Original Article

Indian Journal of Anesthesia and Analgesia
Volume 10 Number 2 April-June 2023
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.10223.1

Utility of Pre-operative Glasgow Coma Scale and SKALE Scoring System to Predict need for Post-operative Ventilator Support in Intracranial Tumour Patients

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How to cite this article:
Meghana. S, Hemangi Karnik, Aparna Nair/Utility of pre-operative Glasgow coma scale and SKALE scoring system to predict need for post-operative ventilator support in intracranial tumour patients/Indian J Anesth Analg. 2023;10(2) 49-53.

Abstract

Objective: To evaluate the feasibility of GCS and SKALE in predicting post-operative requirement of ventilator support in intracranial tumour patients.

Methods: Seventy patients undergoing intracranial tumour resection surgery were assessed pre-operatively using GCS and SKALE scoring systems to predict their post-operative requirement of ventilator support. The data was analysed using SPSS software and Shapiro-Wilk test and Chi-Square tests were apllied to compare the obtain data.

Results: The study included 70 patients, of whom 88.6% had good GCS of 13-15 and 72.9% had good SKALE score of >8. We found that all patients with poor GCS ≤8 required post -operative ventilator support, while only 4 out 62 patients with GCS 13-15 required ventilator support post-operatively (p value <0.05). Patients with SKALE score ≤8 also had higher incidence of post-operative ventilator requirement (31.6%) as against those with SKALE score >8 (11.8%).

Conclusion: GCS is a good predictor of post-operative ventilator requirement. SKALE scoring system requires further studies to prove its utility.

Keywords: Glasgow Coma Scale (GCS); SKALE; Intracranial Tumour; Post-operative Ventilator Support.

INTRODUCTION

Pre-operative physical condition, severity of the disease, age, associated co-morbidities and the nature of surgical intervention play an important role in post-operative morbidity and patient outcome. A type and extent of neurosurgical pathology like intracranial space occupying lesion may affect the patients' pre-operative condition and well-being significantly and may have major impact on post-operative morbidity.

Evaluation of pre-operative status and such alterations in general conditions help an anaesthesiologist to identify high risk patients and to judge the possible course a patient may under go after a major neurosurgical surgery. Such judgement is necessary to plan the preparedness of intensive care unit and availability of mechanical ventilation facilities. It also helps to provide information to patient and their relatives about hospital course, duration of stay or possibility of mortality. It can

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Received on: 05.04.2023
Accepted on: 19.04.2023

also have significant financial implications.

Glasgow coma scale (GCS) is a scoring system which is used to assess the extent of brain injury. It includes eye opening, best verbal response and best motor response. (Table 1) It is a useful tool to judge clinical status of a neurosurgical patient and plan the management.

SKALE grading system originally proposed by Sacko et al in 2007, incorporates Sex, Karnofsky performance score, American society of anaesthesiologist class, location of tumour and peritumoural edema to predict outcome in very old patients with meningioma. It has been validated and used by several authors in elderly patients.[3-5] How ever its use in all ages and in different types of tumours is still unknown.

Hence, this study was conducted to evaluate the utility of GCS and SKALE for predicting post -operative need for ventilator support in intracranial tumour patients.

Aim and objective

To evaluate the feasibility of GCS and SKALE in predicting post-operative requirement of ventilator support in intracranial tumour patients.

PATIENTS AND METHODS

The present study was carried out in 70 patients under going intracranial tumour surgery to find utility of pre-operative risk assessment scores GCS and SKALE in predicting post-operative ventilator requirement in patients with intracranial tumours. After permission of IEC, patients admitted in neurosurgical wards for elective surgeries for removal of intracranial tumours, satisfying all inclusion and exclusion criteria were considered for the study. The study included all age group patients posted for elective surgeries for intracranial tumour excision. We excluded patients/next of kin not willing to give consent for study, those planned for stereotactic biopsy and patients planned for transnasal excision without craniotomy.

All patients or their near relations were explained about the study and a written valid informed consent for their willingness to participate in the study were taken. All demographic data of the patients were noted from the patient's history and case sheets. Later, a detailed pre-operative assessment was done on the patient and GCS and SKALE scores were applied.

GCS score of 13 and above is considered mild brain injury, 9-12 is moderate brain injury and 8 and less is severe brain injury. Severe brain injury emphasises immediate intubation to maintain ventilation. While moderate brain injury emphasises close observation as any further drop in GCS, intubation will be required. Same criteria were used for the tumour cases. If the patient was intubated at presentation, we considered the GCS before intubation and this was compared with the need of post-operative ventilator support.

SKALE Score

(Sex, Karnofsky, ASA, Location, and Edema): Sacko proposed risk-assessment system for meningioma patients called the Sex, Karnofsky, ASA, Location, and Edema (SKALE) score comprising five independent factors: sex, KPS, ASA classification, meningioma location, and peritumoral edema. Each factor earns 0, 2, or 4 points, and a low total score suggests an unfavourable neurological outcome.[3] The SKALE score is applicable only to intracranial meningioma patients. (Table 2)

A score of 8 or less was considered poor score while that above 8 was considered good score.

Post-surgery, the need for ventilator support was decided based on pre-operative requirement of respiratory assistance, magnitude of surgery, replacement of intraoperative blood loss and post-operatively patients' level of consciousness and ability to breath after reversal agent. The need for ventilator was noted and correlated with pre-operative GCS and SKALE score.

Statistical Analysis

The data was processed and analysed using IBM Statistical Packages for Social Sciences, SPSS software version.22 Shapiro-Wilk test was used to test for normality of the data. Results of continuous measurements was measured as frequency, mean and standard deviation. Results of categorical measurements was measured as number (%). Chi-square test and Fisher test was used for association of all parameters. For contingency tables which had more than two rows or columns, Post Hoc multiple comparisons chi-squared tests were done and the level of significance was adjusted using simple Bonferroni's correction.

RESULTS

In this prospective observational study carried out on 70 patients under going intracranial surgeries, we found that the minimum age of participant was 2 years whereas maximum was 67 years. The mean

Table 1: Glasgow coma scale (GCS) scoring system

Scores	Eyes opening	Best Motor response	Verbal Response
6	–	Obeys command	–
5	–	Localizing	Oriented
4	Spontaneous	Normal Flexion	Confused
3	To sound	Abnormal flexion	words
2	To pressure	Extension	sounds
1	None	None	None
NT	Non-testable	Non- testable	Non- testable

Table 2: SKALE Score (Sex, Karnofsky, ASA, Location, and Edema)

Factors	Scores		
	0	2	4
Sex	M	F	-
KPS	≤ 50	60-70	≥ 80
ASA	IV	III	I, II
Location	Critical	Not Critical	-
Edema	Severe	Moderate	No Edema

(KPS - Karnofsky performance score, **ASA** - American society of anaesthesiology)

age of participants was 37.2 years with standard deviation 16.98. The maximum patients i.e., 45.7% were belonged to 19-40 age group.

The distribution of our 70 patients based on pre-operative scores of GCS and SKALE is shown in Table 3.

Table 3: Distribution of patients based on GCS and SKALE

GCS score	<8	2	2.9%
	9-12	6	8.6%
	13-15	62	88.6%
SKALE	≤8	19	27.1%
	>8	51	72.9%

Table 4: Association of pre-operative GCS with post-operative need for ventilator support

	Total	Ventilator Support	p value	Extubated	p value
GCS < 8	2	2	0.0026	0	0.1941
GCS = 9-12	6	5	<0.0001	1	0.0712
GCS = 13 - 15	62	4	0.0658	58	0.4269
Total	70	11		59	

Table 4 shows the association of pre-operative GCS with post-operative need for ventilatory support. It is seen that all patients with poor pre-operative GCS of ≤8 required post-operative ventilator support, while 5 out of 6 patients with GCS 9-12 required ventilator support for longer period (>48 hours). Only 4 out of 62 patients with good pre-operative GCS 13-15 required ventilator support for >48 hrs. The differences between the groups were statistically significant suggesting that the patients with poor GCS required ventilator support (p value < 0.05).

Table 5 shows the association of Preoperative SKALE with post-operative need for ventilatory support. Out of total 70 subjects, majority of the subjects had pre-operative SKALE >8 (72.9%). Out of 51 subjects with pre-operative SKALE >8, 7.1% of the subjects had Ventilator support requirement. Out of 19 subjects with pre-operative SKALE ≤8, 8.6% of the subjects had Ventilator support requirement. There were no statistically significant association seen when pre-operative SKALE was compared with Ventilator support requirement (p= 0.08).

Table 5: Association of Pre-operative SKALE and Requirement of Post-operative Ventilator Support

			Ventilator support requirement			p
			Total	Required	Not required	
Pre-operative SKALE	≤8	n	19	6	13	0.08 NS
		%	27.1%	31.6%	68. 4%	
	>8	n	51	6	45	
		%	72.9%	11.8%	88.2%	
Total		n	70	11	58	
		%	100.0%	15.7%	82.9%	

Chi-square test, *Statistically significant, p<0.05

DISCUSSION

Perioperative morbidity and mortality play a very vital role in determining the quality of life of patients undergoing surgeries. Thorough pre-operative assessment of patients helps to identify and predict the post-operative morbidity/ mortality. There have been many scoring systems proposed to assess such outcomes pre-operatively.

In neurosurgical patients the post-operative morbidity/mortality is two fold due to high risk complications like intraoperative hypertension, haemorrhage, status epilepticus among others.[6,7]

Similar to our patient demographics, Cinotti et al in their cohort study evaluated 1094 patients undergoing brain tumour craniotomy. The mean age was 57 years with standard deviation of 15, all cases included were older than 18 years. Of them 521 (47.6%) were males and 573 were females (52.4%).[8]

In this study, both patients with pre-operative poor GCS of ≤8 required post-operative ventilator support. Similarly, five out of six patients with pre -operative GCS score of 9-12 needed post-operative ventilator support. As against that only 4 out of 62 patients with pre-operative GCS 13 or more needed post-operative ventilation. This suggested that pre-operative GCS is a significant clinical determinant to predict post-operative ventilator support.

In a multicentric survey conducted by Bindra et al also found pre-operative poor GCS to be an important risk factor for considering post-operative elective ventilation.[9]

Zhao et al. confirmed that Glasgow coma scale is a predictor of mortality and functional outcome of comatose patients, how ever suggested other better scores for predicting long term outcome.[10]

In our study, patients with poor pre-operative SKALE of ≤8 had higher incidence of post-operative ventilator requirement for >48 hrs (31.6%) than those with better pre-operative SKALE >8 (11.8%). However, probably due to lesser number of patients, the results were not statistically significant.

As SKALE is a relatively new score, its utility to predict post-operative ventilation need is not yet reported. However, Sacko et al and D'Andrea et al reported higher incidence of post-operative complications in patients with SKALE score of ≤8.[2,11]

KPS is a component of SKALE score and D'Andrea et al and Song et al found that there was higher incidence of post-operative complications in patients with KPS score ≤ 70.[11,12]

Limitations of the study were very few of the

patients were of poor grade pre-operative ly and intraoperative complications like blood loss etc., were not included in studying the association.

CONCLUSION

From this study we conclude that pre-operative GCS is a good predictor of need for post-operative support, irrespective of intra-operative variables with most patients with GCS 12 or below may need ventilator support. We also conclude from this study that, pre-operative SKALE of 8 or less was associated with increased ventilator support and that there is a good scope for further studies are required to prove its usage in predicting post-operative ventilator requirement.

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