INTUBATION IN OBESE PATIENTS;
DIAGNOSTIC ACCURACY OF NECK CIRCUMFERENCE TO THYROMENTAL DISTANCE RATIO FOR DIFFICULT INTUBATION IN OBESE PATIENTS

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ABSTRACT… Objectives: To determine the diagnostic accuracy of ratio of neck circumference to thyromental distance to predict the difficult intubation in obese patients by using Intubation difficulty scale as gold standard. **Study Design:** Cross-sectional study. **Place and Duration of Study:** Jinnah Hospital, Department of Anesthesia, Lahore from August 2013 to July 2014. **Methodology:** 250 patients were included. Ratio of neck circumference to thyromental distance was measured during preoperative assessment in all patients. **Results:** There were 59.2% males and 40.8% females with mean age of patients was 37.13 ± 11.64 years. 19.2% patients showed difficult intubation and 80.8% easy. Sensitivity of NC/TM was 89.58% and Specificity 72.77% with positive predictive value of 43.88% and Negative predictive value of 96.71%. **Conclusion:** Neck circumference to thyromental distance ratio is sensitive method for determining the difficult intubation among obese patients.

Key words: Obesity, Difficult Intubation, Neck Circumference to Thyromental Distance Ratio, Intubation Difficulty Scale.

INTRODUCTION

Difficult airway and tracheal intubations are major concern of anesthetists, ranging 1.5% to 8% of patients undergoing general anesthesia[1] and associated with perioperative morbidity and mortality.[2] Intubation related morbidity included airway damage, injury to oral cavity, tooth breakage, edema of the airway, bleeding in air way, increased stress response, increase in BP, heart rate, intra cranial pressure, hypoxia leading to temporary or permanent neurological damage. Almost all the anesthesiologists encounter these complications after unanticipated difficult intubation. Difficult intubation is more common in obese patients than that of non-obese and at the same time obese patients have more co morbidities like hypertension and diabetes mellitus which can worse the morbidities resulting from laryngoscopic stress response. Reported incidence of Post intubation hoarseness (PH) and sore throat (ST) are in range between 3-44% which is a significant morbidity. Difficult intubations usually followed by multiple attempts

which indirectly means more complications, In the past many tests have been devised to predict the unanticipated difficult intubation in obese patients as mallampati class[3,4], modified mallampati class, upper lip bite test, thyromental distance, sterno-mental distance, jaw protrusion, body mass index[5], neck circumference to thyromental distance ratio[6], short neck and Wilson score[1] and obstructive sleep apnoe.[7] Above mentioned tests do not have significant high accuracy for the prediction of difficult intubation in obese patients.

Ratio of Neck circumference to thyromental distance is recently being investigated and used for the prediction of difficult intubation. Kim et al[6] observed that the frequency of difficult intubation is more common in obese patients than in non-obese patients 13.8% vs. 4.8% so concluded that there is significant large amount soft tissue in neck which can be observed by the ratio of neck circumference to thyromental distance in obese patients. They compared intubation difficulty scale with that of NC/TM ≥ 5.0 and predicted

the sensitivity of 88.2 %, specificity of 83.0% and positive predictive value of 45.5 % and negative predictive value of 97.8%.

METHODOLOGY

We conducted this cross sectional study in the Department of Anaesthesia, Jinnah Hospital Lahore over a period of one year from August 2013 to July 2014. Two hundred and fifty patients were included. Preoperative assessment was done in the pre-operative area and the ratio of neck circumference to thyromental distance was calculated. Patients age 18-80 years, BMI >27.5, ASA class I and 2 and elective surgery were included. Those patients undergoing general anesthesia without tracheal intubation, inability to open mouth or to move neck due to existing trauma, medical condition, pre-existing disease causing distortion of airway, edentulous patients, abnormal Glasco Coma Scale and cervical supine fracture were excluded from the study. Participants received a standard induction sequence with propofol 1.5-2.0 mg/kg, Atracurium 0.5mg/kg, nalbuphine 0.1-0.2mg/kg, isoflurane 1.0 % and 100% oxygen. The patients assessed in preoperative holding area using neck circumference to thyromental ratio. The NC/TM ratio noted down and subjects graded accordingly with difficult intubation. A larygyoscopy performed by an experienced anesthetist, who was blind to preoperative neck circumference to thyromental ratio, with Macintosh blade 3 or 4. Difficult intubation on laryngeal view graded according to IDS the finding also be recorded by the consultant anesthesiologist. Patient intubated and rest of routine anesthesia continued. Difficult intubation on IDS and on NC/TM ratio cross tabulated for further assessment of diagnostic accuracy. All data was entered into SPSS Version 11.0. Accuracy of NC/TM ratio is determined by calculating sensitivity, specificity, positive predictive values along with negative predictive values for the prediction of difficult intubation with IDS as gold standard.

RESULTS

There were 148 (59.2%) males and 102 (40.8%) females with mean age of patients was 37.13±11.64 years. Mean height of patients was 169.70±5.51 cm, minimum height of patient was 156 cm and maximum 183 cm. Mean weight was 84.12±7.30 kg, minimum weight 71.0 Kg and maximum 110 Kg. Mean BMI of patient was 29.20±2.04 Kg/m² (Table-I). The sensitivity of NC/TM 89.58% and Specificity 72.77% with positive predictive value of 43.88% and Negative predictive value of 96.71% (Table-II).

Variable	No.	%
Age (years)		
18 – 30	96	38.4
31 – 40	45	18.0
41 – 50	69	27.6
51 -60	40	16.0
Gender		
Male	148	59.2
Female	102	40.8
Height (cm)	169.70±5.51	
Weight (kg)	84.12±7.30	
BMI (kg/m²)	29.20± 2.04	

Table-I. Descriptive statistic of the patients

NC/TM Ratio	Difficult Intubation on IDS Scale		Total
	Yes	No	
Difficult Intubation	43	55	98
Easy Intubation	5	147	152
Total	48	202	250

Table-II. NC/TM Ratio VS IDS

Sensitivity: 89.58 %
Specificity: 72.77 %
Positive Predictive Value: 43.88 %
Negative Predictive Value: 96.71 %

DISCUSSION

Present study showed that NC/TM is a better predictor of difficult intubation and should be done in the patients particularly in obese patients where increasing neck soft tissues could be problematic in intubation and even in mask ventilation due to tongue fall. It is responsibility of anaesthetist[7] to secure airway safely. Due to poor airway assessment many serious complications has been reported which can be prevented by careful assessment and planning before anaesthesia[8] Poor airway management has been recognized as a serious patient safety concern

for more then thirty years, highlighting the need for careful airway assessment pre preoperatively.[8]

Difficult tracheal intubation accounts for 17% of the respiratory related problems. .In fact most of anaesthetic deaths are due to the situations of cant intubate and ventilate it is up to 28%[9] In fact up to 28% of all anaesthesia related deaths are secondary to the inability to mask ventilation and intubation.[9]

The obese patients are big challenge for surgeon and anaesthetist. It is very import to understand pathophysiological effects of obesity to avoid lethal complications due to difficult airway.[10] The anaesthesiologist must recognize increased risks and comorbidities inherent to the obese patients which can further compromise patients during unanticipated difficult intubation, optimizing multisystem function in the perioperative period that leads to uneventful outcomes.[10]

It is difficult to do mask ventilation, laryngoscopy and intubation due to large tongue, limited movement at atlantoaxial joint and presternal fat deposits that cause difficulty in insertion of laryngoscope and cause difficulty[11] we can avoid this problem by using small handle blade.

It is fact that if we anticipate the difficult airway we can manage it in a better way with full preparation and risk stratification. Various predictors for difficult airway anticipation has been used i.e. mouth opening, broken or absent denture, mallampatti, upper lip bite test, TM distance ratio, sternohyoid distance, neck extension, neck circumference, a lot of studies have been performed to establish their accuracy for difficult airway anticipation some experts prefer one on another and others do vice versa but there is point where almost all experts agreed and that is together all these predictors shows better result than any one predicted alone.

As obese patients have more chances of difficult airway, so they need more concentration and some new predictor for anticipation of difficult airway. In this aspect people having excessive soft tissue around the neck are problematic and

started work on that to identify the problem and later use it as predictor to anticipate difficult airway. Some started to measure neck circumference at cricoid level and others used ultrasound for this purpose but aim was to quantify the excessive soft tissue around the neck which can further make the airway difficult.

A new predictor for difficult airway anticipation with a numerator of NC and a denominator of TM distance (NC/TM), was developed and evaluated as a new index on the assumption that obese patients with both a large neck circumference and a short neck might be more difficult to intubate than patients with a large neck circumference or a short neck alone.

Our study has shown the incidence of difficult airway is 19.2% in obese patients. This is comparable to Castro et al[12] reported the incidence of difficult intubation 20.75% in obese population. Shiga et al[13] also stated the incidence of difficult airway 15.8% in obese population compared to 5.8% in the general population. In another study by Juvin et al[14] reported incidence of difficult intubation rate of 15.5% in obese patients and 2.2% in lean patients.

The present study showed that NC/TM ratio has sensitivity 89.58%, specificity 72.77%, positive predictive value 43.88% and negative predictive value of 96.71%. Our results are comparable to Kim et al[6] who has shown that NC/TM has sensitivity of 88.2%, specificity of 83.0% and positive predictive value of 45.5 % and negative predictive value of 97.8 % in predicting difficult airway in obese patients.

We have compared NC/TM ratio to intubation difficulty scale (IDS) as gold standard for evaluation of difficult airway. Several studies have already used it as gold standard in their study.[15] IDS have shown to be the best indicator of total intubation difficulty assessment.[16] We found that NC/TM is good test for prediction of difficult intubation and should be done in obese patients.

CONCLUSION
Neck circumference to thyromental distance ratio

is sensitive method for anticipation of difficult intubation in the obese patients.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Liaqat Ali	Data collection	
3	Asif Nadeem	Statistical analysis & guidance in writing the manuscript.	