TraumaCare International

This contribution from TraumaCare International (ITC) will address developments in the multidisciplinary field of trauma care that affect anesthesiologists. We conclude with a few highlights of programs and projects conducted under the auspices of ITC worldwide.

**Advanced Trauma Life Support® (ATLS®): 8th Edition - Changes of Importance to Anesthesiologists**

William C. Wilson, M.D., M.A.

ATLS® is a systematic protocol for the assessment and treatment of the trauma patient. An orthopedic surgeon in Nebraska developed the initial algorithms in 1978. Two years later, the guidelines were adopted by the American College of Surgeons. ATLS® has been taught to more than a million individuals and is now offered in more than 50 countries. The ATLS® system begins with a “Primary Survey,” the initial phase of management where life-threatening conditions are rapidly identified and life-saving treatment is expeditiously initiated. The Primary Survey is performed in a prescribed sequence, reviewing the most life-threatening conditions first, including airway, breathing, circulation, disability and exposure (ABCD/E).

Once the Primary Survey is completed, the “Secondary Survey” commences whereupon all other injuries (not immediately posing a threat to life) are identified and staged. Resuscitation efforts occur coincident with each phase of care.

The current 8th edition of ATLS® has numerous important changes of interest to anesthesiologists, including a renewed focus on the airway and resuscitation endpoints. Some of the most important new changes are summarized here. The difficult airway is finally addressed, as the new ATLS® guidelines recommend that airway evaluation be performed prior to attempting rapid-sequence intubation (RSI), and a new evaluation mnemonic has been suggested – “LEMON”: look, evaluate, Mallampati, observe and neck. Confirmation of intubation using a CO₂ detector is now required (capnography is preferred, but if not available, other colorimetric techniques are acceptable). The roles of the laryngeal mask airway (LMA), laryngeal tube airway (LTA) and gum elastic bougie are specifically recognized as important adjuncts useful during emergency airway management. Drugs recommended for RSI are left more to local practice rather than advocating a single “ATLS” cocktail for the whole world.

ATLS® now includes a far more extensive discussion on the importance of balancing the concept of “limited resuscitation” (or damage control resuscitation, see page 43) with the reality of experience demonstrating that excessive early crystalloid administration may dilute blood, dislodge clot and increase hemorrhage; but too little resuscitation fluid in hypotensive bleeding patients will result in exsanguination following penetrating torso injury. A more developed discussion is now offered on the equivalency of Ringer’s lactate and normal saline during the initial resuscitation for shock and that hypertonic saline is at least equivalent, and perhaps superior, in patients with traumatic brain injury. There is increased emphasis on using multiple end-points in resuscitation. Tourniquets are now endorsed for the first time for use in exsanguinating extremity injury in the pre-hospital phase. A new pelvic fracture algorithm is offered in the new guidelines emphasizing the use of pelvic binders and angiography. Blast injury is now specifically addressed because of the recent military experience with improvised explosive devices. There is increased emphasis on early recognition of blunt carotid injury, and methylprednisolone is no longer advocated for the management of acute spinal cord injury.

**Bibliography:**


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Clearing the Cervical Spine in Blunt Trauma Patients With Head Injury

Charles E. Smith, M.D., F.R.C.P.C.

C-spine immobilization is routinely done after multisystem trauma, especially in patients with head injury. C-spine immobilization is not without risk and may lead to difficulties with intubation and tracheostomy and tissue damage near the collar.

In alert patients without mental status changes, no pain with full range of motion, no distracting pain and no neurologic deficits, the c-spine is considered cleared. If a reliable physical examination cannot be done, injuries must be evaluated by other means. Practice guidelines for identifying c-spine injuries after trauma are under revision. The following applies to obtunded head-injured patients without neurological deficit at MetroHealth Medical Center.

- Plain radiographs are no longer routinely performed.
- CT scanning is done from skull base to T1 (16-row detector) with sagittal and coronal reconstructions. CT identifies bony fractures, marked prevertebral soft tissue swelling or hematoma (more than the anteroposterior dimension of the vertebral body), malalignment and abnormal facets. CT has negative predictive values of 98.9 percent for ligament injury and 100 percent for unstable c-spine injury.
- MR imaging has been advocated to evaluate ligamentous and soft tissue injuries not detected by CT. MR is, however, costly, availability is restricted, and transport requires multiple personnel and equipment. Because the incidence of significant c-spine injury in obtunded head-injured patients with a negative CT approaches zero, MR is no longer required to clear the c-spine.
- Dynamic fluoroscopy with flexion/extension is not done because the technique is inadequate and potentially dangerous.

One of the greatest worries is failure to diagnose a c-spine injury in a neurologically intact patient. New developments in CT technology have greatly enhanced the ability to diagnose or exclude c-spine injuries after blunt trauma.

Blunt Thoracic Aortic Trauma and Anesthesia

Anesthetic management of patients with blunt aortic injury (BAI) is complex. The injury to the aorta most commonly involves all three layers of the aorta (intima, media and adventitia), with complete disruption between the edges. Incomplete or partial disruption of the aorta may also occur and in some cases may result in focal dissection or the development of an intramural hematoma. Arterial blood pressure can force blood between the layers of the aortic wall, forming a false aneurysm (pseudoaneurysm).

Improvements in technology have resulted in computed tomography being the definitive screening test for BAI. Options for the management of BAI include open surgical and stent graft repair. Endovascular repair has replaced open repair in many centers, resulting in a major reduction of mortality and procedure-related paraplegia. Endovascular stenting of BAI has been shown to have excellent mid-term results and acceptable rates of morbidity and mortality.

Potential benefits of stenting include the option to perform this procedure under local and regional anesthesia and nonrequirement for thoracotomy, one-lung ventilation, aortic cross clamping and bypass. Avoidance of a thoracotomy minimizes...
postoperative pain and associated respiratory compromise. Endovascular exclusion of an aortic disruption reduces blood pressure shifts and surgical blood loss and minimizes visceral organ ischemic time. Requirement for anticoagulation is minimal, which is desirable in patients with intracranial, orthopedic and abdominal injuries. Adequate proximal and distal landing zones must be present for fixation of the stent graft in the thoracic aorta.

Endovascular management of BAI represents a major advance in the care of trauma patients. Careful follow up is necessary to prove the long-term efficacy of this treatment modality.

Bibliography:

Complete references are available from Dr. Smith by contacting ASA headquarters at (847) 625-5586.

The Emerging Concept of Damage Control Resuscitation

Maureen McCunn, M.D., M.J.R.P., F.C.C.M.

Damage control resuscitation (also known as hemostatic resuscitation) supports 1:1:1 transfusion of packed red blood cells (PRBCs): FFP:platelets for patients with traumatic exsanguinating hemorrhage.

<table>
<thead>
<tr>
<th>Fibrinogen Content in Various Blood Products (mg)</th>
<th>1U FFP</th>
<th>400 mg in 200-250 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 U six-pack platelets</td>
<td>80 mg x 6U = 480 mg in 300 mL</td>
<td></td>
</tr>
<tr>
<td>1 U apheresis platelets</td>
<td>300 mg in 200-250 mL</td>
<td></td>
</tr>
<tr>
<td>1 10U bag cryoprecipitate</td>
<td>2,500 mg in 150 mL</td>
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<tr>
<td>1 U fresh whole blood</td>
<td>1,000 mg</td>
<td></td>
</tr>
<tr>
<td>1 U pRBCs</td>
<td>&lt; 100 mg</td>
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Source: Hess, M.D., U/ Maryland/CC Simon, M.D., Brooke Army Medical Center.

Military experience: Multiple studies demonstrate a decrease in mortality with a 1:1 transfusion practice. Retrospective analysis of 252 massive transfusion patients at two U.S. Army Combat Support Hospitals had an overall mortality of 30 percent. Patients were identified as having received a low fibrinogen-to-RBC (F-R) ratio (< 0.2 g) or a high F-R ratio (> 0.2 g). The mean F-R ratios transfused for the low and high groups were 0.11 g/unit and 0.48 g/unit, respectively (p < 0.0001). Mortality was 52 percent in the low and 24 percent in the high F-R ratio group (p < 0.001). Although other variables were associated with survival (temperature, BP, Hgb, INR, base deficit, platelet concentration and ISS), the F-R ratio was independently associated with mortality.

Civilian data: Records of 467 massive transfusion patients from 16 Level I trauma centers between July 2005-June 2006 were reviewed; survival varied from 41-74 percent by center. The plasma:RBC ratio ranged from 0-2.89 and the platelets:RBC ratio ranged from 0-2.5. Plasma and platelet to RBC ratios and ISS were predictors of death at six hours, 24 hours and 30 days. Thirty-day survival, decreased truncal hemorrhage and ICU, ventilator and hospital-free days were increased in patients with high plasma: RBC (> 1.2) and high platelet:RBC (< 1:2) ratios.

Bibliography:
Conclusions

Enrico M. Camporesi, M.D.

Trauma impacts us all. It knows no boundaries, affecting both the wealthy and the poor. ITC, formerly ITACCS, has contributed to and/or organized more than 100 major trauma care textbooks and monographs. Among these is Trauma Anesthesia, published in 2008 by Charles E. Smith, M.D., with contributions from ITC faculty around the world. “Sedation and Airway-support For Everyone” (SAFE) is a special project designed to enhance patient safety through the creation of a standard international training program for procedural sedation and out-of-operating-room airway management. The accompanying textbook, authored by more than 40 ITC faculty, has an anticipated publication date of 2009. A subsequent hands-on training program utilizing advanced simulation platforms is envisaged.

ITC is accredited by the Accreditation Council for Continuing Medical Education (ACCMCE) to offer continuing medical education (CME) for physicians. ITC’s annual forum includes current practice and basic science and clinical research, where internationally recognized faculty present cutting-edge topics for all members of the trauma team. TraumaCare 2009 www.traumacare2009.com will be held jointly with the Bavarian Emergency Medical Society in Ulm, Germany, on October 2-4. For more information on ITC programs and projects, please visit www.itaccs.co.