Regional anesthesia in trauma patients

Essay

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INTRODUCTION

Trauma is a major cause of mortality and morbidity worldwide, and pain is the most common symptom reported by patients entering the Emergency Department. Each year, more than 100,000 deaths in the USA and about 8% of all deaths worldwide are caused by traumatic injuries. Trauma is also a leading cause of death in persons younger than 30 years **(Elena et al., 2012).**

Regional anesthesia is a valuable option for analgesia in trauma patients, enabling improved pain control in the emergency department and has benefits in the anesthetic management of therapeutic procedures outside the operating room **(Souter, 2012).**

Regional anesthesia, such as epidurals and nerve blocks, offers excellent pain control and decreases the amount of required intravenous anesthesia and analgesics. There are other well-documented advantages including decreased infection rates and neuroendocrine stress responses **(Soni and Johannsson, 2013).**

PROBLEMS OF TRAUMA PATIENTS

I. Airway Problems:

Loss of the airway is an immediately life-threatening potential complication of any trauma situation. Consequently, airway assessment and management of patients suffering major trauma is always a top priority, and maintaining oxygenation and ventilation are critical first steps in managing any trauma patient, especially if the patient has sustained a head injury or an injury to any airway structures. Similarly, patients who are unconscious or have signs suggestive of respiratory insufficiency (like tachypnea or stridor) require immediate attention **(Doyle, 2011).**

Although any patient who is awake, alert and able to talk without difficulty likely has a patent airway, investigations to rule out injury to airway or respiratory structures may still be needed. Most trauma patients are given supplemental oxygen as determined by vital signs (especially by pulse oximetry) and physical exam **(Doyle, 2011).**

The possibility of an unstable cervical injury exists in patients exposed to significant blunt trauma; during airway interventions, neck movement must be minimized to avoid secondary harm to the spinal cord. Depending on the series, 2–12% of major trauma victims have a cervical spine injury and 7–14% of these are unstable. Approximately 10% of comatose trauma patients have a cervical spine injury.

Head injury with impaired consciousness and reduced pharyngeal tone is the commonest trauma-related cause of airway obstruction. The airway may also be soiled with blood or regurgitated matter. Blunt or penetrating injuries that obstruct the airway include maxillary, mandibular, laryngotracheal fractures and large anterior neck haematomas. Significant partial and incipient airway obstruction are also potential causes of early death. Vigilant reassessment with immediate restoration and protection of airway patency is essential **(Cranshaw and Nolan, 2006).**

Tracheal intubation is usually considered to be the gold standard for airway management in many patients with severe trauma, since it allows for protection of the airway from gastric material, allows for high concentrations of oxygen to be delivered, allows for positive pressure ventilation, allows for the administration of PEEP in patients with acute lung injury, and allows for hyperventilation in patients with increased ICP. However, despite the importance of tracheal intubation in this setting, for a variety of reasons achieving tracheal intubation may sometimes be difficult in the trauma setting: adequate pre-oxygenation may not be possible, particularly in agitated patients or in patients with facial injuries; cervical spine immobilization may make laryngoscopy difficult; and the presence of oropharyngeal vomitus, blood, tissue debris and edema may all contribute to poor visualization of the laryngeal structures **(Doyle, 2011).**

☒ Indications for Intubation:

In both the prehospital and inhospital scenarios:

- Immediate (life-threatening hypoxaemia is likely in these circumstances):
  - Life-threatening hypoxaemia caused by airway obstruction not relieved by simple means.
  - Inadequate facemask seal leading to insufficient ventilatory support.

- Urgent:
  - To protect the lower respiratory tract from aspiration of blood or stomach contents.
  - To preserve the airway from anticipated occlusion by:
  - ➢ Oedema.
  - ➢ Haematoma.
  - ➢ Displacement of a laryngotracheal fracture.

  (Cranshaw and Nolan, 2006).

Typically, in the inhospital scenario only:

- To regulate intracranial pressure by controlling CO_2.
- To provide a therapeutic ventilatory strategy for hypoxaemia after:
  - Flail chest.
  - Pulmonary contusion.
- To perform therapeutic and diagnostic procedures in uncooperative patients **(Cranshaw and Nolan, 2006).**

The ASA difficult airway algorithm is a useful starting point to consider in airway management in the trauma patient **(Figure 1).**

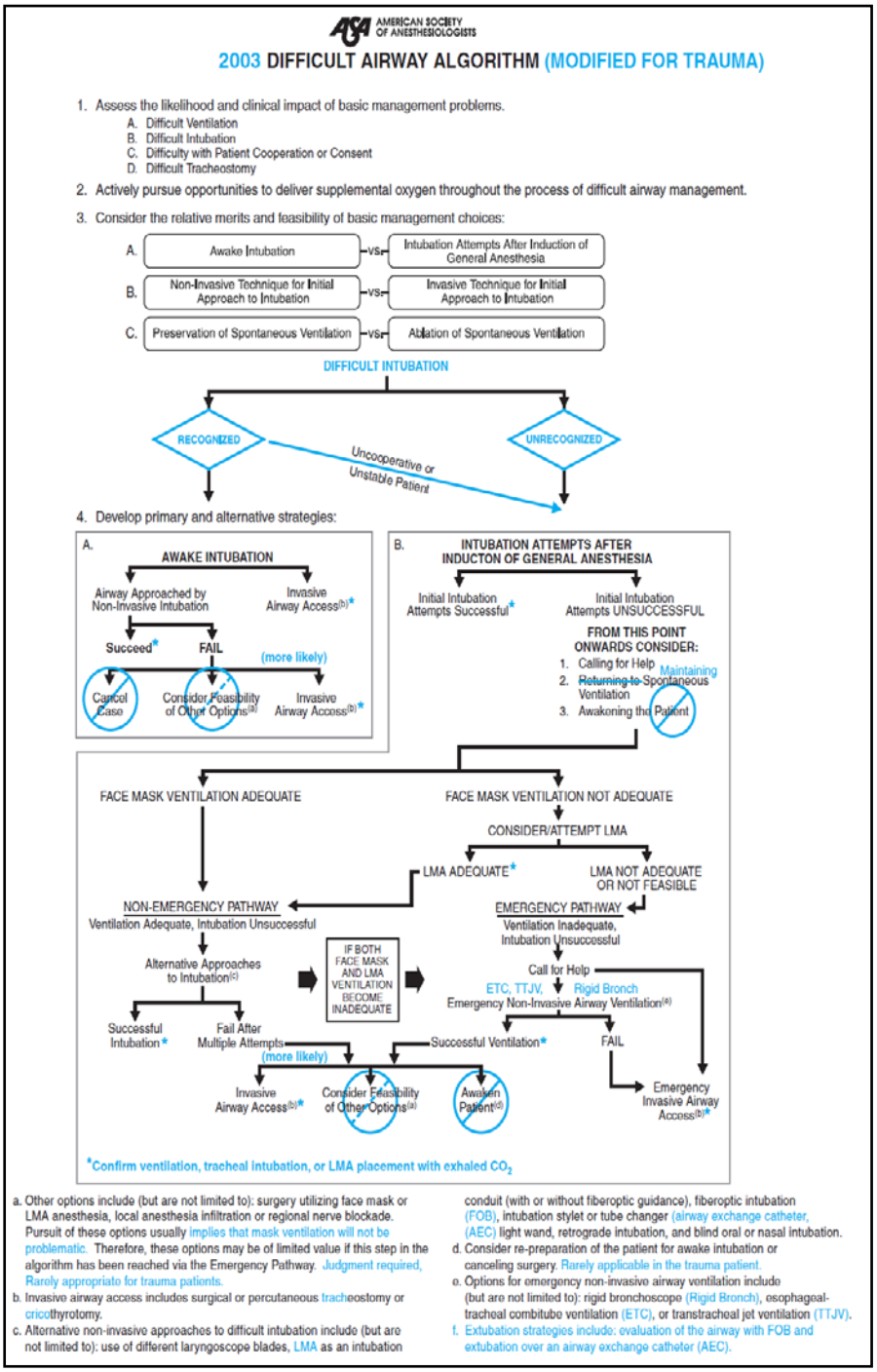

Figure (1): Difficult Airway Algorithm (Modified for Trauma) **(Wilson, 2005).**

☒ Modifications of the ASA DA Algorithm for Trauma (shown on above algorithm):

A. Stopping to come back another day is seldom an option with trauma.

B. A surgical airway may be the first/best choice in certain conditions.

C. An awake ETT technique should be chosen in a DA patient provided the patient is cooperative, stable and spontaneously ventilating.

D. If the patient becomes uncooperative/combative, general anesthesia (GA) may need to be administered - but if the airway is difficult, spontaneous ventilation (SV) should be continued (if possible).

E. Awake limb of the ASA Algorithm - Trauma Notes. An awake intubation technique is recommended for all trauma patients with a recognized difficult airway, provided the patient is cooperative, stable and maintains spontaneous ventilation and adequacy of O_2 saturation. The ASA DA Algorithm does not endorse any particular airway technique. It does, however, emphasize that the patient must be properly prepared (mentally and physically) for an awake technique **(Wilson, 2005).**

F. Anesthetized or uncooperative limb of ASA DA Algorithm - Trauma Notes. There are three common conditions when the need arises to intubate the trachea of an unconscious or anesthetized trauma patient with a DA:

1. Clinician fails to recognize a difficult airway in preoperative evaluation prior to the induction of anesthesia.

2. The DA patient is already unconscious prior to being assessed by the trauma anesthesiologist.

3. The patient obviously has a DA but is hemodynamically unstable (e.g. following trauma) or absolutely refuses to cooperate with an awake intubation (e.g. child, mentally retarded, drugged or head-injured adult). Once the patient is anesthetized or is rendered apneic or presents comatose and the trachea cannot be intubated, O_2-enriched mask ventilation (MV) is attempted **(Wilson, 2005).**

If MV is adequate, a number of intubation techniques may be employed. Techniques allowing continuous ventilation during airway manipulations are favored over those requiring an interruption of mask ventilation (e.g. fiberoptic bronchoscope (FOB), via an LMA or an airway intubating mask, with self-sealing diaphragm) **(Wilson, 2005).**

Alternatively, techniques requiring a cessation of ventilation (at least temporarily) can be employed. These techniques are relatively contraindicated for patients with large right-to-left transpulmonary shunt or decreased functional residual capacity **(Wilson, 2005).**

G. Confirmation of ETT position. Immediately after the patient's trachea is intubated, one must confirm ETT position with end-tidal CO_2 measurement. If end-tidal CO_2 measurement is unavailable, Wee's esophageal detector device (EDD) is reasonably reliable (close to 100 percent sensitive and specific).

H. Extubation or ETT change of the DA. If the conditions that caused the airway to be difficult to intubate still exist at the time of extubation, or if new DA conditions exist (e.g. airway edema), then the trachea should be extubated over an airway exchange catheter and/or with the assistance of an FOB **(Wilson, 2005).**

II. Circulatory Problems:

☒ Traumatic Shock and Resuscitation:

Shock is best defined as an abnormal physiological state in which oxygen delivery is inadequate to meet normal metabolic needs. It has been classified as hypovolemic, cardiogenic, and distributive. Indeed, traumatized patients usually present with hypovolemic shock secondary to acute blood loss from bleeding; however, they can also present with cardiogenic or distributive shock. In particular, cardiogenic or rather