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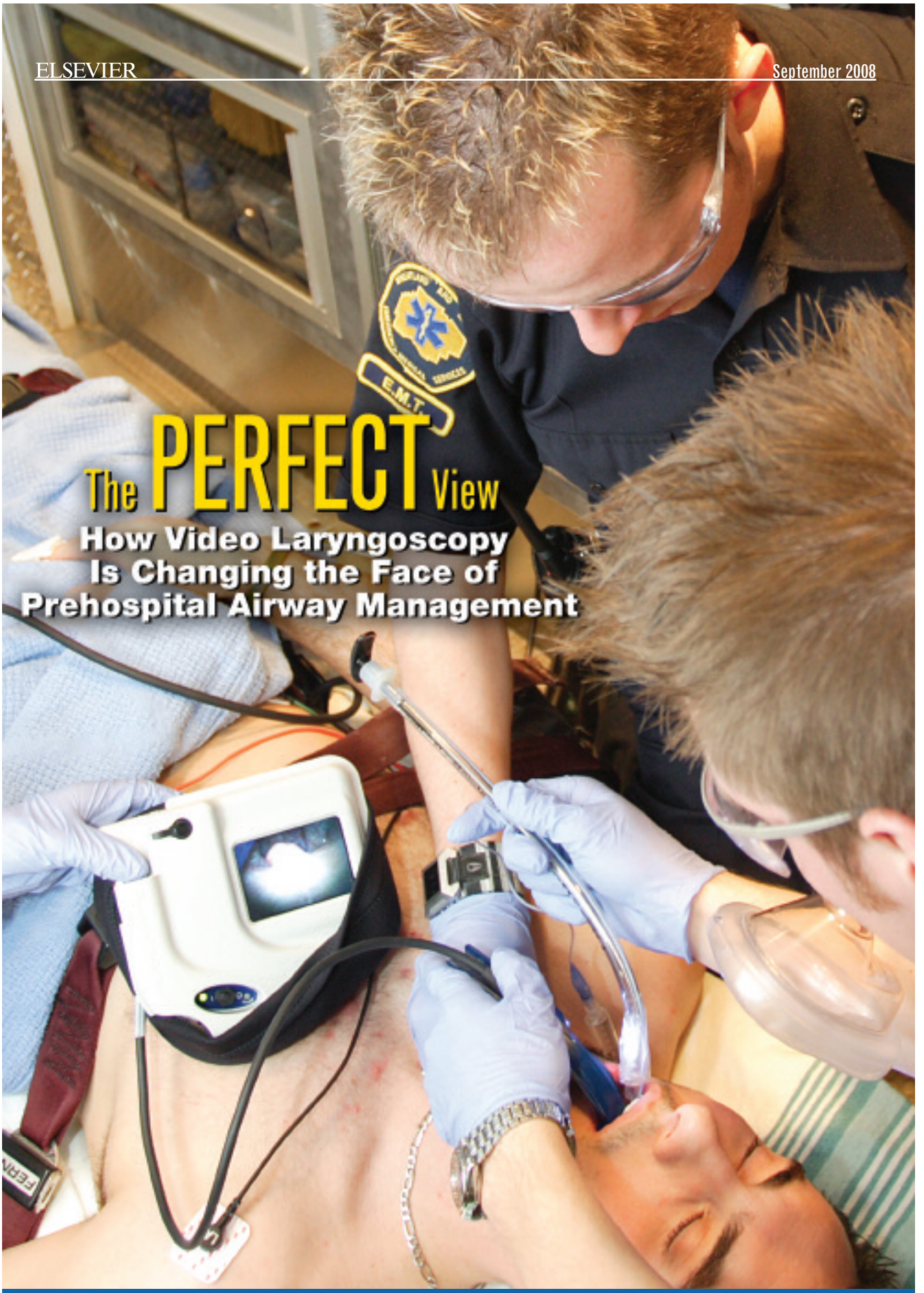

The PERFECT View

How Video Laryngoscopy Is Changing the Face of Prehospital Airway Management

The Conscience of EMS JEMS JOURNAL OF EMERGENCY MEDICAL SERVICES

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VERATHON

The Military Experience

The GlideScope Ranger Improves Visualization in the Combat Setting

BY MICHAEL R. HAWKINS, MS, CRNA

It's 1800 HRS, and the radio calls for the Trauma Team to report to the emergency department STAT. The information coming across the radio continues: "Medivac inbound. Two urgent surgicals, one intubated. Ten-minute ETA." Although it may sound like the initial report of an inbound helicopter at any urban trauma center in the U.S., the reality is that minutes before, the flight medic rolled out of a Black Hawk helicopter in Iraq to meet a combat medic who had just pulled two of his fellow soldiers out of their Humvee. Over the roar of the helicopter and small arms fire in the distance, the medic quickly gives a report, yelling, "IED. Patient One was unconscious. I intubated him. Has a loose dressing on his neck. Open neck wound, right side, bleeding controlled. Right leg is partially amputated at mid-thigh, and a tourniquet is in place. Patient Two is awake. Multiple fragment wounds on his face, right arm and leg." The casualties are loaded into the Black Hawk and urgently flown to the nearest Combat Support Hospital.

CPT Michael R. Hawkins (left) and COL Thomas C. Broach (right) show their GlideScope® Rangers at the 325th CSH, COB Speicher, Iraq.

Whether you're a prehospital medic in the mountains of Afghanistan or the sands of Iraq, many of the same airway issues that challenge EMS here in the U.S. also challenge the prehospital providers in the combat zones of the Middle East. One North American airway study conducted in a large urban EMS system found that paramedics reported as many as 70% of laryngoscopies performed had poor glottic visualization and required multiple laryngoscopy attempts.[1] Even data in the hospital/surgical setting shows that clinicians encounter poor glottic visualization in as many as 9% of laryngoscopies.[2]

In the combat zone, more than 75% of surgical injuries presenting to a Combat Support Hospital (CSH, pronounced "CaSH") result from either improvised explosive devices (IEDs) or gunshot wounds (GSWs).[3] These patients frequently present with blast or penetrating fragment (shrapnel) injuries that disrupt the integrity of the oral, pharyngeal or glottic structures.

These injuries can make direct laryngoscopy (DL) even more challenging. Thus, airway management and optimal DL success in the combat setting require concise airway protocols and experience, as well as equipment that's reliable, sturdy and enhances the provider's proficiency.

In addition to the challenges of glottic visualization during endotracheal intubation (ETI) in the complex trauma airway, military medics and prehospital providers also face the constant task of minimizing the amount and size of equipment necessary to deal with these injuries.

With the advancement of technology, several video laryngoscope systems have been developed that enhance the view of the glottis with the goal of improving laryngoscopy success rates in the difficult airway. Verathon

Medical® has developed the GlideScope® Ranger Video Laryngoscope (Ranger), a compact, sturdy system that can withstand the demanding operating environment of the military.

The blade of the Ranger is similar to a Macintosh blade but has a pronounced 60° angulation and incorporates a high-resolution color camera with the image displayed on a 3.5" LCD panel. Because of the size and durability of the Ranger, it was the ideal video laryngoscope system to test in combat.

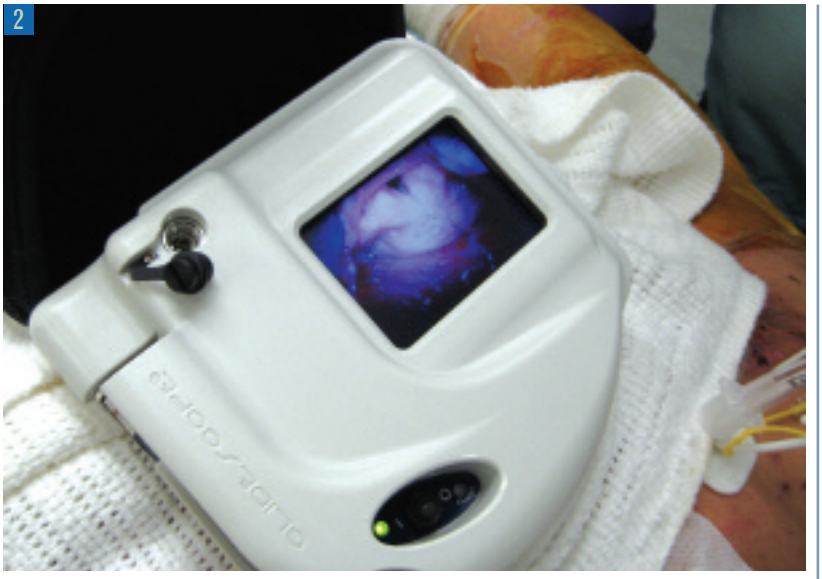
SENDING THE RANGER 'DOWN RANGE' ... TO IRAQ!

An Army anesthesia team deployed to a CSH in Northern Iraq supplemented the standard "difficult airway" equipment with the Ranger (see Photo 1). The use of the Ranger was tracked during a six-month period, and data was collected on how the device functioned. In this study, Army providers utilized the Ranger as the primary "difficult airway" adjunct for any patient requiring ETI with predictive factors that would classify the patient as a difficult intubation.[3] Some of the factors included a Mallampati score of two or higher, disruption or penetration of tissue in the neck or oral-pharyngeal region from IED or GSW fragments, facial and airway thermal injuries, or potential cervical spine trauma.

Even though the Ranger was utilized exclusively on difficult airway cases, providers reported the view seen on the LCD screen as equal to a Cormack-Lehane, Grade I view in 97% of patients. A partial view (Cormack-Lehane, Grade II) was reported in the remaining 3%. There were no reported cases of obstructed glottic view with the Ranger. Data collected from studies in North America had similar results.[4,5]

Despite some combat casualties presenting with disrupted oral-pharyngeal tissue or blood in the supraglottic region, the recessed location of the optics in the Ranger's blade allowed the view on the LCD screen to remain unobstructed by blood and tissue.

Providers also reported that the required "forward-lifting" force used by the GVL® blade to obtain a Grade I view was generally less than that used with a Macintosh blade, and significantly less than that required of a Miller blade. Providers were also able to intubate their patients with the GVL blade without removing cervical collars.



The GlideScope LCD shows the view of the glottis in this burn patient prior to removal of the trach tube placed in the field.

At a combat support hospital, after it was determined that the glottis was patent, staff performed laryngoscopy with the Ranger and placed an endotracheal tube.

Paramedic/physician providers who had infrequent use of laryngoscopy skills reported that the device enhanced their ability to obtain a glottic view. As a result, these providers reported that the individual confidence level of obtaining an ETI in a difficult airway was greater.

And finally, despite the harsh operational environment of a combat zone, there were no mechanical/functional failures seen with the Rangers during the study period.

CASE 1: PENETRATING FRAGMENT INJURIES/BURN VICTIM

An Iraqi local national was driving a car that was hit by an IED and caught fire subsequent to the blast. The driver of the car, injured by both primary and secondary IED fragments, was pulled from the vehicle by U.S. soldiers

and given initial emergency care. Prior to transport, a field medic established a peripheral IV and attempted oral laryngoscopy. Due to the IED's blast wave and thermal effects, his oral and supraglottic tissue had swollen over the glottic opening and ETI was unsuccessful.

The patient received an emergency surgical cricothyrotomy and was transported to a CSH where he was evaluated and taken to the operating room for his initial surgery. After approximately 72 hours, the tissue swelling of both the patient's face and airway had decreased significantly. Prior to removing the surgical cricothyrotomy, the GlideScope Video Laryngoscope system was utilized to assess the patency of the glottic opening (see Photo 2).

This patient presented to a medic in the field with an unexploded ordinance (UXO) in his leg, which could have been triggered by the slightest movement. The Ranger was used to perform laryngoscopy and secure an endotracheal tube in the exact position the patient was found and with minimal force.

Despite mild swelling and sloughing of airway epithelial tissue above the glottis, it was determined that the glottis was patent. The trach tube was safely removed from the cricothyroid space, and an endotracheal (ET) tube was then placed from above through his glottic opening (see Photo 3).

CASE 2: UNEXPLODED ORDINANCE LODGED IN THE LEG

A patient presents with an explosive device embedded in his leg and any movement could trigger it. This was a dilemma faced by the medic of a combat unit in Iraq. His patient was awake and alert, had no airway distress, and minimal bleeding from the entrance wound of the unexploded ordinance (UXO). Once it was determined that there was no emergent surgical need to control bleeding, a plan was carefully devised to remove the UXO from the leg of this patient with minimal movement.

The area around the patient was cleared and secured. A surgeon and anesthetist responded from the CSH to assist the medic in removing the UXO. The team of three carefully removed enough clothing to establish an IV line, all the while cognizant that any movement could trigger the device. The patient required general anesthesia in order to remove the UXO from his leg, and the goal was to perform rapid sequence induction with minimal or no movement. Once the patient had an IV and was placed on oxygen, he was induced with general anesthesia. After the patient was asleep, the Ranger was used to perform the laryngoscopy and secure an ET tube. Once the airway was secured, the surgeon, medic and explosive ordinance team removed the UXO (see Photo 4).

The providers later acknowledged that the Ranger was utilized for several reasons: First, "the patient could be intubated exactly in the position found." Second, "the force required to obtain a glottic view is minimal." The goal was to be as gentle as possible. And finally, "it was felt that the Ranger would give the providers the quickest, clearest view of the glottis."

CONCLUSION

Video laryngoscopy using the Ranger has simplified management of the difficult airway in the combat environment. It has given patient-care providers a compact and durable device to definitively secure ET tubes in complex airways. In addition, it may be the optimal way to secure endotracheal tubes in those patients with suspected cervical-spine injuries or traumatized airways. For EMS systems that struggle to maintain proficiency with ETI, the GlideScope may level the skill requirement enough to increase the overall success rates of ETI by providers who have infrequent intubation experience.

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