Current and future combat airway options available to the Advanced Medical Assistant (AMA)

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The consequences of ineffective airway control are obvious to all clinicians. With this in mind, can it be said that the AMA is adequately trained and equipped to manage the airways of combat casualties? In order to respond, we must first explore five other questions.

1. How common are airway injuries in combat?
2. Which challenges are specific to the battlefield compared with civilian prehospital models?
3. Which airway adjuncts are currently available to the AMA?
4. Which airway adjuncts are unsuitable for the combat casualty?
5. Which airway adjunct is seen in evidence based practice to provide the most effective airway to critical combat casualties?

Colonel Ronald F. Bellamy (US) of the Walter Reed Army Medical Centre, tells us that during the Vietnam war, US casualties sustaining upper airway injuries, and casualties sustaining central nervous system injuries causing airway problems accounted for 0.7% and 0.6% (respectively) of soldiers evacuated from the battlefield [1]. These figures, whilst pertinent today, fail to incorporate injuries sustained by contemporary weapon systems used today, such as Vehicle Borne Improvised Explosive Devices (VBIED) and suicide bombers. Penetrating wounds to the face or neck are the most likely causes of airway obstruction [2].

Like all prehospital casualties, those encountered in combat are non fasted. The similarities between combat and civilian prehospital models end there. Although the incidence of aspiration pneumonitis is "exceedingly rare", it can be minimized by the AMA with the aid of basic manoeuvres and prokinetic agents, which are discussed later [3]. Combat casualties coexist with challenges which may prompt a particular choice of airway adjunct, which in the civilian prehospital environment, would only be used 'in extremis'. These challenges include: "darkness, hostile fire, resource limitations, prolonged evacuation times, unique casualty transportation issues, command and tactical decisions affecting health care, hostile environments and provider experience levels" [2].

Currently the airway adjuncts in the AMA skill set include: airway opening manoeuvres, oro/nasopharyngeal airway (OPA/NPA), Laryngeal Mask Airway (LMA), naso/orogastric tube (NGT/OGT) and Metoclopromide.

Airway opening manoeuvre encompass chin lift, jaw thrust and posturing, with the focus being to prevent occlusion of the hypopharynx by the flaccid tongue [4]. Each has a particular place in airway management. For example, chin lift is best suited to rescue breathing, or to prevent anatomical obstruction in the spontaneously breathing casualty [4]. Jaw thrust is utilized during bag valve mask (BVM) ventilations, and unlike chin lift, it prevents hyperextension at C1/C2 and hyperflexion at C5/C6, which is of particular importance during spinal immobilization [4.] Chin lift is a skill which can be practiced in the recovery/post operative environment, while jaw thrust is best experienced in the preoxygenation stage of intubation. Posturing is the act of providing a gravity fed path of least resistance for secretions, vomitus and blood from the oral cavity/nares. This can take the form of: the lateral aka recovery position, sitting with the head forward, or the head down position of the fireman's carry, if providing care under fire. The world witnessed the failure of posturing in October 2002, when 118 civilian hostages died as a direct result of inhalation of Fentanyl, which was pumped by Russian police into a Moscow theatre prior to the rescue operation. The hostages were left supine, with their airways anatomically occluded, and "with breathing problems and memory loss" [5].

In the absence of head injury (HI), the NPA is the airway of choice for management during care under fire. It is simply and quickly inserted into both the obtunded and the semi conscious casualty, and "is unlikely to be dislodged during transport" [2]. The OPA is unsuitable for the semi conscious casualty, and, if the obtunded casualty regains his gag reflex, vomiting and therefore aspiration could compromise the airway. Ventilations via BVM with the OPA are difficult to achieve for the inexperienced medic, and it is dangerously simple to achieve gastric insufflation, again with the risk of aspiration. This pertains only to use of the OPA in the combat environment. Its use is proven in civilian prehospital and in hospital settings.

The LMA is a simple to insert, supraglottic device designed by Dr Archie Brain. It is known to have provided an airway to more than 100 million patients, and is proven to be less prone to causing gastric insufflation than BVM ventilations. Studies into the success of the LMA are well documented and are

discussed elsewhere. The use of cricoid pressure (first described by British anaesthetist Brian Sellick) following placement of the LMA prevents gastric insufflation, but is not recommended as it inhibits ventilation [6,7].

Two striking issues surrounding LMA use which require review for the AMA are: choice of size, and the use of the OPA as a bite block. Five studies from 1998 onwards have concluded that basing LMA size on casualty weight is erroneous. What is recommended is gender based size selection. It is now understood that a size 5 LMA is suitable for men, and a size 4 LMA for women. One particular study tells us that the size 3 LMA "should never be used in adults", and that a larger size LMA with a minimally inflated cuff provides the best use of the device [8]. Despite the recommendation from the Laryngeal Mask Co. Ltd. "Do not use an oral Guedel airway as a bite block", this is the technique used in the ADF and in fact is commonly used in civilian practice [8, 15]. The reason for this recommendation is that the "combination of LMA and Guedel airway probably prevents either from sitting in the correct position" [8]. What is recommended is the use of several gauze swabs rolled, inserted and taped securely in position [8]. Studies have shown that the OPA bite block technique has caused "ventilatory problems, bleeding, hoarseness, and sore throat" [8].

The OGT/NGT has been included here, as its use can prevent gastric distention, leading to aspiration of gastric contents. The prokinetic agent of choice in use by the AMA is Metoclopromide (MCP) 10mg. Interestingly MCP only exerts its "anti-emetic" effect at doses far higher (1-4mg/kg) than those authorized for use by the AMA. It is the gastric prokinetic effects of an "increase in lower oesophageal pressure tone, along with accelerated gastric emptying through both more frequent and more intense antral and duodenal contractions" which are experienced by our client base [9]. It is worthy of mention that "the oesophageal and gastrokinetic effects of MCP are blocked with concurrent use of atropine 10mcg/kg owing to the involvement of intramural cholinergic modulation in the prokinetic pathway" [9].

Some examples of airway adjuncts which are unsuitable for combat casualties are: endotracheal intubation, needle cricothyroidotomy, the safety pin through the tongue manoeuvre, and the use of promethazine 25mg as an antiemetic.

The clinical shortfalls of OPA use in combat casualties have already been discussed. Endotracheal intubation (ETI) is a procedure which has gained popularity, courtesy of TV programs such as "ER" and "House". However "there have been no studies examining the ability of well trained but relatively inexperienced military medics to accomplish endotracheal intubation on the battlefield" [2]. Maxillofacial injuries can make for difficult ETI, and "oesophageal intubations are probably much less recognizable on the battlefield" 2. There is also the issue of the white light of the laryngoscope, although some US Special Forces medical officers have documented their success with the use of night fighting equipment while intubating [2]. "Passing the laryngoscope and tracheal tube is a strong stimulus to the autonomic nervous system and to suppress it requires a sufficiently deep plane of anaesthesia", or an obtunded casualty [10]. Rapid sequence induction is a procedure which remains unsuitable for the battlefield. Not only is it complex, requiring intensive skill maintenance, but it requires at least two skilled operators, which cannot be guaranteed in that environment.

In late 2005, needle cricothyroidotomy became a procedure which is no longer approved for use by the AMA. This is a particularly unsuitable procedure for the combat medic. At most it can only "provide up to 45 minutes of oxygenation of a patient with partial airway obstruction" [11]. Operational casualty evacuation times can very quickly extend beyond this vital 45 minutes from such factors as: air frame availability, weather, and terrain.

The Field Medical Service Technician (FMST) course in California, currently teaches the "safety pin through the tongue manoeuvre" for casualty care whilst taking effective fire [12]. This procedure (whilst physically capable of withdrawing the tongue from the hypopharynx) is likely to cause haemorrhage to the highly vascular tongue, which is sufficient enough to provide an additional source of insult to the airway. It is a skill made redundant by the concurrent use of the NPA, and posturing (either the fireman's carry to withdraw from contact, or the recovery position). (Personal Communication-Dr M. Bowyer, Chief of the Division of Trauma and Combat Surgery, Bethesda USA).

The Committee on Tactical Combat Casualty Care recommends the use of Promethazine 25mg as an anti emetic during tactical field care [2]. This is likely to cause sedation and associated loss of upper airway control, which is a particularly unwanted effect in a casualty with an altered level of consciousness.

The only overwhelming deficiency in the AMA skill base is the Surgical Cricothyroidotomy.

"Cricothyroidotomy has been reported safe and effective in trauma victims" and "is felt to provide the best chance for successful airway management in this (battlefield) setting" [2]. A US study into the use of the cricothyroidotomy in civilian prehospital patients displayed that it "can be performed effectively with few complications after training on animal models" [13]. "Combat casualties who require airway management almost always have such destructive wounds that a surgical airway will be required" [1]. Without this skill the AMA has no retort for the "can't ventilate" scenario. Such a scenario can arise from: the burned airway exacerbated by overzealous fluid therapy, anaphylaxis, or maxillofacial trauma. It is a simple technique which can be performed using improvised equipment if necessary. "Surgical cricothyroidotomy has a complication rate of about 6%" and "voice change is the most common complication" [14.]

The answer to the initial question of "is the AMA adequately trained and equipped to manage the airways of combat casualties" should come in the form of a recommendation. There is a valid place for surgical cricothyroidotomy in the AMA skill base (Personal Communication-Dr M. Bowyer, Chief of the Division of Trauma and Combat Surgery, Bethesda USA). The present inability to ventilate a casualty sustaining a compromised airway, demonstrates an overwhelming gap in the continuum of care, which can be provided in combat by the AMA. Factors such as delayed surface/ aeromedical evacuation or prolonged extrication could feasibly translate from a training shortfall to a coronial inquest. Surgical cricothyroidotomy is battle proven, and as clinicians we must strive to adopt the approach of evidence based practice, and provided the best possible care for our critical casualties.

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