Low-cost teaching aid: 
A modification of Macintosh blade into a video laryngoscope for teaching laryngoscopy and intubation

Video laryngoscopy is increasingly being recognized as an essential tool during intubation. Easy availability of advanced camera technology should be properly explored for safe airway management. Learning laryngoscopy and endotracheal intubation is an important and essential skill for anesthesiologists. There are earlier reports of low-cost USB cameras being used with Macintosh blades for real-time video laryngoscopy. Their use of similar cameras was limited because of the need to connect it to a computer laptop, which needs space and adds significant weight. Video laryngoscopes which are currently available need a re-learning of the technique of laryngoscopy. Teaching laryngoscopy and intubation can be made easier with video laryngoscopy. We tested a modification to Macintosh laryngoscope blade for teaching traditional laryngoscopy. Our aim was to test whether this device can help in teaching and learning laryngoscopy and intubation skills by resident doctors.

We modified Mac size 3 and 4 blades by removing the light head and its channel. We attached a tube into the groove left by removal of this channel. The channel was replaced with a piece of tube cut from a 9.0-mm endotracheal tube. The cut ends were smoothened out and glued to the groove on the flange of the laryngoscope blade [Figures 1 and 2].

The important advantage of this technique is its simplicity and ease of setting up. The camera we used is one of the many USB borescopes readily available online at a low cost. They run on open-source free software available on android platform. We used phones with android (ver. 6.0 and above) which allow OTG (On The Go) support. This camera comes with a 2 m cable so that the mobile screen can be placed conveniently during intubation without hindering the procedure.

We used an application called CameraFi (free download from Google Play store) which can capture images and videos from this device. This device can be switched on in
less than 20 s. The camera has a built-in LED light source at the tip avoiding the need for a separate light source. The attached piece of endotracheal tube acts as a holding channel for the camera.

We assessed the performance of the device by asking the residents to evaluate and analyze the performance by the recorded video.

Cormack and Lehane grading of laryngoscopic view was noted. Any need for external manipulation of larynx to improve the view during laryngoscopy was noted. Laryngeal manipulation was based on the real-time video. The number of attempts for intubation was noted. A feedback was collected from the residents about the ease of laryngoscopy and intubation.

After each use, the device was sterilized with water and povidone iodine or chlorhexidine-based solutions.

We recorded videos of 50 intubations real time [Figure 3]. External laryngeal manipulation improved the view in 22 (44%) cases. We intubated 10 (20%) cases with the help of bougie, and the rest were passed with endotracheal tube directly. Forty-one (82%) of the intubations were completed in the first attempt. The remaining 9 (18%) cases were intubated in the second attempt. None of the cases needed third attempt. In 32 (64%) intubations, the residents gave a feedback that intubation was easy and they felt confident.

Use of USB camera device has been described earlier with camera connected to a computer laptop and directly onto an android smartphone. Previous descriptions used adhesive tapes to secure camera to the Mac blade\cite{12,13} and a description of use along with Airtraq models.\cite{14} We tried to overcome this issue by attaching and securing a channel, to which the camera can be secured just before intubation.

Most available video laryngoscopes need introduction of the blade in midline along the tongue. We used the standard curved blade and handle for laryngoscope without the battery, and laryngoscopy was done using the traditional method of introducing the blade from the right side of the mouth and pushing the tongue to the left. Therefore, there is no need to re-learn the technique for laryngoscopy. This also helps learning the traditional laryngoscopy even for a novice.

Our study shows that novices in anesthesia can be taught interactively using video laryngoscopy. The low cost also helps setting up training for medical and paramedical personnel with minimal expenditure.

**Declaration of patient consent**
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Acknowledgements**
We wish to acknowledge the support of Dr CVR Mohan, HOD Department of Anaesthesiology, ANIIMS for his help, support and permission for the study. We thank Mr Abraham, OT technician for helping in making changes to MacIntosh blades.

**Financial support and sponsorship**
Nil.
Letters to Editor

Conflicts of interest
There are no conflicts of interest.

Anil K. Narayan, Janardhan A. L, Avinash Prakash, Sarasa K. Sahoo
Department of Anaesthesiology, ANIIMS, Port Blair, Andaman and Nicobar Islands, India

Address for correspondence: Dr. Anil K. Narayan,
Department of Anaesthesiology, OT Complex, 1st Floor,
G B Pant Hospital, ANIIMS, Port Blair - 744 104,
Andaman and Nicobar Islands, India.
E-mail: docanilnarayan@gmail.com

References
1. Zaouter C, Calderon J, Hemmerling TM. Videolaryngoscopy as a new standard of care. Br J Anaesth 2015;114:181-3.
2. Karippacheril JG, Umesh G, Ramkumar V. Inexpensive video-laryngoscopy guided intubation using a personal computer: Initial experience of a novel technique. J Clin Monit Comput 2014;28:261-4.
3. Karippacheril JG, Le Cong M. Videolaryngoscopy using an Android smartphone: A direct digital technique. Indian J Anaesth 2016;60:143-5.
4. Trivedi JN. An economical model for mastering the art of intubation with different video laryngoscopes. Indian J Anaesth 2014;58:394-6.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Narayan AK, Janardhan AL, Prakash A, Sahoo SK. Low-cost teaching aid: A modification of Macintosh blade into a videolaryngoscope for teaching laryngoscopy and intubation. J Anaesthesiol Clin Pharmacol 2018;34:552-4.

© 2019 Journal of Anaesthesiology Clinical Pharmacology | Published by Wolters Kluwer - Medknow