**Case Report**

**Pentax-AWS videolaryngoscope for awake nasal intubation in patients with unstable necks**

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In patients with unstable necks and at risk of pulmonary aspiration, awake fibreoptic intubation is often appropriate. However, stabilization of the neck can make fibreoptic intubation more difficult. I report the use of awake nasal intubation using the Pentax-Aiway Scope (AWS) in three patients with restricted neck movement, in whom awake fibreoptic intubation had failed.

**Case 1**: a 59-yr-old man, at risk of aspiration, required an emergency cervical laminectomy. Awake fibreoptic intubation was attempted while a Halo vest was being applied, but it was impossible to see the glottis, mainly due to pharyngeal and laryngeal oedema. The Pentax-AWS was easily inserted orally, and nasotracheal intubation was achieved within 20 s.

**Case 2**: an 85-yr-old woman with neck injury required emergency surgical stabilization. A retropharyngeal haematoma prevented a fibreoptic bronchoscope from being advanced beyond the epiglottis. Nasotracheal intubation using the Pentax-AWS (with the aid of a gum elastic bougie) was achieved within 1 min.

**Case 3**: a 22-yr-old man, with partial spinal cord damage, was undergoing cervical laminoplasty. He was at risk of aspiration and had an oedematous larynx. Although it was possible to insert a fibreoptic bronchoscope into the trachea while the neck was stabilized with a Halo vest, it was impossible to advance a tube over the fibrescope. Awake nasotracheal intubation using the Pentax-AWS was achieved within 15 s.

The Pentax-AWS may be useful for nasotracheal intubation in awake patients with restricted necks.

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In patients with unstable necks, stabilization of the head and neck is required during tracheal intubation. A major problem with this procedure is that the stabilization of the neck makes mask ventilation, insertion of a laryngeal mask airway, and tracheal intubation (using a Macintosh laryngoscope or fibreoptic bronchoscope) more difficult. When tracheal intubation and mask ventilation are predicted to be difficult and the patient is also at risk of pulmonary aspiration, it is necessary to intubate the trachea before induction of anaesthesia. In such a case, awake fibreoptic intubation is considered to be most suitable. However, it may be difficult to locate the glottis with a fibrescope in patients with a difficult airway and restricted head and neck movement. In addition, even if the fibrescope has been placed successfully in the trachea, it may be difficult to advance a tracheal tube over the fibrescope. Difficulty in advancing a tracheal tube over the fibrescope may provoke retching, vomiting, and airway obstruction. It is also a blind method when a tracheal tube is being advanced over the fibrescope.

The Pentax-Aiway Scope (AWS) videolaryngoscope (Hoya Co., Tokyo, Japan), designed for orotracheal intubation, has been shown to be useful in patients with difficult airways, including in patients with restricted neck movement. In addition, unlike fibreoptic intubation, the entire course of tracheal intubation is displayed on the videoscreen.

I report on the use of the Pentax-AWS for awake nasal intubation in three patients with restricted neck movement, in whom awake fibreoptic intubation had failed.

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Case 1
A 59-yr-old man, who had undergone cervical laminectomy without spinal cord injury, had infection in the cervical spine and an acutely swelling neck abscess and was brought to the operating theatre for an emergency cervical laminectomy. The patient’s head and neck were stabilized with a Halo vest. The patient was drowsy, but responsive to verbal command. Computed tomography indicated that the pharynx was narrowed by the abscess, and the larynx by oedema. The stomach was full due to enteral feeding until a few hours previously. Oxygen saturation ($Sp_O_2$) was 92–93% on oxygen at 8 l min$^{-1}$ via a Hudson mask. Surgeons requested nasotracheal intubation or they would proceed to tracheostomy. The patient’s family requested tracheostomy as a last resort.

Although oxygen was being given through an anaesthesia facemask, a bolus of propofol 10 mg, as a test dose, was injected i.v. This caused a rapid deterioration of breathing and $Sp_O_2$ temporarily decreased $<80%$. Therefore, the decision was made not to sedate the patient. After topical anaesthesia to the nose (2 ml lidocaine 10%), a 6.5 mm ID tracheal tube was inserted nasally, the breathing circuit was attached, and oxygen insufflated through the tube. No local anaesthetics were applied to the oropharynx, the larynx, or the trachea. A fibreoptic bronchoscope (diameter: 5.0 mm) was passed through the tube, but it was impossible to see the glottis, mainly due to the swelling in the pharynx which prevented the fibrescope from being advanced beyond the epiglottis. Attempts at fibreoptic intubation were abandoned, because of repeated desaturation.

Before carrying out tracheostomy, a final attempt was made to intubate with the Pentax-AWS. The Pentax-AWS was easily inserted (with the nasotracheal tube in place), with negligible response of the patient. It was apparent from a videoscreen that the posterior pharyngeal wall was grossly swollen, the larynx was oedematous, and the glottis narrowed. Insertion of the Pentax-AWS increased $Sp_O_2$ from 95% to 99%, due possibly to widening of the pharyngeal space. The tube was then smoothly advanced into the trachea, when the glottis opened at the beginning of inhalation. This caused mild coughing, but the reservoir bag started to move and the end-tidal carbon dioxide waveform appeared, indicating correct tracheal intubation. Time from insertion of the Pentax-AWS to successful intubation was $<20$ s. Anaesthesia was induced, neuromuscular block produced with rocuronium, and operation was carried out without complications. Operation proceeded uneventfully, and the trachea was extubated on the fifth postoperative day, without complications.

Case 2
An 85-yr-old woman with neck injury, with possible incomplete spinal cord injury, required emergency surgical stabilization. The patient had eaten immediately before the accident and was judged as at high risk of pulmonary aspiration. The magnetic resonance imaging showed a haematoma in the posterior pharyngeal wall, at the level of C4–7, and the supraglottic space was narrowed. The head and neck had been stabilized with a Halo vest. In the operating theatre, the patient was sedated with midazolam 1 mg, fentanyl 50 μg, and incremental doses of propofol (30 mg in total). After topical anaesthesia to the nose with 10% lignocaine 1 ml, a 6.0 mm reinforced tube was passed through the nose. No local anaesthetics were applied to the oropharynx, the larynx, or the trachea. A fibrescope (diameter: 5.0 mm) was passed through the tube and attempts were made to locate the glottis, but it was impossible. Thrusting the jaw forward or applying external pressure to the larynx did not improve the view. After considerable difficulty, it became possible to see the tip of the epiglottis resting on the posterior pharyngeal wall, but it was impossible to advance the fibrescope beyond the epiglottis.

Nasotracheal intubation using the Pentax-AWS was then attempted. With a nasal tube in place, the Pentax-AWS was inserted orally, and a full view of the glottis was obtained within 10 s. The tip of the nasal tube was also displayed on the videoscreen, but deviated from the target symbol. Therefore, a gum elastic bougie was passed through the nasal tube, and inserted into the trachea, by controlling the angle of its tip (Fig. 1). This caused no airway reflexes. After injection of propofol 10 mg, the nasal tube was then easily passed over the bougie into the trachea. After the correct tracheal intubation was confirmed, general anaesthesia was induced. Total time taken for successful tracheal intubation with the Pentax-AWS was $<1$ min. On the fifth postoperative day, it was decided to carry out surgical tracheostomy, because of paralysis of the diaphragm.

Case 3
A 22-yr-old man, with multiple injuries from a traffic accident 9 days previously, was undergoing cervical laminoplasty. The spinal cord was judged to be partially damaged, because the patient could not move his lower limbs. The patient’s head and neck were stabilized with a Halo vest. Before operation, the patient was awake, and the voice was hoarse. Computed tomography indicated an oedematous larynx (due possibly to trauma to the larynx and steroid therapy) and a full stomach due to paralytic gastrointestinal ileus.

In the operating theatre, the patient was sedated with midazolam 2 mg and fentanyl 50 μg. After topical anaesthesia to the nose, a 7.0 mm ID tracheal tube was inserted nasally. No local anaesthetics were applied to the oropharynx, the larynx, or the trachea. A fibreoptic bronchoscope was passed through the tube and it was relatively easy to
insert the fibroscope into the trachea. While intermittent
doses of propofol (40 mg in total) were given, unsuccess-
ful attempts were made to advance the tracheal tube over
the fibroscope. The $S_pO_2$ decreased to $<90\%$. Immediate
removal of the fibroscope and administration of oxygen
through the tube increased $S_pO_2$ to 99\%.

While emergency tracheostomy was being prepared, the
Pentax-AWS was inserted orally, with the nasotracheal
tube in place. Because the oedematous glottis was clearly
displayed in the target symbol of the videoscreen, the nasal
tube was advanced into the trachea without difficulty. This
caused several coughs, but this was prevented by immedi-
ate injection of propofol 40 mg. Time taken from insertion
of the Pentax-AWS to tracheal intubation was $<15\ s$.

### Discussion

In patients with restricted neck movements, it is more dif-

cult than in normal positioning to see the glottis with a
Macintosh laryngoscope or a fibreoptic bronchoscope.

The Pentax-AWS has been shown to be more effective
than the Macintosh laryngoscope for visualizing the
glottis, in patients with neck stabilization. In this report,
all three patients had neck stabilization with a Halo vest
and attempted fibreoptic intubation had failed, but the
glottis was easily seen with the Pentax-AWS.

In awake patients, insertion of a Macintosh blade may
be stressful to the patient, particularly because more force
will be required in patients with stabilized necks. In con-
trast, with the Pentax-AWS, it is unnecessary to place the
head and neck to the sniffing position, and thus, insertion
of the Pentax-AWS could be less stressful to the patient.
In all the patients reported here, there were minimal stress
responses during insertion of the Pentax-AWS.

In patients with laryngeal pathology, it is not possible to
see if the tube is causing local damage while it is being
advanced over the fibroscope. In contrast, with the
Pentax-AWS, it is possible to see the entire course of tra-
cheal intubation, and thus, it should be easier to avoid
unwanted injury. In addition, with a fibreoptic broncho-
scope, it can be difficult to advance the tube over the
scope into the trachea. In contrast, such difficulties are
rare with the Pentax-AWS.

The Pentax-AWS is designed for orotracheal intubation.
However, nasal intubation can be achieved with the
Pentax-AWS with the following sequence (Fig. 1). After a
tracheal tube has been inserted nasally, the Pentax-AWS
is inserted orally and the view of the glottis is obtained.
The tracheal tube is advanced so that the tip of the tube comes
into the video view. When the tube tip is directed towards
the target symbol on the videoscreen, it is easy to advance
the tube into the trachea. When, in contrast, the tip of the
tube is deviated from the target symbol, a gum elastic
bougie may be useful (Fig. 1). The bougie is passed
through the tracheal tube and advanced through the glottis,
by adjusting the direction of its angulated tip. The tracheal
tube is advanced over the bougie into the trachea. In one
of the three patients, the tip of the nasal tube was deviated
from the target symbol, but with the aid of a bougie, it
was easy to advance the tube into the trachea.

In conclusion, the Pentax-AWS may be useful not only for
orotracheal intubation, but also for nasotracheal intubation,
in awake patients with a known or predicted difficult airway.

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