

The Case for Single-Use Laryngoscopes



Dr Kevin F Yee and Dr Peter A Hales
Westmead Hospital, Sydney, Australia

Email address: yeemail@bigpond.net.au

Background

Anaesthetic procedures such as laryngoscopy may result in cross infection when the patients' mucosal barriers are broken, and contaminated equipment is used. Such incidents have been reported in the literature^{1,2,3}.

Abramson and colleagues⁴ demonstrated that microbes adhered to 19 out of 45 rigid laryngoscopes after clinical use. Contamination of laryngoscope handles and blades by bacteria, blood and residual protein are well documented.

Beamer and Cox⁵ isolated the following *micro-organisms* from 12 out of 20 reprocessed laryngoscope blades ready for use:

MRSA	1
Commensal oropharyngeal flora	5
Viridans streptococci	5
Bacillus sp.	1

Simmons⁶ isolated the following *micro-organisms* from 20 out of 20 laryngoscope handles ready for use:

Staphylococcus epidermidis, 9 multiresistant strains
S. aureus
Citrobacter freundii
Pseudomonas
Enterococci

Occult blood contamination has been demonstrated consistently in the following reports:

	Morell ⁷	Phillips & Monaghan ⁸	Ballin ⁹
Handles	50%	40%	38%
Blades	10.5%	20%	2%

Residual protein deposits have been shown by Miller and colleagues¹⁰ to occur on 82% of 'cleaned' laryngoscope blades, 11% of these heavily stained with protein.

Surveys of laryngoscope blade cleaning methods show that only 22.2% routinely use the autoclave in the UK, and only 5.2% in the USA¹².

Current Issues

The laryngoscope is used at induction of anaesthesia and maintenance of life support, yet anaesthetists face the following potential problems when using this critically important instrument:

- Failure of illumination following repeated sterilisation associated with:
 - Dim, flickering, intermittent or non-functioning light
 - Poor contacts between blade & handle, and/or light bulb & housing
 - Premature expiry of bulb following sterilisation
 - Deterioration of fibreoptic light guide
- Risk of cross contamination due to:
 - Residual soiling on the blade following decontamination
 - Contamination of the handle - by the folded blade after intubation - by other airway equipment, (especially following difficult intubations)
 - The lack of uniform decontamination procedure on handles

Survey

An electronic (Digivote) survey was conducted on delegates at the Australian and New Zealand College of Anaesthetist Annual Scientific Meeting in May 2003, where these issues were discussed. The survey questions and results are presented below:

1) How do you rate the illumination system of current laryngoscopes?

Excellent	26.7%
Adequate	56.7%
Poor	16.6%
Total	100.0%

2) What problems have you experienced with the light source?

Bulb - expired	17.8%
- poor contact	73.3%
Fibreoptics - dirty ends	32.2%
- broken fibres	20.0%
Battery power - failing	51.1%

3) Is the laryngoscope blade that you use

Sterile?	24.1%
Clean?	62.1%
Contaminated?	13.8%

4) Is the laryngoscope handle that you use

Sterile?	6.9%
Clean?	44.8%
Contaminated?	48.3%

5) How do you rate the reliability of the current laryngoscope?

Always	24.1%
Intermittent	75.9%
Unreliable	0

6) Is there room for improvement in current equipment and practice?

Yes	80%
No	13.3%
Indifferent	6.7%

Discussion

The basic design of the standard laryngoscope most commonly used for endotracheal intubation has been virtually unchanged since Macintosh introduced the curved blade in 1943. However there has been an increased presence of pathogens such as multiple resistant bacteria, hepatitis viruses, HIV and prions in the patient community over the recent past. It is therefore quite appropriate for government and regulatory bodies to address the issue of potential cross infection and provide more stringent guidelines for clinical practice.

Current regulations and policies show a trend towards sterilisation of laryngoscope blades, and regular decontamination of laryngoscope handles:

	ANZCA Policy 28 1995 ¹³	ASA (USA) 1999 ¹⁴	Dutch WIP 1/01 ¹⁵	NSW Health 4/02 ¹⁶	AAGBI 11/02 ¹⁷
Blade	Disinfect	Disinfect	Sterilise	Sterilise	Sterilise
Handle	Decontaminate	n/r	n/r	n/r	Wash/Disinfect/ Sterilise
Single use					Encourage

Repeated cycles of heat sterilisation have led to a more rapid deterioration and decreased reliability of the laryngoscope.

56.7% of Australian Anaesthetists indicated the illumination system of the current standard laryngoscope to be 'adequate', and 73.3% experienced problems of failing light attributable to poor electrical contact.

24.1% considered their laryngoscope blade to be sterile while 48.3% considered their handles to be contaminated.

Only 24.1% regarded the laryngoscope as being always reliable, and 80% of respondents indicated there was room for improvement on the current equipment and practice.

Potential problems of laryngoscopes with an incandescent light source include:

- Impossible to clean properly
- Premature expiry of bulbs following heat sterilisation
- Deterioration of electrical connections following repeated heat sterilisation
- Potential to lose bulb into airway

Potential problems of laryngoscopes with a fibreoptic light source¹⁸ include:

- Gradual reduction in light intensity
- Fractures in synthetic material in which the fibres are mounted
- Severe dislocation of the fibre bundle
- Changes which allowed the fibre bundle to vibrate

These potential problems of cross infection and equipment failure will be avoided if single-use laryngoscopes are utilised, as encouraged by the AAGBI¹⁷.

Our solution to the problems of premature laryngoscope failure and potential cross infection is a new single-use laryngoscope. The *Yeescope* is protected by international patent application no: PCT/AU2004/000159 and features:

- A one-piece instrument incorporating handle and blade with improved ergonomics
- Sterile packed, ready for use
- A new bright illumination system with every use
- An electronic timing switch to prevent reuse of the instrument

Yeescope Prototype



Yeescope Prototype



Conclusion

The current laryngoscope was designed more than 60 years ago and has virtually remained unchanged, whereas the microbiological environment in which we practise has changed significantly over recent years. It is therefore quite appropriate for regulatory bodies to provide more stringent guidelines to cope with this changing clinical environment. Unfortunately this has resulted in a life saving piece of anaesthetic equipment becoming unreliable. Our solution is to provide a single use laryngoscope that has a bright illumination system with an intrinsic design to reduce potential cross infection. A prototype of this new instrument is attached for demonstration purposes.

La conclusion en français

Le laryngoscope actuel a été conçu il y a soixante ans et a peu changé depuis. Pourtant l'environnement microbiologique a beaucoup changé récemment. Donc il est approprié que les organisations sanitaires prévoient des recommandations plus rigoureuses pour s'adapter à cet environnement en évolution. Malheureusement le résultat est qu'un appareil anesthésique qui peut sauver la vie est devenu peu fiable. Notre solution est un laryngoscope à usage unique qui possède un système d'éclairage puissant et il est conçu pour éviter les infections croisées. Voici un prototype de ce nouvel instrument.

References

- Foweraker JE. The laryngoscope as a potential source of cross-infection. *J Hosp Infect* 1995; 29:315-316.
- Neal TJ, Hughes CR, Rothburn MM, Shaw NJ. The neonatal laryngoscope as a source of cross-infection. *J Hosp Infect* 1995; 30:315-317.
- Nelson KE, Warren D, Tomasi AM, Raju TN, Vidasagar D. Transmission of neonatal listeriosis in a delivery room. *Am J Dis Children* 1985; 139:903-905.
- Abramson AL, Gilberto E, Mullooly V, France K, Alperstein P, Isenberg HD. Microbial adherence to and disinfection of laryngoscopes used in office practice. *Laryngoscope* 1993; 103:503-508.
- Beamer JER, Cox RA. MRSA contamination of a laryngoscope blade: a potential vector for cross infection. *Anaesthesia* 1999; 54:1010-1011.
- Simmons SA. Laryngoscope handles: A potential for infection. *J Am Assoc Nurse Anesth* 2000; 68:233-236.
- Morell RC, Ririe D, James RL, Crews DA, Huffstetler K. A survey of laryngoscope contamination at a university and a community hospital. *Anesthesiology* 1994; 80:960.
- Phillips RA, Monaghan WP. Incidence of visible and occult blood on laryngoscope blades and handles. *J Am Assoc Nurse Anesth* 1997; 65: 241-246.
- Ballin MS, McCluskey A, Maxwell S, Spielsbury S. Contamination of laryngoscopes. *Anaesthesia* 1999; 54:1115-1116.
- Miller DM, Youkhana I, Karunaratne WU, Pearce A. Presence of protein deposits on 'cleaned' re-usable anaesthetic equipment. *Anaesthesia* 2001; 56:1069-1072.
- Esler MD, Baines LC, Wilkinson DJ, Langford RM. Decontamination of laryngoscopes: a survey of national practice. *Anaesthesia* 1999; 54:582-598.
- Tait AR, Tuttle DB. Preventing perioperative transmission of infection: A survey of anaesthesiology practice. *Anesth Analg* 1995; 80:764-769.
- Policy on Infection Control in Anaesthesia. Australian and New Zealand College of Anaesthetists Policy 28, 1995.
- Recommendations for Infection Control for the Practice of Anaesthesiology (Second Edition) 1999. American Society of Anaesthesiology. www.asahq.org accessed March 2004.
- Cleaning and disinfection of endoscopes. Dutch Working party on Infection Prevention. Document no 21b, January 2001. www.wip.nl accessed March 2004
- Infection Control Policy. NSW Health Department, File No 01/336, Circular No 2002/45, Issued 11 April 2002, Section 9.
- Infection Control in Anaesthesia. Published by The Association of Anaesthetists of Great Britain and Ireland. November 2002. www.aagbi.org
- Bucx MJL, de Gast HM, Veldhuis J, Hassing LH, Meulemans A, Kammeyer A. The effect of mechanical cleaning and thermal disinfection on light intensity provided by fibrelight Macintosh laryngoscopes. *Anaesthesia* 2003; 58:461-465.