

Difficult airway management in an emergency in Nepal

Sunil Kumar Das¹, Gaurav Mahato²

¹GPEM Resident, Dept. of General Practice and Emergency medicine, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Nepal; ²MBBS, Kalaiya Hospital, Kalaiya, Bara, Nepal

ABSTRACT

Introduction: Health care provider often face challenges in managing airway in-patients in emergency department having respiratory compromise. Here in this review, we have discussed advances in management of difficult airway in emergency setting in Nepal.

Method: Articles available in google scholar with key word “airway management,” “difficult airway,” “emergency,” “failed intubation,” “Nepal” were retrieved. Amongst which 14 articles were retrieved for the discussion.

Result: MMT was better for predicting difficult laryngoscopy when compared to measurement of sternomental, thyromental and inter-incisor distances and grading of mandibular protrusion. Similarly, when comparing upper lip bite test to MMT, ULBT has better sensitivity and specificity. Laryngoscopic view with 5 cm of head elevation had a better visualization.

Conclusion: The available evidence recommends using upper lip bite test in emergency setting with comparison to modified / mallampati classification. Different tests can be used in accordance to urgency of intervention. Similarly, head elevation of 5 cm can be routinely practiced for better visualization during laryngoscopy.

Keywords: Management, difficult airway, emergency, failed intubation, Nepal

CORRESPONDENCE

Dr. Sunil Kumar Das

Department of General Practice and Emergency Medicine, Patan Hospital, Patan Academy of Health Sciences, Lalitpur, Nepal

Email: res.sunilkumardas@pahs.edu.np

INTRODUCTION

Assessing airway and its management is a crucial skill for any medical personnel practicing clinical medicine. Correct and rapid technique of securing the airway and maintaining it are the main concerns of emergency.¹ Airway assessment and management in the emergency department are different from those in operation theater where things are planned and prepared beforehand. Proper preparation of equipment and assessment of the airway are the key for the successful intubation.² We are often faced with difficult airway, crashed airway, difficult intubation, difficult laryngoscopy etc. in the emergency department, while the attending doctors are always short of time. There are different types of assessment tools to adjunct intubation and ventilation.³ Hence in this review article we overview pros and cons of the different tools used in assessment of difficult and failed airways in the emergency department of hospitals of Nepal.

METHOD

All the published articles on the difficult airway management in the emergency department in the hospitals of Nepal published within the five years (July 2017 – Dec 2021) were searched using Google Scholar. The keywords used to search the article were “airway management”, “difficult airway”, “failed intubation”, “emergency department”, “Nepal.” The abstract and title of the first 100 articles listed in Google Scholar was screened and 14 article were identified that matched the objective of this review which were published by Nepalese author. Among which 5 were case report, 2 were randomized control trial, 5 were descriptive study, 1 was analytical study and 1 was review article. Findings of abstract and conclusion of the studies were analyzed and detailed data set were not analyzed.

RESULT

The reviewed articles can be grouped under different domain like prediction of difficult intubation, Upper lip bite test (ULBT) vs modified mallampati test and other bedside tests. Effect of head elevation in ease of intubation, anesthetic challenges in difficult intubation, application of DOPS checklist while securing airway, use of alternatives in airway access like Choledochoscope and Percutaneous Transtracheal Jet Ventilation, use of bag and mask ventilation in low resource setting, and Awake Fiberoptic Intubation in Cervical Spine Injury.

There are many tools to predict difficult airway like modified mallampati test (MMT) , Upper lip bite

test (ULBT), cormack lehane grade, measurement of sternomental, thyromental and inter-incisor distances and gradings of mandibular protrusion. Amongst them most commonly used are modified mallampati test (MMT) , Upper lip bite test (ULBT), cormack lehane grade. These tools are frequently used on the basis of availability of time and urgency. In a study conducted by Laxmi Pathak (May 2020) among 80 adult patient concluded that sensitivity for prediction of difficult intubation was higher for modified mallampati test alone or in combination with thyromental distance while specificity was highest for thyromental distance test alone.⁴ Similarly study conducted by Sindhu Khatiwada (Jul 2017), the modified mallampati test was better for predicting difficult laryngoscopy in study with sample size 314, with sensitivity of 83% while compared to measurement of sternomental, thyromental and inter-incisor distances and grading of mandibular protrusion.⁵

With regards to modified mallampati and Upper lip bite test 4 articles were reviewed. Study by Sabin Koirala (oct 2019) in total sample size of 121, 16.5% were difficult intubation defined by cormack lehane (CL) III and IV where the sensitivity, specificity, PPV, NPV and accuracy of upper lip bite test was 50%, 100%, 100%, 91% and 91.74% respectively, which were higher than for MMT or TMD or MMT and TMD when combined together.⁶ While study conducted by Lakhe G (Jan 2021) among 665 ASA I/II adult patient the prevalence of difficult laryngoscopy and intubation was 6.6%, ULBT was better predictor of difficult intubation and there was significant association with difficult intubation.⁷ Another study conducted by Gurung PK (Apr 2019) among 100 ASA I /II patient incidence of difficult intubation was 6% where ULBT had specificity of 98.9% and accuracy of 95 %, however there was no difference in sensitivity and negative predictive value when compared to MMC.⁸ In a study conducted by Devkota K (Jun 2021) among 610 (ASA grade I / II) patient, the incidence of difficult intubation was 17.7 %. In same study the ULBT when compared MMT showed better sensitivity 79.63% vs 37.96%, specificity 93.82% vs 69.92 %, positive predictive value 73.5% vs 21.35, negative predictive value 95.53% vs 83.97% and accuracy 91.31% vs 64.26%. Hence ULBT was better predictor of difficult intubation compared to MMT with higher accuracy and predictive values.⁹

Head elevation during visualization by laryngoscope has a significant impact. In the study of 150 patients the laryngoscopic view with the 5cm pillow was significantly superior to other head

position ($p < 0.01$).¹⁰ Use of airway management checklist can improve patient healthcare in stressful emergency situation regardless of age, sex, specialty and duration of clinical practice of health care provider.¹¹ Maximum number of intubation that should be tried is 3 or 4 attempts in children to prevent airway edema, while duration should not exceed more than 30 sec, in

such condition flexible fibro-optic bronchoscope is first line while choledochoscope can be second line for airway management.¹²⁻¹³ In case of failed intubation or in low resource setting one continue to do bag and mask ventilation.¹⁴ In pediatric age group, needle cricothyroidectomy following manual jet ventilation is preferred over tracheostomy.¹⁵

Table 1. Summary of articles retrieved for the analysis

| S. No. | Authors/ date of publication | TITLE OF STUDY | TYPE OF STUDY | SUMMARY |
|--------|------------------------------|--|---|---|
| 1. | Laxmi Pathak / May 2020 | Prediction of difficult intubation in apparently normal patients by combining modified mallampati test and thyromental distance: A prospective observational study | Prospective observational study Sample size = 80 | MMT showed sensitivity of 72.7% and specificity of 98.6% where as thyromental distance alone had sensitivity of 36.4% and specificity of 100%. This study concluded that sensitivity for prediction of difficult intubation was higher for modified mallampati test alone or in combination with thyromental distance while specificity was highest for thyromental distance test alone. ⁴ |
| 2. | Sindhu Khatiwada / Jul 2017 | Prediction of Difficult Airway Among Patients Requiring Endotracheal Intubation in a Tertiary Care Hospital in Eastern Nepal | Prospective observational study Sample size = 314 | MMT was better for predicting difficult laryngoscopy, with sensitivity of 83% while compared to measurement of sternomental, thyromental and inter-incisor distances and gradings of mandibular protrusion. ⁵ |
| 3. | Sabin Koirala / Oct 2019 | Comparison of Upper Lip Bite Test with Modified Mallampati Test and Thyromental Distance for Prediction of Difficult Intubation | Descriptive cross sectional study Sample size = 121 | 16.5% were difficult intubation defined by cormack lehane (CL) III and IV. The sensitivity, specificity, PPV, NPV and accuracy of upper lip bite test was 50%, 100%, 100%, 91% and 91.74% which were higher than for MMT or TMD or MMT and TMD when combined together. ⁶ |
| 4. | Lakhe G / Jan 2021 | Assessment of Airway Parameters for Predicting Difficult Laryngoscopy and Intubation in a Tertiary Center in Western Nepal | Analytical cross sectional study Sample size = 665 | Prevalence of difficult laryngoscopy and intubation was 6.6%. ULBT was better predictor of difficult intubation and there was significant association with difficult intubation. ⁷ |
| 5 | Gurung PK / Apr 2019 | Comparison of Upper Lip Bite Test with Modified Mallampati Classification for Prediction of Difficult Endotracheal Intubation | Prospective observational comparative single blind study Sample size = 100 | Incidence of difficult intubation was 6%. ULBT had specificity of 98.9% and accuracy of 95 %, however there was no difference in sensitivity and negative predictive value when compared to MMC. ⁸ |
| 6 | Devkota K/ Jun 2021 | comparison of upper lip bite test and modified mallampati test for prediction of difficult intubation | Cross sectional study Sample size = 610 | The incidence of difficult intubation was 17.7 %. The ULBT when compared MMT showed better sensitivity 79.63% vs 37.96%, specificity 93.82% vs 69.92 %, positive predictive value 73.5% vs 21.35, negative predictive value 95.53% vs 83.97% and accuracy 91.31% vs 64.26%. Hence ULBT was better predictor of difficult intubation compared to MMT |

| | | | | |
|-----|----------------------------------|---|---|---|
| | | | | with higher accuracy and predictive values. ⁹ |
| 7 | P Acharya / Apr-Jun 2019 | Effect of Head Elevation to Different Heights in Laryngeal Exposure with Direct Laryngoscopy | Randomized control trail Sample size = 150 | The laryngoscopic view with the 5cm pillow was significantly superior to other head position ($p < 0.01$). The incidence of difficult laryngoscopy (Cormack and Lehane grade III) was 32.7% without a pillow which improved to (Cormack and Lehane grade III) 4% with 10cm pillow and there were no cases of difficult laryngoscopy with 5 cm pillow. ¹⁰ |
| 8 | Manoj Kumar Yadav / June 2021 | Application of DOPS Checklists in Assessing the Skills of Emergency Bag Mask Ventilation and Endotracheal Tube Intubation | Quantitative , analytic single center , prospective study Sample size = 40 | Implementation of the checklist can improve patient healthcare in stressful emergency situation. On multivariate regression analysis, improvement in the scores after training was not associated with age, sex, years after medical graduation or number of procedure performed previously. ¹¹ |
| 9 | Anisha Basnet / May 2019 | Anesthetic Challenge in Cleft Lip Surgery: A Case Report | Case report | Maximum number of intubation attempt must be limited to 3 or 4, in children to avoid airway edema, while attempt at intubation must not exceed 30 seconds. An flexible fiber -optic intubation is highly effective in securing difficult airway and is considered gold standard. ¹² |
| 10. | Poudel A / mar 2020 | Choledochoscope" as an Important Addition in Difficult Airway Management: A Case Report | Case report | Choledochoscope can be considered as second in alternative when fiber-optic bronchoscope is not available. ¹³ |
| 11. | Suraj Rijal / Dec 2018 | Use of bag-mask ventilation for cardiopulmonary resuscitation: Do we need more evidence for low resource setting? | Review article | Continue bag and mask ventilation if working well instead of switching to endotracheal intubation while doing cardiopulmonary resuscitation in a cardiac arrest patient. ¹⁴ |
| 12. | Parajuli BD / June 2018 | Percutaneous Transtracheal Jet Ventilation: An Alternative for pediatric difficult airway management a case report | Case report | In pediatric age group, needle cricothyroidectomy following manual jet ventilation is preferred over tracheostomy. ¹⁵ |
| 13. | Singh J / Dec 2018 | Awake Fiberoptic Intubation in Cervical Spine Injury: A Comparison between Atomized Local Anesthesia versus Airway Nerve Blocks | Randomized control trial Sample size = 30 | The nerve blocks (bilateral superior laryngeal and transtracheal recurrent laryngeal) provides adequate airway anesthesia, lesser patient discomfort, and faster intubation to aid in awake fiberoptic intubation in patients with anticipated difficult airway as compared to topical anesthesia using atomizer. ¹⁶ |
| 14 | Acharya U/ Jan 2020 | Securing airway in a burn patient with inhalation injury – A narrow escape | Case report | securing the endotracheal tube can be challenging in burn patients with inhalation injury , the rapid swelling that occurs within 72 hours. Most experienced clinician in airway management available should secure the airway. While all patient should be made for difficult airway managemnt including surgical accesss. ¹⁷ |

In a study conducted by Singh Jj (Dec 2018) with sample size of 30 the nerve blocks (bilateral superior laryngeal and trans-tracheal recurrent laryngeal) provides adequate airway anesthesia, lesser patient discomfort, and faster intubation to aid in awake fiberoptic intubation in patients with anticipated difficult airway as compared to topical anesthesia using atomizer.¹⁶ Securing endotracheal intubation in anticipated difficult intubation should be performed by most experienced health care provider with surgical airway as a back-up.¹⁷

CONCLUSION

The available evidence recommends using upper lip bite test in emergency setting with comparison to modified/ mallampati classification. Different tests can be used in accordance to urgency of intervention. Similarly, head elevation of 5 cm can be routinely practiced for better visualization during laryngoscopy. In a dire situation where there is scarcity of resources one can simply use bag and mask ventilation to buy some time. Similarly, experience of the health care provider does account for the successful airway management.

REFERENCES

- Bhandari R, Gupta P, Bhandari R. Endotracheal intubation in emergency - an experience from Eastern Nepal. *J Evol Med Dent Sci*. 2017;6(85):5900-3. | [DOI](#) |
- Goto T, Goto Y, Hagiwara Y, Okamoto H, Watase H, Hasegawa K. Advancing emergency airway management practice and research. *Acute Med Surg*. 2019;6(4):336-51. | [DOI](#) |
- Orebaugh S. Difficult airway management in the emergency department. *J Emerg Med*. 2002;22(1):31-48. | [DOI](#) |
- Pathak L, Sah PK. Prediction of difficult intubation in apparently normal patients by combining modified mallampati test and thyromental distance: a prospective observational study. *Int J Anesth Sci*. 2020;2(1):16-20. | [Full Text](#) |
- Khatiwada S, Bhattarai B, Pokharel K, Acharya R. Prediction of difficult airway among patients requiring endotracheal intubation in a tertiary care hospital in Eastern Nepal. *JNMA J Nepal Med Assoc*. 2017;56(207):314-8. | [PubMed](#) |
- Koirala S, Shakya BM, Marhatta MN. Comparison of upper lip bite test with modified mallampati test and thyromental distance for prediction of difficult intubation. *Nepal J Med Sci*. 2020;5(1):2-9. | [DOI](#) |
- Lakhe G, Poudel H, Adhikari KM. Assessment of airway parameters for predicting difficult laryngoscopy and intubation in a tertiary center in Western Nepal. *J Nepal Health Res Council*. 2020;17(4):516-20. | [DOI](#) |
- Gurung PK, Singh AK, Gupta S, Ali K, Iqbal M. Comparison of upper lip bite test with modified mallampati classification for prediction of difficult endotracheal intubation. *Med Phoenix (An Official Journal of National Medical College, Nepal)*. 2019;4(1):21-6. | [DOI](#) |
- Devkota K, Adhikari K. Comparison of upper lip bite test and modified mallampati test for prediction of difficult intubation. *J Chitwan Med Coll*. 2021;11(2):3-6. | [DOI](#) |
- Acharya P, Shrestha A, Gurung A, Koirala M, Shrestha GS, Marhatta MN. Effect of head elevation to different heights in laryngeal exposure with direct laryngoscopy. *J Nepal Health Res Council*. 2019;17(2):168-72. | [DOI](#) |
- Yadav MK, Pal A, Pant C, Bhattarai MD. Application of DOPS checklists in assessing the skills of emergency bag mask ventilation and endotracheal tube intubation. *Nepal Med J*. 2021;4(6):68-72. | [Google Scholar](#) |
- Basnet A, Poudel Y, Baral PR, Burathoki BB, Shrestha RD. Anesthetic challenge in cleft lip surgery: a case report. *BBMed*. 2019;3(1):74-8. | [Full Text](#) |
- Poudel A, Pokharel K, Jaisani MR. "Choledochoscope" as an important addition in difficult airway management: a case report. *A A Pract*. 2020;14(5):134-6. | [DOI](#) |
- Rijal S. Use of bag-mask ventilation for cardiopulmonary resuscitation: do we need more evidence for low resource setting? *J Gen Pract Emerg Med Nepal*. 2018;5(7):24-6. | [Full Text](#) |
- Parajuli B, Shrestha PS, Shrestha A. Percutaneous transtracheal jet ventilation: an alternative for pediatric difficult airway management a case report. *Anaesth Crit Care Med J*. 2018;3(2):1-3. | [Full Text](#) |
- Singh J, Shakya S, Shrestha B, Subedi B, Singh PB. Awake fiberoptic intubation in cervical spine injury: a comparison between atomized local anesthesia versus airway nerve blocks. *Kathmandu Univ Med J KUMJ*. 2018;16(64):323-7. | [Full Text](#) |
- Acharya U, Bhandari SB. Securing airway in a burn patient with inhalation injury – a narrow escape. *Indian J Burn*. 2019;27(1):102-4. [Accessed July 19, 2022] | [Weblink](#) |