM. At cutoff of 10% predicted mortality, SAPS II showed sensitivity, specificity, PPV and NPV of 94.7%, 88.2%, 62.1% and 98.8%, respectively. Area under the ROC curve for SAPS II was 0.964 which was better than the area under the curve for POSSUM of 0.906. (Figure 1)

DISCUSSION

Mortality rate due to hollow viscus perforation in different studies is variable.¹⁻⁵ However these variations may be attributed to various factors like age of the patient, time of presentation and site of perforation.

Copeland, et al, created the POSSUM score in 1991, In the study, taking the mortality cutoff at 0.5, the sensitivity and specificity to be 54.1 % and 99.3 % respectively.⁶ In a review of 10000 general surgical interventions studied prospectively, reported sensitivity of 73.2 % and specificity of 98.5 %.¹³ In the present study, sensitivity of 73.7% was comparable to the study however, specificity of 87.1% was inferior to the study. In an article comparing Sequential Organ Failure assessment (SOFA) and SAPS II in 237 polytrauma patients, at cutoff of 0.2 for SAPS II, sensitivity and specificity were 55.6 % and 94.0 %, respectively.¹⁴ In a comparative study of SAPS II, POSSUM and P-POSSUM in patients undergoing colorectal surgery, sensitivity of 75.0% and specificity of 98.6% was observed.¹² In our study, sensitivity of 68.4% was in between the two series while specificity of 87.1% was inferior to both the studies. Comparison of area under ROC curve for POSSUM in the present study was comparable with a comparative study of POSSUM and P-POSSUM, whereas the area under curve was greater when compared to the other studies. (Table 3).^{12,15,16} For SAPS II, area under ROC curve was larger than in other studies. (Table 4)¹⁷⁻¹⁹ High area under the ROC curve for POSSUM and SAPS II indicated that both these scoring systems were able to discriminate well between survivors and non- survivors.

CONCLUSIONS

Mortality was observed in nearly one fifth of the patients undergoing surgery for hollow viscus perforation. Both POSSUM and SAPS II provided good discrimination between survivors and non survivors. In addition, SAPS II showed higher sensitivity and specificity than POSSUM in predicting mortality.

CONFLICT OF INTEREST

None.

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