Clinical Investigation

Awake tracheal intubation using Pentax airway scope in 30 patients: A Case series

Address for correspondence:
Dr. Payal Kajekar, Department of Anaesthesia, University Hospital and Warwickshire NHS Trust, Clifford Bridge Road, Coventry, CV2 2DX, United Kingdom.
E-mail: payalkajekar@gmail.com

Access this article online

Website: www.ijaweb.org

DOI: 10.4103/0019-5049.138987

Quick response code

Payal Kajekar, Cyprian Mendonca, Rati Danha, Carl Hillermann

Department of Anaesthesia, University Hospital Coventry and Warwickshire NHS Trust, Coventry, CV2 2DX, United Kingdom

ABSTRACT

Background and Aims: Pentax airway scope (AWS) has been successfully used for managing difficult intubations. In this case series, we aimed to evaluate the success rate and time taken to complete intubation, when AWS was used for awake tracheal intubation. **Methods:** We prospectively evaluated the use of AWS for awake tracheal intubation in 30 patients. Indication for awake intubation, intubation time, total time to complete tracheal intubation, laryngoscopic view (Cormack and Lehane grade), total dose of local anaesthetic used, anaesthetists rating and patient's tolerance of the procedure were recorded. **Results:** The procedure was successful in 25 out of the 30 patients (83%). The mean (standard deviation) intubation time and total time to complete the tracheal intubation was 5.4 (2.4) and 13.9 (3.7) min, respectively in successful cases. The laryngeal view was grade 1 in 24 and grade 2 in one of 25 successful intubations. In three out of the five patients where the AWS failed, awake tracheal intubation was successfully completed with the assistance of flexible fibre optic scope (FOS). **Conclusion:** Awake tracheal intubation using AWS was successful in 83% of patients. Success rate can be further improved using a combination of AWS and FOS. Anaesthesiologists who do not routinely use FOS may find AWS easier to use for awake tracheal intubation using an oral route.

Key words: Awake fibreoptic intubation, awake intubation, pentax airway scope, video laryngoscope

INTRODUCTION

The Pentax airway scope (Pentax-AWS® [Airway Scope; Hoya Corporation, Tokyo, Japan]) is a rigid indirect video laryngoscope with an integrated tube channel. It consists of a disposable blade (P Blade®; Hoya Corporation, Tokyo, Japan), a 12-cm image tube with a charge-coupled device camera, and handle with a 6-cm adjustable high-resolution colour liquid crystal display monitor.[1] The Pentax AWS has been successfully used for tracheal intubation in anaesthetised patients with difficult airway,[1-4] but it's use for awake intubation has been limited to isolated case reports. We evaluated the success rate and problems encountered during awake tracheal intubation using the AWS in a series of 30 patients. The reasons for the failures, the literature review, with advantages and disadvantages of the AWS are discussed.

METHODS

In our institution, the AWS® has been used routinely for tracheal intubation; both in awake and anaesthetised patients by two of the authors (CM and CH). Prior to this data collection, each of them had performed more than twenty tracheal intubations using the AWS.

The need for ethical approval and patient consent were reviewed in detail with the National Research Ethics Service and local Research and Development Committee. As this clinical service evaluation used a recognised technique as per authors' routine clinical practice and did not involve any additional procedures for the patients, the committee deemed that formal ethics committee approval and written consent was not required. However, the procedure was fully explained,

How to cite this article: Kajekar P, Mendonca C, Danha R, Hillermann C. Awake tracheal intubation using Pentax airway scope in 30 patients: A Case series. Indian J Anaesth 2014;58:447-51.

and verbal consent for awake intubation was obtained from all patients.

Adult patients requiring awake tracheal intubation through oral route, both to maintain and test cervical-spinal cord integrity following intubation or due to anticipated difficult airway (where awake intubation was indicated for patient safety) were included in this evaluation. Children under 18 years, pregnant women and patients with airway tumours were excluded from this study.

Prospective data were collected over a period of 1½ years from December 2010 to June 2012. Patient's age, gender, weight, body mass index and details of preoperative assessment of airway were recorded. On arrival in the anaesthetic room, standard monitoring was commenced, and intravenous access secured. Glycopyrrolate 200 mcg was administered intravenously, and a remifentanil target controlled infusion of 1-4 ng/ml was started in all patients. Midazolam 1-2 mg was administered as required during the procedure. Oxygen at 2 L/min was administered via nasal catheter. The level of sedation (maintaining response to verbal commands), noninvasive blood pressure, peripheral oxygen saturation and electrocardiogram were continuously monitored. The tongue, palate and oropharynx were anaesthetised using lidocaine 4% as gargle, and as a spray through a 20G cannula which was connected to the oxygen source with oxygen flow set at 3 L/min (Mackenzie technique).[5] Following adequate topical anaesthesia, the AWS® mounted with P blade and a reinforced tracheal tube ([Figure 1] Mallinckrodt Medical, Athlone, Ireland) with an internal diameter of 7-8 mm was introduced into the oropharynx. On the visualisation of the larynx, lignocaine 4% was sprayed onto the vocal cords and into the trachea using an 8FG catheter passed through the lumen of tracheal tube. Subsequently, the tracheal tube was advanced into the trachea, the AWS was removed from the oral cavity and the breathing system was connected to the tracheal tube. The time of appearance of the first-end tidal carbon dioxide ($EtCO_2$) trace on the monitor was noted.

Figure 1: Pentax airway scope; tracheal tube loaded into the integrated tube channel of the P blade

Following the confirmation of correct placement of the tracheal tube (and testing the integrity of cervical-spinal cord) general anaesthesia, was induced. During the procedure, the data collected included the total dose of local anaesthetic used, sedative drugs used, the best view of the larynx (Cormack and Lehane grade) obtained, intubation time (from AWS® inserted to the oral cavity to first $EtCO_2$ trace) and total time to complete tracheal intubation (from the start of local anaesthetic technique to first $EtCO_2$ trace). The anaesthesiologist rated the overall tolerance of the procedure by the patient on a visual analogue scale (VAS) of 0-10 (0 being poorly tolerated and 10 being well tolerated). During the routine postoperative visit on the next day, all patients were asked about their recollection of the procedure. They were also asked to rate their overall experience of the procedure on a VAS of 0-10 (0 = unpleasant and 10 = tolerable and do not mind having it again).

RESULTS

Data were collected from 30 patients who required awake tracheal intubation through oral route using the AWS. Patients' characteristics and the result of the preoperative assessment were as shown in Table 1.

Indications for awake intubation in 83% of patients were severe limitation of cervical-spine movement due to cervical-spine disease and critical cervical-spinal stenosis. The remaining 17% of the patients had anticipated difficult airway due to other causes. Remifentanil and midazolam were used in all patients, and the median (interquartile range) dose of lidocaine used was 520 (480-600) mg [Table 2].

The procedure was successful in 83.3% of the patients (25/30), 24 of successful patients were intubated in the first attempt, while one patient required second attempt at tracheal intubation (patient

Table 1: Patient's characteristics values expressed as the total number or median (range)

Patient characteristics	Total number, median (range)*
Age; years	56.5 (41-79)
Male:female	18:12
Weight; kg	82 (64-101)
BMI*; $kg.m^{-2}$	28 (21-41)
ASA score	
1	12
2	12
3	5
4	1
Mouth opening in cm	
<2	0
2-3	5
>3	25
Mallampati score	
1	8
2	12
3	10
4	0
Jaw protrusion class[6]	
A	21
B	9
C	0
Cervical-spine movement	
Limited	25
Normal	5

*BMI – Body mass index; ASA – American Society of Anesthesiologists

Table 2: Dose of sedative drugs and local anaesthetic used

Sedative and local anaesthetic drugs	Dose median (IQR* [range])
Midazolam; mg	1 (1-2 [0-2])
Remifentanil TCI**; ng/ml	3 (2-4 [1-4.5])
Lidocaine; mg	520 (480-600 [360-800])

Values expressed as median (IQR [range]). *IQR – Interquartile range; **TCI – Target controlled infusion

gagged on first insertion of AWS®, further lidocaine was administered and AWS was re-inserted). The mean [±standard deviation] intubation time and total time to complete tracheal intubation was 5.4 (2.4) and 13.9 (3.7) min respectively in successful cases [Table 3]. Awake intubation with the AWS was abandoned in the other five patients and intubation was completed with either flexible fibre optic scope (FOS) alone, or using a combination of AWS® and FOS where the AWS® with P blade was left *in situ* and FOS was passed through the tracheal tube and advanced into the trachea. Twelve patients had partial recall of the procedure, 12 patients had no recall, and one patient had full recall of the intubation events. Visual analogue scores for the overall experience and tolerance of the procedure by the patients are described in Table 3. There was no oral injury or dental damage sustained in any of the patients.

DISCUSSION

Video laryngoscopes are increasingly being used for awake intubation in patients with normal and difficult airways.[7] This case series demonstrated an 83% success rate when evaluating the use of the AWS in 30 patients for oral awake tracheal intubation. With a combination of AWS and FOS the success rate can be improved further.

In our institution prior to the availability of video laryngoscopes, awake tracheal intubation using FOS was the preferred choice for patients presenting for surgery with unstable cervical-spine. We chose the AWS® for numerous reasons; first it has been recognised as a fast, accurate and portable means of intubating patients with difficult intubation.[1,2,8,9] Second, studies have shown it to produce superior glottic views compared with the Macintosh and Airtraq, and there are reports of successful tracheal intubation using the AWS® in patients after failed intubation using a Macintosh laryngoscope.[3,10-12] Furthermore, there have been case reports of its use for awake intubation both through oral and nasal routes.[13-21] In our experience, minimal force and minimal neck movement was required in order to achieve a grade 1 view of the larynx, which is also supported by the reports from other users.[18,22,23] The other advantages of the AWS® are that, it is portable and easy to set up when compared to FOS and proficiency of its use requires less skill, dexterity and practice. This provides anaesthesiologists encountering difficult airway on a sporadic basis an alternative to the FOS.[13] Although single-use FOS has recently become available, majority of the departments are using standard FOS which needs to be disinfected following clinical use. This process may take up to 60 min prior to its availability for next use. AWS® has the benefit of single use P blade, which eliminates the risk of cross infection, and is immediately available for use in the next patient.

The disadvantage of the AWS® is that the P blade is 18 mm thick requiring a mouth opening of at least 25 mm[24] and it can only be used for awake intubation through oral route. In our view, the P blade takes up more space in the mouth and, therefore, requires good topical anaesthesia of the oral cavity to make it more tolerable to the awake patient.

In our case series, awake intubation with the AWS® failed in five patients. The reasons for failure were variable [Table 4]. The airway was anaesthetized in all patients using the same technique described above. The first patient presented for surgery with a critical stenosis of the cervical-spine. AWS® was inserted into the oral cavity, and a Cormack and Lehane grade 1 view was obtained.[25] On anaesthetising the larynx the patient started gagging which made the intubation difficult. As a grade 1 laryngoscopy view had been achieved with the AWS, it was decided to induce general anaesthesia while maintaining head in a neutral position. Trachea was successfully intubated following administration of propofol and atracurium using the AWS®. Failure in this case was due to patient discomfort, which could have been due to inadequate topical anaesthesia. The second patient was for an elbow surgery, with associated cervical-spine injury and rigid cervical collar *in situ*. On insertion of the AWS® but prior to achieving a view of the larynx, the patient complained of neck pain. The AWS® was left is situ and used as a conduit for a FOS [Figure 2]. Anaesthesia of the larynx and trachea in this case was achieved with lidocaine 4% delivered through an epidural catheter passed through the suction port of the FOS. The patient was intubated uneventfully, without any neurological sequel. In the third patient, following airway anaesthesia and advancement of the AWS® the best view attained was Cormack and Lehane grade 2 and advancing the tracheal tube was not possible. The AWS® was left *in situ*, and trachea was successfully intubated using FOS (using the same technique as inpatient two). The fourth patient was a very anxious patient, during the attempted advancement of the AWS®, the patient did not tolerate the procedure. The tracheal intubation was completed successfully using FOS, following induction of general anaesthesia. The fifth patient presented for surgery with a critical stenosis of the cervical-spine. The best view attained was Cormack and Lehane grade 2, and it was not possible to advance the tube into the trachea. Hence the AWS was left *in situ*, and trachea was intubated successfully by advancing the FOS through the tube channel of P blade of the AWS®.

Table 3: Procedure details in successful patients (25/30)

Parameters observed	Scoring
Intubation time (minutes): Mean (SD*)	5.4 (2.4)
Total time to complete tracheal intubation (minutes): Mean (SD)	13.9 (3.7)
Coughing: None/mild/moderate/severe	10/12/3/0
Gagging: None/mild/moderate/severe	7/12/6/0
Cormack and Lehane view: Grade 1/2/3/4	24/1/0/0
Tube rotation required: Yes/no	5/20
Anaesthesiologist rating on a VAS** of 1-10; median (IQR [range])	8 (7-9 [2-10])
Patient's rating a VAS** of 1-10; median (IQR [range])	9 (8-9 [8-10])
Patients recollection: None/partial/full	12/12/1

Values expressed as the total number, mean (SD) and median (IQR [range]). *SD – Standard deviation; **VAS – Visual analogue scale; IQR – Interquartile range

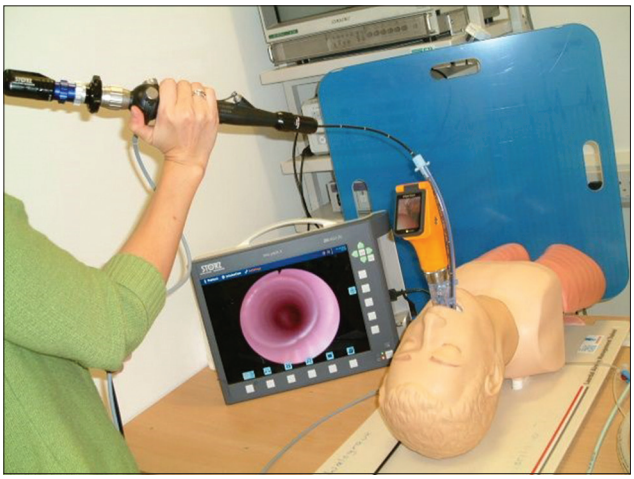

Figure 2: Pentax airway scope with P blade being left *in situ*; fibre optic scope passed through the tracheal tube and advanced into the trachea

Table 4: Procedure details of five patients in whom awake tracheal intubation using AWS failed

Patient	Reason for failure	Laryngoscopic view (Cormack and Lehane)	Rescue technique
One	Patient gagging	Grade 1	General anaesthesia was induced, and intubation completed using AWS*
Two	Patient with history of cervical-spine injury complained of neck pain	N/A**	Intubation was completed using a combination of FOS*** and AWS, where tube channel of P blade was used as a conduit for passing FOS
Three	Inability to advance the tracheal tube through the glottis	Grade 2	Same technique as inpatient two
Four	Very anxious patient and did not tolerate the procedure	N/A	General anaesthesia was induced, and intubation was completed using FOS
Five	Inability to advance the tracheal tube through the glottis	Grade 2	Same technique as inpatient two

*AWS - Pentax AWS videolaryngoscope; **NA - Not applicable as no laryngeal structures were visible as Pentax AWS was not advanced further into the airway; ***FOS - Flexible fibre optic scope; AWS - Airway scope

In three out of the five intubations where the AWS® failed, tracheal intubation was successfully achieved with the assistance of FOS using AWS® as a conduit.

CONCLUSION

Awake intubation using Pentax AWS® was successful in 83% of patients. Anaesthesiologists who do not routinely use the FOS may find the AWS® easier to use when they need to perform oral awake intubation. However, familiarity with the use of the device and an appreciation of potential problems must be acquired by using the device during routine tracheal intubation of anaesthetised patients prior to attempting an awake intubation.

In cases where tracheal intubation does not succeed with AWS® (either due to suboptimal view of the larynx or failure to advance the tracheal tube) tracheal intubation can then be completed using AWS as a conduit for passing the FOS. Further randomised controlled trials comparing the AWS to FOS are useful in evaluating the success rate and benefits.

Initial experience of our use of Pentax AWS® in six patients for awake tracheal intubation was presented as a poster at the Difficult Airway Society annual scientific meeting at Cheltenham, United Kingdom in November 2010.

ACKNOWLEDGEMENTS

Assistance with the article: We would like to thank Helen Parsons, Research Fellow at the division of Health Sciences, Warwick Medical School for her help with the data analysis.

REFERENCES

1. Asai T, Liu EH, Matsumoto S, Hirabayashi Y, Seo N, Suzuki A, *et al.* Use of the Pentax-AWS in 293 patients with difficult airways. Anesthesiology 2009;110:898-904.
2. Suzuki A, Toyama Y, Katsumi N, Kunisawa T, Sasaki R, Hirota K, *et al.* The Pentax-AWS((R)) rigid indirect video laryngoscope: Clinical assessment of performance in 320 cases. Anaesthesia 2008;63:641-7.
3. Enomoto Y, Asai T, Arai T, Kamishima K, Okuda Y. Pentax-AWS, a new videolaryngoscope, is more effective than the Macintosh laryngoscope for tracheal intubation in patients with restricted neck movements: A randomized comparative study. Br J Anaesth 2008;100:544-8.
4. Asai T, Enomoto Y, Shimizu K, Shingu K, Okuda Y. The Pentax-AWS video-laryngoscope: The first experience in one hundred patients. Anesth Analg 2008;106:257-9.
5. Mackenzie I. A new method of drug application to the nasal passage. Anaesthesia 1998;53:309-10.
6. Vaughan RS. Predicting difficult airway. Br J Anaesth CEACCP 2001;2:44-7.
7. Moore AR, Schricker T, Court O. Awake videolaryngoscopy-assisted tracheal intubation of the morbidly obese. Anaesthesia 2012;67:232-5.
8. Hirabayashi Y, Seo N. Airway scope: Early clinical experience in 405 patients. J Anesth 2008;22:81-5.
9. Kim MK, Park SW, Lee JW. Randomized comparison of the Pentax AirWay Scope and Macintosh laryngoscope for tracheal intubation in patients with obstructive sleep apnoea. Br J Anaesth 2013;111:662-6.
10. Asai T, Enomoto Y, Shingu K, Okuda Y. Pentax AWS airway scope. Masui 2007;56:862-5.
11. Suzuki A, Hayashi D, Toyama H, Minami S, Iwasaki H. Use of the pentax-AWS in a patient with Cormack 3a difficult airway. Masui 2007;56:341-4.
12. Teoh WH, Saxena S, Shah MK, Sia AT. Comparison of three videolaryngoscopes: Pentax Airway Scope, C-MAC, Glidescope vs the Macintosh laryngoscope for tracheal intubation. Anaesthesia 2010;65:1126-32.
13. Jarvi K, Hillermann C, Danha R, Mendonca C. Awake intubation with the Pentax Airway Scope. Anaesthesia 2011;66:314.
14. Xue FS, Liao X, Wang Q. Tracheal Intubation with the Pentax-AWS in Morbidly Obese Patients. Anesth Analg 2012;114:916.
15. Jeyadoss J, Nanjappa N, Nemeth D. Awake intubation using Pentax AWS videolaryngoscope after failed fibreoptic intubation in a morbidly obese patient with a massive thyroid tumour and tracheal compression. Anaesth Intensive Care 2011;39:311-2.
16. Komasawa N, Ueki R, Tomita Y, Kaminoh Y, Tashiro C. Case of awake intubation in semi-sitting position for a patient with myasthenia gravis combined with cervical disc hernia utilizing Pentax-AWS Airwayscope. Masui 2011;60:84-7.
17. Xue FS, Xiong J, Yuan YJ, Wang Q, Asai T. Pentax-AWS videolaryngoscope for awake nasotracheal intubation in patients with a difficult airway. Br J Anaesth 2010;104:505.
18. Asai T. Pentax-AWS videolaryngoscope for awake nasal intubation in patients with unstable necks. Br J Anaesth 2010;104:108-11.
19. Suzuki A, Terao M, Aizawa K, Sasakawa T, Henderson JJ, Iwasaki H. Pentax-AWS airway Scope as an alternative for awake flexible fiberoptic intubation of a morbidly obese patient in the semi-sitting position. J Anesth 2009;23:162-3.
20. Suzuki A, Kunisawa T, Takahata O, Iwasaki H, Nozaki K, Henderson JJ. Pentax-AWS (Airway Scope) for awake tracheal intubation. J Clin Anesth 2007;19:642-3.
21. Shinohara H, Ishii H, Kakuyama M, Fukuda K. Morbidly obese patient with a huge ovarian tumor who was intubated while awake using airway scope in lateral decubitus position. Masui 2010;59:625-8.
22. Malik MA, Subramaniam R, Churasia S, Maharaj CH, Harte BH, Laffey JG. Tracheal intubation in patients with cervical spine immobilization: A comparison of the Airwayscope, LMA CTrach, and the Macintosh laryngoscopes. Br J Anaesth 2009;102:654-61.
23. Hirabayashi Y, Fujita A, and Seo N. Cervical spine movement during laryngoscopy using the Airway Scope compared with the Macintosh laryngoscope. Anaesthesia. 2007;62:1050-5.
24. Thong SY, Lim Y. Video and optic laryngoscopy assisted tracheal intubation - The new era. Anaesth Intensive Care 2009;37:219-33.
25. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia 1984;39:1105-11.

Source of Support: Nil, **Conflict of Interest:** None declared