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Introduction: Airway management is an arduous task where skillful techniques and appropriate devices must be simultaneously incorporated. Insufficient training and lack of equipment support not only results in inaccurate esophageal intubation but also leads to unnecessary airway injury [1]. The conventional laryngoscope does not reveal the vocal cords as a result of the discrepant anatomic structure or the lack of skill [2, 3]. An additional disadvantage of direct laryngoscope is the hygiene hazard, in order to reach a maximal view, the clinical user need to approach their eyes close to the patient's mouth. As a result, the patient's airway may directly contaminate the performer's skin and the patient's exhalations are capable of ~~transmitting infectious diseases such as severe acute~~ respiratory syndrome (SARS) and open tuberculosis.

Methods: Sunscope combines a comprehensive collection of conceptual design: "Detachable", "Portable", "disinfection", and "Commercially available". The whole construct integrates a visual module into the distal end of the detachable probe and packaged with a high resolution lens, low power CMOS sensor [4, 5], LEDs, and air/water channel. Moreover, the proximal end of probe is a single-pin connector that enables readily replacement with different length and diameter on demand. By way of detachable and disposable design, a new probe is replaced onto the same platform once the procedure is complete on one individual. This practice eliminates the likelihood of cross contamination, the lengthy cycle time for disinfection, and the costly material for heat-resistant and chemical-resistant coating. The diameter of tube can be designed according to any available endotracheal tube size. The all-in-one portable device serves any occasion

for endotracheal intubation requiring suction and simultaneous oxygen supply.

The platform includes the 4-inch LCD with rotatable viewer panel and an operating console. The viewer exhibits real-time video image with optimal view angle while the console equips light control and power supply. The wireless module enables image sharing on multiple devices and can also send the real-time image stream by 3.5G communication protocol to the remote medical center for consultation. The comparison of functions with the conventional laryngoscope (C) and various devices used in difficult airway management was shown in Table 1, and the profile of Sunscope was shown in Figure 1.

Results: In our simulation test in eight Emergency Medical Technician (EMT), median level and four EMT-Paramedic level, all the EMTs finished the intubation process within one and half minutes after 30 min training courses. Our mini pig studies also showed the same result for reducing the time and improve the success rate on both experience and inexperience user. The entire process of intubation can be readily recorded in medical database for both online and offline analysis. Furthermore, the accumulated images can also help in building a powerful database for large-scale study off-line. Throughout these tests, we demonstrate that Sunscope can largely improve the quality of airway management [6].

Discussion: Sunscope development team has designed a multifunctional intubation endoscope which integrates a semiconductor image sensor into a compact video-guided intubation and airway management tools. This platform also serves as a useful tool for endoscope specialists, gynecologists and otolaryngologists in various clinical conditions. In pediatric practice, Sunscope platform can accommodate any diameter of the camera tip specifically fir for children airway at various ages. In colon rectal practice, the unique working channel proves to be a reliable access for drug instillation or instrumentation. In general, Sunscope brings forth a multifunctional platform

Table 1. Comparisons of functions with the conventional laryngoscope (C) and various devices used in difficult airway management

Functions	C	Lightwand	Pentax WAS	Glidescope	Fiberoptic	Sunscope
Using	+	-	Modified	Modified	-	-
laryngoscope	+	-	+	-	-	+
Mobile	-	-	Fixed	Fixed	Controllable	Controllable
image guide						
Wireless	-	-	-	-	-	+
transmission	-	-	-	-	Suction	Suction, ventilation
Database	-	-	-	-	-	+
processing						
Disposable	-	-	-	-	-	+

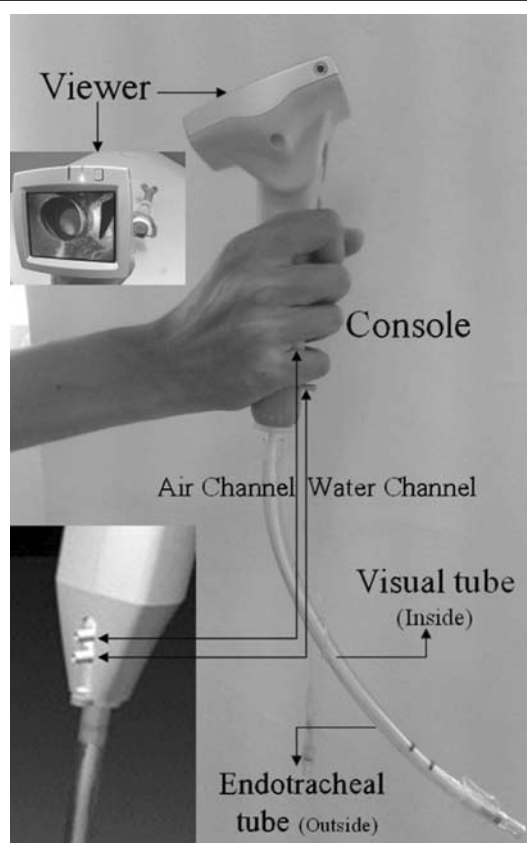


Fig. 1. The profile of Sunscope.

through close interaction among medicine, technology and industry.

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