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A Comparative Study between Shape Scoring and ASA Grading For Anesthesia Risk Stratification

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Abstract: *American Society of Anaesthesiologists (ASA) physical status is commonly used system to predict the incidence of intra- and postoperative complications in surgical patients. Silverman-Holt aggregate preoperative evaluation (SHAPE™) score is based on information learned from the patient history and physical examination overcomes limitations of ASA grading. Objective was to compare the efficacy of SHAPE scoring and ASA Grading in Anesthesia risk stratification in terms of Assessment of patient's condition; risk assessment and intra-operative and postoperative complications/events. Patients admitted for elective or emergency surgeries to be done under general anaesthesia /regional were included and assessed with ASA and SHAPE scoring. The time duration for anaesthesia and surgery; any blood loss and replacement; any ICU stay ; Mean and SD caluculated for age, height, weight. Categorical data presented as number(percentage) and analysed with Chi-square test. Spearmans correlation co-efficient used to test the relationship between the Scoring systems. Comparison of Aspirin score and Blood loss in relation to S score was significant, Post op ICU admission of patients studied in relation to S score was also significant and Post op ventilation of patients studied in relation to S score was also significant. SHAPE scoring shows good correlation for intraoperative complication and postoperative ICU admission.*

Keywords: *American Society of Anaesthesiologists , Silverman-Holt aggregate preoperative evaluation*

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I. Introduction

American Society of Anaesthesiologists (ASA) physical status (7-grade) can provide a better grading outcome for predicting the incidence of intra- and postoperative complications in surgical patients [1].
Silverman-Holt aggregate preoperative evaluation (SHAPE) score in which 1 to 5 severity score is assigned for each major organ system, based on information learned from the patient history and physical examination. Overcomes limitations of ASA grading [2].

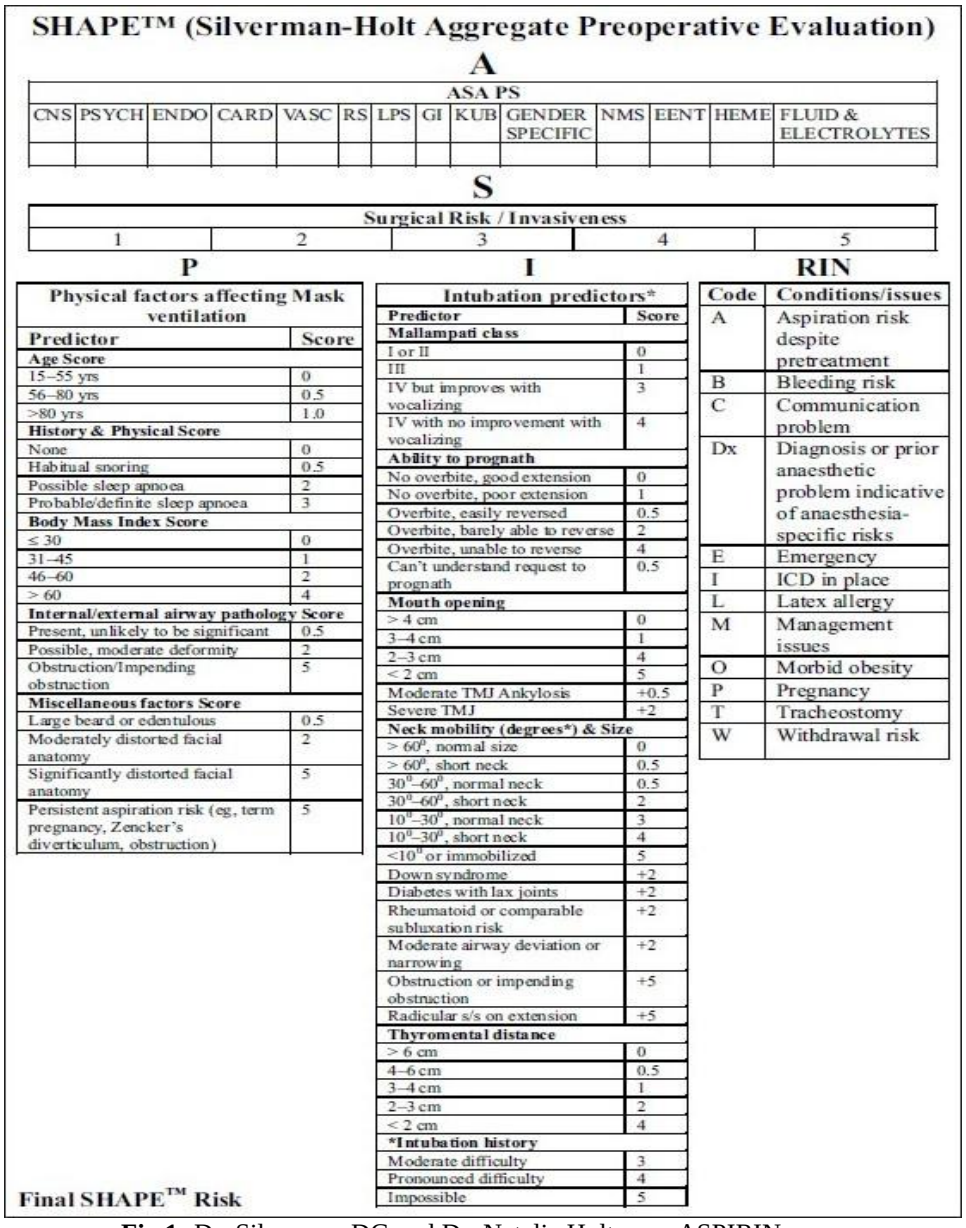
Objectives

To com pare the efficacy of SHAPE scoring and ASA Grading in Anesthesia risk stratification in terms of Assessment of patient's condition; risk assessment and intra-operative and postoperative complications/events.

II. Methods

After obtaining Institutional Ethical clearance and informed consent, adult patients admitted for elective or emergency surgeries from January 2017 to May 2017, to be done under general anaesthesia/regional were included and assessed with ASA and SHAPE scoring.

It was a prospective observational study; there was a standard protocol as per the anaesthesiologist for GA or Regional technique. The time duration for anaesthesia and surgery; any blood loss and replacement; any ICU stay; complications were noted. Mean and SD were caluculated for age, height, weight. Categorical data was presented as number(percentage) and was analyzed with Chi-square test. Spearmans correlation co-efficient was used to test the relationship between the Scoring systems.



SHAPE™ (Silverman-Holt Aggregate Preoperative Evaluation)

A

ASA PS													
CNS	PSYCH	ENDO	CARD	VASC	RS	LPS	GI	KUB	GENDER SPECIFIC	NMS	EENT	HEME	FLUID & ELECTROLYTES

S

Surgical Risk / Invasiveness				
1	2	3	4	5

P

Physical factors affecting Mask ventilation	
Predictor	**Score**
Age Score	
15–55 yrs	0
56–80 yrs	0.5
>80 yrs	1.0
History & Physical Score	
None	0
Habitual snoring	0.5
Possible sleep apnoea	2
Probable/definite sleep apnoea	3
Body Mass Index Score	
≤ 30	0
31–45	1
46–60	2
> 60	4
Internal/external airway pathology Score	
Present, unlikely to be significant	0.5
Possible, moderate deformity	2
Obstruction/Impending obstruction	5
Miscellaneous factors Score	
Large beard or edentulous	0.5
Moderately distorted facial anatomy	2
Significantly distorted facial anatomy	5
Persistent aspiration risk (eg, term pregnancy, Zencker's diverticulum, obstruction)	5

I

Intubation predictors*	
Predictor	**Score**
Mallampati class	
I or II	0
III	1
IV but improves with vocalizing	3
IV with no improvement with vocalizing	4
Ability to prognath	
No overbite, good extension	0
No overbite, poor extension	1
Overbite, easily reversed	0.5
Overbite, barely able to reverse	2
Overbite, unable to reverse	4
Can't understand request to prognath	0.5
Mouth opening	
> 4 cm	0
3–4 cm	1
2–3 cm	4
< 2 cm	5
Moderate TMJ Ankylosis	+0.5
Severe TMJ	+2
Neck mobility (degrees*) & Size	
> 60^0, normal size	0
> 60^0, short neck	0.5
30^0–60^0, normal neck	0.5
30^0–60^0, short neck	2
10^0–30^0, normal neck	3
10^0–30^0, short neck	4
<10^0 or immobilized	5
Down syndrome	+2
Diabetes with lax joints	+2
Rheumatoid or comparable subluxation risk	+2
Moderate airway deviation or narrowing	+2
Obstruction or impending obstruction	+5
Radicular s/s on extension	+5
Thyromental distance	
> 6 cm	0
4–6 cm	0.5
3–4 cm	1
2–3 cm	2
< 2 cm	4
***Intubation history**	
Moderate difficulty	3
Pronounced difficulty	4
Impossible	5

RIN

Code	Conditions/issues
A	Aspiration risk despite pretreatment
B	Bleeding risk
C	Communication problem
Dx	Diagnosis or prior anaesthetic problem indicative of anaesthesia-specific risks
E	Emergency
I	ICD in place
L	Latex allergy
M	Management issues
O	Morbid obesity
P	Pregnancy
T	Tracheostomy
W	Withdrawal risk

Final SHAPE™ Risk

Fig 1: Dr. Silverman DG and Dr. Natalie Holt gave ASPIRIN score

III. Results

Table 1: All age groups were included in the study in which 54% were male and 44% were female.

Age in years	No. of patients	%
1-10	3	2.0
11-20	12	8.0
21-30	44	29.3
31-40	13	8.7
41-50	32	21.3
51-60	23	15.3
61-70	20	13.3
>70	3	2.0
Total	150	100.0

Table 2: Comparison of Aspirin score and Blood loss in relation to S score

	S score			Total	P value
	Grade I	Grade II	Grade III		
ASPIRIN Score	5.65±0.61	6.28±0.46	8.18±1.10	6.61±0.40	0.051+
Blood loss	160.23±21.45	207.91±20.62	742.50±39.61	336.80±25.20	<0.001**

Table 3: Post op ICU of patients studied in relation to ASA grade

Post op ICU	ASA Grade			
	Grade 1	Grade 2	Grade 3	Total
0	90(100%)	34(97.1%)	20(100%)	144(96%)
4	2(4.1%)	0(0%)	0(0%)	2(1.3%)
16	1(2%)	0(0%)	0(0%)	1(0.7%)
24	0(0%)	1(2.9%)	0(0%)	1(0.7%)
50	2(4.1%)	0(0%)	0(0%)	2(1.3%)
Total	95(100%)	35(100%)	20(100%)	150(100%)

P=0.113, not Significant, Fisher Exact test

Table 4: Post op ICU of patients studied in relation to S score

Post op ICU	S score			Total
	Grade I	Grade II	Grade III	
0	43(100%)	65(97%)	36(90%)	144(96%)
4	0(0%)	2(3%)	0(0%)	2(1.3%)
16	0(0%)	0(0%)	1(2.5%)	1(0.7%)
24	0(0%)	0(0%)	1(2.5%)	1(0.7%)
50	0(0%)	0(0%)	2(5%)	2(1.3%)
Total	43(100%)	67(100%)	40(100%)	150(100%)

P=0.034*, Significant, Fisher Exact test

Table 5: Post op ventilation in relation to ASA grade

Post op ventilation	ASA Grade			
	Grade 1	Grade 2	Grade 3	Total
0	94(100%)	34(97.1%)	20(100%)	148(98.7%)
15	0(0%)	1(2.9%)	0(0%)	1(0.7%)
16	1(2%)	0(0%)	0(0%)	1(0.7%)
Total	95(100%)	35(100%)	20(100%)	150(100%)

P=0.600, Not Significant, Fisher Exact test

Table 6: Post op ventilation of patients studied in relation to S score

Post op ventilation	S score			Total
	Grade I	Grade II	Grade III	
0	43(100%)	67(100%)	38(95%)	148(98.7%)
15	0(0%)	0(0%)	1(2.5%)	1(0.7%)
16	0(0%)	0(0%)	1(2.5%)	1(0.7%)
Total	43(100%)	67(100%)	40(100%)	150(100%)

P=0.070+, Significant, Fisher Exact test

Statistical software: The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.**

IV. Discussion

Pre anesthetic evaluation is the basic foundation for anesthesia care plan. It helps anesthesiologist to know about different medical conditions patient suffering from for which specialty consultation may be taken and further medical tests can be done and helps in intraoperative anesthesia care plan and also need for postoperative intensive care monitoring and /or ventilatory support. Determination of physical status can be done bedside. Only physical status cannot be used for determining operative risk. The other factors influencing risk stratification are type of anesthesia, duration of surgery, invasiveness of surgery, facilities available, and surgeons' skill. ASA PS classification was proposed by American society of anesthesiologist to assess the physical status of the patient and classify them in 1941. The advantages were its simplicity and easy learning curve. The disadvantages were it takes only preoperative physical status of patient into consideration which is one of the many factors affecting perioperative outcome. Confusion arises in grading the patient when multiple systems are involved as not every system is involved to the same extent. It does not recognize any risk factors like pregnancy.

To address these problems Dr. Silverman DG and Dr. Natalie Holt gave ASPIRIN score in which A- ASA physical status (ASA PS); S- Surgical risk; P- Physical factors affecting mask ventilation; I – Intubation predictors and RIN- Risk indicators were used. A part of ASPIRIN included ASA scoring so that learning a new score will not be difficult; S part tells about invasiveness and risk of surgery based on expected blood loss and fluid shifts; P part helps to predict any difficulty in mask ventilation; I part helps to predict difficulty in intubation; RIN part tells about related anesthesia concerns and adds suffix to the total score. For example: P for pregnancy, E for emergency etc.

Total score ranges from 2 to 20. At one glance this score gives wide range of information for planning and resource management. Hence this study was done to know if SHAPE classification is useful for anesthesiologist Example: Male 60 year's old height of 160 cm weighing 50 kg with uncontrolled diabetes along with Ketoacidosis posted for below knee amputation. Echocardiography detected wall motion abnormality. Ejection Fraction (EF) was 25%–45%. He has no tooth (edentulous). SHAPE™ 4ENDO>CARD, 3, 1, 2, A, E^2 Many studies are done to know the reliability of ASA PS classification. Thomas J Hopkins et al have studied the association between ASA PS and postoperative mortality at 48 hours, they found that mortality risk within 48 hours are decreased in recent days for emergency and elective procedures when ASA PS is between 2E and 4E which is attributed to the improvement in anesthetic medical and surgical care and also advances in population health over several decades but increase in mortality risk in 5E patients as surgeries are offered to high risk cases today which was not few decades ago [3]. Kay HF et al carried out a study to know the effects of ASA PS on length of stay and inpatient cost in surgical treatment of isolated orthopaedic fractures and concluded that ASA is a generalizable predictor of length of stay and cost of in patient in fractured patient and also post-operative course and cost of given procedure [4]. Woodfield JC et al studied ASA classification of physical status as a predictor of wound infection and concluded that after effective antibiotic prophylaxis used the ASA PS was significant predictor of wound infection [5].

Anila D Malde studied about anesthesia risk stratification: Time to think beyond ASA PS classification and found that ASA PS has inability to disguise disorders of different systems; inability to delineate or cumulate risk based u multiple system involvement to consider surgical invasiveness or identify specific anesthetic risk and SHAPE score overcomes all above mentioned limitations and it is easy to use as acronym ASPIRIN [2]. This study was done in 150 patients to find out whether anesthesiologist find the new SHAPE scoring system useful and whether it correlates with perioperative outcome. We observed that all the anesthesiologist find SHAPE scoring system better than ASA classification. Surgical severity scoring correlates with intraoperative blood loss. Among 150 patients 2 patients needed postoperative ventilation and 6 patients needed post op ICU care. Airway examination forms a very important part of preanesthetic evaluation and ASPIRIN score has excellent predictive power in detecting anticipated difficult airway scenarios. Scoring for physical factors affecting mask ventilation abbreviated as P score was able to predict possible difficult mask ventilation

V. Limitations of SHAPE classification system

Patients under the age of 15 years cannot be included in SHAPE classification. Classification looks much lengthy, systems individual scoring is very much extensive and it takes some time before one gets used to it.

VI. Conclusion

SHAPE scoring correlated well with intraoperative, postoperative complications, blood loss, postoperative ventilatory support and ICU stay. SHAPE scoring also identifies airway related problems. Anaesthesiologists experience was better for SHAPE classification system than ASA in assessment of patient's condition.

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