WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 5.990
Volume 4, Issue 9, 36-42. Research Article ISSN 2277– 7105

COMPARISON OF THE SENSITIVITY AND SPECIFICITY OF DIFFERENT TESTS TO DETERMINE DIFFICULT INTUBATION

***[1]Javaher Foroosh Zadeh F and [2]Safaii Sara**

[1]Associate Professor, Ahvaz Anesthesiology and Pain Research Center, Ahvaz Jundishapoor University of Medical Sciences, Ahvaz, Iran.

[2]Assistant of Anesthesia, Ahvaz Anesthesiology and Pain Research Center, Ahvaz Jundishapoor University of Medical Sciences, Ahvaz, Iran.

Article Received on
19 June 2015,

Revised on 10 July 2015,
Accepted on 05 Aug 2015

***Correspondence For Author**
Javaher Foroosh Zadeh F
Associate Professor, Ahvaz Anesthesiology and Pain Research Center, Ahvaz Jundishapoor University of Medical Sciences, Ahvaz ,Iran.

ABSTRACT

Back ground: Difficult intubation is variably predicted by different tests. In this study we evaluated the sensitivity and specificity of four airway examination tests including: Mallampati, Thyro-mental distance, ULBT(Upper Lip Bite Test), and Inter incisicor gap for predicting difficult tracheal intubation. **Methods:** Total of 448 patients with a mean age of 53.5 years were enrolled. Preoperative airway assessment of patients by Mallampati test, Thyro mental distance measurement, ULBT and Inter incisor gap were done. All patients were anesthetized and intubation grade was assessed by experienced anesthesiologist according to Cormack-Lehan classification. Degree of observed difficulty of intubation was compared to predicted values. Statistical analysis was performed using SPSS version 16. Data were analysis by using Fishers exact and McNemar's test, and a P value <0.05 was considered statistically significant. **Results and discussion**: The incidence of difficult intubation by Cormack-Lehane in this study was 8.4%, Mallampati test had the highest sensitivity (47.3%) and Thyro-mental distance was most specific(96%). The ULBT (upper lip bite tests) had most positive and negative predictive value(37.9% &93.5%).Data also showed that power of these tests in predicting easy intubation is more than their ability in assessing the likelihood of difficult intubation.

KEYWORDS: Difficult intubation, Mallampati, Thyro-mental Distance, Inter incisor gap, Upper Lip Bite Test.

INTRODUCTION

The fundamental responsibility of an anesthesiologist is to maintain adequate gas exchange through a patent airway. Failure to maintain a patent airway for more than a few minutes results in brain damage or death.[1] Anesthesia in a patient with a difficult airway can lead to both direct airway trauma and morbidity from hypoxia and hypercarbia. Direct airway trauma occurs because the management of the difficult airway often involves the application of more physical force to the patient's airway than is normally used. Much of the morbidity specifically attributable to managing a difficult airway comes from an interruption of gas exchange (hypoxia and hypercapnia), which may then cause brain damage and cardiovascular activation or depression.[2]

Though endotracheal intubation is a routine procedure for all anesthesiologists, occasions may arise when even an experienced anesthesiologist might have great difficulty in the technique of intubation for successful control of the airway. As difficult intubation occurs infrequently and is not easy to define, research has been directed at predicting difficult laryngoscopy, i.e. when is not possible to visualize any portion of the vocal cords after multiple attempts at conventional laryngoscopy. It is argued that if difficult laryngoscopy has been predicted and intubation is essential, skilled assistance and specialist equipment should be provided. Although the incidence of difficult or failed tracheal intubation is comparatively low, unexpected difficulties and poorly managed situations may result in a life threatening condition or even death.[3, 4]

The paucity of fool proof tests in predicting difficult intubation commonly results in unanticipated difficult scenarios and their attendant repercussions. The reported incidence of difficult intubation ranges from 0.5 to 18%.[3, 4, 5] It is obvious that preoperative identification of difficult intubation in patients would decrease the rate of anesthesia related complications .Although many advances have been made and many methods have been used to overcome the conundrum of an unanticipated difficult intubation, most tests are not reliable.

All preoperative airway assessment tests are low sensitivity and specificity except ULBT.[6, 7] In this study we evaluated sensitivity, specificity, positive predictive value, and negative predictive value of 4 common tests : Mallampati, Thyromental distance, Inter incisor gap and Upper lip bite test (ULBT) for predicting preoperative difficult intubation.

METHODS

Between sep 2008 and may 2011, 448 patients with American society of anesthesia class I or II were selected. Patients who had an age above 18 years with BMI<30 and were scheduled for elective surgery under general anesthesia requiring endotracheal intubation. After approval of the ethics committee of the Ahvaz Jundishapoor University, an informed consent was obtained from all patients. Excluding criteria included patients with: Airway malformation, inability to cooperate, pregnancy, edentulous patients, those unable to open the mouth and limitation in mobility of temporomandibular and atlanto axial joints.

Preoperatively the airway were evaluated by two anesthesiologist who were not involved in intubation .The details of evaluation are given in table 1.

Table 1: Methods of assessment of airway.

Mallampati scoring	class1: faucial pillars, soft palate and uvula visible. Class2: soft palate and base of uvula seen Class3: only soft palate visible Class4: soft palate not seen
Tyro mental distance	Distance between tip of thyroid cartilage and tip of chin, with fully extended
Inter incisors gap	Distance between the incisors with mouth fully open(Cm)
ULBT	Class1 lower incisor can bite the upper lip above the vermilion Class 2 lower incisor can bite the upper lip below the vermilion Class 3 lower incisor can not bite the upper lip

Mallampati class3 and 4, inter incisor gap≤4cm, thyromental distance≤ 6 and ULBT class3 were considered as markers of a potentially difficult intubation based on receiver operating characteristic (ROC) analysis.

After induction of anesthesia direct laryngoscopy with Macintosh blade no.3 was performed by an anesthesiologist who was blinded to preoperative assessment. Glottic exposure was graded as per Cormack–Lehane classification.[8] (Table2) No external laryngeal pressure was applied while laryngoscopy. Grade 1 and 2 were considered as easy and grade 3 and 4 as difficult.

Table 2: Cormack – Lehane classification

Grade 1 :Most of glottis visible,
Grade2 :only the posterior extremity the glottis and the epiglottis seen
Grade 3 :no part of the glottis visible, only the epiglottis seen,
Grade 4: not even the epiglottis seen.

Statistical analysis was performed using SpSS software version 16/0. Data were analysis by using Fishers exact andMc-Nemar tests, and a P value <0.05 was considered statistically significant and calculation of sensitivity ,specificity ,positive predictive value(PPV), negative predictive value(NPV), and accuracy with their 95%confidence interval(95%CI).

RESULTS

Four hundred forty eight (448) patients were included in our study(235women&213men)The mean age was 53.5yr.Intubation was difficult in38 patients(8.4%).From four preoperative tests Mallampati was most sensitive(47.3%) and thyromental distance was most specific for detection of difficult intubation(96%). Most PPV (37.9%) and NPV (93.5%) were found for ULBT. This study showed also that the power of these tests in predicting easy intubation is more than their ability in assessing the likelihood of difficult intubation. The results in detail are in table 3&4.

Table 3: the frequency analysis of predictor parameters

Airway parameter	Group	No	Frequency%
Modified mallampati scoring	Class1&2 Class 3&4	292 156	65.2 34.8
Inter incisor gap	Class1 ≥4 cm Class 2≤4cm	372 76	83.1 16.9
Thyromental distance	Class1 ≥6 cm Class 2≤6cm	428 20	95.5 4.5
ULBT	Class1&2 Class 3	419 29	93.5 6.5

Table 4: comparative analysis of various scoring system.

Various scoring system	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Modified mallampati scoring	47.3	66.3	11.5	93.1
Inter incisor gap	31.5	84.3	15.7	93
Thyromental distance	10.5	96	20	92
ULBT	28.9	95.6	37.9	93.5

Most sensitive test wasMMT, Most specific test was TMD, MostPPV&NPV were found for ULBT

DISCUSSION

Difficulty in endotracheal intubation is a major cause of morbidity and mortality, especially when it is not anticipated preoperatively. This unexpected difficulty in intubation is the result of a lack of accurate predictive tests and inadequate preoperative assessment of the airway. Since no anatomical factor can correctly forecast a difficult intubation with100% accuracy , we might expect predictive tests to be unreliable. Only few published articles regarding the use of Hyomental distance or Tyromental distance or Modified Mallampaty as screening tests to detect difficulty in intubation .This study was designed to evaluate the efficacy of Modified mallampaty, Inter incisor gap ,Tyromental distance and Upper Lip bite test in detection difficult intubation ,and to draw a possible correlation between the tests and Cormack – Lehane grades.

The prevalence of difficult intubation in our study was 8.4% that is comparatively with previous studies(0.5-18%).[3,4]

Wilson et al suggested five risk factors in predicting difficult intubation, including weight (p=0.05), head and neck movement(p=0.001), jaw movement(p=0.001), receding mandible (p=0.001),and protruding upper incisor (p=0.001).[9]

ULBT when tested initially had the potential to evaluate both jaw movement and buck teeth simultaneously, providing additional support for its use as an airway evaluation test.
Sensitivity, specificity, PPV and NPV of the ULBT (28.9%, 95.6%, 37.9%, 93.5%) in our study were similar to those reported in Khan et al.

The ULBT has high specificity and NPV, making it superior in identifying easy intubation. The high sensitivity and specificity of MMP and TM suggests these tests to be a valuable adjuvant when combination with ULBT providing additional support for air way assessment.

Our study has similar results to Kashan hospital. In this study PPV&NPV of MMP was 12% and 93% and for TM9.8%&92.7%.this group have concluded the low sensitivity and PPV of TM and MMP, they are of limited value for detection of difficult intubation.[10]

In Khan et all study in 2006 specificity and accuracy of ULBT was significantly higher than inter incisor and TMD similar to our study and was more accurate in airway assessment.[11]
In Jimson and et all study in 1995, they concluded that MMP &TMD had a little value for prediction of difficult intubation, although the likelihood of an easy intubation is high when

they yield negative results.[12] In 2003 Khan et all concluded that the ULBT significantly higher specificity and accuracy than the MMT($p<0.001$).[13] Our results similar to theose.

In 2009 Khan et all had similar results and they concluded that the specificity and accuracy of the ULBT is significantly higher than other tests and is more accurate in airway assessment.[6] Also In 2011 Khan and et all concluded an agreement between laryngoscopic grading and HMD and MMP ,but was comparatively weaker.[7] The high accuracy of ULBT specificity, NPV, PPV as revealed a good rationale for its application in the prediction of difficulty or easiness in intubation that these were similar to our results too.

CONCLUSION

Despite the validity of MMP, TMD, ULBT and IIG in predicting easy intubation is much greater than the value in prediction of difficult intubation, however the simplicity of performing these tests and results of the four tests in evaluating patients before surgery by combination of tests in predicting difficult intubation will likely safe. It seams that best results are from applying combined test than a single one.

REFERENCES

1. Rose DK, Cohen MM.The airway: problem and predictors in 18500 patients. Can J Anesthesia., 1994; 41: 372-83.
2. Benumof JL: Management of the difficult airway: With special emphasis on awake tracheal intubation. Anesthesiology., 1991; 75: 1087-1110.
3. Wilson ME, Spiegelhalter D, Robertson JA, Lesser P.Predicting difficult intubation.Br J Anesthesia., 1988; 61(2): 211-6.
4. 4)Arun Kr,Gupta,Mohamad Omid,Showkat Nengroo,Imtiyaz Naqash:Predictors of difficult intubation.British J Of M., 2010; 3(1): 307-311.
5. Turkan S, Ates Y, Cuhruk H, Tekdemir I. should we reevaluate the variables for predicting the difficult airway in anesthesiology? Anesth Analg., 2002; 94: 1340-4(Pub Med).
6. Zahid Hussain Khan,MD,Mostafa Mohammadi,MD,Mohammad R.Rasuouli,MD,Fahimeh Farrokhnia,MD,Razmeh Hussain Khan:The diagnostic value of the upper lip bite test combined with sternomental distance, thyromental distance for prediction of easy laryngoscopy and intubation. Anesth Analg., 2009; 109: 822-824.
7. Zahid Hussain Khan,MD,Anahid Maleki, Jalil Makarem,Mostafa Mohammadi,MD,Ramooz Hussin Khan,Ali Zandieh:A comparison of the upper lip bite

test with thyomental/thyrosternal distance and mandible length in predicting difficulty in intubation. Indian JAnesthesia., 2011; 55(1): 43-46.

8. Cormack RS,Lehane J.Dificult intubation in obstetrics. Anesthesia., 1984; 39(11): 1105-11.
9. Wilson ME,Spiegelhalter D,Robertson JA,Lesser P.Predicting difficult intubation.Br J Anesthesia., 1988; 61: 211-6.
10. Nurizad S,Mahdian M, Sayyedi H R,Mallampati and thyromental tests to predict difficult intubation, J of KUMS., 2002; 6(3): 16-21.
11. Zahid Hussain Khan,MD,Mohammady M,MD,Eghtesadi P.Upper lip bite test with thyromental, sternomental and interincisior distance in predicting difficult intubation: a comparative study. Tehran university of medical J., 2006; 64(5): 102-110.
12. Jimson C. Tse, MD, PhD*, Eric B. Rimm, sat, and Ayyaz Hussain, FFARCS: Predicting Difficult Endotracheal Intubation in Surgical Patients Scheduled for General Anesthesia: A Prospective Blind Study. Anesth Analg., 1995; 81: 254-8.
13. Zahid Hussain Khan,MD, Arash Kashfi,MD,and Elham Ebrahimkhani, MD : A Comparison of the Upper Lip Bite Test (a Simple New Technique) with Modified Mallampati Classification in Predicting Difficulty in Endotracheal Intubation. Anesth Analg., 2003; 96: 595–9.