Are Bedside Predictors of Difficult Intubation Really True Indicators in Head and Neck Cancer Patients?

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ABSTRACT

BACKGROUND

Unanticipated difficult airway can lead to serious morbidity and mortality in Head and Neck cancer surgical patients. We wanted to determine the incidence of difficult laryngoscopy, difficult intubation and their correlation with routine bedside predictors of difficult airway.

METHODS

In this prospective observational study, 30 patients posted for elective oral and neck cancer surgery were assessed preoperatively and history of addiction, previous head and neck chemoradiation therapy, Mallampati grade, inter-incisor distance, thyromental distance and neck movements were noted. After standard anaesthetic induction, Cormack Lehane Grade was noted on first direct laryngoscopy attempt and intubation difficulty was assessed using intubation difficulty scale on the basis of seven variables.

RESULTS

Tobacco chewing was found to be a major risk factor for developing H & N cancer in 90% of subjects. Incidence of difficult laryngoscopy was 46.66% and incidence of difficult intubation was 20% in our study. On doing univariate logistic regression analysis, Cormack Lehane grade >=3 was found to have significant correlation with difficult intubation but on assessing independent correlation using multivariate regression analysis, none of the predictors had any significant correlation with difficult intubation.

CONCLUSIONS

The routine bedside predictors of difficult airway are not accurate indicators of difficult intubation in Head & Neck cancer surgical patients.

KEYWORDS

Bed Side Predictors, Difficult Intubation, Difficult Laryngoscopy, Head and Neck Cancer, Intubation Difficulty Score (IDS)

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BACKGROUND

Head and neck (H & N) cancer is emerging as a major cancer burden in India where it ranks among the top three types of cancers in the country and accounts for over 30% of all cancers in India.[1] The incidence of difficult intubation (DI) is found to be higher in H & N cancer patient than in general population (15.7% vs. 2.5%).[2] Delay in intubation or not able to intubate a patient can lead to serious morbidity and mortality. So it's always better if an anaesthesiologist can predict DI accurately and be prepared in advance, so as to avoid unexpected complications. But the various bedside predictors of difficult laryngoscopy (DL) and difficult intubation (DI) has been tested and developed for general population and their use has been just extrapolated to H & N cancer patients.[3,4] So in this study we examine their significance in predicting DL & DI in H & N cancer patients.

Objectives

1. Determine the incidence of difficult intubation as predicted by bedside tests done in pre-anaesthetic check up
2. Determine the incidence of difficult laryngoscopy (Cormack Lehane >=3)
3. Determine the true incidence of difficult intubation as assessed using 7-point intubation difficulty score (IDS).[5]
4. Determine the predictive value of routine bed side predictors of airway assessment {Mallampati grade (MPG), inter-incisor distance (IID), Thyro-mental distance (TMD), neck movement (NM)} for predicting difficult intubation.

This is a prospective single arm observational study conducted among 30 consecutive patients undergoing surgery (composite resection for oral cancers / radical neck dissection for large neck node masses with unknown primary) under General Anaesthesia with tracheal intubation. Patients with cancer of thyroid, larynx, parotid gland, orbit and sinuses, and patients who have already undergone tracheostomy pre-operatively were excluded from the study.

METHODS

Qualified anaesthesiologist conducted preoperative assessment and recorded parameters such as weight, co-morbid conditions, addictions, modified Mallampati grading (MPG), inter-incisor distance (IID), neck movements (NM), and thyromental distance (TMD).

After obtaining Institutional Ethics Committee approval and written informed consent. All patients were premedicated with inj. midazolam 1 mg I.v and inj. xylocard 75 microgram I.v half an hour before surgery. In the operating room, standard monitoring was established (electrocardiogram, non-invasive blood pressure, pulse oximetry, and capnography) and patients were positioned in sniffing position. Difficult airway cart was kept ready. After pre-oxygenation with 100% Oxygen for 3 min, anaesthesia was induced with injection Fentanyl 2 µg/kg I.v and injection Propofol 2 mg/kg I.v. After performing check ventilation, patients were given either inj. Succinyl Choline 1.5 mg/kg I.v or inj. Vecuronium 0.1 mg/kg I.v for intubation. Intubation was performed by the experienced anaesthesiologists (>5 years) using Macintosh 3 or 4 no. blade. The laryngoscopic view was graded by Cormack and Lehane (CL) grading without optimal external laryngeal manoeuvre (OELM) at first attempt as Grade I: Visualization of the entire laryngeal aperture, Grade II: Visualization of parts of the laryngeal aperture of the arytenoids, Grade III: Visualization of only the epiglottis, and Grade IV: Visualization of only the soft palate.

Successful intubation was confirmed by bilateral auscultation of the lungs and capnography. Immediately after the endotracheal intubation, the points for each of the seven IDS parameters were collected, and the IDS score for each patient was calculated.

Intubation difficulty was assessed by intubation difficulty scale (IDS) developed by Adnet et al. on the basis of seven variables associated with difficult intubation.[5] They were as follows: N1, number of additional intubation attempts; N2, number of additional operators; N3, number of alternative intubation techniques used; N4, glottic exposure as defined by Cormack and Lehane (grade 1 – N4 = 0; grade 2 – N4 = 1; grade 3 – N4 = 2; and grade 4 – N4 = 3); N5 – lifting force applied during laryngoscopy (N5 = 0 if inconsiderable and N5 = 1 if considerable, as assessed subjectively); N6 – need to apply external laryngeal pressure to improve glottic pressure (N6 = 0 if no external pressure or only the Sellick manoeuvre was applied and N6 = 1 if external laryngeal pressure was used); and N7 – position of the vocal cords at intubation (N7 = 0 if abducted or not visible and N7 = 1 if adducted). The IDS score is the sum of N1 through N7. A score of 0 indicates easy intubation, 1 to 5 indicates slight difficulty and >5 indicates moderate to major difficulty.

RESULTS

30 consecutive head and neck cancer patients undergoing surgery under General anaesthesia with tracheal intubation were prospectively analysed. Tobacco Chewing (90%) is the Major Risk Factor in Developing Oral Cancers.[6] Though there is high incidence of prediction of difficult airway as per MPG (56.66%), IID (33.33%) and TMD (23.33%) but true incidence of difficult laryngoscopy (CL>=3) is found to be 46.66%, and the overall incidence of difficult intubation as calculated by IDS score was found to be in 20% of our study population. The incidence of easy intubation (IDS0) is 3 (10%), slightly difficult intubation IDS (0-5) is 21 (70%), and difficult intubation was found to be in 6 (20%) patients. There were no failed intubation or surgical airway performed. On analysing components of IDS score, OELM was performed in 24 (80%) patients and use of intubating bougie was the most commonly employed alternative

technique in 5 (16.67%) patients. Subjective increase in lifting force during laryngoscopy was reported in 16 (53.33%). Only 1 patient had right cord fixity due to disease and previous radiation given. Various airway parameters were compared between easy (IDS<6) and difficult (IDS>=6) IDS score using univariate logistics regression analysis in following table. On univariate logistic regression analysis, only Cormack Lehane grade was found to be an independent predictor of difficult intubation.

Overall Patient Data	
Age	54.90±9.40 yrs.
Gender ratio	1.7: 1
Comorbidity	17/30 (56%)
Tobacco	27/30 (90%)
Alcohol	3/30 (10%)
Previous Chemoradiation	2/30 (6.67%)
Site of Disease	
A) Oral Cavity	28/30 (93.33%)
B) Oropharynx	1 (3.33%)
C) Hypopharynx	2 (6.66%)

Table 1. Demographic and Patient Characteristics of the Study Population

Airway Characteristics	
Type of Intubation	
A. Nasal	25/30 (83.33%)
B. Oral	5/30 (16.66%)
Mallampati Grading	
A. 3≥	17/30 (56.66%)
B. <3	13/30 (43.33%)
Inter-incisor distance	
A. ≤ 2 fingers	10/30 (33.33%)
B. >2 fingers	20/30 (66.66%)
Neck movement	
A. <80%	0 (0%)
B. >80%	30 (100%)
Thyro-mental distance	
A. ≤ 3 fingers	7/30 (23.33%)
B. >3 Fingers	23/30 (76.64%)
Cormack and Lehane Grade	
A. >=3	14 (46.67%)
B. <3	16 (53.33%)

Table 2. Airway Characteristics of the Study Population

Intubation Difficulty Score	No. of Patients (n=30)
6≥ (Difficult)	6 (20%)
<6 (Easy)	24 (80%)
1-5	21 (70%)
0	3 (10%)

Table 3

Bedside Clinical Predictor	IDS Score 6≥ (Difficult)	IDS Score <6 (Easy)	p
Mallampati Grading			
A. 3≥ (n=17)	2	15	p=0.1972
B. <3 (n=13)	4	9	
Inter-incisor distance			
A. ≤ 2 fingers (n=10)	1	9	p=0.3329
B. >2 fingers (n=20)	5	15	
Thyro-mental distance			
A. ≤ 3 fingers (n=7)	1	6	p=0.6659
B. >3 Fingers (n=23)	5	18	
Cormack and Lehane Grade			
A. ≥3 (n=14)	6	8	p=0.0006
C. <3 (n=16)	0	16	

Table 4

Predictor	Adjusted Odds Ratio	95% Confidence Interval	p
MPG Grade 3 and 4	0.3000	0.0454-1.9816	0.2113
Inter-incisor distance ≤ 2 fingers	2.7386	0.1571-47.7251	0.4896
Thyro-mental distance ≤ 3 fingers	3.4665	0.3235-37.1430	0.3042
Cormack and Lehane Grade 3≥	2.6520	0.2833-24.8286	0.3927

Table 5

Bedside Clinical Predictors of intubation difficulty (IDS score 6≥) using Multivariate Logistic Regression Analysis: On multivariate logistic regression analysis, no parameter showed any association with difficult intubation. In our study group only two patients were post chemoradiation and both had difficult intubation (IDS 6 and 10).

DISCUSSION

India contributes up to 57.5% of the global head and neck cancer burden.[7] Head and neck cancers account for 30% of all newly diagnosed cases.[1] In our study 20% patients had moderate to major and 70% had minor intubation difficulty. Arne et al[2] found difficult intubation in 15.7% of head and neck cancer patients undergoing surgery. Higher incidence of DI in our study could be due to more advanced stage cases in our study.[7] Adnet et al.[8] reported minor intubation difficulty in 37% and moderate to major in 8% of patients undergoing General Surgery. It is imperative to predict and prepare for difficult intubation in head and neck cancer surgery. We found that MPG (>=3) and IID (<=2 finger breadths) incidence is 56.66% & 33.33% in our study which is way above the true incidence (20%) of DI. In awake patient, restricted mouth opening could be due to disease extending to masticator space, fibrosis (Chronic tobacco chewing, or radiation induced), reflex contraction and pain. In our study mouth opening was improved significantly after induction of anaesthesia and neuromuscular block as evidenced by easy introduction of laryngoscope blade during direct laryngoscopy[9] .So when restricted mouth opening is due to pain and reflex contraction, false high prediction of difficult airway can be achieved on using only MPG and IID as bedside tests. We also tested TMD and neck movements. None of the patients had restricted neck movements. TMD does not need patients' voluntary effort and thus we hypothesized that it can accurately predict the DI. But though TMD was less in 23.33% patients but on univariate and multivariate regression analysis even TMD did not show significant correlation. Similarly, in a study done by Patrick Wong et al.[10] on 818 patients, difficult intubation occurred in 12.6% of patients in which they have included both benign and malignant ENT cases and have used CL>=3 as measure of DI. They found that bed side predictors of DI yielded poor sensitivity. Factors significantly associated with difficult intubation were: history of difficult airway; previous head or neck radiotherapy treatment; presence of airway symptoms; presence of moderate or severe limited neck movement; and short interdental distance. Shiga et al[4] did a meta-analysis to determine the diagnostic accuracy of bedside tests for predicting difficult intubation in patients with no airway pathology. Thirty-five studies (50,760 patients) were selected from electronic databases. The overall incidence of difficult intubation was 5.8% (95% confidence interval, 4.5-7.5%). Screening tests included Mallampati oropharyngeal classification, thyromental distance, sternomental distance, Interincisor distance, and Wilson risk score. The most useful bedside test was found to be a combination of Mallampati classification and thyromental distance (positive likelihood ratio, 9.9; 95% confidence interval, 3.1-31.9). Combinations

of tests add some incremental diagnostic value in comparison to the value of each test alone.[4] On doing direct laryngoscopy we assessed Cormack Lehane grade on first attempt without OELM. We found that incidence of DL (CL>=3) was 46.67% which on univariate regression analysis showed a significant correlation with DI. But even DL has no significant correlation with DI on doing multivariate regression analysis. This can be explained by the fact that we have used IDS score, which has 7 components and CL has only a small contribution in calculating the final DI incidence. Although, difficult laryngoscopy is an important component of difficult intubation, the two may not always be necessarily correlated .In our study only 2 patients had received chemoradiation (RT) prior to surgery and both had difficult DL & DI which is in concordance with study done by P. Wong et al. In oral cancer surgery patients.[11] But in another study done by Gang Zeng et al[12] in 472 patients that previous treatment with H & N RT was not associated with additional risk of difficult tracheal intubation. He also analysed that Mallampati score may be a sensitive measurement for difficult tracheal intubation in this patient population. There are various limitations in our study. First is the small sample size of patients which makes it difficult to give any recommendation. But being a pilot study, this can pay way to further studies to find a true predictor of DI in H & N patients. Secondly, we have not included the data regarding presence of airway symptoms which can distinguish between true and false restricted mouth opening. So may be assessment of IID and MPG should be undertaken after the effect of reversible causes has been taken care of. Thirdly, tests were assessed alone and may be their predictive power can be increased when used in combination.[4] We recommend doing future studies on including imaging studies while predicting DI in H & N patients. In few but sparse studies, authors have tried other parameter like virtual endoscopy,[13] USG of airway[14,15] and MRI neck[16] findings for assessment of DI in H & N cancer patient.

CONCLUSIONS

Incidence of difficult intubation was found to be high but none of the routine bedside predictors of difficult airway evaluated showed any significant correlation in H & N cancer patients in our study as these patients have different set of requirements and difficulties, so the bed side predictors of difficult airway used for general patients cannot be used for this subset of patients and there is a need for better and accurate predictors.

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