

KISS- Keep it Simple Yet Safe: A Dependable Option in Anticipated Difficult Airways

MILON VASANT MITRAGOTRI¹, ROOPA SACHIDANANDA², TRIVENI BEDRADI VENUGOPAL³, PRITI SHERIKAR⁴

ABSTRACT

Difficult airway guidelines provide an algorithmic approach as suggested by many international societies and journals. These guidelines have always been made with an earnest conviction at securing an airway with utmost safety and they provide a framework in times of difficulty. These guidelines are likely to add complexity with technological advances and gadgets available at hand like video laryngoscopes, fibreoptic bronchoscope etc., that may confuse the anaesthesiologist and hinder the decision making process. KISS- Keep it Simple, Stupid!- A concept well known, was first used in aviation which advices the pilot to keep things simple. We applied the same principle to our airway management protocol by modifying it into 'Keep it simple yet safe'. The current case series describes 10 subjects which seemed to have a difficult access to airway and intubation. These patients were difficult to ventilate or difficult to intubate. Cases were successfully managed by applying this KISS technique. Due care was taken to keep our difficult airway cart ready as an alternative option.

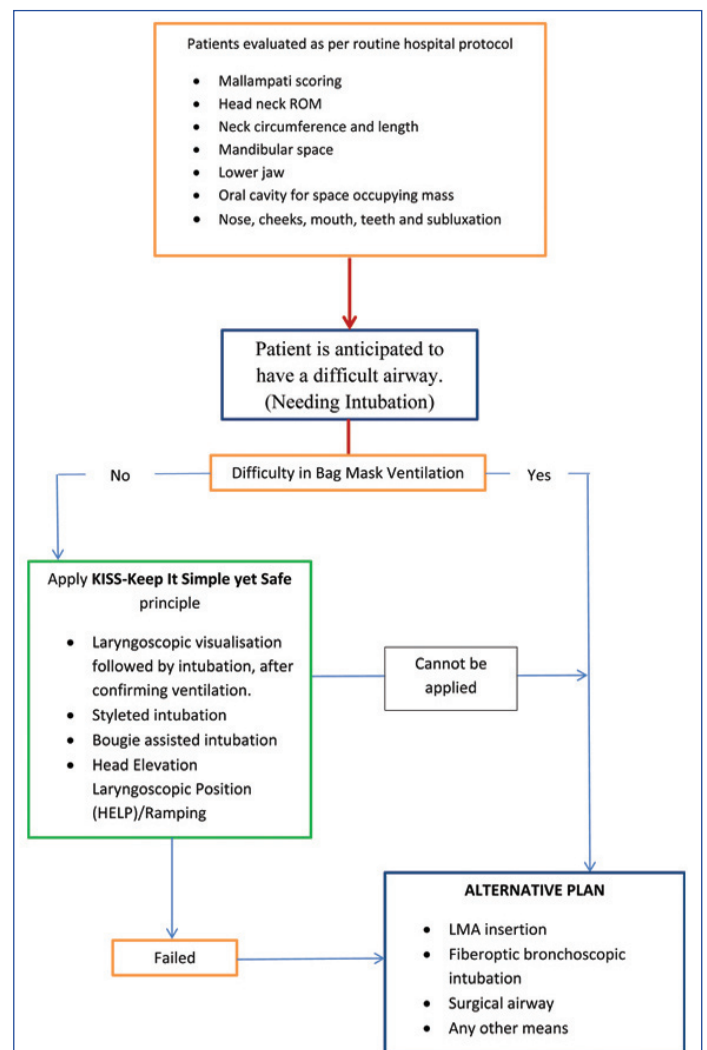
Keywords: Algorithm, Anaesthesiology, Basic life support, Emergency intubation, Guidelines

INTRODUCTION

Difficult airway guidelines have been made by various organisations which have been systematically developed following recommendations and research [1-4]. These assist the anaesthesiologist in making decisions when encountered with a difficult airway [1]. Researchers have noted that management of difficult airway is far from optimal. It needs a simplified and concise algorithm that is easy to remember and execute [5]. Although, Difficult Airway Society (DAS), All India Difficulty Airway Association (AIDAA) and American Association of Anaesthesiologists' (ASA) have provided guidelines on managing unanticipated difficult airway but literature regarding the managing of an anticipated difficult airway appears limited. Law JA et al., in their recommendations on managing an anticipated difficult airway state a 'rational' decision needs to be taken in such cases and having an alternative plan in case of failure of chosen approach [3]. It is important to use a systematic approach and a well defined plan when faced with a patient with a potentially difficult airway [6].

"Keep It Simple, Stupid!" (KISS) is a wordplay first conceived by the US aircraft engineer Kelly Johnson in the year 1960. The KISS is a design rule which basically states that systems perform best when based upon simple designs rather than more complex ones [7]. It basically tells the user to keep things simple. The KISS is also used in anaesthesia management when complicated decisions are needed to be taken but it remains underutilised [8]. It was a modified aphorism of 'Keep it Simple, Stupid!' to 'Keep it Simple yet Safe!' for managing our decisions in managing difficult airways in present series of patients over a period of one year.

The various techniques or means to intubate the trachea were divided into two pathways. One, the KISS principle- where all conventional means of intubation like direct laryngoscopy, stylet or bougie guided intubation, ramping etc., were included. Second, alternate means such fibreoptic bronchoscopy, videolaryngoscopy, surgical airway, supraglottic airway were included [Table/Fig-1]. Caution was exercised in managing these patients including adequate preoxygenation, judicious premedication and never losing the focus towards providing adequate oxygenation and ventilation [6,9]. Following are the cases managed effectively using the above mentioned principle. Informed consent was taken from the patient for participation in the study and publication of their clinical details.



[Table/Fig-1]: Keep It Simple yet Safe (KISS) principle.

LMA: Laryngeal mask airways; ROM: Range of motion

Case 1

A 46-year-old male presented with a soft tissue mass lesion over the nape of the neck. Contrast Magnetic Resonance Imaging (MRI)

report stated an irregular, fairly defined heterogenous mass extending from suprascapular region and posterior chest wall on the left side with size of 12.3x5.2x6.5 cm. It extended from C2 vertebral body superiorly to D5 vertebral body level, inferiorly.

Profile examination of the patient from the left side revealed a seemingly difficult airway with restricted neck extension needing sophistication at anaesthetic management [Table/Fig-2a]. However, the patient when examined from the right side and in supine position showed a not-so-difficult airway [Table/Fig-2b]. Hence, after discussion it was planned to go ahead with a simple laryngoscopic visualisation and intubation after confirmation of ventilation. The alternative plan was to insert an intubating LMA and proceed. The patient could be successfully be intubated on first attempt.



[Table/Fig-2]: Case 1 - Soft tissue mass lesion on the nape of the neck.

Case 2, 3 and 4

Two male patients aged 50 and 65 years and a 45-year-old female patient with similar difficult airway profile (neck swelling) were posted for excision. Case 2 and 3 had thyroid swellings in the anterior part of the neck while case 4 had a huge submandibular swelling. Case 2 had a multinodular goiter extending to both sides of neck measuring about 11x8 cm [Table/Fig-3]. Case 3 also had a diffuse thyroid swelling along with restricted mouth opening which did not seem to hinder insertion of laryngoscopic blade [Table/Fig-4]. Case 4 had a globular looking swelling located more on the right side of the neck measuring 6x5 cm [Table/Fig-5].



[Table/Fig-3]: Case 2 - Multinodular goiter on both sides of the neck.

All these three patients were managed successfully by laryngoscopic visualisation and bougie insertion. The alternative plan in case of failure was to go ahead with Airraq™ assisted intubation.

Case 5

A 16-year-old male, diagnosed with Down's syndrome associated with limited neck extension, macroglossia and short neck, was posted for laparoscopic cholecystectomy. In addition to difficult airway, neck extension was to be avoided in view of atlanto-axial

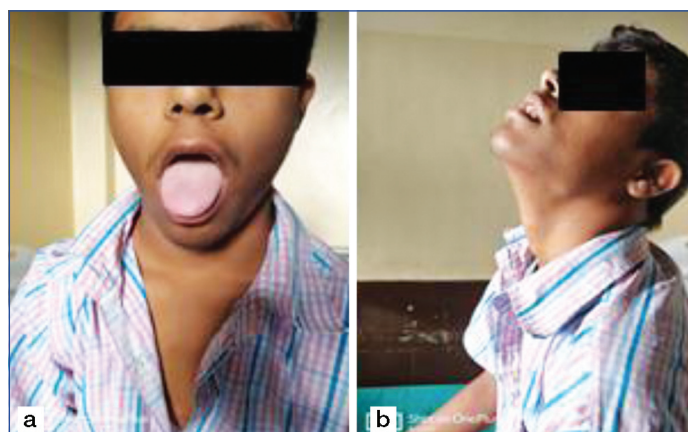


[Table/Fig-4]: Case 3 - Diffuse thyroid swelling with restricted mouth opening.



[Table/Fig-5]: Case 4 - Globular swelling on the right side of neck.

subluxation. The improvised KISS principle was to intubate him using stylet guided intubation with McCoy blade. Alternate plan was to insert a proseal LMA and continue the procedure. The patient could be successfully intubated on first attempt [Table/Fig-6].



[Table/Fig-6]: Case 5 - Down's syndrome associated with limited neck extension, macroglossia and short neck.

Case 6

A 55-year-old obese male, with short neck and restricted neck extension, was posted for diagnostic laryngoscopy and biopsy for carcinoma larynx. Indirect laryngoscopy revealed malignancy in the supraglottic region. Glottic chink could not be visualised due to the growth. It was decided after discussion not to go ahead with KISS principle and choose a rational alternate plan considering the difficulty in ventilation and intubation. An awake fiberoptic bronchoscopic nasal intubation was performed with 7.5 size endotracheal tube [Table/Fig-7].

Case 7 and 8

Two obese female patients aged 35 years posted for Functional Endoscopic Sinus Surgery (FESS), presented with complaints of Obstructed Sleep Apnoea (OSA). They also had short neck with



[Table/Fig-7]: Case 6- Short neck and restricted neck extension with malignancy in supraglottis.



[Table/Fig-10]: Case 9- Mass in the lateral part of neck and face.

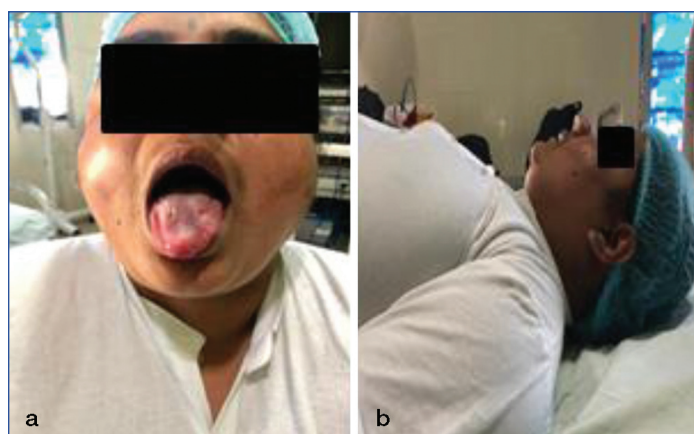
thyromental distance less than 5 cm. The successful KISS principle was to intubate them by ramping them in a Head Elevated Laryngoscopic Position (HELP). Alternate plan was to insert LMA in case ventilation failed and go ahead with videolaryngoscopy [Table/Fig-8,9].



[Table/Fig-8]: Case 7- Obese female with obstructive sleep apnoea and short neck.



[Table/Fig-11]: Case 10- Mass in the lateral part of the face and neck.



[Table/Fig-9]: Case 8- Obese female with short neck and obstructive sleep apnoea.

Case 9 and 10

Two patients with masses on lateral aspect of face and neck were posted for removal. Case 9 was a 60-year-old female, operated case of total thyroidectomy for papillary carcinoma thyroid now presenting with huge left cervical lymph node metastasis measuring 10x8 cm [Table/Fig-10]. She was posted for left cervical radical neck dissection with flap reconstruction. Case 10 was a 69-year-old male with pedunculated sarcoma arising from the nape of the neck [Table/Fig-11]. Although, both had ominous looking huge swellings, they were managed successfully with laryngoscopic visualisation and intubation on first attempt.

DISCUSSION

Difficult airway is defined as the clinical situation where a conventionally trained anaesthesiologist experiences difficulty in

facemask ventilation, difficulty with tracheal intubation or both [1]. It is either anticipated or unanticipated. Guidelines for managing anticipated difficult airway are presently inadequate. Further, the intubator may get easily perturbed by the multitude of options and plethora of devices available. Heidegger T noted that the updated DAS guidelines, though revolutionary, failed to incorporate management of anticipated difficult airway [10]. American Society of Anaesthesiologists' states that a pre planned, pre induction strategy with identification of the primary and secondary strategies should be in place [1]. However, the decision is left to the discretion of the operator. Most guidelines are derived from the experience of airway experts and analysis of the related literature, which consists of a limited number of randomised controlled trials and numerous case reports [6].

Identifying the deficiency in guidelines, we tried to simplify the methodology by dividing the techniques available into two pathways. Keep It Simple yet Safe (KISS)-pathway that includes conventional methods while alternate pathway involves use of sophisticated devices. The choices between the two pathways were made based on the assessment of the airway as per routine hospital protocol for difficult facemask ventilation. Predictors for difficult facemask ventilation include high body mass index, older age, male sex, limited mandibular protrusion, decreased thyromental distance, modified Mallampati score 3 or 4, beard, lack of teeth, history of radiation, history of snoring or obstructive sleep apnoea [3].

Similar approaches by other authors employing primary and secondary strategies are available. Wang HX et al., utilised a new strategy in 20 morbidly obese patients where a supraglottic airway device was inserted with sevoflurane anaesthesia and secondary strategy involved intubating the patient through the supraglottic device with fiberoptic scope [11].

This kind of dual strategy can also be helpful in resource poor settings. In a previous case by Subramanyam KL managing post burn contracture restricted mouth opening, regional nerve blocks were administered for contracture release. This resulted in increase

of mouth opening followed by routine laryngoscopic intubation. This case could also have been done using a fiberoptic scope or a videolaryngoscope but the absence of devices was stated in their settings [12]. This is yet another case where a more simplistic KISS method was used to manage a difficult airway.

Similarly many case reports state the use of ketamine injection and tumescent anaesthesia for contracture release followed by routine intubation [13,14].

When difficulty is anticipated, airway management after induction of anaesthesia can be justified only when the risk of failure of oxygenation is low and when an appropriate backup plan can be quickly implemented. However, with availability of recent innovations (videolaryngoscopes) and alternate methods of providing oxygen (supraglottic airways), more patients can be safely managed after induction [3]. The presence of this technology has its own limitations in the form of want of resources and skill.

Proper preoperative assessment and multiple contingency plans to secure airway is necessary for a positive outcome and to handle such airway [15]. Hence, after assessing for ease of facemask ventilation, it was decided to classify patients who could be managed conservatively and those who couldn't in the presence of all sophistication. We were able to successfully manage difficult airways in our case series of ten subjects, nine by KISS and one by alternate means. Present approach to managing a difficult airway is innovative and it provides a framework at managing challenging and difficult airway cases.

Canadian guidelines for anticipated difficult airway recommend an algorithm wherein the oxygenation risk associated with induction is assessed to take a decision of awake intubation versus intubation after induction of anaesthesia [3]. Present guidelines in contrast to the above guidelines favours intubation under anaesthesia due to risks involved with awake intubation [16].

CONCLUSION(S)

The KISS principle, though simplistic, when applied with due diligence and safety has helped us to take a decision and successfully manage difficult airway cases. Present case series is an attempt to address the

issue of management anticipated difficult airway, as well as to draw the attention regarding the inadequacy of guidelines in managing the same. Further guidelines to manage anticipated difficult airway should be dwelt on by various anaesthesia societies to make the approach more realistic especially in resource poor settings.

REFERENCES

- [1] Apfelbaum JL, Hagberg CA, Caplan RA. Practice guidelines for management of the difficult airway: An updated report by the American Society of Anesthesiologists Task Force on management of the difficult airway. *Anesthesiology*. 2013;118:251-70.
- [2] Frerk C, Mitchell VS, McNary AF. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *Br J Anaesth*. 2015;115(6):827-48.
- [3] Law JA, Broemling N, Cooper RM, Drolet P, Duggan LV, Griesdale DE, et al. The difficult airway with recommendations for management—part 2—the anticipated difficult airway. *Can J Anesth*. 2013;60:1119-38.
- [4] Ramkumar V, Divatia JV. Airway management guidelines: A safe passage to India. *Indian J Anaesth*. 2016;60:883-84.
- [5] Zepinga X. Anticipated and unanticipated difficult airway management. *Curr Opin Anesthesiol*. 2018;31(1):96-103.
- [6] Drolet P. Management of the anticipated difficult airway—a systematic approach: Continuing Professional Development. *Can J Anesth*. 2009;56(9):683-701.
- [7] Di Marco L, Leone A, Murana G, Pacini D. The application of the "KISS principle" for the treatment of type A acute aortic dissection: Is this always right? *J Thorac Dis*. 2018;10:3884-86.
- [8] Neville R, George H. How to survive in anaesthesia: A guide for trainees. In: *Anaesthetic aphorisms*. 2nd Ed. London: BMJ books; 2002. 179.
- [9] Myatra SN, Shah A, Kundra P, Patwa A, Ramkumar V, Divatia JV, et al. All India Difficult Airway Association 2016 guidelines for the management of unanticipated difficult tracheal intubation in adults. *Indian J Anaesth*. 2016;60:885-98.
- [10] Heidegger T. Difficult Airway Society guidelines 2015: What about the anticipated difficult airway? *Anaesthesia*. 2016;71:466-79.
- [11] Wang HX, Wan L, Tian M, Xue FS. A safe strategy for anesthesia induction and airway management in morbidly obese patients. *Chin Med J*. 2019;132:1747-48.
- [12] Subramanyam KL. Anesthetic management of post-burn contracture chest with microstomia: Regional nerve blocks to aid in intubation. *J Anaesthesiol Clin Pharmacol*. 2015;31:250-52.
- [13] Agarwal P. Safe method for release of severe post burn neck contracture under tumescent local anaesthesia and ketamine. *Indian J Plast Surg*. 2004;37:51-54.
- [14] Sharma R. Tumescent anaesthesia for post burn contracture release. *Indian J Anaesth*. 2010;54(6):579-80.
- [15] Gupta P, Bamba C. Airway management of a patient with severe post burn mento-sternal contracture: A novel approach. *Egyptian Journal of Anaesthesia*. 2017;33(3):295-97.
- [16] Law JA, Morris IR, Brousseau PA, Ronde SL, Milne AD. The incidence, success rate, and complications of awake tracheal intubation in 1,554 patients over 12 years: An historical cohort study. *Can J Anesth*. 2015;62:736-44.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Anaesthesiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.
2. Associate Professor, Department of Anaesthesiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.
3. Assistant Professor, Department of Anaesthesiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.
4. Senior Resident, Department of Anaesthesiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Priti Sherikar,
Senior Resident, Department of Anaesthesia, Karnataka Institute of Medical Sciences,
Vidyanagar, Hubli-580021, Karnataka, India.
E-mail: preeti.sherikar@gmail.com

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

PLAGIARISM CHECKING METHODS: [Jan H et al.]

- Plagiarism X-checker: Jul 01, 2021
- Manual Googling: Jan 15, 2022
- iThenticate Software: Jan 19, 2022 (9%)

ETYMOLOGY: Author Origin

Date of Submission: **Jun 29, 2021**
Date of Peer Review: **Aug 31, 2021**
Date of Acceptance: **Jan 17, 2022**
Date of Publishing: **Apr 01, 2022**