

Original Research Article

AIRWAY ASSESSMENT AND MANAGEMENT IN ONCOSURGERY: A PROSPECTIVE STUDY ON ORAL MALIGNANCY PATIENTS

Amala Kudalkar¹, Hemachander Sridharan², Saarani Guha Sarkar³

¹Professor, Seth Gs and KEM hospital, Mumbai, Maharashtra, India. ²Assistant Professor, Tagore medical college and hospital, Chennai, Tamil Nadu, India. ³Assistant Professor, Shri Sathya Sai Medical College and Research Institute, Chengalpet, Tamil Nadu, India.

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Corresponding Author:

Dr. Amala Kudalkar, Professor, Seth Gs and KEM hospital, Mumbai, Maharashtra, India.. Email: Hemachander1993@gmail.com

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ABSTRACT

Background: Airway management in patients with oral malignancy presents unique challenges due to anatomical distortions, restricted mouth opening, and potential airway obstruction. Accurate preoperative assessment is crucial in predicting and managing difficult intubation. This study aims to evaluate airway assessment, techniques used for tracheal intubation, and airway-related complications in patients undergoing oral oncosurgery. Additionally, the predictive value of the El-Ganzouri Risk Index (EGRI) in anticipating difficult intubation was analyzed.

Materials and Methods: This prospective observational study included 55 patients with oral malignancy undergoing oncosurgery. A detailed preoperative airway assessment was conducted, including parameters such as mouth opening, thyromental distance, Mallampati classification, neck movement, prognathism, body weight, and history of difficult intubation. The El-Ganzouri Risk Index was calculated for each patient. The choice of intubation technique was at the discretion of the attending anesthesiologist and was recorded for analysis.

Results: Patients with an EGRI score >4 predominantly underwent awake fiberoptic intubation, while those with a score ≤ 4 were intubated using direct laryngoscopy. This correlation was statistically significant (p = 0.001), with a sensitivity of 100%, specificity of 49.01%, positive predictive value (PPV) of 13.33%, and negative predictive value (NPV) of 100%. A higher number of positive difficult airway predictors was associated with increased intubation attempts (p = 0.32), prolonged intubation time (p = 0.001), and poorer glottic visualization (p = 0.002).

Conclusion: A systematic preoperative airway evaluation is critical in reducing airway-related complications in oral malignancy patients undergoing oncosurgery. The El-Ganzouri Risk Index is a valuable tool for predicting difficult intubation and guiding airway management strategies, thereby improving patient safety and clinical outcomes.

Keywords: Airway management, Difficult intubation, El-Ganzouri Risk Index, Oncosurgery, Oral malignancy, Preoperative airway assessment.

INTRODUCTION

One of the most difficult responsibilities for an anaesthesiologist is providing general anaesthesia for surgery in patients with oral cancer. Because of limited mouth opening, tongue fixation, reduced intra-oral space caused by the tumour, inability to protrude the mandible, oedema from previous surgery, distorted airway anatomy caused by tumour expansion or previous surgery or radiation fibrosis, and the risk of tumour bleeding within the oral cavity when touched, there is a risk of difficult airway. Additionally, tumour growth outside the oral cavity and the presence of pre-existing myocutaneous flaps may make mask holding and ventilation difficult. Maintenance of a patent airway is a primary responsibility of anesthesiologists. Interruption of gas exchange, for even a few minutes, may end up in catastrophic outcomes like brain damage or death. Accurate preoperative prediction of potential difficulty with intubation can help reduce the incidence of catastrophic complications. Intubation of the trachea after standard induction of anaesthesia with IV anaesthetics and muscle relaxants, awake direct laryngoscopy intubation, and awake fiberoptic intubation are all options for securing the airway in such individuals. Many newer techniques and gadgets have been developed to tackle the problem of difficult airway and minimize these complications, such as different laryngoscope blades like McCoy blade, intubating bougies, Supraglottic airway devices, video-laryngoscopes and fiberoptic bronchoscope.

Multiple predictive indices for difficult intubation aim to warn of difficult laryngeal exposure and tracheal intubation. El-Ganzouri and colleagues created a multivariate risk score that combines and stratifies seven variables derived from parameters and observations independently linked to difficult intubation.

The goal of this study is to evaluate the patient's airway, identify the factors associated with difficult intubation and the various techniques used for tracheal intubation and airway related complications occurring during induction & extubation in patients with oral malignancy undergoing oral oncosurgery and to study the extubation practices and also the El-Ganzouri risk index (EGRI) was tested for its ability to predict difficult intubation in patients with oral cancer.

MATERIALS AND METHODS

After approval from the Institutional ethics committee, this prospective observational study was carried out in the operation theatres of a tertiary care centre from November 2018 to August 2020. During this period, patients of age 18 - 65 years with oral malignancy undergoing oncosurgery of 55 patients were included in the study. Age less than 18 years and patients with obvious airway malformation were the only exclusion criteria.

All patients were explained about the study and a written valid informed consent for their willingness to participate in the study was taken. A standard OT protocol for routine pre-anaesthetic checkup was followed and were assessed for airway parameters.

Mouth opening or inter-incisor distance is measured with maximal mouth opening in which mouth opening was classified as ≥ 4 cm or <4 cm. Modified Mallampati Classification was assessed with the patient seated, head held in neutral position and tongue protruded without phonation. The MPC class depend on the structures visualized in the oropharynx. Class I: Soft palate, fauces, pillars & uvula are visible. Class II: Visualization of the Soft palate, fauces & uvula. Class III: visualization of soft palate & base of uvula. Class IV: soft palate is not visible, only Hard palate seen. Head and neck movement was measured by asking the patient to fully extend as a range of motion from full flexion to full extension and was categorised into >90°, 80- 90° or $<\!\!80^{\circ}$ ranges. Ability to prognath was assessed as the ability or inability to bring the lower incisors in front of the upper incisors. Teeth prognation was examined and categorised as an ability or inability to protrude lower incisors in front of upper incisors. Patient weight was categorised as <90 kg, 90-110 kg or >110 kg. History of difficult intubation was classified as absent, questionable or definite.

The multivariate risk index developed by El-Ganzouri combines and stratifies seven variables derived from the parameters and observations individually associated with the difficult intubation (Table 1). After airway examination, El Ganzouri Risk Index ranging from 0 to 12 was calculated and entered into a database and a final score ≥ 4 is indicative of difficult intubation.

Table 1: EL ganzouri multivariate risk index					
Variable	Findings	Points			
Mauth an air -	>4 cm	0			
Mouth opening	< 4 cm	1			
	>6.5 cm	0			
Thyromental distance	6-6.5 cm	1			
	<6cm	2			
	I	0			
Mallamnati saana	П	1			
Wanampau score	Ш	3			
	IV	2			
	>90	0			
Neck movement	80-90	1			
	<80	2			
Ability to prograth	yes	0			
Ability to prognatil	no	1			
	<90 kg	0			
Bodyweight	90-110 kg	1			
	>110 kg	2			
History of difficult intubation	None	0			

questionable	1
definite	2

The method of induction and intubation was at the discretion of the attending anaesthesiologist, whether to do direct laryngoscopic intubation or awake fiberoptic intubation.

For the patients who were planned for direct laryngoscopic intubation, after the induction of anaesthesia, with the head and neck in an optimal position, the laryngeal view was assessed with direct laryngoscopy by experienced anaesthesia personnel. A preferred blade was used by a consultant anaesthesiologist and if required external laryngeal manoeuvre was given. The laryngeal view was classified according to Cormack and Lehane. Grades I and II laryngeal views were considered to be easy intubation and grades III and IV views were considered to be difficult intubation. The best laryngeal view, laryngoscopic blade used, difficulty in mask holding, time for intubation and the change of technique with the no. of attempts and operator was noted.

The patients undergoing awake fibreoptic intubation received, Inj. Dexmedetomidine infusion and airway

anaesthesia to facilitate intubation. Immediately after awake intubation in these patients, they were anaesthetised by administration of Inj. Propofol. Time for intubation and the change of technique with the no. of attempts and operator was noted.

Airway Complications during tracheal intubation and extubation were noted. Patients were monitored postoperatively for difficulty in breathing, stridor, desaturation and any change in voice.

Statistical Analysis

ata was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical variables were determined. Association between variables was analysed by using Chi-Square test for categorical Variables and non-paired 't' test was used for continuous data. P-value <0.05 was considered significant.

Age 48.4 (30 - 65) Gender 33 Female 32 Value 33 Female 22 Mouth Opening 22 <4cm 51 24 cm 51 26 27 6-6.5 28 >6.5 0 Mallampati score (MPC) 0 Class 1 0 Class 2 4 Class 3 25 Class 4 26 Neck Movement 25 >0 3 >0 52 80 90 S0 52 80 0 Ability to Prognath 49 Yes 49 No 6 Bodyweight (kg) 55 90 55 90 55 90 0 110 0 110 0 12 0 13	ratient's characteristics and outcome	
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RESULTS

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No airway complication 51	Nasal bleeding	2
	No airway complication	51

Comparison of predictors with respect to the glottic visualization

Predictor	CL Grading	g				Chi-Square Test	P-Value	
Mouth Opening	CL 1	CL 2	CL 3	CL 4	Total			
Mouth Opening								
< 4cm	0	6	20	0	26			
\geq 4 cm	0	4	0	0	4	9.231	0.002	
Total	0	10	20	0	30			
Mallampati Class								
Class 1	0	0	0	0	0			
Class 2	0	4	0	0	4			
Class 3	0	6	17	0	23	10.043	0.007	
Class 4	0	0	3	0	3	10.045	0.007	
Total	0	10	20	0	30			
Thyromental								
distance (cm)								
<6	0	0	2	0	2			
6 - 6.5	0	10	18	0	28	1.071	0.301	
>6.5	0	0	0	0	0	1.071	0.501	
Total	0	10	20	0	30			
Neck Movement								
>90	0	10	20	0	30			
80 - 90	0	0	0	0	0	-	-	

<80	0	0	0	0	0		
Total	0	10	20	0	30		
Ability to Prognath							
Yes	0	10	19	0	29		
No	0	0	1	0	1	0.517	0.472
Total	0	10	20	0	30	0.517	0.472
Bodyweight (kg)							
<90	0	10	20	0	30		
90 - 110	0	0	0	0	0		
>110	0	0	0	0	0	-	-
Total	0	10	20	0	30		
History of difficult							
intubation#							
None	0	10	20	0	30		
Question level	0	0	0	0	0		
Definite	0	0	0	0	0] -	-
Total	0	10	20	0	30		

El Ganzouri and Method of Induction

		Ν		Chi-		Significant at		
El Ganzouri Index Score	Direct laryngoscopy		Awake Fiberoptic		Total	Square Test	P-Value	5% level
	No.	%	No.	%				
2	4	7.3	0	0.0	4			
4	24	43.6	0	0.0	24			
5	2	3.6	18	32.7	20	47 740	<0.001	Vec
6	0	0.0	7	12.7	7	47.740	<0.001	105
Total	30	54.5	25	45.5	55			

Sensitivity= 100% Specificity= 49.01%

PPV= 13.33%

NPV= 100%

Relationship between El Ganzouri Index Score and CL grading (N=30)

El-Ganzouri Index	CL grading-2		CL grading-3				
Score	Frequency	Percentage (%)	Frequency	Percentage (%)			
<4 (Easy)	04	13.3	00	00			
\geq 4 (Difficult)	06	20	20	66.7			
Total	10	33.3	20	66.7			
Chi square value= 9.23, p value= 0.0002 (Statistically significant)							
	Corr	elation coefficient= 0.56					

Sensitivity= 100%, Specificity= 76.92% PPV= 40% NPV= 100%

Relationship between El Ganzouri Index Score and No. of attempts (N=55)

El Ganzouri Index	No. of attem	pts-1	No. of attempts-2						
Score	Frequency	Percentage (%)	Frequency	Percentage (%)					
<4 (Easy)	04	7.27	00	00					
\geq 4 (Difficult)	41	74.54	10	18.18					
Total	45	81.82	10	18.18					
Chi square value= 0.95 , P value= 0.32 (Statistically not significant)									
	Correlation coefficient= 0.35								

Sensitivity= 100% Specificity= 19.60% PPV= 8.88% NPV= 100%

Relationship between El Ganzouri Index Score and Time taken for intubation (N=55)

El Ganzouri Index Score	No. of patients	Time taken for intubation Mean ± SD			
<4 (Easy)	04 (7.27%)	85 ± 3.53			
\geq 4 (Difficult)	51 (92.72%)	112.25 ± 27.32			
Total	55 (99.99%)				
	t value= 6.46				
P value= 0.001 (Statistically significant)					
Correlation coefficient= 0.74					

Relationship between	El Ganzouri	Index Score and	Intubation	difficulty score	(IDS)	(N=30)	J)
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El Ganzouri Index	IDS- <5	5	IDS	- ≥5	
Score	Frequency	Percentage (%)	Frequency	Percentage (%)	
<4 (Easy)	04	13.33	00	00	
\geq 4 (Difficult)	06	20	20	66.66	
Total	10	33.33	20	66.66	
Chi square value= 9.23, P value= 0.0002 (Statistically significant)					

Sensitivity= 28.57% Specificity= 100% PPV= 100% NPV= 76.92% AUC= 0.27



-Spearman's Rho = r = 0.539, P=0.002.





-Spearman's Rho = r = 0.815, P<0.001

DISCUSSION

Expertise in airway management is crucial for anesthesiologists. A patent airway ensures proper oxygenation and ventilation, and failure to maintain it, even briefly, can be fatal. Anesthesia-related respiratory complications are common, with inadequate ventilation, esophageal intubation, and difficult tracheal intubation being the primary causes.

Difficult direct laryngoscopy occurs in 1.5-8.5% of cases, while failed intubation occurs in 0.13-0.3% of general anesthetics. To mitigate risks, anesthesiologists conduct preoperative airway assessments. In the 1980s, Vijayalakshmi Patil suggested that anatomical measurements of the head and neck could predict airway difficulties. Around

the same time, Seshagiri Rao Mallampati introduced classification system based on visible oropharyngeal structures. Since then, additional predictors such as interincisor gap, sternomental distance, and neck mobility have been studied. However, these tests alone lacked predictive accuracy, leading to the development of combined indices like Wilson's score, Lemon's ARNE score, and the El-Ganzouri multivariate risk index (EGRI). El-Ganzouri et al. introduced EGRI in 1996 to predict difficult airway management. Their study reported a sensitivity of 43.6% and specificity of 91.7%, with an AUC of 0.76, demonstrating its superior ability to predict ventilation difficulties. A score of 4 or higher was associated with difficult intubation.

In our study, we retrospectively analyzed the correlation between EGRI and the choice of intubation technique. In the direct laryngoscopy group (n=30), 4 patients had an EGRI score of 2, 24 had a score of 4, and 2 had a score of 5. In the awake fiberoptic intubation group, 18 patients had a score of 5, while 7 had a score of 6.

We found that when the EGRI score was <4, CL grading was 2, indicating easy intubation. Conversely, when the EGRI score was \geq 4, 66.66% of patients had CL grading 3, indicating difficult intubation. This correlation was statistically significant (p=0.0002, Sensitivity=100%, Specificity=40%, PPV=76.92%, NPV=100%, Spearman's Rho r=0.539).

Patients with an EGRI score ≤ 4 underwent direct laryngoscopy, while those with a score >4 underwent awake fiberoptic intubation (p<0.001). The attending anesthesiologists were unaware of EGRI scores, eliminating bias.

Cortellazzi et al. conducted a similar study comparing intubations with Macintosh laryngoscopy (994 cases) and videolaryngoscopy (843 cases). Their analysis confirmed that an EGRI score \geq 4 had a sensitivity of 43.6% and specificity of 91.7% in predicting both difficult ventilation and intubation.

Our findings align with those of Antons and Sigita, who assessed the predictive value of EGRI for difficult laryngeal exposure using the C-MAC videolaryngoscope. In 29 patients, an EGRI cut-off of 2 had a sensitivity of 54.2%, specificity of 80%, PPV of 26.7%, NPV of 92.9%, and an AUC of 78.3%.

Bergesio et al. utilized EGRI in a retrospective study of 24,500 adult patients to predict difficult intubation. Their findings confirmed that preoperative EGRI scores were strongly correlated with difficult intubation.

Comparison of EGRI and Intubation Difficulty Score (IDS) Among patients undergoing direct laryngoscopy (n=30), 20 had difficult intubation (IDS \geq 5) with an EGRI score \geq 4. This correlation statistically significant (p=0.0002,was Sensitivity=28.57%, Specificity=100%, PPV=100%, NPV=76.92%, AUC=0.27). No prior studies have compared these two indices.

Conclusion The El-Ganzouri risk index is a reliable predictor of difficult intubation and offers significant value in preoperative airway assessment.

Strength of the study

Most of the information about airway management in oral malignancy is available in form of the case report, case series and retrospective studies and not many prospective studies so far are conducted for airway management and complications related to oral malignancy patients undergoing oncosurgery. Hence, we decided to undertake this prospective studv.

Limitations of the study

Our study was an observational study and not a Randomised Control Trial (RCT) and the sample size was small

CONCLUSION

- Airway management in oral malignancy patients poses unique challenges and one should be thoroughly prepared for any anticipated airway difficulty. So, a thorough Preoperative evaluation of the airway in patients with oral malignancy is important.
- El Ganzouri risk index Score can be used to anticipate the difficult intubation. The method of anaesthesia induction must be tailored to meet individual patients' anatomical and radiological variations.
- With the proper method of induction, airway complications can be reduced.
- El Ganzouri risk index Score is a better predictor of difficult intubation.

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