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THE DIFFICLUT AIRWAY: INCIDENCE AND PREDICTORS IN LEAN VS. OBESE PATIENTS

Anaesthesiology

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ABSTRACT

OBJECTIVE: The primary aim of the following study is to find out the incidence of difficult intubation in obese and lean patients using IDS and secondary aim is to assess the performance of bedside screening tests to predict difficult intubation, mask ventilation and laryngoscopy in obese and lean patients.

MATERIAL AND METHOD: A prospective, observational cohort study of 100 patients requiring general anesthesia were categorized into 50 each based on body mass index (BMI) into lean (BMI <25 kg/m2) and obese (BMI ≥25 kg/m2) groups. IDS score ≥5 was termed as difficult intubation. Pre-operative airway assessment included MMP score, mouth opening, thyromental distance, sternomental distance. Patients having difficulty in mask ventilation and laryngoscopy was recorded.

RESULTS: Obese patients had a higher incidence of difficult facemask ventilation and laryngoscopy. Physical status, prevalence of Comorbidities, neck circumference, SMD, and Mallampati index were higher in the obese group. Obese patients were slightly more difficult to intubate than lean. Age >40 years, NC >35 cm, SMD <12.5 cm and Comorbidities were factors which were associated with IDS ≥5. There was no significant difference regarding grading of laryngoscopy between the two groups.

CONCLUSION: Obese patients are difficult to mask ventilate and slightly more difficult to intubate than lean patients but have no difference regarding laryngoscopy. It is preferable to have another skilled anesthesiologist while intubating an obese patient.

KEYWORDS

Difficult intubation, intubation difficulty scale, lean, obese

INTRODUCTION

Obesity can be defined as excess of fat in the body. The incidence of obesity has increased almost worldwide. In India the prevalence rate is 16% for the female and 12.1% for the male population.[1] Internationally, a BMI over 25 kg/m2 is considered overweight.[2] Due to genetic tendency of Indians towards abdominal obesity and its associated risk of related lifestyle diseases like Diabetes & Heart Disease, the Health Ministry of India redefined overweight and obesity as BMI ≥23 and ≥25, respectively.[3]

Obesity is a growing problem globally and anaesthesiologists frequently encounter such patients whose airway management can be challenging due to impaired respiratory mechanics. Several reviews have reported that endotracheal intubation is more difficult in obese than in lean patients.[4,5] However, this assertion remains debated because some of studies have found no evidence about difficulty in obese[6,7] One of the reasons for these variations is, several definitions are there for term difficult intubation which varies between authors. So, an objective scoring system has been proposed to assess the intubation difficulty: the intubation difficulty scale (IDS), which has been validated.[8] This score uses several variables associated with difficult intubation.

Hence the primary objective of study was to identify independent predictors to predict and diagnose difficult airway in obese & lean patients during the preoperative period, through the correlation between preanesthetic evaluation and associated comorbities.

The secondary objective was to find out the incidence of difficult intubation using IDS and to assess the performance of bedside screening tests to predict incidence of difficult mask ventilation & laryngoscopy in obese and lean patients.

PATIENTS SELECTION

Patients who were 15 to 45 years old, with ASA physical status 1 or 2, who were scheduled to undergo elective general surgery under general anaesthesia of > 1 h duration at Jhalawar Medical college, Jhalawar randomly enrolled into the study.

Patients were excluded from the study are of ASA physical status III, IV and Age <18, >60 yrs Emergency surgery and Patients with upper airway pathology (tumors, maxillofacial fractures), cervical spine injury, thyroid or neck swelling were excluded. Pregnant females were not included.

Study approval was obtained from College and Hospital ethical committee and all patients provided written informed consent before enrolment.

STUDY DESIGN:

This was a prospective, observational study .100 Patients of ASA Physical Status I and II patients of either sex, aged between 18 and 60 years posted for surgery requiring general anaesthesia were enrolled for the study.

SAMPLE SIZE:

Total sample size was 100 patients. First group (Obese) included 50 patients (BMI ≥ 25kg.m-2).Second group (Lean) included 50 patients with (BMI < 25 kg.m-2)

MATERIAL & METHODS

Demographic variables (age, sex, height, weight, BMI, and ASA physical status) & Clinical predictors {OSAS (self-reported snoring or family history of snoring, daytime sleepiness and apnoea during sleep) treated or untreated Comorbidities evaluation done.

The anatomical parameters assessment was based on the modified Mallampati index, measurement of neck circumference, thyromental and sternomental distances, mouth opening recorded. A previous history of difficult intubation was noted.

All patients were maintained in fasting state for about 6-8 hours. In the operation theatre, the patients were positioned in the sniffing position. All routine monitors which included electrocardiogram, pulse oximetry, and non-invasive arterial pressure was used for each patient. Premedication was given after connecting monitors, Patients was pre-oxygenated with 100% oxygen through a facemask for 3 min. Anaesthesia was then induced with propofol 1-2 mg/kg The ability to mask ventilate was checked and paralyzed with suxamethonium 1.5 mg/kg laryngoscopy and intubation was performed after complete muscle relaxation. BURP was applied when the intubator requested this for a better view at laryngoscopy. A size 3 Macintosh laryngoscope

blade was used for the first laryngoscopy in each case.

All tracheal intubations were performed by two anaesthetists with more than 2 yrs of experience. Grading done by CL Grading.

The whole intubation process was scored by using seven measurable variables of IDS.
N1 = Every additional attempt adds 1 point,
N2 = Every additional operator adds 1 point,
N3= Each alternative technique adds 1 point:

Repositioning of patient, change of materials (blade, endotracheal tube, addition of stylette) or use of another technique-fibreoptic/laryngeal mask airway

The IDS score is the sum of N1 through N7.

The two groups of patients were classified further according to the IDS score. Those with an IDS score of ≥5 and <5 were defined as the difficult and easy groups, respectively.

Table1: Intubation Difficulty Scale.

Parameter	Score
No. of attempts>1	N1
No. of operators>1	N2
No. of alternative techniques	N3
Cormack	
Grade I	N4=0
Grade II	N4=1
Grade III	N4=2
Grade IV	N4=3
Lifting force required	
Normal	N5=0
Increased	N5=1
Laryngeal pressure	
Not applied	N6=0
Applied	N6=1
Vocal cord mobility	
Abduction	N7=0
Adduction	N7=1

STATISTICALANALYSIS

The analysis was carried out using Statistical Package for Social Science (SPSS version 16.0). BMI was divided into three subgroups as <25, 25-35, >35 and Age was divided into <45 years and >45 years for interpretation purpose. Chi-square test ,Fischer's test, student's t test used wherever appropriate. P < 0.05 was considered to be statistically significant.

RESULTS

The demographic data and patient assessment are as shown in Table 2. There was a significant difference between obese and lean groups regarding Age, Sex, Weight, BMI (P<0.05)

Table 2: Demographic Data

Parameter	Obese *(N=50)*	Lean *(N=50)*	P Value
Age (years) 18-39	16	28	0.016
>40	34	22	
SEX Male	19	27	0.026
Female	31	23	
Weight	75.9±10.1	61.9± 11.3	<0.05
Height	158.8±11.0	162.1±10.9	>0.05
BMI	29.89±4.7	21.77±2.27	0.001

Prevalence of the Anatomical & Clinical Predictors for Airway Assessment

The higher prevalence of Comorbities (snoring, hypertension, and type 2 diabetes mellitus) and OSA in obese patients was statistically significant ($p < 0.05$).

There was a **significant difference** between obese and lean groups regarding **Modified Mallampati classification** (MMC) P=0.013 , **neck circumference** (NC) P=0.002 and **Mouth Opening** P=0.0156 .There was no difference between groups regarding thyromental and sternomental distances

Significant difference in Difficult mask ventilation & IDS Score(P<0.05)

Non Significant in CL Grading and Hypoxic episodes (P>0.05)

Table 3 : Anatomical & Clinical Evaluation

Parameter	Obese N=50	Lean(N=50)	P value
MMC I,II	40	49	0.013
III,IV	10	1	
MO (cm)	4.76±0.10	4.89±0.36	0.0156
NC(cm)	35.84±2.811	32.95±2.06	0.002
TMD (cm)	6.49±1.07	6.54±1.09	0.781
SMD (cm)	13.12±1.78	13.40±3.07	0.578
Difficult Mask Ventilation	7	1	0.026
C L Grading ½	43	44	0.748
¾	6	5	
IDS <5	40	48	0.0138
≥5	10	2	
Hypoxic episodes	4	3	0.695
OSA (Present)	31	8	0.0002
(Absent)	19	42	
Comorbidities (Present)	22	12	.034
(Absent)	28	38	

Incidence for Ventilation, Laryngoscopy, Intubation

Obese group had a higher incidence of difficult mask ventilation and greater IDS score.

There was no difference regarding grading of laryngoscopy between the two groups. Obese patients were slightly more difficult to intubate & mask ventilate than lean (P <0.05).

Difficult intubation was observed in 20% obese and 10% lean. The significant predictors of difficult intubation were **Age of >45 years, NC>35cm SMD <12.5 cm, MMC grade III/IV of IDS>5 (difficult intubation)with** (P<0.05)

Difficult mask ventilation was encountered in 14% obese and 2% lean patient ($P < 0.05$). **NC >35cm, SMD <12.5 cm, TMD<6.5 Weight >70 kg , OSA** were significant **predictors of difficult mask ventilation** with (P<0.05)

Difficult laryngoscopy was observed in 20% obese and 4% lean patients.In the obese group, **MMC III and IV, Cormack lehane grading 3/4** was a mild predictor of **difficult laryngoscopy** (P<0.05) In the lean group, **male sex and OSA** were predictors of **difficult laryngoscopy** (P<0.05).

Patients with IDS <5 were compared with those of IDS ≥5 as shown in Table 4.

Table 4: Airway Assesment Factors of Patients with easy and difficult intubation

Parameter	IDS<5 easy intubation	IDS>5 difficult intubation
Sex Male	16	28
Female	34	22

MMC I,II	44	35
MMC I,II	44	35
III,IV	6	15
MO (cm)	4.70±0.13	4.82±0.41
NC(cm)	35.80±2.7	32.89±2.02
TMD (cm)	6.42±1.02	6.67±1.14
SMD (cm)	13.22±1.66	13.38±3.18

DISCUSSION

Airway management is the basic and essential skill of an anesthesiologist and identifying characteristics of difficult airway is the first step in airway management.

It is believed that the airway access is more difficult in obese than in lean patients due to the anatomic changes resulting from excess weight, fat deposition on cervical structures and pharyngeal area.

Obese patients were slightly more difficult to intubate compared to lean patients based on IDS. This is concurrent with studies by Juvin, et al[9]Kim, et al[10]and Seo, et al[11]

In the obese group of our study, age >45 years and SMD <12.5 cm were the only significant predictors of difficult intubation and had a higher incidence of OSA & comorbidities as also observed by Shailaja et al,[12] Moon, et al.[13]and Rose and Cohen[14]

Relatively few studies have addressed the importance of SMD which indirectly signifies the head and neck mobility[15,16] Present study had significant correlation with decreased SMD and high IDS score similar to that observed by Shailaja et al[12], Shiga, et al.[17]

In our study, intubation was more difficult in the obese patients, whereas the incidence of difficult laryngoscopy (i.e., Cormack class III or IV) was similar in obese and lean patients as observed in Shailaja et al,[12] Kim, et al[10] and Juvin, et al.[9]. This is not surprising, because factors complicating laryngoscopy do not reflect the full spectrum of complex events that can make intubation difficult or easy. The use of the IDS score allowed us to demonstrate that tracheal intubation, not laryngoscopy, was more difficult in obese than in lean patients.

Obese patients is a predictor of difficult mask ventilation as observed in the present study and also identified in other studies.[16,18] We found weight >70 kg, BMI >35, OSA, NC >35 cm, SMD <12.5 and restricted neck mobility to be predictors of difficult mask ventilation. Similar observations were made by Shah and Sundaram[18] & Shailaja et al.[12]

The limitations of the present study are that we were unable to do randomized controlled trial because the observer could not be blinded to do airway examination or intubation as obesity cannot be concealed. A larger study with more number of patients and also higher degree of obesity it needed.

CONCLUSION

We conclude that difficult tracheal intubation is more common among obese than lean patients. Obese patients are difficult to mask ventilate and slightly more difficult to intubate than lean patients but have no difference regarding laryngoscopy. It is preferable to have another skilled anesthesiologist while intubating an obese patient.

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