A Comparative Study Of Pulp Scoring Vs Jabalpur Prognostic Scoring In Predicting Outcome In Patients With Peptic Ulcer Perforation

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Abstract: *This is a prospective analytical study done in a group of 50 patients with perforative peptic ulcer at Govt. Rajaji Hospital, Madurai. The objective of the study is to analyse the two scores, The Peptic Ulcer Perforation Score and Jabalpur score. The study compares the positive predictive value and reliability of the prediction of the two scores. All data were analysed using SPSS Version for WINDOWS software. Area under Curve was calculated using Receiver operator Characteristic curves.*
PULP score apart from taking into account of all variables like vital measures, age, serum creatinine levels and time from perforation to operation, that were even included in the Jabalpur score, also pays significance to the past history of the patient. This inclusion has improved both the AUC and Positive predictive values of the PULP score.
To conclude though none of the scores provides an exact prediction of the mortality rate. Of the two scores, the PULP score overwhelms the Jabalpur score thereby making it a more simple, reliable and feasible scoring system.
Keywords: *peptic ulcer perforation, mortality prediction, peptic ulcer perforation Score, Jabalpur Score.*

I. Introduction

Peritonitis is the condition causing inflammation of serosal membranes found lining the abdominal cavity and the organs within it. Peritonitis is caused by introduction of an infection into the sterile peritoneal cavity through perforation of gastrointestinal tract. Peritonitis can also occur by any introduction of a chemically irritating material, like the gastric acid from a perforated ulcer. Peritonitis secondary to perforation of the gastro intestinal tract, a common occurrence in this country, which requires emergency surgical intervention and is associated with significant morbidity and mortality rates.

With the advances being made in many fields of medicine, the surgeon must possess a strong knowledge on the infectious diseases of the peritoneum, which has increased in severity and complexity. Further in addition to the management of secondary peritonitis from gastro intestinal perforation, the practising surgeon may also need to manage a cirrhotic patient with infected ascitic fluid as well as patient on peritoneal dialysis with a similar dialysis fluid.

There is also increasing recognition of patients with persistent intra- abdominal sepsis or tertiary peritonitis where the condition is associated with multiple organ system failure and general depression of immune system.

Peritonitis continues to be one of the major infectious problems confronting the surgeons. Even after many advances in anti microbial agents and supportive measures, the mortality rate of diffuse suppurative peritonitis remains unacceptably high. Its causes vary from the one requiring immediate surgical Intervention to that requiring conservative management. Its accurate diagnosis and management is a challenge to every surgeon. The complex nature of surgical infections, the multifaceted aspects of treatment, and the increasing complexity of ICU support make evaluation of new diagnostic and therapeutic advances in this field very difficult. Scoring systems providing objective descriptions of patient's conditions at specific points in the disease aid for better understanding of these problems. This is important in determining the course; the disease is taking in a particular patient, whether the line of management taken is appropriate or need to be changed. With optimum number of investigations remain the corner stone of emergency. The management of peritonitis patients has taken a new turn with the understanding of patho- physiologic basis of the disease, the concept of sepsis syndrome and multi- organ failure.

The current trend is to recognize these at the earliest and institute aggressive therapy. When the patient has already gone into multi-organ failure, the outlook appears dismal whatever the line of management is. It is

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here that conservative line of management, as well as newer modalities of treatment such as programmed relaporatomy, immuno modulation is being tried. Although these newer modalities may be useful are expensive. Hence, proper clinical monitoring with optimum number of investigations remain the corner stone of emergency surgery and also for the better use of above methods. Peptic ulcer gets associated with some life threatening complications, that includes bleeding, perforation, penetration and obstruction. The second most important and frequent complication, after bleeding is Perforation. While\ Clinical picture of patients with perforated peptic ulcer can be blurred by some vague clinical features, most PPU patients can present with exaggerated symptoms and signs of peritonitis and even sepsis. Variations in the course of presentation and delay in diagnosis at admission to the hospital may potentially cause worsening of symptoms and deterioration of the clinical status, with dreadful outcome. Still there is high risk for morbidity (20-50%) and mortality (3-40%) are encountered in surgically managed PPU patients. About one in every five patients with PPU present with features of sepsis and by a skilful preoperative status of the patients´ severity grade, appropriate management can be proceeded to achieve a good outcome. Currently, the ASA score and the Boey score are more frequently used in patients with PPU. Though the ASA score is a surgical risk score it is not only for PPU patients in particular.

A major limitation in scoring systems is their dependence on sophisticated investigations. Such investigations may not be easily available in developing countries. Therefore a simple prognostic scoring system which can be easily used in developing countries is needed. The aim of the study is to compare the predictive accuracy of two scoring systems namely the Jabalpur scoring system and Peptic Ulcer Perforation scoring system (PULP) in predicting the mortality and morbidity of patients with perforative peritonitis. The reason behind choosing these two scoring systems is that the variables used can be easily calculated with the available investigations in Government hospitals.

II. Aims And Objectives

1. To calculate and compare the positive predictive value of Jabalpur scoring system and Peptic Ulcer Perforation scoring system (PULP) for each of these patients.
2. Compare standard cut offs for predicting mortality with cut offs obtained in the study.
3. To calculate the discriminatory power of each index by plotting Receiver operator Characterstic Curves.
4. To Determine the reliability of prediction and sharpness of prediction.

III. Matrerials And Methods

1.   Study design:
It is a prospective study. All patients with peptic perforation will be subjected to this study. Various parameters will be assessed and scoring hence done. The predicted results will then be compared with the observed results over a follow- up of 30 days and the accuracy of each system determined.

2. Study Period
January 2016 to June 2016

3. Place of study
Government Rajaji Hospital Madurai.

4. Sample Size
Minimum of 50 patients

5. Selection of Study Subjects:
All subjects admitted in General surgical wards of Govt. Rajaji Hospital with perforative peritonitis were included in the study after getting informed written consent.

6. Data Collection: Required data were collected on the basis of complaints, history of presenting illness and past history of the patients and biochemical investigations.

7. Ethical clearance:
Approved by the Institute of Ethical Committee, Madurai Medical College.

8. Consent
Informed written consent from the patient obtained in the patient's own mother tongue.

9. Analysis:

All data were analysed using SPSS Version for WINDOWS software.Area under Curve was calculated using Receiver operator Characteristic curves.

10. Conflict of Interest:

Nil

11. Financial Support:

Nil

12. Participants:

Patients diagnosed with perforative peritonitis

13. Inclusion Criteria:

1. Patients - Age between 16 and 70 years in both sexes
2. All patients with pre-pyloric gastric and duodenal perforations.
3. Patients consented for inclusion in the study according to designated proforma.

14.Exclusion Criteria:

1.Patients with perforation secondary to causes other than peptic ulcer disease. 2.Patients who refuse to give informed written consent.

IV. Methodology:

To determine and compare the accuracy of the Jabalpur score and PULP score in predicting mortality, Receiver Operating Characteristics(ROC) curve was used. The ROC curve was constructed using Statistical Package for Social Sciences(SPSS) version 20.0 The cut off point was determined from the ROC curve.

DEFINITIONS:

Mortality:
All deaths within 30 days of surgery were taken into account.
Positive predictive value:
**Defined as the propotion of the patients with positive test who have the disease.**

OBSERVATIONS AND RESULTS

DISCRIMINATORY ABILITY AND CUT OFF POINTS
Discriminatory ability or accuracy was analysed using ROC and Area under Curve was calculated.
Cut Off Point for PULP Score
ROC analysis was done to identify the best cut off for PULP score.The cut off point that was determined by using ROC curve for Jabalpur score is 4.50. Using the cut of 4.50 the sensitivity and specificity values of Jabalpur score in predicting mortality is 90% and 72.5% respectively.
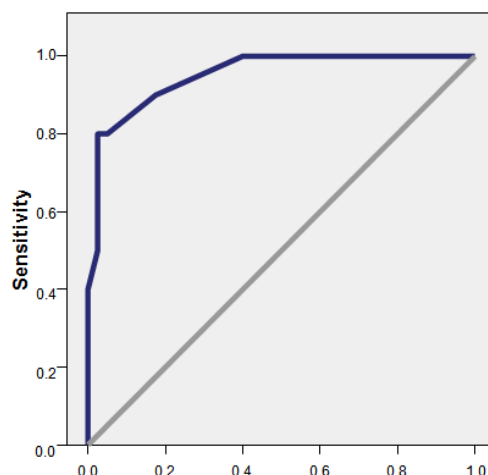
1 - Specificity

ANALYSIS OF PULP SCORING SYSTEM WITH CUT OFF OF 5.5
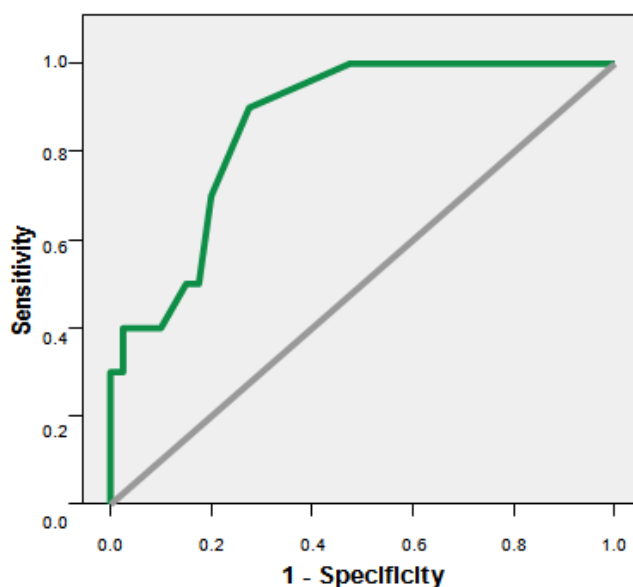
PULP score - assuming the cut off 5.5

Statistic	Value	95% CI
Sensitivity	90.00%	55.50% to 99.75%
Specificity	82.50 %	67.22% to 92.66%
Positive Likelihood Ratio	5.14	2.54 to 10.40
Negative Likelihood Ratio	0.12	0.02 to 0.78
Disease prevalence	20.00% (*)	10.03% to 33.72%
Positive Predictive Value	56.25% (*)	29.88% to 80.25%
Negative Predictive Value	97.06 % (*)	84.67% to 99.93

The positive predictive value of PULP score was 56.25%

Cut Off Point For Jabalpur Score

ROC analysis was done to identify the best cut off for Jabalpur score. The cut off point that was determined by using ROC curve for Jabalpur score is 4.50. Using the cut of 4.50 the sensitivity and specificity of Jabalpur score in predicting mortality is 90% and 72.5% respectively.

ROC Curve

ANALYSIS OF JABALPUR SCORING SYSTEM WITH CUT OFF OF 4.5

Jabalpur score – assuming the cut off 4.5

Statistic	Value	95% CI
Sensitivity	90.00%	55.50% to 99.75%
Specificity	72.50 %	56.11% to 85.40%
Positive Likelihood Ratio	3.27	1.90 to 5.64
Negative Likelihood Ratio	0.14	0.02 to 0.89
Disease prevalence	20.00% (*)	10.03% to 33.72%
Positive Predictive Value	45.00% (*)	23.06% to 68.47%
Negative Predictive Value	96.67 % (*)	82.78% to 9

The Positive predictive value was 45% for Jabalpur Score.

Age distribution of patients admitted with peptic ulcer perforation
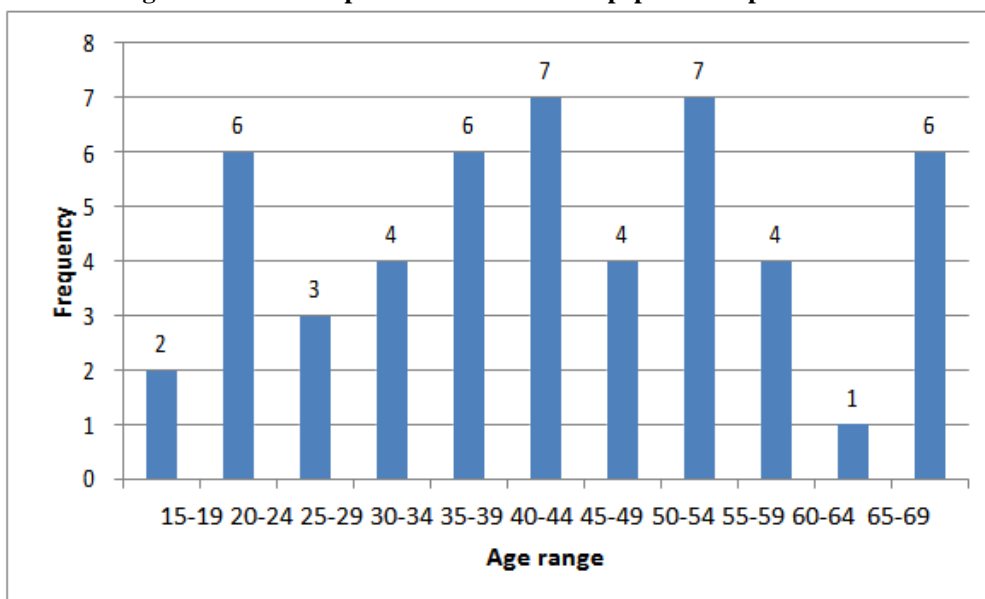
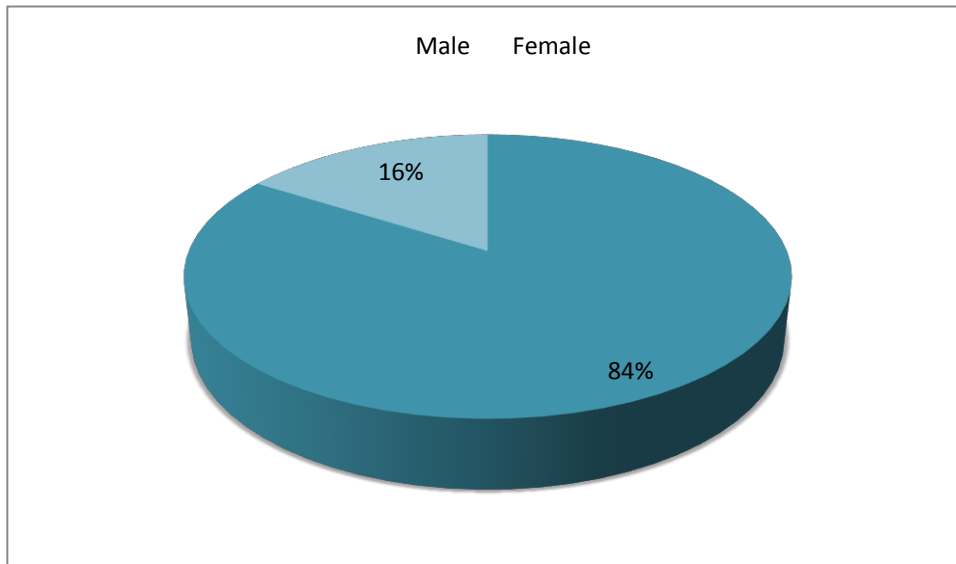**No. of deaths and no. of patients in each category**
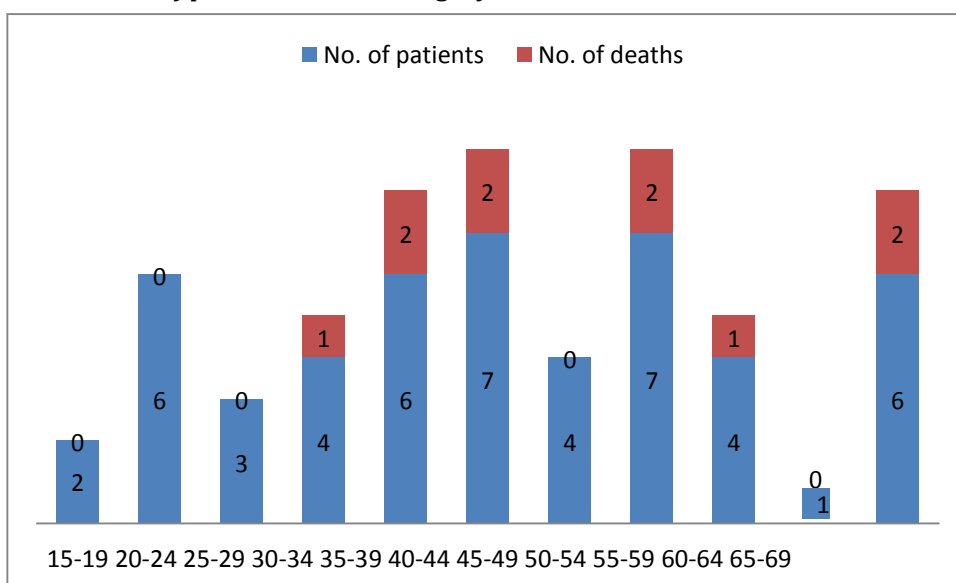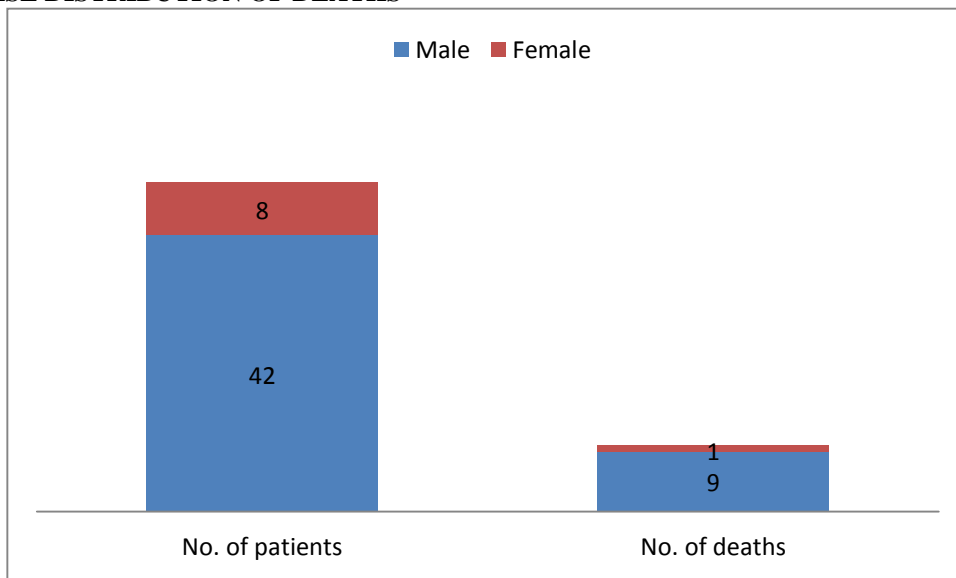

Mortality according to age group

Age groups	Mortality percentage(percentage of deaths in each age group)
15-19	0
20-24	0
25-29	0
30-34	25
35-39	33.33
40-44	28.57
45-49	0
50-54	28.57

55-59	25
60-64	0
65-69	33.33

Sex distribution of patients admitted with PPU

SEX WISE DISTRIBUTION OF DEATHS

RELIABILITY OF PREDICTION

On comparing the mortality rate with similar studies we get the following results:

Mortality rate by Jabalpur Scoring system

SCORE	NO. OF PATIENTS	DEATHS	MORTALITY RATE
0-4	31	1	3.2%
4-15	18	8	44%
>15	1	1	100%

Comparision of Jabalpur scoring system with other studies

JABALPUR SCORE	Mishra Sharma Raina et al. (2003)	PRESENT STUDY
0-4	0%	3.2%
4-15	16%	44%
>15	100%	100%

On comparing the mortality rate with similar studies we get the following results.

Mortality rate by PULP Scoring system

SCORE	NO.OF PATIENTS	NO. OF DEATHS	MORTALITY RATE
0-7	40	2	5%
8-18	10	8	80%

PULP SCORE	Moller et al	Present study
0-7	3%	5%
8-18	92%	80%

V. Discussion

Receiver operator characteristic curves were drawn to calculate the discriminatory ability of the two scores. The ROC Curves are graphs plotted between sensitivity and specificity. The Area Under Curve for each of the scores were calculated for different cut off points and the cut off at which maximum AUC was obtained was chosen. The area under the curve for jabalpur score is 0.863 with 95% confidence intervals 0.756 and 0.969.The area under the curve for PULP score being 0.951 with the 95% confidence intervals 00.886and 1.017.

S.NO.	NAME OF THE SCORING SYSTEM	AUC	CUT 0FF
1	PULP SCORE	95%	5.5
2	JABALPUR SCORE	86%	4.5

PULP Score has the maximum area under the curve of 95% compared to the Jabalpur score with 86%. So this shows that the PULP Score has an upper hand over the Jabalpur score in predicting the number of patients who are going to die of perforative peritonitis.

POSITIVE PREDICTIVE VALUE

S.NO.	NAME OF THE SCORING SYSTEM	POSITIVE PREDICTIVE VALUE
1	PULP SCORE	56.25%
2	JABALPUR SCORE	45%

Thus the positive predictive value of PULP Score ismore than the Jabalpur Score.

Analysis of individual of Scores: PULP SCORE:

This score has more AUC value of 95% compared to the 86% of the Jabalpur score. Thusthe curve for the PULP score is higher than the area under the curve for Jabalpur score, making the PULP score, more accurate in predicting mortality, following peptic ulcer perforation, when compared to Jabalpur score. The Positive predictive value of the PULP Score is also more than the Jabalpur score.The important point to be noted in the score is that it pays more importance to the co morbid history of the patient, which plays a very important role in the outcome of the patient. The score gives 2 points to prior liver disease. Prior use of steroid is given 1 point. Prior immune compromised status and malignancy are given 1 point. The most significant factor about the scoring system is the points given to the ASA grades. Thus the PULP score is comparatively superior to the Jabalpur score.

JABALPUR SCORE

The score is comparatively poor in both AUC values and the positive predictive value. Though the variables included in this score are similar to that of the PULP score. The score does not include details of the prior history of the patient. The over emphasis on the vital measures of the patient also reduces the score'sreliability. Thus the score lags behind the PULP score in both Positive predictive value and AUC values.

VI. Conclusion:

Peptic ulcer perforation constitutes about 16% of the total emergency surgeries. Though Mortality due to peptic perforation increases with age, presence of prior co morbid diseases also plays a significant role. Males are more affected when compared to females. Increase in the duration between perforation and surgery also plays a significant role.

Mortality rate in our study was about 20%. Early diagnosis and prompt management of the shock also improves the prognosis of the patient. Both scores used, are simple methods,taking into account of simple investigations. Both scores can be carried out in peripheral settings also, as there is no need of sophisticated measures.

PULP score apart from taking into account of all variables like vital measures, age, serum creatinine levels and time from perforation to operation,that are even included in the Jabalpur score, also pays significance to the other vital information of the past history. This inclusion has improved both the AUC and Positive predictive values of the PULP score.

To conclude though none of the scores provides an exact prediction of the mortality rate of the two scores. The PULP score overwhelms the Jabalpur score thereby making it a more simple, reliable and feasible scoring system

Bibliography

[1]. Jordan PH. Duodenal ulcers and their surgical treatment: Where did they come from? Am J Surg.1985;149:2-14.
[2]. Johnson AG. Peptic ulcer - stomach and duodenum. Morris PJ, Wood WC. Oxford Textbook of Surgery. 2nd ed. Oxford: Oxford University Press, 2000. pp.997.
[3]. Wangensteen OH. Non-operative treatment of localized perforation of the duodenum. Minnesota Med 1935;18:477-480.
[4]. Taylor H. Perforated peptic ulcer treated without operation. Lancet 1946;2:441-4.
[5]. Franksson C. Selective Abdominal Vagotomy. Acta Chir. Scandinav. 1948;96:409.
[6]. Mathur SN, Khandelwal R. Peptic perforation - A clinical study of prognostic factor. Indian J Surg 1991;59:251-3.
[7]. Bharati Ramesh C. et al. Immediate definitive surgery in perforated duodenal ulcer. A comparative study between definitive surgery and simple closure. Indian J Surg 1996;58:275-9.
[8]. Mourougayan V, Smile SR, Sibal RN. Morbidity and mortality of definitive surgical procedure in duodenal ulcer perforation. Indian J Surg 1994;56(3):102
[9]. Coustsottides T, Himal HS: Perforated gastroduodenal ulcers. *American Journal of Surg.,* 1976; **132**: 572-576.
[10]. Hermansson M et al: Surgical approach and prognostic factors after peptic ulcer perforation. *Eur. J. Sur., 1999;* **165(6)** :566-572.
[11]. Johnson David et al: Duodenal ulcer and peptic ulcer perforation, Maingot's Abdominal operations, 10th Edition, 1997; 941-970.
[12]. Palmer KR et al: Diseases of the alimentary tract and pancreas, Davidson's Principles and Practice of Medicine, **18th** Edition, 1999; 599-682.
[13]. Primrose N John: Stomach and duodenum, Bailey & Loves's Short Practice
[14]. Camavali J.F. et al: Radical versus conservative surgical mangement of acute perforated peptic ulcer, *Post graduate medicine*, 1962**: 32 :** 119-126. 15.DeBakey ME: Acute perforated gastroduodenal ulceration.
[15]. Hau T, Ahrenholz D, Simmons R. Secondary bacteria peritonitis. The biological basis of treatment. Currt Probi Surg. 1979; 16:1-65.
[16]. Mileski W.J. Sepsis what it is and how to recognize it. Surgical Clinics of North America. 1991 August; 71(4) :749.
[17]. Michial J. Zinner MD, FACS : Maingot's abdominal operations,Vol. 1 633-653, Tenth Edition. Appleton and Langi 1977.
[18]. Santoshi B, Eggleston. Typhoid perforation of Bowel. Ann.Surg. 1979; 190(1) : 31-5.
[19]. Khanna Y.K. et al. A new clinical test in gastroduodenal perforation.
[20]. **J. Indian Med. Assoc. 1991 Feb; 89(2):35-8.**
[21]. Fry D. Multiple System organ failure. Surgical Clinics of North America. 1988 Feb; 68(1) : 107.
[22]. Dellinger P.E. Use of scoring systems to assess patients with surgical sepsis. Surgical Clinics of North America. 1988 Feb; 68(1) :123.
[23]. Isselbacher J, Kunt et al: Peptic ulcer, Harrison's Prinicple of Internal Medicine, **14th** Edition, 284: 1596-1609.
[24]. Jarczyls G Katedry et al: Evaluation of early and late results of radical treatment for perforated doudenal ulcer. *Pot Juglek,* 1996; **51**:205-209.
[25]. Kate V, Ananthakrihnan N et al: Effect of H-pylori eradication on ulcer 26.Retrospective and prospective randomized controlled studies. *British Journal of Surgery*, 2001; **88**: 1054-1058.
[26]. Lawal OO et al: Clinical pattern of perforated prepyloric and duodenal ulcer at Ile-Ife, Nigeria. *Trop. Doct.*, 1998; **28**: 152-155.
[27]. Macintyre I Mc et al: Stomach and duodenum. Farquharson's textbook of operative surgery, **8th** Edition, 2000;367-402.
[28]. Palmer KR et al: Diseases of the alimentary tract and pancreas,
[29]. **Davidson's Principles and Practice of Medicine,** 18th **Edition, 1999; 599- 682.**
[30]. Primrose N John: Stomach and duodenum, Bailey & Loves's Short Practice of Surgery **24th** Edition, 2004;1026-1061.
[31]. Sadler TW William, Willans: Langman's medical embryology **7th** Edition, 1995; 247-253.
[32]. Sawyers JL, Herrington JL. Jr. et al: Acute duodenal perforated doudenal ulcer. *Archives Surgery*, 1975; 527-530.
[33]. Skovgaard S et al: Late results of perforated duodenal ulcer treated by simple closure. *World Journal of Surgery*, 1997**; 1 :**521-526.
[34]. Skovgaard S et al: Late results of perforated duodenal ulcer treated by *Journal of Surgery*, 1997**; 1 :**521-526.
[35]. . Baker RJ. Perforated Duodenal Ulcer. Fischer JE, Bland KI, eds. Mastery of Surgery, 5th ed. New York: Lippincott Williams &

Wilkins; 2007. pp. 892- 901.

[36]. Grassi R, Romano S, Pinto A, Romano L. Gastro-duodenal perforations: Conventional plain film, US and CT findings in 166 consecutive patients. 37.Eur J Radiol. 2004 Apr;50(1):30-6. Ali Tavakkolizadeh, Ashley SW. Operations for Peptic Ulcer. Yeo CJ.

[37]. Shackelford's Surgery of the Alimentary Tract. 6th ed. Vol. 1. Philadelphia, PA: Saunders; 2007: pp. 791-810.

[38]. Irvin TT. Mortality and perforated peptic ulcer: a case for risk stratification in elderly patients. Br J Surg. 1989Mar;76(3):215-8.

[39]. Datsis AC, Rogdakis A, Kekelos S, Zografos K, Sarantopoulou A, Spilliotis J. Simple closure of chronic duodenal ulcer perforation in the era of Helicobacter pylori: an old procedure, today's solution. Hepatogastroenterology. 2003 Sep- Oct;50(53):1396-8.

[40]. Glasgow RE, Mulvihill

[41]. **Glasgow RE, Mulvihill SJ. Surgery for peptic ulcer disease and postgastrectomy syndromes.**

[42]. Yamada T, Alpers DH, Kaplowitz N, Laine L, Owyang C, Powell DW. Yamada's Textbook of Gastroenterology. 5th ed. Wiley Blackwell Publishing; 2008. pp. 1054-1070.

[43]. Oliver McAnena, Myles Joyce. Operative management of upper gastrointestinal disease. M. Farquharson M, Moran B. Farquharson's Textbook of Operative

[44]. **General Surgery. 9th ed. London: Hodder Arnold; 2005. pp. 285-315.**

[45]. Lau WY, Leung KL, Zhu XL, Lam YH, Chung SCS, Li AKC. Laparoscopic repair of perforated peptic ulcer. Br J Surg.1995;82(6):814-816.

[46]. Siu WT, Leong HT, Law BK, Chau CH, Li AC, Fung KH, et al.

[47]. **Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. Ann Surg. 2002 Mar;235(3):313-9.**

[48]. Oliver McAnena, Myles Joyce. Operative management of upper gastrointestinal disease. M. Farquharson M, Moran B. Farquharson's Textbook of Operative General Surgery. 9th ed. London: Hodder Arnold; 2005. pp. 285- 315.

[49]. Lau WY, Leung KL, Zhu XL, Lam YH, Chung SCS, Li AKC. Laparoscopic repair of perforated peptic ulcer. Br J Surg.1995;82(6):814-816.

[50]. Siu WT, Leong HT, Law BK, Chau CH, Li AC, Fung KH, et al.

[51]. **Laparoscopic repair for perforated peptic ulcer: a randomized controlled trial. Ann Surg. 2002 Mar;235(3):313-9.**

[52]. Boey J, Choi SK, Poon A, Alagaratnam TT: Risk stratification in perforated duodenal ulcers. A prospective validation of predictive factors. Ann Surg 1987, 205(1):22–26.

[53]. Soreide K, Korner H, Soreide JA: Diagnostic accuracy and receiveroperating characteristics curve analysis in surgical research and decision.

[54]. Altaca G, Sayek I, Onat D, Cakmakci M, Kamiloglu S: Risk factors in perforated peptic ulcer disease: comparison of a new score system with the Mannheim Peritonitis Index. Eur J Surg 1992, 158(4):217–221.

[55]. Arveen S, Jagdish S, Kadambari D: Perforated peptic ulcer in South India: an institutional perspective. World J Surg 2009, 33(8):1600–1604.

[56]. Copeland GP, Jones D, Walters M: POSSUM: a scoring system for surgical audit. Br J Surg 1991, 78(3):355–360.