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Research Article

EVALUATE THE USE OF VIDEO LARYNGOSCOPE IN FACILITATING ENDOTRACHEAL INTUBATION IN UNANTICIPATED DIFFICULT AIRWAYS

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A B S T R A C T

Background: PENTAX Airway Scope (AWS-S100) is a fast, accurate and portable VIDEO LARYNGOSCOPE which incorporates advanced imaging technology with optimized ergonomic design. Utilizing a 2.4" high-resolution colour LCD video monitor, identification of anatomical structures can be easily obtained. When combined with the unique targeting system, fast and accurateplacement of the endotracheal (ET) tube is achieved during tracheal intubation.

Objectives:
1. To study the feasibility of laryngeal visualization using PENTAX Airway Scope (AWS-S100) video laryngoscope after an initial diagnosis of unanticipated difficult airway using a direct laryngoscope.
2. To study the time taken for endotracheal intubation in cases of unanticipated difficult airway.
3. To study complications of the procedure, if any

Methods: 100 consecutive ASA grade I and II patients scheduled for various surgical procedures with unexpected difficult airway were intubated with the PENTAX Airway Scope (AWS-S100) Video laryngoscope after confirmation of anticipated difficult airway(i.e. Cormack- lehane grade III & IV) on direct laryngoscopy. Induction of anaesthesia was standardized according to our institutional protocol. All tracheal intubations were performed by anaesthetists trained in the use of the PENTAX Airway Scope (AWS-S100) Video laryngoscope prior.

Results: Overall success rate was 100% (n = 100). Among all, in 90 patients trachea could be intubated in the firstattempt (90%). 10 patients were intubated in a second attempt (10%). In 98% of patients C-L grade improved from III & IV to I & II indicating good visualisation.Mean intubation time was 33.6s (range 10-94s). Complication included one incidence of lip trauma during intubation attempt.

Conclusion: Tracheal intubation with the PENTAX Airway Scope (AWS-S100) Video laryngoscope was feasible, safe and easy to perform in patients with unanticipated difficult airway, undergoing various surgical procedures. In all patients, a sufficient view of the vocal cords could be obtained. The
view of glottis was considerably improved on use of Pentax videolaryngoscope.

INTRODUCTION

Tracheal intubation is the gold standard of securing the airway under clinical and preclinical conditions. It is life saving in cases of resuscitation, respiratory failure, unconsciousness and loss of a patent airway. Macintosh laryngoscope is the most popular device used for intubationworldwide. However, the failure rate of intubation using this laryngoscope has been demonstrated to be upto 35% in cases of unpredicted difficult airway [1, 2]. Difficult intubation can be defined by the requirement of multiple attempts with a standard macintosh (curved) laryngoscope blade, impossible visualization of glottis, or that an experienced operator states that intubation is difficult or impossible. The main contributors toanaesthesia-related morbidity and mortality are the problems in securing the airway [3]. Therefore, a wide variety of alternatives to the Macintosh laryngoscopehave been introduced into clinical routine, includingthe Miller, McCoy, and Bullard-laryngoscope. The management of difficult airway was revolutionised with the introduction of Archie Brain's supra glottic laryngeal mask airway (LMA) in 1982 and subsequently introduced diverse supra glottis airway devices, (laryngeal tube (LT), the intubating laryngealmask airway

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(ILMA)) [4, 5]. The introduction of video assisted laryngoscopy in the last decade, allowed a better visualization of the anatomical landmarks and an improved teaching and learning curve [6-9]. Pentax airway scope AWS-S100 is a newer group of video laryngoscope for intubation, with a video monitor that allows simple yet accurate verification during tracheal intubation procedures. The device has an imaging CCD and LED light attached to its tip. AWS-S100 is paired with an Intlock blade with curved shape. These features allow the operator to verify conditions in the oral cavity and the intubation status during tracheal intubation on a 2.4-inch colour LCD monitor.The angle of the built-in monitor screen can be adjusted for easier viewing. This makes it possible to perform tracheal intubation while comfortably viewing inside the patient's mouth cavity from various positions.Even less experienced operators can perform fast and accurate tracheal intubation using this device. The airway scope's video output allows a group of people to view the images on an external medical monitor.The AWS is operated by two AAbatteries which allow almost 1 hour of operating time. [10]

This study was undertaken toevaluate the feasibility of laryngeal visualisation and tracheal intubation using Pentax AWS-S100 laryngoscope after an initial diagnosis of unanticipated difficult airway using direct laryngoscope in patients undergoing routine surgical procedures. The time taken for intubation in cases of unanticipated difficult airway and complications using AWS laryngoscope were also studied.

METHODS

After taking approval from the institutional ethical committee and informed consent from the patients, 100 consecutive Cormack Lehane Grade III& IV patients of age 18 years and above scheduled for routine surgical procedures were studiedto evaluate the feasibility of laryngeal visualisation and tracheal intubation using Pentax AWS-S100 laryngoscope after an initial diagnosis of unanticipated difficult airway using direct laryngoscope. Exclusion criteria included emergency procedures, a history of difficult intubation, reduced neck mobility, an inter-incisor distance less than 3.5 cm and ASA grade more than III.

All patients received general anaesthesia according to our institutional standard regimen. 90 min before induction of anaesthesia, patients were pre-medicated with midazolam (3.75-7.5 mg p.o.). ECG, pulse oximetry, non-invasive and invasive arterial blood pressure measurements were used for monitoring the patients during induction of anaesthesia. All the baseline parameters like heart rate, systolic, diastolic and mean arterial pressure and arterial oxygen saturation were recorded. After 2 min of pre-oxygenation (100% oxygen,8 L*min-1), 0.25-0.5 µg*kg-1 Sufentanil were given i.v.Anesthesia was induced with 0.1-0.2 mg*kg-1 Etomidate after additional 3 min of spontaneous or assisted bagvalve ventilation.The patients' lungs were manually ventilated using 100% oxygen. All patients underwent a rapid laryngoscopic assessment of the airway by a trained anaesthetist, using the direct laryngoscope. Patients diagnosed to have Cormack & Lehane views III and IV then underwent video laryngoscopy using Pentax AWS-S100. All anaesthetists engaged in this study had been trained in the use of the Pentax AWS-S100 in manikin and had performed at least 5 successful clinical intubations in surgical patients prior to the investigation. In those cases where first intubation attempt had failed, bag valve ventilation was re established and, after another period of maskventilation, a second intubation attempt was performed. In cases of second intubation attempt failure, or failure of trachealintubation after a total of 120 s, the senior anaesthetist took overand, after another 2 minutes of bag valve ventilation, one more attempt of intubation using AWS was performed. In cases of definite failures, the institutional (ASA protocol derived) guidelines for the management of the difficultairway would have been applied which includes fiberoptic bronchoscopy and/orthe use of the intubation laryngeal mask.

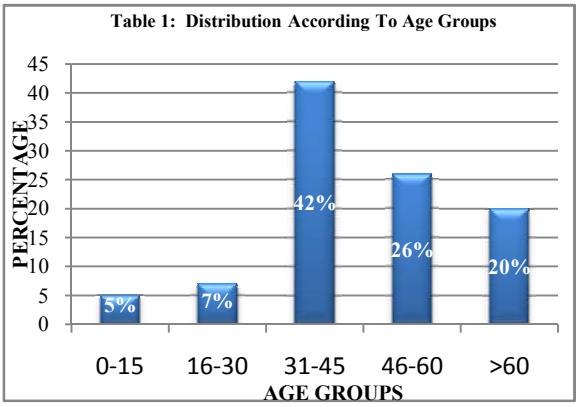
Age, weight, sex, ASA physical status, surgical procedures, preoperative airway assessments, laryngoscopic airway grading and time taken for intubation was recorded in the data. Time taken for Intubationwas calculated frompassing theAWSthrough the lips and stopping when the lungswere successfully ventilated. Also, the number of attempts,SpO2, the ease of glottis visualization, commonproblems and side effects, e.g. soft tissue bleeding, lacerationof the lips were evaluated after the intubation.

Statistycal Analysis

Statistical analysis was performed using SPSS software (version 20). Results are presented as means ± standard deviation (M ± SD) for continuous variables.A value of $p<0.05$ was considered significant. The sample size for estimating average time taken for the procedure with 95% confidence level with error margin of 01 second was calculated to be 96. A total of 100 subjects were studied.

RESULTS

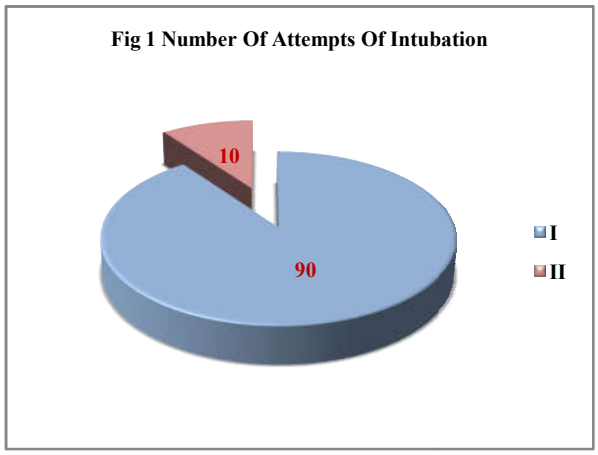
100 patients (45 males, 55 females) undergoing routine surgical procedures were included in this observational feasibility study from Jun 2012 to Jun 2013. In allpatients tracheal intubation with the AWS S100 laryngoscope was feasible and safe. Age wise distribution is shown in Table 1

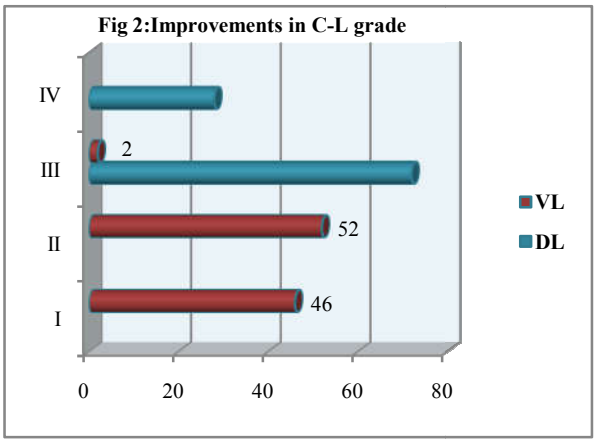


90 Patients (90%) were intubated at the first attempt. A second attempt was required in 10 (10%) patients as depicted in Fig 1. Visualization of the vocal cords was very good in all the patients.In 98% of patients Cormack-Lehane grade improved from III& IV to I (46%) & II (52%) II indicating good visualisation ($p<0.001$), however C-L grade remained III in 2% of patients as depivted in Table 2 & Fig 2.

Table 2 Improvements in the C-L grade post video laryngoscopy

CL GRADE	Direct laryngoscopy	Video laryngoscopy
I	-	46
II	-	52
III	72	2
IV	28	-





Mean time taken for tracheal intubation was 36.6 ± 18.3 s (range:10 s-94 s). Failure to intubate in first attempt in 10 patients was due to shifting of the tube towards esophagus. The position of the device was rechecked and corrected and again the intubation attempt was tried. There was only one incidence of lip contusion during intubation attempt. There was no incidence of dental or any other mucosal trauma.

DISCUSSION

In this observational study, intubation with AWS-S100 laryngoscope was feasible, safe and easy to perform in patients with unanticipated difficult airway undergoing routine surgical procedures. A satisfactory view of glottis could be obtained in all the patients independent of preoperative CL grade.The results of our study are confirmed by a variety of other studies highlightingthe usefulness of the AWS S100 in tracheal intubationand the management of the difficult airway[11-13].

The results are in line with several reports showing time required for intubation as 36 s. The results are also similar to other studies with relation to improvements in intubation conditions, 98% of the patients showed an improvement of C-L grade from III & IV to I & II [12]. Recent studies show that the device is useful in patients undergoing cervical spine immobilisation [14]. In our study, few patients still requiredsecond intubation attempts despite achievement of good intubation conditions which was due toshifting of the tube towards oesophageal aperture. This problem has also been reported for other video-assisted intubation devices [15].

The AWS S100 device appeared to be safe and superiorin the hand of experienced, novice and inexperiencedusers in simulated difficult airway settings. The AWS S100 reduces the duration of intubationattempts in patients at an increased risk of difficult airway and thus significantly more number of patients could be intubated [16, 17].

It has been documented that laryngoscopy and tracheal intubationwith a conventional Macintosh laryngoscope maycause severe dental injury in 0.04%-0.36% [18] and oraltissue trauma in 6.9% [19]. However, in our study there was only one single episode of lip contusion. There was no evidence of dental injury or a mucosal tear.

CONCLUSION

To conclude our results shows that routine trachealintubation with the AWS S100 is feasible, fast and safe. Direct laryngoscopy always should be retained as a primary skill; however, the video laryngoscope has the potential to be a good primary choice for the patient with potential cervical spine injury, limited jaw or spine mobility, or who is difficult to access. It also will become a rescue airway device for intubating patients with the unanticipated difficult airway.

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