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Original Research Article

Study on the Basis of APACHE-III Scoring System to Predict the Outcome of Patients with Perforation Peritonitis

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Abstract:

Background: The most prevalent cause of peritonitis, which is an inflammation of the peritoneum, is a localized or widespread infection. In India, this is the most frequent surgical emergency. In India, perforated stomach or duodenal ulcers are the most frequent causes. If not properly diagnosed and treated, peritonitis of any kind can be extremely dangerous and even fatal. An important factor in the prognosis of peritonitis is the patient's state of health at the start of treatment. Numerous prognostic scoring systems are currently in use, and they can be used to initially make accurate predictions about the course of the disease. The purpose of the study is to use the APACHE - III scoring method to predict the prognosis of patients with perforated peritonitis.

Methods: This study was carried out on 72 patients who were diagnosed with perforation peritonitis between December 2017 and November 2018 and were hospitalized to the emergency ward (general surgery) of Darbhanga Medical College and Hospital, Laheriasarai, Bihar. Within 24 hours of their hospitalization, all patients had evaluations using the APACHE - III grading system. Every patient brought to the emergency room had a clinical examination before any necessary investigations were carried out. Range of total scores for APACHE III (0-299).

Results: Majority of survivors belong to age group 20- 60 yrs. In this series, male patients were 55 (76%) and female patients were 17 (23%). Mortality was higher in females (23.5%) as compared to male (7.2%). Most common cause of perforation peritonitis was gastric/duodenal perforations (55%) followed by small bowel perforations (20%), blunt abdominal trauma (11%), appendicular perforation (4%), colon perforation (2.7%), gall bladder perforation (2.7%), stab injury abdomen (1.3%) and firearm injury abdomen (1.3%). Most of the patients (72%) were managed with primary repair of perforations. Mean duration of hospital stay is 13 days. Major causes of postoperative complications were wound infection (25%), wound dehiscence (15%), septicemia (8%) and faecal fistula (2.7%). Patients with lower scores have more favourable prognosis than patients with higher score. Observed mortality rate was 41.6% in the group with APACHE –III score of >60, which was comparable to predicted mortality of 42.6%.

Conclusion: The prognosis for patients with lower scores is better than that of those with higher scores. Thus, the study's conclusion was that patients with lower scores fare better than those with higher scores.

Keywords: Peritonitis, APACHE, Prognosis, Outcome.

Introduction

The most prevalent cause of peritonitis, which is an inflammation of the peritoneum, is a localized or widespread infection. Currently, there are three categories for peritonitis based on the type and source of microbial contamination.

1. Primary peritonitis is diffuse bacterial infection without loss of integrity of GI tract, and is most commonly caused by Streptococcus pneumonia.
2. Secondary peritonitis occurs due to acute peritoneal inflammation resulting from GI tract perforation, infected pancreatic necrosis, perforations of other infected viscera e.g. hepatic abscess or pyometra and penetrating abdominal injuries.
3. Tertiary peritonitis develops following treatment failure of secondary peritonitis.

In India, peritonitis is the most frequent surgical emergency. The most frequent causes in India include typhoid fever, TB, physical trauma-related GIT perforation, appendicitis, and perforated gastric or duodenal ulcers. Severe abdominal discomfort that gets worse with movement, abdominal distention, stiffness that feels like board,

fever, chills, nausea, vomiting, difficulty passing gas and feces, low blood pressure, and limited urine production are all indications of peritonitis.

If not properly diagnosed and treated, peritonitis of any kind can be extremely dangerous and even fatal.

Prognosis in peritonitis is decisively influenced by the health status of the patients at beginning of treatment accurate prediction of the outcome of the disease can initially be made on the basis of the prognostic scoring systems, currently several scoring systems are employed.

The APACHE prognostic scoring system for measuring severity of illness in critically ill patients was developed in 1981 by William A Knaus1, Statistical detail on the predictive power of APACHE was published in 1983, which showed that by using estimated equation to forecast death rates for independent data, APACHE allowed accurate estimates of death rates for groups of patients.

APACHE - II introduced in 1985 was a simplified modification of original APACHE. The APACHE - II scores consisted of three parts –

1. 12 acute physiological variables (0-60) points
2. Age (0-6) points
3. Chronic health status (0-5) points

The probability of death can be calculated from the individual APACHE - II total scores (0-71) points. APACHE - II scores has received far more attention in the literature than any other prognostic model. APACHE - II was further refined to APACHE - III in 1991, Five new variables –

1. Blood urea nitrogen
2. Urine output
3. Serum bilirubin,
4. Serum albumin
5. Glucose

It is important for surgeons to develop at least a rudimentary knowledge of scoring system for perforation peritonitis, as it will play an increasing role to explain the prognosis of the disease.

Aims & objectives of study are to predict the outcome of the patients with perforation peritonitis on the basis of APACHE - III scoring system.

Material and Methods

This study was conducted on 72 patients, admitted to emergency ward (General Surgery) of Darbhanga Medical College and Hospital Laheriasarai, Bihar, who were diagnosed as cases of perforation peritonitis from December 2017 to November 2018.

All the patients were evaluated according to APACHE - III scoring system within 24 hours of admission.

All the patients admitted in emergency ward initially examined clinically then required investigations were done.

- Plain x-ray abdomen : Erect view, Supine view
- USG whole abdomen
- Aspiration of peritoneal fluid

The following acute physiological parameters of APACHE III scoring system were assessed and recorded at the time of admission- Pulse rate, Respiratory rate, Mean arterial pressure (mm of Hg), Temperature (^{0}C), Urine output (24 hr), Hematocrit (%), White blood cell count, Serum sodium (mmol./L), Serum creatinine (mg/dl), Serum albumin (g/dl), Serum bilirubin (mg/dl), Blood urea nitrogen (mg/dl), Blood sugar (mg/dl), Arterial pH, Oxygenation (PaO2 in mm of Hg with FiO2 <0.05). Glasgow coma score.

These values were scored in accordance to the APACHE III chart scoring for abnormally high or low range. Zero score represents a normal value. These parameters represent Acute physiology Score.

(A)Acute Physiology score (0-252)

1. Pulse rate 0 – 17
2. Mean B.P. 0 – 23
3. Temperature 0 – 20
4. Respiratory rate 0 – 18
5. PaO2 /AaDO2 0 - 15 / 0 – 14
6. Hematocrit 0 – 3
7. WBC 0 – 19
8. Creatinine 0 – 10
9. rine output 0 – 15
10. BUN 0 – 12
11. Sodium 0 – 4
12. Albumin 0 – 11
13. Bilirubin 0 – 16
14. Glucose 0 – 9
15. pH 0 – 12
16. GCS 0 – 48

(B) Age points (0-24)

- 1 < 44 0
- 1 45 – 59 5
- 1 60 - 64 11
- 1 65 – 69 13
- 1 70 – 74 16
- 1 75 – 84 17

A> 85 24

(C) Chronic health points (0-23)

1. None 0
2. Cirrhosis 4
3. Immunosuppression 10

4. Leukemia/multiple myeloma 10
5. Metastatic cancer 11
6. Lymphoma 13
7. Hepatic failure 16
8. AIDS 23

APACHE III Score = (A) + (B) +(C)

= 252 +24 + 23

= 299

Total APACHE III score range for (0-299)

Results

Table 1: Causes of Perforation Peritonitis (n=72)

Cause	Patients		Male		Female	
	Number	%	Number	%	Number	%
Gastric/Duodenal	40	55.0%	35	87.5%	5	12.5%
Small bowel Perforation	15	20.8%	9	60.0%	6	40.0%
Colon Perforation	2	2.7%	1	50.0%	1	50.0%
Appendicular Perforation	3	4.1%	2	66.0%	1	33.0%
Gall bladder Perforation	2	2.7%	0	0.0%	2	100.0%
Blunt abdominal Trauma	8	11.0%	6	75.0%	2	2.5%
Stab injury Abdomen	1	1.3%	1	100.0%	0	0.0%
Firearm injury Abdomen	1	1.3%	1	100%	0	0.0%

Table 2: Distribution of Patients with Post-Operative Complication According to APACHE-III Score

APACHE III score	No. of patients	Wound Infection	Septicemia	Burst Abdomen	Fecal Fistula
0-30	35	9	1	3	0
31-60	25	6	2	5	2
>60	12	3	5	3	0

Table 3: Distribution of Patients with Outcome According to APACHE-III Score

APACHE III score	No. of patients	Survived	Expired	LAMA	Observed Mortality
0-30	35	33	1	1	2.8%
31-60	25	22	2	1	8.0%
>60	12	7	5	0	41.6%

Table 4: Comparison of Observed and Predicted Mortality

APACHE III score	No. of patients	Expired	Mortality	
			Observed	Predicted
0-30	35	1	2.8%	7.5%
31-60	25	2	8.0%	25.2%
>60	12	5	41.6%	42.6%

Discussion

Perforation peritonitis is a frequently encountered surgical emergency in tropical countries like India. In majority of cases presentation to hospital is late with well-established generalized peritonitis with purulent/faecal contamination and varying degree of septicemia. Clinical presentation of patients varied according to site of perforation. Abdominal distension was found in 84% along with vomiting in 50% and constipation in 60% cases. 15% patients were in shock at the time of admission. Only 64% patients had evidence of pneumoperitoneum on chest X- ray done in erect posture.

The most elaborate study on APACHE III prognostic system and the risk prediction has been conducted by knaus et al [2], where they prospectively collected data on 17,440 medical/surgical ICU patients and found that a 5 points increase in APACHE III score (range 0 – 299) is independently associated with a statistically significant increase in the relative risk of hospital death. We categorised patients into 3 groups according to APACHE – III score of 30 points each and found an increase in the mortality risk as the scores increased from < 30 to > 60. Perforations of proximal gastrointestinal tract are more common than of distal gastrointestinal tract as has been noted in earlier studies from India, which is in sharp contrast to studies form developed countries like United States and Japan. Rajender Singh Jhobta et al [3] in their study concluded that most common cause of perforation was perforated dupdenal ulcer (57%) followed by appendicitis (11%) and blunt trauma (9.1%). These findings are similar to present study in which most common cause of perforation was gastric/duodenal ulcer (55%), blunt trauma (8%) and appendicitis (3%). A study done by Mathkere LR et al [4] also showed perforation of peptic ulcer was most common cause of peritonitis (64%). Not only the site but the

etiological factors also show a wide geographical variation. Khanna et al [5] from Varanasi studied 204 consecutive patients of gastrointestinal perforation and found that over half (100 cases) were due to typhoid. Duodenal ulcer (58), appendicitis (9), amoebiasis (8) and tuberculosis (4). These figures show the importance of infection and infestation in third word. At the other end of spectrum, Noon et al [6] from Texas studied 430 patients of gastrointestinal perforations and found 2010 cases to be due to penetrating trauma. This shows the importance of trauma in developed countries.

The mean length of hospital stay was 13 days. For survivors mean length of stay was 17.8 days as comparable to 18 days in the study by Bohnen et al [7]. The study by Adesunkanmi et al [8] showed an incidence of postoperative complications of 42.4% similar to present study with an incidence of 54% patients having higher APACHE – III score had higher incidence of postoperative complications. In this series, the major cause of postoperative morbidity were wound infection (25%), wound dehiscence (15.2%), septicemia (11%) and faceal fistula (2.7%) as compared to series by Rajender Singh Jhobta et al [9] in their study wound infection rate was (25%), wound dehiscence (9%) and septicemia (18%). Markgrof R et al [4] done a showed that hospital morality rate was higher than predicted for APACHE III score > 60 is 41.6% as compared to predicted mortality rate of 42.5%.

Conclusion

In conclusion, patients with low scores have favourable outcome as compared to patients with high scores. And APACHE III score, as measured before the treatment of perforation peritonitis, correlates significantly with the outcome of disease with respect to both morbidity and mortality.

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