What's new above the cords? Simulation based education for supraglottic airway management.

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Introduction

Supraglottic airway management devices comprise a family of medical devices that facilitate oxygenation and ventilation without endotracheal intubation [1]. "Supraglottic airway" is a generic description for devices that facilitate ventilation and oxygenation with devices that do not penetrate the vocal cords. Classification of these devices can be constructed based on based on the laryngeal sealing mechanism of each device [2]. Three main mechanisms are identified: cuffed perilaryngeal sealers (e.g. laryngeal mask airway), cuffed pharyngeal sealers (e.g. laryngeal tube), and cuffless anatomically preshaped sealers (e.g. I-gel airway). Supraglottic devices became routinely used in the operating room, with the advent of the laryngeal mask airway (LMA) over 20 years ago. Emergency resuscitation paradigms have traditionally utilized sealed facemask (a type of supraglottic device) ventilation by pre-hospital personnel and others who are untrained in intubation techniques. A variety of alternate devices have been developed which can be placed blindly, and reliably provide secure oxygenation and ventilation, some with capability of secure conversion to an endotracheal tube. Advantages of these devices include higher seal pressures (allowing higher ventilation pressure), ease of insertion, and the ability to drain gastric fluid, and the ability to avoid cervical spine neck extension to visualize the larynx. The Combitube, Laryngeal tube, I-gel Airway, Streamlined Pharynx Airway Liner (SLIPA), and intubating laryngeal mask airway are examples of such devices. New commercial supraglottic devices are regularly introduced for clinical used, over 25 versions are currently available from multiple manufacturers. The King Laryngeal Tube is a simple to use, reliable device that results in >90% first attempt successful placement by paramedics in a pre-hospital clinical setting [3]. In general, blindly placed supraglottic devices are contraindicated in patients who are awake, with intact gag reflexes, or with distorted supraglottic anatomy. Complications can include malpositioning, aspiration, and upper airway trauma. Reference [4] contains images of the described devices.

Simulation-Based Training Methods

Simulation based familiarization and training in the indications, contraindications, and device specific techniques can be utilized to provide practitioners exposure to multiple devices in a short period of time. Simulation can likewise be utilized to assess individual performance and device functionality. Effective use of simulation for these purposes requires knowledgeable matching of the selected supraglottic device to the airway simulator chosen for training [4]. A recent review concludes that none of the four airway training manikins studied was a single "best" match for all of the eight supraglottic devices tested, and that several devices were suitable for training with a wide variety of supraglottic airway devices. The Laerdal Airway Trainer and Trucorp Airsim simulators performed well with most supraglottic airway devices. Difficult airway simulation with pharyngeal swelling and trismus can be introduced as curriculum elements with the Laerdal Airway trainer, extending the versatility of the device for advanced airway management training.

Summary

Simplicity of blind placement technique and high rates of correct positioning make supraglottic airway devices an important element in the armamentarium available for emergency airway rescue. A large variety of devices are available, with varying performance characteristics and variable degrees of evidence regarding use in the pre-hospital setting. Pre-hospital and emergency airway management with supraglottic devices is advocated more routinely as evidence accumulates [5]. Simple low cost airway simulators are available for evaluation of devices, training, and assessment.

Conclusions

The use of supraglottic airway devices is a pre-hospital airway management strategy whose time has come. "Above the cords" is now a validated anatomic location for definitive airway management strategies in pre-hospital and emergency settings.

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Airway management: Shining a New Light

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Introduction

Airway management is practiced by anesthesiologists, emergency physicians, critical care experts, and less frequently by specialists in other disciplines. Pre-hospital personnel and military medics are also called upon to provide airway support for acutely ill and injured patients. Intubation success rates are decreased in the pre hospital setting, and when a difficult airway is unexpectedly encountered [1]. Novel approaches to improved airway rescue and management include the use of video enable devices, which can mitigate many unfavorable factors which contribute to low intubation success rates in emergency situations. Laryngeal visualization is a primary determinant of successful intubation, and video enabled devices significantly improve visualization of laryngeal structures [2]. Training in the utilization of video enabled devices requires deliberate practice for unique eye-hand coordination and psychomotor skill development. Fundamental skill acquisition and device orientation can be accomplished utilizing manikin airway simulators in both normal and difficult airway configurations.

Description of Workshop

Workshop participants were introduced to an ensemble of video enabled airway management tools. The Bonfils lighted stylet, Berci videolaryngoscope, and intubating fiberscope devices (Karl Storz KARL STORZ GmbH & Co. KG, Tuttlingen Germany) were utilized. Skill stations utilizing SimMan® and Difficult Airway ® simulators (Laerdal Pty Ltd, Oakleigh, Victoria Australia) were configured for facilitated skills development through demonstration and deliberate practice. Simulated normal and difficult airway anatomy was presented for students to gain experience and practice skills with these novel devices. No participants had previously utilized video-enabled airway devices for intubation. Participants included nurses, medical students, oral surgeons, and practicing physicians. Each had a military role that could place them in the position of primary airway manager, despite the fact that none routinely practiced intubation in their usual clinical setting. Participants practiced techniques and skills for intubation of normal and difficult airways, using traditional laryngoscopy, and video devices.

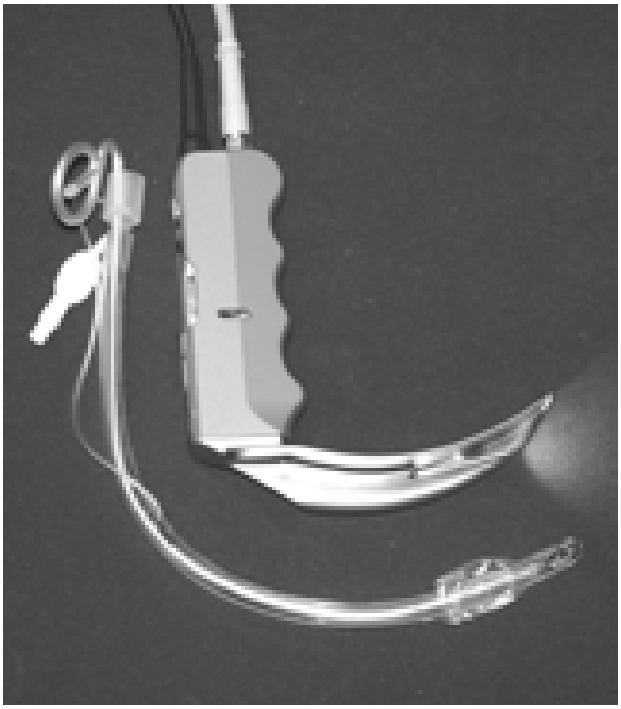

Figure 1. Storz Berci Macintosh 3 Video Laryngoscope.

The Bonfils retromolar intubating video stylet was utilized for simulated trismus, the videolaryngoscope for tongue and pharynegeal edema, and the intubating fiberscope for obstructed oropharyngeal airway and cervical spine injury simulation. Difficult airway conditions were thus replicated and successful video-facilitated intubation was contrasted to challenging and often unsuccessful intubation using traditional direct laryngoscopy. Combined video device methodologies were also demonstrated and practiced [3]

Discussion

Advanced video technology has enabled miniaturized light source and image acquisition through fiberoptic bundles and video camera chips on medical devices such as endoscopes, laparoscopic instruments, and others. Innovative application of video technology to airway management enables less experienced practitioners in the successful intubation of uncomplicated airways, and facilitates management of difficult airways for both experienced and inexperienced practitioners [4] [5]. Military care providers are called upon to provide care for urgent

medical conditions in challenging environments, constrained by sub-optimal environmental conditions, limited infrastructure, variable personnel, and unpredictable equipment supply. Such environments include the battlefield, deployed hospitals and aide stations, and aircraft and ships.

Conclusions

Video aided laryngoscopy is evolving as a methodology for operating theater and pre-hospital airway management. Continued development with ruggedization and miniaturization will afford far forward deployed medical personnel a new lifesaving tool for integration into battlefield care doctrine and algorithms. Rapid skill acquisition can be accomplished with the use of structured manikin-based training for both experienced practitioners and novices.

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