

A Prospective Study of Surgical Apgar Score In Hollow Viscus Perforation

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Abstract:

Background: Hollow viscus perforation is an emergency condition with an estimated 10 % of the cases presenting at the emergency room. It is one of the most complex cases encountered in surgical practice due to the varied etiologies and prognoses. Thus, there is a need for a prognostic model in this subset of patients so as to provide them with utmost quality care and to utilize resources optimally. The Surgical Apgar scoring system is superior to the less scientific clinical assessment of surgical risk in patients with perforation of hollow viscus, which might help the treating surgeon to tailor the modality of surgical management for individual patients. The main aim of this study is to assess the role of Surgical Apgar Score as a prognostic tool in patients presenting with hollow viscus perforation.

Materials and Methods: In this prospective study, 100 patients with diagnosis of hollow viscus perforation who were admitted in the Surgical emergency ward of Government Mohan Kumaramangalam Medical College hospital, Salem between October 2018 and October 2020 were included in the study. Details of patients such as history, clinical examination, basic blood workup and radiological investigations necessary to arrive at the diagnosis of hollow viscus perforation are documented. Weight of the patient (Kg) is documented at the time of admission. Hemoglobin is measured at the time of admission and 24 hours after the surgery. Number of blood products transfused preoperatively and intraoperatively are documented. Intraoperative findings needed for the calculation of Surgical Apgar Score namely Lowest Heart rate and Lowest Mean Arterial Pressure are recorded from the anesthesiologist's record. Surgical Apgar Score is the arithmetic mean of the individual scores allotted to the three parameters namely Estimated Blood loss (0-3), Lowest Mean Arterial Pressure (0-3) and Lowest Heart Rate (0-4). Patients are followed up for the occurrence of any major complications within 14 days of surgery.

Results: The difference in outcome following surgery among the various SAS groups were statistically significant. Patients with SAS in the range of 0-4 had major complications occurring in 76.3 % of study population, whereas those with SAS in the range of >8 had no major complication (95% CI, P < 0.0001).

Conclusion: The present study shows that the Surgical Apgar Scoring system to be an accurate predictor of prognostic outcome in patients with hollow viscus perforation. It is a simple, quick, objective means of estimating patient outcome in surgery utilizing parameters that are conveniently and easily available in any hospital setup. The score helps in picking up patients who are otherwise to be missed beyond the average likelihood of major complications in the post-operative period, thereby devising the suitable interventional protocol to prevent/address the adverse outcome.

Key word: Hollow viscus perforation, Surgical Apgar Score, prognosis

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I. Introduction

Hollow viscus perforation is an emergency condition with an estimated 10 % of the cases presenting at the emergency room. It is one of the most complex cases encountered in surgical practice due to the varied etiologies and prognoses. Thus, there is a need for a prognostic model in this subset of patients so as to provide them with utmost quality care and to utilize resources optimally.

The Surgical Apgar scoring system is superior to the less scientific clinical assessment of surgical risk in patients with perforation of hollow viscus, which might help the treating surgeon to tailor the modality of surgical management for individual patients. The surgical Apgar score (SAS) is a simple scoring system that utilizes intraoperative data on to prognosticate post-operative morbidity and mortality. It is a score on a scale of 0-10 calculated from three parameters collected during the operative procedure namely,

1. Estimated blood loss (EBL).
2. Lowest heart rate (HR) and
3. Lowest mean arterial pressure (MAP).

Several algorithms have been used for risk assessment such as the ASA classification, POSSUM scoring system and APACHE scoring system. However, each of these systems has its own limitations. The SAS because of its availability in real time has made it a powerful tool for broad safety improvement in surgery. It provides a readily available “Snapshot” of how an operation went by rating the condition of a patient after surgery from 0 (indicating heavy blood loss, hypotension, and an elevated HR or asystole) to 10 (indicating minimal blood loss, normal blood pressure, and a physiologically low to normal HR).

II. Materials And Methods

STUDY AREA:

Government Mohan Kumaramangalam Medical College And hospital, Salem, Tamil Nadu.

STUDY POPULATION:

Patients admitted in GMKMCH surgical emergency ward with clinical and/or radiological evidence of hollow viscus perforation who are posted for emergency surgeries.

STUDY PERIOD:

October 2018 to October 2020 (2 years)

INCLUSION CRITERIA:

1. Age:18-80 years
2. Patients with clinical and/or radiological features of hollow viscus perforation

EXCLUSION CRITERIA:

1. Pregnancy
2. Blunt injury abdomen with associated solid organ damage / fractures.
3. Patients unwilling for surgery
4. Patients who died on operating table
5. Immunosuppressive patients

SAMPLE SIZE:

One hundred patients.

STUDY DESIGN:

A Prospective study including all patients eligible by inclusion and exclusion criteria.

Informed consent has been taken from each respondent.

Institutional ethical clearance has been obtained and adhered.

STUDY ENDPOINT:

The patients were followed up to the 14th post-operative day after surgery.

METHODS:

1. Details of patients such as history, clinical examination, basic blood workup and radiological investigations necessary to arrive at the diagnosis of hollow viscus perforation are documented.
2. Weight of the patient (Kg) is documented at the time of admission.
3. Hemoglobin is measured at the time of admission and 24 hours after the surgery.
4. Number of blood products transfused preoperatively and intraoperatively are documented.
5. Intraoperative findings needed for the calculation of Surgical Apgar Score namely
 - a) Lowest Heart rate and
 - b) Lowest Mean Arterial Pressure - recorded from the anesthesiologist's record.
6. Intra-operative surgical findings are documented.
7. Surgical Apgar Score (SAS) is calculated as follows:

SCORE	0	1	2	3	4
ESTIMATED BLOOD LOSS (mL)*	>1000	601-1000	101-600	<100	-
LOWEST MEAN ARTERIAL PRESSURE (mm of Hg) #	<40	40-54	55-69	>70	-
LOWEST HEART RATE (beats/min) #	>85	76-85	66-75	56-65	<55

(*Estimated Blood Loss is calculated using the formula:

Estimated Blood loss (EBL) = $EBV \times (HB_i - HB_f) \div \{(HB_i + HB_f)/2\} + \{500 \times Tu\}$ where,

EBV = Estimated blood volume (body weight in kgs \times 70 ml/kg)

HB_i = Pre-operative hemoglobin (g/dl),

HB_f = Post-operative hemoglobin (g/dl) around 24 h after surgery

Tu = Sum of whole blood, packed red blood cell transfused.

Lowest Heart Rate (HR) and Lowest Mean Arterial Pressure (MAP) noted intraoperatively are collected from the anesthesiologist's records)

8. SAS = Estimated Blood loss (0-3) + Lowest Mean Arterial Pressure (0-3) + Lowest Heart Rate (0-4).

(SAS has a minimum score of 0 and a maximum score of 10)

9. Scores are categorized as follows:

SURGICAL APGAR SCORE	RISK CATEGORY
0-4	HIGH
5-7	MEDIUM
8-10	LOW

10. Patients are followed up for the occurrence of any major complications within 14 days of surgery. The following events are considered major complications:

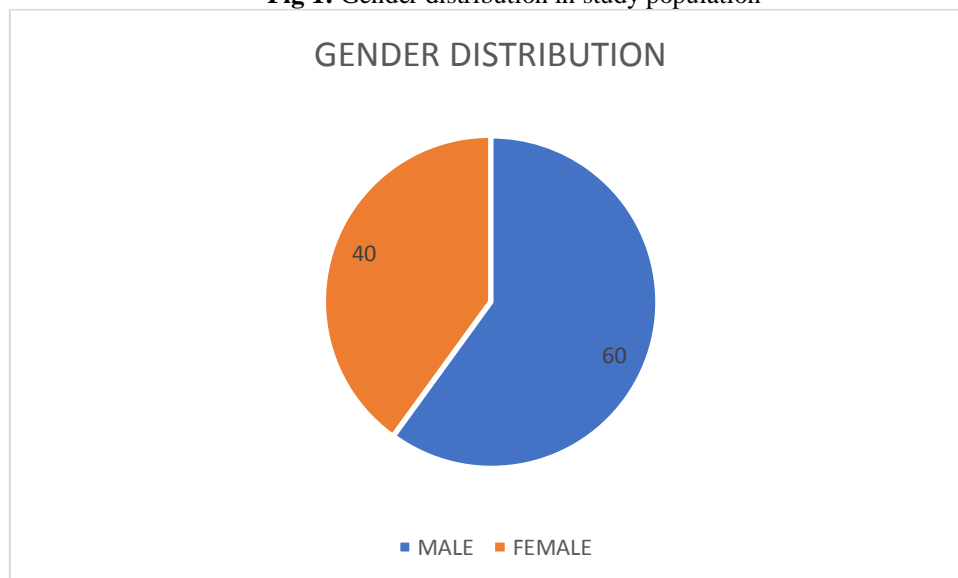
• Wound disruption
• Deep or organ-space surgical site infection
• Sepsis and septic shock
• Acute renal failure
• Requirement of transfusion of 2 Units or more of red blood cells within 48 hours after surgery
• Ventilator use for 48 hours or more
• Deep vein thrombosis
• Pneumonia
• Pulmonary embolism
• All deaths in the post-operative period

III. Result:

Gender distribution:

A total of 100 patients studied of which 60 were males and 40 were females.

Fig 1: Gender distribution in study population



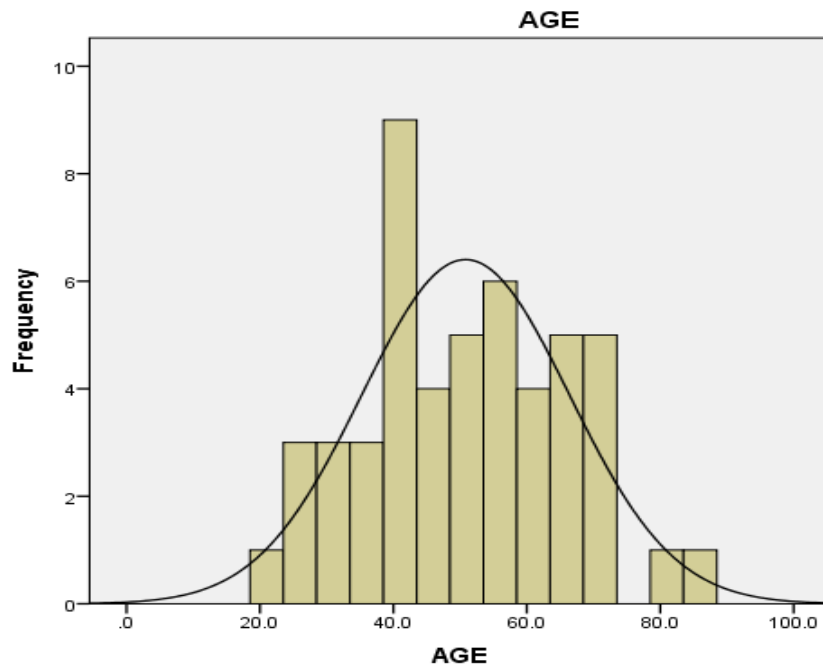
Age distribution:

Youngest age recorded in the study population was 21 years and oldest being 88 years.

Table no 1: Age distribution of study population

S.NO	MEASURES	AGE IN YEARS
1	MEAN	50.82
2	MEDIAN	50.5
3	MODE	39
4	STANDARD DEVIATION	15.49674
5	MAXIMUM	88
6	MINIMUM	21

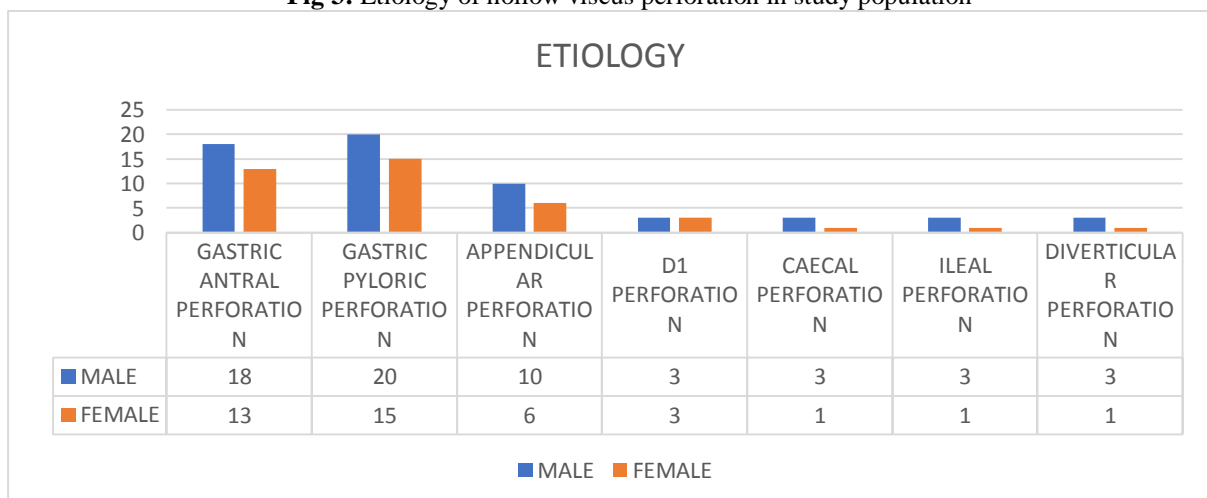
Fig 2: Age distribution in study population



Etiology and procedure performed:

- Most common cause of hollow viscus perforation in the study population was gastric pyloric perforation, gastric antral perforation and appendicular perforation.

Fig 3: Etiology of hollow viscus perforation in study population



- Procedures performed includes primary closure of perforation with pedicled omental flap reinforcement in case of gastric antral / pyloric perforation, appendectomy for appendicular perforation,

primary closure or exteriorization of bowel in case of jejunal / ileal / large bowel perforation depending on the degree of peritoneal contamination and bowel status.

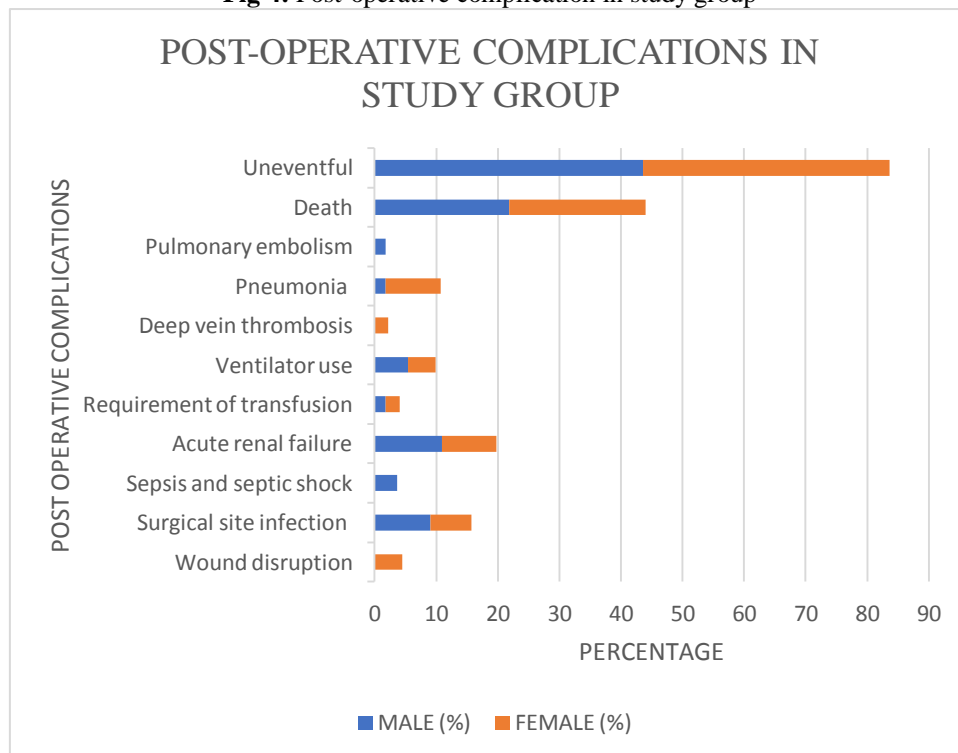
Complications:

Among the list of major complications included in the study, 22 deaths (12 in male and 10 in female) were recorded in the post-operative period and 42 cases were uneventful. Most common major complication noted in the study population was acute renal failure (10.91 % in male and 8.89 % in female).

Table no 2: Post-operative complications in study population

POST OPERATIVE COMPLICATIONS	GENDER		TOTAL(%)
	MALE (%)	FEMALE (%)	
Wound disruption	0 (0)	2 (4.44)	2 (2)
Surgical site infection	5 (9.09)	3 (6.67)	8 (8)
Sepsis and septic shock	2 (3.63)	0 (0)	2 (2)
Acute renal failure	6 (10.91)	4 (8.89)	10 (10)
Requirement of transfusion	1 (1.81)	1 (2.22)	2 (2)
Ventilator use	3 (5.45)	2 (4.44)	5 (5)
Deep vein thrombosis	0 (0)	1 (2.22)	1 (1)
Pneumonia	1 (1.81)	4 (8.89)	5 (5)
Pulmonary embolism	1 (1.81)	0 (0)	1 (1)
Death	12 (21.82)	10 (22.22)	22 (22)
Uneventful	24 (43.63)	18 (40)	42 (42)
TOTAL	55 (100)	45 (100)	100 (100)

Fig 4: Post-operative complication in study group



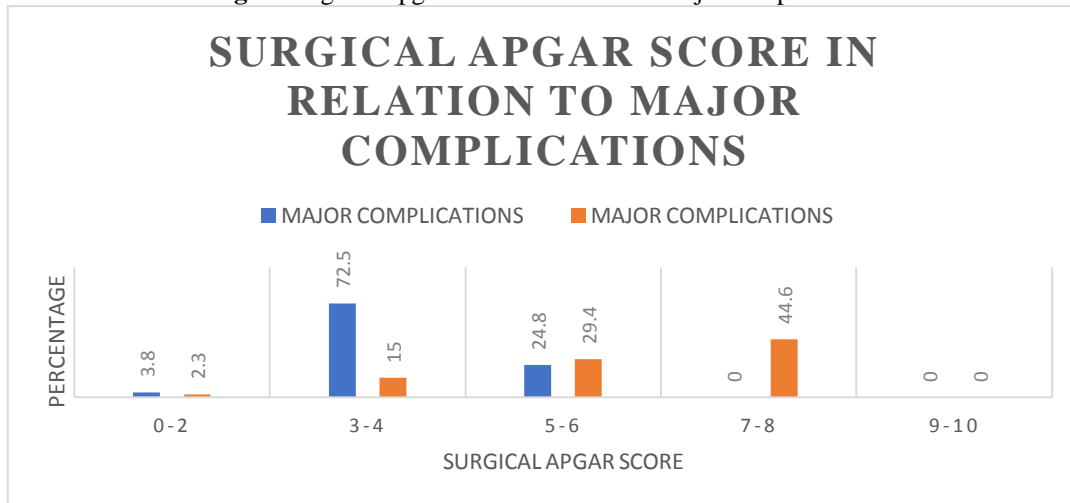
Complications and SAS:

The rate of complications increases as the Surgical Apgar Score decreases.

Table no 3: SAS and major complications

SAS	MAJOR COMPLICATIONS	
	PRESENT (%)	ABSENT (%)
0-2	3.8	2.3
3-4	72.5	15
5-6	24.8	29.4
7-8	0	44.6
9-10	0	0

Fig 5: Surgical Apgar Score in relation to major complications



IV. Discussion

In this prospective study, 100 patients were included with diagnosis of hollow viscus perforation. There was a male predominance noted with 60 % male and 40 % female. The youngest age recorded in the study population was 21 years and the oldest being 88 years. The most common indication of surgery in the study population was gastric pyloric perforation accounting to about 33.3% of cases in male and 37.5 % of cases in female; followed by gastric antral perforation accounting to about 30% in male and 32.5% in female. Most common surgical procedure performed in the study population include primary closure of perforation with pedicled omental flap. The majority of emergency cases were operated within 3 hours of admission.

In this study there were 22 deaths (21.82% in male and 22.22 % in female) and 42 (43.63 % in male and 40 % in female) uneventful outcomes following surgery at the end of 14th post-operative day. The most common major complication recorded in the study population was death (22%) followed by acute renal failure (10%). The majority of complications were noted in age group more than 70 years. 48% of patients in age group >70 had low SAS of <4. Only 6% in the age group of <40 had low SAS of <4. This shows the efficacy of the Surgical Apgar Score in picking up patients at higher risk of major complications after surgery.

The difference in outcome following surgery among the various SAS groups were statistically significant. Patients with SAS in the range of 0-4 had major complications occurring in 76.3 % of study population, whereas those with SAS in the range of >8 had no major complication (95% CI, $P < 0.0001$). Though long duration of surgery contributed as a factor in the occurrence of major complication in most other studies on the SAS, this was not a case in our study.

V. Conclusion

The surgical Apgar Score provides a simple, quick, objective means of estimating patient outcome in surgery utilizing parameters that are conveniently and easily available in any hospital setup. The score helps in picking up patients who are otherwise to be missed beyond the average likelihood of major complications in the post-operative period thereby devising the suitable interventional protocol to prevent the adverse outcome. The present study shows the SAS system to be an accurate predictor of group outcome in patients with hollow viscus perforation. It can be used for assessment of outcome in similar populations. However, it does not provide sufficient confidence for outcome prediction in individual patients. More studies need to be performed with a larger number of patients to evaluate the SAS system for the morbidity and mortality prediction of patients with hollow viscus perforation.

References

- [1]. Gawande AA, Kwaan MR, Regenbogen SE, Lipsitz SA, Zinner MJ. An Apgar score for surgery. *J Am Coll Surg* 2007;204:201-8.
- [2]. Regenbogen SE, Ehrenfeld JM, Lipsitz SR, Greenberg CC, Hutter MM, Gawande AA. Utility of the surgical Apgar score: Validation in 4119 patients. *Arch Surg* 2009;144:30-6.
- [3]. Regenbogen SE, Lancaster TR, Lipsitz SR, Greenberg CC, Hutter MM,
- [4]. Gawande A, *et al.* Does the surgical Apgar score measure intraoperative performance? *Ann Surg* 2008;248:320-8.
- [5]. Mak PH, Campbell RC, Irwin MG; American Society of Anesthesiologists. The ASA physical status classification: Inter-observer consistency. *American Society of Anesthesiologists. Anaesth Intensive Care* 2002;30:633-40.
- [6]. Brooks MJ, Sutton R, Sarin S. Comparison of Surgical risk score, POSSUM and p-POSSUM in higher-risk surgical patients. *Br J Surg* 2005;92:1288-92.
- [7]. Copeland GP, Jones D, Walters M. POSSUM: A scoring system for surgical audit. *Br J Surg* 1991;78:355-60.
- [8]. Jones HJ, de Cossart L. Risk scoring in surgical patients. *Br J Surg* 1999;86:149-57.
- [9]. Hariharan S, Zbar A. Risk scoring in perioperative and surgical intensive care patients: A review. *Curr Surg* 2006;63:226-36.
- [10]. Chandra A, Mangam S, Marzouk D A review of risk scoring systems utilised in patients undergoing gastrointestinal surgery. *J Gastrointest Surg* 2009;13:1529-38.
- [11]. McCullough TC, Roth JV, Ginsberg PC, Harkaway RC. Estimated blood loss underestimates calculated blood loss during radical retropubic prostatectomy; *Urol Int* 2004;72:13-6.
- [12]. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004;240:205-13.
- [13]. A Report by National Confidential Enquiry Into Perioperative Death. Who Operates When II? 2003. Available from: <http://www.ncepod.org.UK>. [Last Accessed on 2016 Apr 25].
- [14]. Faiz O, Banerjee S, Tekkis P, Papagrigoriadis S, Rennie J, Leather A. We still need to operate at night! *World J Emerg Surg* 2007;2:29.
- [15]. Capewell S. The continuing rise in emergency admissions. *BMJ* 1996;312:991-2.
- [16]. Greenburg AG, Saite RP, Coyle JJ. Mortality in BI surgeries in the aged. *Arch Surg* 1998;1116:788.
- [17]. Zigelboim I, Kizer N, Taylor NP, Case AS, Gao F, Thaker PH, *et al.* "Surgical Apgar score" predicts postoperative complications after cytoreduction for advanced ovarian cancer. *Gynecol Oncol* 2010;116:370-3.

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