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AIRWAY AND RESPIRATORY MANAGEMENT PROTOCOLS IN TACTICAL COMBAT CASUALTY CARE – UPDATES IN RECENT YEARS

Anaesthesiology

Dr Rashmi Datta Senior Consultant (Anaesthesiology & Critical Care), Army College of Medical Sciences, Delhi Cantt - 110010

Dr Pawan Sharma Senior Adviser (Trauma Surgery), Command Hospital, Udhampur – 182101, J & K

Dr Rahul Yadav* Senior Adviser (Anaesthesiology & Neuroanaesthesiology) INHS Asvini, Colaba, Mumbai - 400005*Corresponding Author

Dr Sachin Narayan Kulkarni Senior Adviser & HOD (Anaesthesiology) INHS Asvini, Colaba, Mumbai - 400005

ABSTRACT

Over the past century, an evolution in battlefield casualty care has occurred. As the current century unfolds, we expect even more remarkable advances as increasing resources are focused on the out-of-hospital phase of emergency care. The Wound Data and Munitions Effectiveness Team (WDMET) study provided one of the first objective databases from which inferences regarding evacuation and enroute care were drawn. The WDMET study identified the following three conditions as primary causes of preventable death on the battlefield: [1] airway obstruction (6 percent), [2] tension pneumothorax (33 percent), and [3] hemorrhage from extremity wounds (60 percent). To further underscore the need for out-of-hospital phase early airway support, a subanalysis of the Registry of Emergency Airways at Combat Hospitals (REACH) study by Adams et al. reported that 76 of 1,622 subjects (5 percent) reached a Combat Support Hospital (CSH) without a definitive airway, despite needing one.

KEYWORDS

tactical combat casualty care, extraglottic airway, needle decompression

INTRODUCTION

The goal of tactical combat casualty care (TCCC) is to provide life saving basic interventions at each echelon and facilitate casualty evacuation to the higher echelon having capability of providing definitive treatment. A review of 10 years of US combat fatalities from Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) demonstrated that airway compromise is second only to hemorrhage as a leading cause of death from potentially survivable combat injury.[1] The basic management plan during care under fire is to arrest life threatening external haemorrhage with pressure, and/ or tourniquet placement; if tactically feasible. Airway management is generally best deferred until the Tactical Field Care phase.

History

Key lessons learned in airway management during World War II remain relevant even today, including avoiding supine transport of patients with facial injuries and avoiding excessive use of sedatives and opioid analgesics in patients with airway compromise.[2] There is paucity of high quality data from the World Wars correlating airway compromise to death in battlefield. Approximately 40% of combat casualties with facial wounds died following battlefield evacuation in World War I, compared to only 1.3% in the Korean War.[3] Airway compromise was the second leading cause of preventable death in battlefield during Vietnam war.[4] As per the Vietnam Wounding Data Munitions Effectiveness Team data, 1.3% of combat casualties required emergency airway management following evacuation, and 6% of those killed in action died from isolated airway injuries.[5,6] Review of combat deaths during OIF/OEF revealed that airway compromise comprised 8% of potentially survivable injuries and accounted for 1.6% of the overall mortality.[1]

Airway Management Principles

Airway management principles during TCCC are designed to be simple and readily implementable in all combat scenarios. Since the variable component in the war zone is the evacuation time (few minutes to a few hours), these have the potential to become critical life saving interventions. Battlefield airway management may require the medical aid provider to care for multiple patients in austere environments, with the limiting factor being the equipment that can be carried in the backpack. All these factors may have contributed to the reduction in mortality observed in military operations post World War II.

By definition, 'Care under fire' is the care rendered by the medic at the scene of the injury while he and the casualty are still under effective enemy fire. Available medical equipment is limited to that carried by the soldier or the medic in his aid bag. The basic principle is to alleviate injury to existing casualties and to prevent additional casualties. Cessation of life-threatening hemorrhage is the overriding concern at this juncture. Airway management is generally deferred until the Tactical Field Care phase.

The 'Tactical Field Care' phase is distinguished from the Care under Fire phase by having more time available to provide care and a reduced level of hazard from hostile fire. The time available to render care may be quite variable. Airway management is based on the presence/absence of airway obstruction. In an unconscious patient without airway obstruction, the recommendations are to perform one of the basic manoeuvres (chin lift or jaw thrust), consider nasopharyngeal airway, and to place the patient in the recovery position. The management protocol remains the same for an unconscious patient with actual or impending airway obstruction. A conscious casualty should be allowed to assume any position that best protects the airway and allows clearance of secretions, which may include sitting up. Casualties with isolated maxillofacial injuries can sometimes maintain the patency of their airway by sitting up, leaning forward, and spitting out blood.[7] Cricothyroidotomy should be reserved for those casualties with airway obstruction where the above measures are not successful in maintaining airway patency.

'Combat Casualty Evacuation Care' is the care rendered while the casualty is evacuated to a higher echelon of care. The extra medical personnel and equipment being available on the evacuation asset may facilitate provision of some additional care. Initial management principles remain the same as Tactical Field Care, with the exception that advanced airway management should include additional considerations for supraglottic airway (SGA), endotracheal intubation (ETI), or surgical cricothyroidotomy (SC). Airway management remains largely based on the presence or absence of airway obstruction. Assessment of the tactical and clinical situation, available equipment, and the expertise of the medical personnel play a major role in deciding the nature/ type of advanced airway procedure.[8]

Respiration/Breathing

Progressive respiratory distress in a casualty, secondary to a unilateral penetrating chest trauma should be considered and managed as tension pneumothorax. Tachycardia, tachypnoea, chest pain, air hunger, hypotension, tracheal deviation, and distended neck veins may be present. The pathognomonic features are: (a) Unilateral absent breath

sounds; (b) Hyper-resonance over the affected hemi thorax; and (c) Distended neck veins. Cyanosis is a late feature.

Treatment is by needle thoracocentesis. A 16 G needle is introduced into either the 5th intercostal space in the anterior axillary line or the 2nd intercostal space in the mid-clavicular line (MCL).

Traumatic chest wall defects (open and/ or sucking chest wounds) should be managed with application of a vented chest seal. In the event of non-availability of vented chest seal, a non-vented occlusive dressing may be utilised for the same.

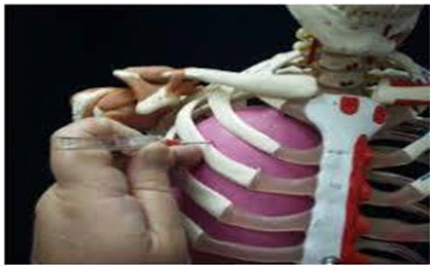

Fig. 1 – Needle decompression of tension pneumothorax

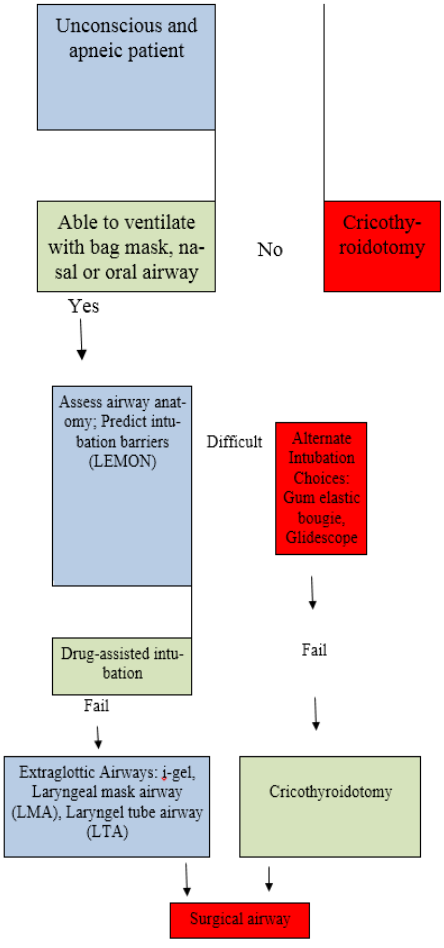

Fig. 2 - Airway Decision Algorithm

Summary of Aug 2017 Changes[8]

1) Adds extraglottic airways (EGAs) as an option for airway management in Tactical Field Care.
2) Recommends the i-gel as the preferred EGA since its gel-filled cuff makes it simpler to use and also does away with the requirement of monitoring cuff pressure.
3) Reinforces that if a supraglottic airway (SGA) with an air-filled cuff is used, the pressure within the cuff must be monitored, especially during and after changes in altitude during casualty transport.
4) Reiterates that extraglottic airways won't be tolerated by a casualty unless he or she is deeply comatose.
5) Adds the utilization of suction as an adjunct to airway management when available and appropriate (i.e. to get rid of blood and vomitus).
6) Clarifies that cervical spine stabilization is not needed for casualties who have sustained only penetrating injury (without blunt force trauma).
7) Emphasizes that surgical cricothyroidotomies shouldn't be performed just because a casualty is unconscious.
8) Provides a reminder that for casualties with facial trauma or facial burns with suspected inhalation injury, surgical cricothyro idotomy should be considered.
9) Adds that pulse oximeter may be a useful adjunct to monitor oxygenation, which might reflect airway patency.
10) Reinforces the need to frequently reassess the airway status as the same may change over time.

Summary of Aug 2018 Changes[9]

This modification to the TCCC Guidelines updates the recommendations for management of suspected tension pneumothorax for combat casualties:

1. Continues the aggressive approach to managing tension pneumothorax before the onset of shock or asytole.
2. Reaffirms the need for needle decompression (NDC) on each side of the chest for a battle casualty with torso trauma who suffers a traumatic asystole before reaching a combat support hospital.
3. Designates two potential sites for performing NDC: either the lateral site (5th intercostal space at the anterior axillary line) or the anterior site (2nd intercostal space at the midclavicular line).
5. Elaborates the component of a successful NDC: an observed hiss of air escaping from the chest; an instant improvement of respiratory distress; an increase in oxygen saturation; and an improvement in signs of shock.
7. As the clinical presentation of hemorrhagic shock may be similar to shock from tension pneumothorax, the TCCC Guidelines now recommend proceeding to treatment for hemorrhagic shock after two NDCs have been performed.
8. Involves consideration of untreated tension pneumothorax as a possible cause for shock that has not responded to fluid resuscitation. This is a crucial aspect of treating shock in combat casualties that wasn't presently addressed within the TCCC Guidelines.
9. Includes finger thoracostomy and chest tubes as additional treatment options to manage suspected tension pneumothorax, if and when further treatment is deemed necessary after two unsuccessful NDC attempts; provided the combat medic has the required expertise to perform these interventions.

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