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UTILITY OF SURGICAL APGAR SCORE IN PREDICTING MORBIDITY AND MORTALITY IN GENERAL SURGICALPROCEDURES-PROSPECTIVE STUDY

Surgery

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ABSTRACT

AIM AND OBJECTIVES: To evaluate the effectiveness of surgical Apgar score in predicting patient's outcome in the form of complications including mortality within 30 days of surgery.
SETTING: General surgical ward in Tertiary care centre
METHODS: 100 patients undergoing general surgical procedures in Govt. Dharmapuri mediclal college hospital from July 2016 to March 2017 were included in the study. Surgical apgar score was calculated for each patient and analysis done.
RESULTS: Patients in the category of 3 to 4 scores had more complications and higher death rate. In elective surgeries, scores less 7 had higher rates of complications and 30 day mortality in comparison to scores of more than 7. Male and female were equally affected. Death was occurred in the score ranging from 2 to 3. Complications were common in elective surgeries.
CONCLUSION: Surgical Apgar Score has proved to be an important tool in detection of the complications early and is a simple and useful method of predicting the morbidity and mortality of patients undergoing general surgical procedures.

KEYWORDS:

Surgical Apgar Score, Morbidity.30 Day Mortality

INTRODUCTION

SURGICAL APGAR SCORE (SAS)

The Surgical Apgar Score (SAS) was developed by Gawande et al in 2007 by modifying and adjusting the National Surgical Quality Improvement program (NSQIP) variables.

The primary outcomes measure was incidence of major com plication or death within 30 days of surgery. A 10-point score based on a patient's estimated amount of blood loss, lowest heart rate, and lowest mean arterial pressure during general surgeries was associated with major complications or 30days mortality.

The SAS is calculated, at the end of the surgery from the EBL, lowest MAP and lowest P.R. recorded during the surgery.

variables	0 Points	1 points	2 Points	3 Points	4 Points
Estimated blood loss(ml)	>1000	601-1000	101-600	≤ 100	-
Mean arterial pressure(mmHg)	<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 formulae

$$\text{Blood loss} = [(EBV \times (H_i - H_f)) / ((Hc_{ti} + Hc_{tf})/2] + (500 \times Tu)$$

Estimated blood volume (EBV) is assumed to be 70cm3/kg

H_i and H_f represent pre and post operative haemoglobin

Hct_i and Hc_{tf} represent per and post operative hematocrit

Tu is the sum of autologous whole blood, packed RBC, FFP, platelet transfused Surgical Apgar score = Sum of the points for each category in the course of a procedure.

Using the above parameters, surgical Apgar score is calculated and the Cumulative scores are separated into 5 categories as 0-2, 3-4,5-6,7-8,9-10.

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Both elective and emergency surgical procedures were allocated into categories for simplicity as follows:

Minor and Intermediate

1. Simple alimentary-

a. Diagnostic laparoscopy,
b. Lap cholecystectomy,
c. Lap. appendectomy,
d. Resection and anastomosis of small bowel,
e. Closure of perforation,
f. Perineal procedures-haemorrhoidectomy, repair of prolapsed rectum, perianal abscess.

2. Breast surgeries

a. Simple mastectomy,
b. Modified radical mastectomy with axillary dissection

3. Total Thyroidectomy with or without neck dissection.
4. Groin or umbilical hernia repair

a. anatomical repair
b. mesh hernioplasty,
c. laparoscopic hernia repair like

i. Total Extraperitoneal repair (TEP),
ii. Transabdominal Preperitoneal repair (TAPP).

MAJOR AND EXTENSIVE:

1. Complex alimentary surgeries
a. Hemicolectomy, total colectomy, colostomy
b. Partial and total Gastrectomy,
c. Abdomino Perineal Resection (APR).
2. Hepatobiliary and pancreas surgery like
a. Open cholecystectomy,
b. Open CBD exploration,
c. Whipple'procedure
d. Splenectomy

3.Ventral or Incisional hernia repair(MESH)

With an estimate of the probability of the morbidity and mortality status derived from the apgar score; patients are followed up for any major complications or any death till 30 days postoperatively. Regular follow ups of all the patients in the study are performed in the OPD and especially the group with low apgar score. Some of the patients are followed up by telephonic interview.

The following events are considered major complications: Acute renal shutdown, Bleeding that required a transfusion of 4 U or more of Red Blood Cells within 72 hours after surgery, Cardiac arrest requiring cardiopulmonary resuscitation, Coma of 24 hours or longer, Anastomotic leak, Deep venous thrombosis, Myocardial infarction Unplanned intubation, Ventilator use for 48 hours or more, Pneumonia, Pulmonary embolism, Wound dehiscence, Wound infection, stroke, Deep infection, Septicaemia ,Wound haemorrhage, Urinary infection, Death.

ELIGIBILTY CRITERIA:

Inclusion criteria:

Patients aged more than 18yrs undergoing elective or emergency surgical procedures under general, epidural, or spinal anaesthesia.

Exclusion criteria:

Surgeries under local anaesthesia, not requiring intensive monitoring and regular follow up

OBSERVATION AND RESULTS:

Figure 1: TOTAL NO. OF ELECTIVE AND EMERGENCY SURGERIES:-

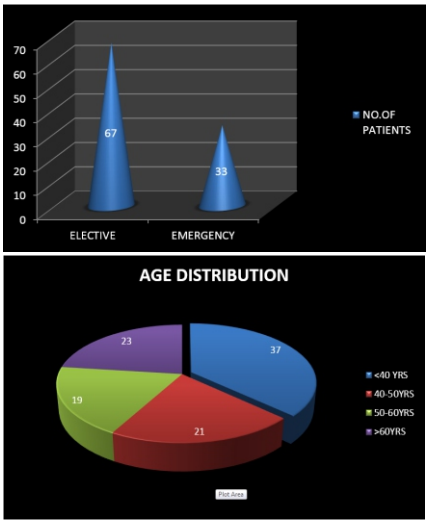

Table:1 Age Distribution

Age	No of patients
<40 yrs	37
40-50	21
50-60	19
>60	23

Figure 3: SURGICAL APGAR SCORE WITH MAJOR COMPLICATIONS AND 30 DAY MORTALITY:

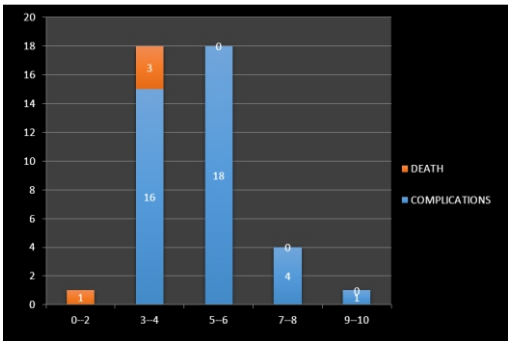

Table:2 SURGICAL APGAR SCORE WITH MAJOR COMPLICATIONS AND 30 DAY MORTALITY:

	NO.OF PATIENTS	MORBIDITY	MORTALITY
0-2	1(1%)	0(0%)	1(100%)
3-4	20(20%)	15(75%)	3(15%)
5-6	42(42%)	18(43%)	-
7-8	33 (33%)	4(12%)	-
9-10	4(4%)	1(25%)	-
	100	38(38%)	4(4%)

Table:3 DISTRIBUTION OF POST-OPERATIVE COMPLICATIONS:

Complications	Elective(67)	Emergency(33)	Frequency
Wound haemorrhage	4	-	4
Stroke	1	-	1
Superficial wound infection	6	3	9
Deep infection	1	2	3
Leak of anastomosis	1	2	3
Renal dysfunction	-	1	1
Respiratory infection	4	-	4
Wound dehiscence	1	3	4
Bile leak	1	-	1
Myocardial infarction	1	-	1
Urinary tract infection	1	1	2
Pneumonia	1	-	1
Enterocutaneous fistula	-	2	2
Transfusion of >4 units of blood	-	2	2
Death	1	3	4
No complication	44	14	
TOTAL	42		

DISCUSSION

The purpose of this study was to establish the applicability of the SAS in post-operative risk stratification for patients undergoing surgery in Govt. Dharmapuri medical Hospital. The SAS was developed as a simple and objective tool that could identify patients at higher than average risk of postoperative complication.

A simple surgical score based on estimated blood loss, HR, and lowest MAP during an operation provides a meaningful estimate of patient's condition and rate of major complications and death after surgery.

All 100 cases admitted in the department of general surgery were evaluated. All the patients were assessed and managed according to

standard guidelines for the respective disease. 43% of the surgical patients in my study were male patients and there was slightly female preponderance of about 57%.

About 37% of the patients were in the age group of less than 40 years. 21% of the patients were in the age group of 40-50 years.19% of the patients were in the age group of 50-60 years. Remaining 23% of the patients were above 60 years (Figure 2).

Majority of the complications were noted in the age group above 45 years and 67% of surgeries were elective in nature.33% of surgeries were emergencies.

About 68(68%) were minor or intermediate cases and major surgeries were performed in 32(32%). About 27(39.7%) of minor surgeries had major complications and 3(4.4%) had death, where as 11(34%) of major surgeries had major complications and death was about 1(3%) {table 2}

In my study male patients were about 43 in number, in that 21 patients, around 48.8%, developed complications including death and 22 patients not developed complications. About 21 patients of female developed complications including death out of 58 patients, remaining 36 patients not developed complications.

Based on the gender and complications, p value was calculated using Chi-square test, it was about 0.5.

In elective surgery totally 67 cases (67%) were operated in that 23(34%) patients developed complications and 44 patients (65.7%) not developed complications. About 33 patients (33%) were operated in emergency surgery, in that 19 patients (57.5%) were developed complications including death and 14(42.4%) patients not developed complications (figure 1).

In the 68 patients of minor and intermediate cases, breast surgery was done for 9 patients, in that 4(44.4%) patients developed complications. Thyroid surgery was done for 9 patients, in that 2(22.2%) patients were developed complications. Hernia, Umbilical and paraumbilical hernia surgery was done for17 patients, in that 5(29.4%) patients developed complications. About 33 cases of simple alimentary surgery were done, in that16 (48.8%) patients developed complications and 3(9%) patients were died.

So majority of cases operated are simple alimentary diseases (33) 48.5% and complications also more in these patients about 16 complications and 3 death.

In the major surgery about 32 cases were operated. 8 patients undergone Hemicolectomy and total colectomy surgery and 1(12.5%) patient developed complication. Ventral and Incisional hernia repair was done for 10 patients in that 3(30%) patients developed complications. One patient underwent pancreatic necrosectomy that patient was died (100%). Splenectomy was done for a patient and developed complication (100%). 10 patients operated for cholelithiasis and CBD exploration out of 10, 4(40%) patients had complications. 2(100%) patients developed complications in 2 cases of abdominoperineal surgery.

The incidence of major complications was 39.7% out of 68% of minor and intermediate surgeries. A death rate of 4.4% in minor surgeries and 3% in major surgeries was seen.

In the age group of less than 40years, 37 patients were present. 21 patients were distributed in age group of 40-50 years, 19 patients were distributed, and 23 patients were distributed in the age group of greater than 60 years. So majority of patients were distributed below 40 years of age.

In the score of 0-2 category, 1% (1) was distributed. 20%(20)of patients were distributed in the of 3-4;in the category of 5-6 ,42%(42) of patient accumulated ; in the category of 7-8 score, about 33%(33) of patients were accumulated; about 4%(4) of patients were accumulated in the category of 9-10 score(table 2). So majority of patients were accumulated in the category of 5-6 score(42%), but complications and death are more common in the category of 3 to 4 score, next to 100% death in the category 0 to 2 score. There was no mortality in the category of 5 to 6, 7 to 8, 9 to 10 score and the total mortality was 4% (4).

In the elective surgery complications were more in the category of 5-6, whereas complications were more in the category 3-4 in emergency operations.

The most common complication noted in this study was superficial wound infection 9(21.4%), respiratory infection4(9.5%), wound dehiscence4(9.5%), deep infection 3(7%), anastomotic leak 3(7%), urinary tract infection 2(4.7%), enterocutaneous fistula 2(4.7%) , 2 patients required transfusion of more than 4 units of blood, pneumonia1(2.3%), renal dysfunction 1(2.3%),deep haemorrhage 1(2.3%), bile leak 1(2.3%),myocardial infection 1(2.3%). Death occurred in 4 patients during the first 6 days of post operative period (Table 3).

CONCLUSION

In this study, Surgical Apgar Score has proved to be an important tool in detection of the complications early. Patients with low Surgical Apgar Score would require ICU monitoring or would require admission in the hospital. Complications rates are almost equal in both elective and emergency surgery except death which was more in emergency procedure.

Complication rate was equal in both male and female patients. Complications are lower with higher surgical Apgar score.
The SAS, despite using simple and widely available intra-operative parameters, is adequate in stratification of post-operative risk of major complications following surgical procedures.

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