Original Research Article

Comparison between Possum and P-Possum Scoring System for Predicting Prognosis in Patients with Perforation Peritonitis in a Tertiary Care Centre: A Prospective Study

Ayush Rathore[1], Kamna Dubey[2], Sandeep Ahirwar[3], Avinash Gautam[4*]

[1]Junior Resident, Department of surgery MGM Medical College & M.Y. Hospital Indore.
[2]Assistant Professor, Department of Anesthesiology LNCT Medical College & Sewakunj Hospital Indore
[3]Assistant Professor, Department of surgery MGM Medical College & M.Y. Hospital Indore
[4]Assistant Professor, Department of surgery MGM Medical College & M.Y. Hospital Indore

Abstract:

Aim: To compare the POSSUM and P-POSSUM scores and to determine the best suitable tool for risk prediction post-surgical intervention.

Methods: The present study was conducted to compare the usefulness of POSSUM and PPOSSUM scores in the prediction mortality risk in patients undergoing surgery for perforation peritonitis. We had included 100 patients of perforation peritonitis in the present study. All patients presenting in the Department of Surgery of M.G.M. Medical College and M.Y. Hospital with complaint of perforation peritonitis formed the source of data for study.

Result: Majority of the patients were in the age group 21-40 years and 41-60 years. The observed mortality in the present study was 22%, while the predicted mortality as predicted by POSSUM and P-POSSUM was 20% by each equation. Both POSSUM and P-POSSUM predicted the mortality slightly lower than the observed mortality. The sensitivity of POSSUM and P-POSSUM in the prediction of postoperative mortality was 100%, specificity was 90.91%, positive predictive value was 97.50%, negative predictive value was 100% and the diagnostic accuracy was 98%. The overall observed / predicted mortality ratio was found to be 1.1 by both POSSUM and P-POSSUM, showing that POSSUM and P- POSSUM both under predicted the postoperative mortality in patients undergoing surgery for perforation peritonitis in the present study.

Conclusion: Hence, we recommend the use of POSSUM and P-POSSUM which is simple, easy to calculate be used in the prediction of postoperative mortality in patients undergoing surgery for perforation peritonitis.

Keywords: Co-morbidity, Perforation to operation time, Mortality, Morbidity.

Introduction

It is a relatively new phenomenon to use a systematic strategy to assessing sickness in critically ill individuals with peritonitis. The development of such systems has been specifically the need for methods to compare patient populations and severity of illness, objectively predict mortality and morbidity, and to evaluate the treatment strategy.[1]

Scoring systems have been developed in response to an increasing emphasis on the evaluation and monitoring of health services. The outcome of surgical intervention is not solely dependent on the abilities and techniques of the surgeon. The physiological status of the patient and the perioperative events has an impact on the final outcome. When comparing the outcomes of emergency surgery between different units and

hospitals, crude morbidity and fatality rates might be deceiving. The ability to predict the result of surgery aids in the development and implementation of a more effective treatment regimen. The Physiological and Operative severity score for the assessment of mortality and morbidity (POSSUM) developed by Copeland et al in 1991, provides a valuable tool for risk adjustment and stratification and this is widely used in various surgical settings.[2]

In a surgical review article, it was concluded that 'POSSUM scoring is the best scoring system available in surgical practice. It scores the physiological status of patients and operative findings and all 12 physiological and 6 operative variables can be recorded easily and reproduced satisfactorily by resident staff without any

difficulty. It is widely used by the surgeons compared to anesthetists who use ASA and APACHE scoring system.[2] The main disadvantage of POSSUM scoring is that it over predicts the mortality in some low risk patients.[3] The Portsmouth predictor {P- POSSUM} modification proposed by Whiteley et al. counters this over prediction of mortality by POSSUM. It uses the same variables as POSSUM but uses a different formula for analysis.[4]

Peritonitis is an infection that causes inflammation of the peritoneum and peritoneal cavity. It can be localised or widespread. In the absence of perforation or inflammation of the GI or GU tract, primary peritonitis is caused by bacterial, chlamydial, fungal, or mycobacterial infection. Secondary peritonitis occurs in the setting of GI or GU perforation or inflammation with common causes including acute appendicitis, colonic diverticulitis, and pelvic inflammatory disease.

The determination of outcome of surgery helps to plan and implement more effective treatment regimen. Hence, the present study was initiated to evaluate the predictive effectiveness of POSSUM and P-POSSUM in the prediction of postoperative mortality in patients undergoing surgery for perforation peritonitis and to find out whether POSSUM or P-POSSUM is more accurate in the prediction of postoperative mortality.

Material & Methods

Sample size: Minimum 100 patients of perforation peritonitis

Study site: The present study was conducted at M.Y. Hospital, Indore (M.P.). Source of data: All patients presenting in the Department of Surgery of M.G.M. Medical College and M.Y. Hospital with complaint of perforation peritonitis formed the source of data for study.

Inclusion criteria

- Patients between 18 to 60 years of age of both sexes.
- Patient who are willing to participate and give written consent for study

Exclusion criteria

- Patients with no radiological evidence of perforation
- Other causes of peritonitis (chemical, spontaneous, etc.)
- Pregnant and lactating women
- Patients who underwent abdomen surgeries other than midline laparotomies.
- Patients not responsive to resuscitation or died on table
- Tuberculosis, Crohn's disease etc.
- Patient not willing to provide voluntary written informed consent to participate in the study

The study was explained to the patient and/or relative in great detail in their own language. If they were willing to be a part of the study, a voluntary written informed consent was obtained from them. A detailed history taking including general examination and investigations were done in each patient. After all preoperative preparations and pre- anesthetic checkup, patients underwent surgery. In all these patients, patient outcome and complications were recorded. Analysis of the data was done at the end of the study period

Assessment tools: We used the following assessment tools in the present study ω Cardiac signs ω Chest X-ray ω Coma score ω Operative magnitude ω Blood loss per operation ω Respiratory signs

Results

Table 1: Distribution of patients according to age

Age group	Number	Percentage
19-20	04	04
21-40	60	60
41-60	24	24
>60	12	12
Total	100	100

Table 3: Distribution of patients according to diagnosis

Diagnosis	Number
Prepyloric perforation	38
Appendicular perforation	22
Enteric fever perforation	14
TB abdomen	10
Foreign body perforation	4
Gastric perforation	4
Caecal diverticular perforation	2
Caecal perforation	2

Diverticular perforation	2
Obstructed hernia	2
Total	100

Table 4: Observed mortality in the present study

Observed mortality	Observed mortality in the present study	Predicted mortality using POSSUM	Predicted mortality using P-POSSUM
Yes	22	20	20
No	78	80	80
Total	100	100	100

The above table shows the observed mortality in the present study. The observed mortality is the actual mortality of the patients who underwent surgery in our institute. In the present study, there were 22 (22%) mortality, while 78 (78%) patients were discharged in well condition.

The above table shows the predicted mortality in the present study using POSSUM equation. According to POSSUM equation, there were 20 (20%) deaths in the present study and 80 (80%) were no deaths.

The above table shows the predicted mortality in the present study using P- POSSUM equation. According to P-POSSUM equation, there were 20 (20%) deaths in the present study and 80 (80%) were no deaths.

Table 7: Observed / Predicted mortality using POSSUM in relation to age

Age Group	No.	Mean Mortality (%)	Observed Mortality	Predicted Mortality	O/P Ratio
19-20 years	04	8.05 ± 0.29	0	0	-
21-40	60	13.57 ± 24.18	4	4	1.0
41-60	24	31.13 ± 36.58	8	6	1.3
>60	12	64.53 ± 33.61	10	10	1.0
Total	100		22	20	-
Overall			22	20	1.1

The above table shows the observed / predicted mortality rate using POSSUM equation in relation to age. In 19-20 years of age there were no deaths, the same was predicted by POSSUM. In the age group 21-40 years, there were 4 observed deaths; the same number of deaths was predicted by POSSUM. The observed / predicted mortality ratio was 1.0. In the age group 41-60 years, there were 8 observed deaths, while deaths predicted by POSSUM were 6. The observed / predicted mortality ratio was 1.3. In the age group >60 years, there were 10 observed deaths, the same number of deaths were predicted by POSSUM. The observed / predicted mortality ratio was 1.0. Overall, there were 22 observed deaths, while POSSUM predicted deaths correctly in 20 patients. The overall observed / predicted ratio was 1.1. POSSUM underestimated the mortality as compared to the observed mortality. The POSSUM equation could not predict deaths in 2 patients.

The observed / predicted mortality rate using P-POSSUM equation in relation to age is also observed. In 19-20 years of age there were no deaths, the same was predicted by P- POSSUM. In the age group 21-40 years, there were 4 observed deaths; the same number of deaths was predicted by P-POSSUM. The observed / predicted mortality ratio was 1.0. In the age group 41-60 years, there were 8 observed deaths, while deaths predicted by PPOSSUM were 6. The observed / predicted mortality ratio was 1.3. In the age group >60 years,

there were 10 observed deaths, the same number of deaths were predicted by P-POSSUM. The observed / predicted mortality ratio was 1.0. Overall, there were 22 observed deaths, while P-POSSUM predicted deaths correctly in 20 patients. The overall observed / predicted ratio was 1.1. P-POSSUM underestimated the mortality as compared to the observed mortality. The P-POSSUM equation could not predict deaths in 2 patients. the observed / predicted mortality rate using POSSUM equation in relation to diagnosis. In appendicular perforation, there were 2 observed deaths, which were missed by POSSUM equation. In cecal perforation, there were 2 deaths, which were also predicted by POSSUM. The observed / predicted ratio was 1.0. In enteric fever perforation, there were 8 deaths, which were also predicted by POSSUM. The observed / predicted ratio was 1.0. In prepyloric perforation, there were 2 deaths, which were also predicted by POSSUM. The observed / predicted ratio was 1.0. In TB abdomen, there were 8 deaths, which were also predicted by POSSUM. The observed / predicted ratio was 1.0. POSSUM missed to predict the 2 deaths that happened in patients with appendicular perforation.

The above table shows the observed / predicted mortality rate using P- POSSUM equation in relation to diagnosis. In appendicular perforation, there were 2 observed deaths, which were missed by PPOSSUM equation. In caecal perforation, there were 2 deaths, which were also predicted by P-

POSSUM. The observed / predicted ratio was 1.0. In enteric fever perforation, there were 8 deaths, which were also predicted by P-POSSUM. The observed / predicted ratio was 1.0. In prepyloric perforation, there were 2 deaths, which were also predicted by P-POSSUM. The observed / predicted ratio was 1.0. In TB abdomen, there were 8 deaths, which were also predicted by P- POSSUM. The observed / predicted ratio was 1.0. P-POSSUM missed to predict the 2 deaths that happened in patients with appendicular perforation.

Discussion:

POSSUM and P-POSSUM are two methods which are helpful in the prediction of postoperative mortality in patients undergoing surgery due to perforation peritonitis. The present study was conducted to compare the usefulness of POSSUM and P-POSSUM scores in the prediction mortality risk in patients undergoing surgery for perforation peritonitis. We had included 100 patients of perforation peritonitis in the present study. 60% of the patients were in the age group 21-40 years. Males were more compared to the females (88% vs. 12%). The mean age of the patients was 37.50 ± 13.73 years. Yosif et al[5] in their study had included 119 patients with a mean age of 22.4 ± 17.4 years. The patients included in the study by Ahmed were younger as compared to the present study patients. Prepyloric perforation (38%), appendicular perforation (22%), enteric fever perforation (14%) and tuberculous abdomen (10%) were the most common diagnosis, while other less prevalent diagnosis were foreign body perforation, gastric perforation, cecal diverticular perforation, cecal perforation, diverticular perforation and obstructed hernia. Vyas et al[6] in their study had included 227 patients of perforation peritonitis and found acid peptic disease, appendicular, enteric, traumatic and tubercular perforations to be the common causes for perforation peritonitis. The observed mortality in the present study was 22%. And by POSSUM and P-POSSUM the predicted mortality was 20% each, respectively. In relation to age, POSSUM predicted mortality accurately in the age groups 21-40 years and in more than 60 years age group, while in the age group of 41-60 years, POSSUM underestimated the mortality rate and missed 2 patients. The overall observed / predicted mortality by POSSUM was 1.1. Hence POSSUM, underestimated the mortality rate in comparison to the observed mortality rate. Vishwani et al[7] in their 50 perforation peritonitis patients, found an observed to expected ratio of 1.005 for mortality using POSSUM, which is quite comparable to the present study. Kumar et al[8] in their study evaluated the POSSUM in 380 patients with ileal perforation. The observed / expected ratio for mortality was found to be 0.47. The observed / expected ratio is very low in Kumar study,

compared to the present study. Our study underestimated postoperative mortality, while Kumar study overestimated the postoperative mortality. Batra et al[9] included 157 patients of perforation peritonitis and used ROC curve to arrive at a cut-off of 35 for POSSUM in the prediction of postoperative mortality. The sensitivity was 100% and specificity was 72.29% at the cut-off of 35. They concluded that higher POSSUM is indicative of higher mortality. We found similar results for P-POSSUM also, where P-POSSUM underestimated the mortality rate in the age group 21-40 years and the overall observed / predicted mortality rate by P-POSSUM was 1.1. Overall, P- POSSUM also underestimated the mortality rate compared to the observed mortality rate. When the observed / predicted mortality was calculated in relation to the diagnosis, POSSUM missed to predict 2 deaths that were observed in the appendicular perforation, but accurately predicted the postoperative deaths in rest of the diagnosis. Similar, finding was seen in P-POSSUM also. A study by Yosif et al [5] also reported that POSSUM and P-POSSUM reported overestimated mortality rate compared to the observed mortality rates. The difference was that Ahmed had included the patients undergoing emergency laparotomy, while in the present study we had included patients of perforation peritonitis. Chaubey et al[10] in their study on 103 patients of perforation peritonitis found no statistically significant difference between observed and predicted mortality as predicted using both POSSUM (P>0.05) and P-POSSUM (P>0.05), showing that POSSUM and P-POSSUM were able to accurately predict the postoperative mortality rate compared to the observed mortality rate. The sensitivity of POSSUM in the prediction of postoperative mortality was 100%, specificity was 90.91%, positive predictive value was 97.50%, negative predictive value was 100% and the diagnostic accuracy was 98%. The sensitivity of P-POSSUM in the prediction of postoperative mortality was 100%, specificity was 90.91%, positive predictive value was 97.50%, negative predictive value was 100% and the diagnostic accuracy was 98%. Both POSSUM and P-POSSUM had higher sensitivity, specificity, positive & negative predictive values and diagnostic values and hence, these two methods can be used independently in the prediction of postoperative mortality in patients undergoing surgery for perforation peritonitis.

Conclusion

The POSSUM and P-POSSUM scoring system have been found equally predictive and accurate in the prediction of postoperative mortality in patients of undergoing surgery for perforation peritonitis. These two equations have been found to be more accurate in patients of perforation peritonitis, but

studies done by other authors on patients undergoing other types of surgeries found these equations to be less reliable in the prediction of postoperative mortality. The sensitivity, specificity, positive and negative predictive values and diagnostic accuracy of both POSSUM and P-POSSUM have been found to be very high in the present study and these two equations can be used as independent predictors of postoperative mortality in these patients. Hence, we recommend the use of POSSUM and P-POSSUM which is simple, easy to calculate be used in the prediction of postoperative mortality in patients undergoing surgery for perforation peritonitis.

References:

1. Rapsang AG, Shyam DC. Scoring systems in the intensive care unit: A compendium. Indian J Crit Care Med. 2014 Apr;18(4):220-8.
2. Tyagi A, Nagpal N, Sidhu DS, Singh A, Tyagi A. Portsmouth physiological and operative severity score for the Enumeration of Mortality and morbidity scoring system in general surgical practice and identifying risk factors for poor outcome. J Nat Sci Biol Med. 2017 Jan–Jun; 8(1):22-5.
3. Yadav K, Singh M, Griwan M, Mishra Ts, Kumar N, Kumar H. Evaluation of POSSUM and P-POSSUM as a tool for prediction of surgical outcomes in the Indian population. Australas Med J. 2011; 4(7):366-73.
4. Paul VA, Anusha A, Sarath Chandra AS. Evaluation of the validity of POSSUM and PPOSSUM score in predicting the risk of morbidity and mortality respectively in patients undergoing emergency laparotomy. Int Surg J. 2020 Sep 23; 7(10):3224-9.
5. Yosif SM, Hamza AA, Mahadi SI. Comparison between POSSUM and P-POSSUM scores in prediction of post-operative mortality and morbidity in patients undergoing emergency laparotomy at Omdurman teaching hospital. Sch. J. App. Med. Sci. 2015;3(2B):650-3
6. Vyas AK. A prospective study of perforation peritonitis in a tertiary health care centre of central India. Ann Int Med Dent Res. 2017; 3(2).
7. Vishwani A. Efficacy of possum scoring system in predicting mortality and morbidity in patients of peritonitis undergoing laparotomy. Int J Sci Study. Jul 2014; 2(4).
8. Kumar S, Gupta A, Chaudhary S, Agrawal N. Validation of the use of POSSUM score in enteric perforation peritonitis - results of a prospective study. Pan Afr Med J. 2011; 9:22.
9. Batra P. Possum scoring system for predicting prognosis in patients of perforation peritonitis. Int Surg J. 2016 Nov;3(4):2115-9
10. Chaubey D, Yadav SK, Yadav J, Kumar P, Sahu SS, Kumar S, Prakash OM. Validation of the use of POSSUM and P-POSSUM score in perforation peritonitis in Indian population. Arch Int Surg. 2015; 5:16- 9.