ASSESSMENT OF POLYTRAUMATIZED PATIENT

ESSAY

Submitted For Partial Fulfillment of Master Degree in Anesthesia

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This essay will be discussed under the following titles:

Aim of the work

To review the update in the modern strategies for successful management of polytraumatized patients.

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CHAPTER 1

Initial Approach at Trauma Site to Polytraumatized Patient

Injuries are nowadays the principle cause of death in the population under 45 years of age, more so than cardiovascular or cancer diseases for example. As such, trauma represents a heavy socioeconomic problem for all countries throughout the world. Patients exposed to high velocity injuries are subject to a large pattern of lesions ranging from neurologic injuries, cervicofacial, and thoracic, abdominal, spine and so on. If one considers these different organs, the osteoarticular system is by far the most frequently concerned, with a fracture probability above 75% in polytraumatized patients. Osteoarticular surgical procedures are required in 65-95% of all polytraumatized patients ***(Liberman M et al., 2003).***

Trauma (injury) is a physical damage to the body resulting from acute exposure to thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen. Often, the term injury is used interchangeably with the term "trauma". Trauma injuries are grouped into three major categories based on the context in which they occur or their intent:

- Unintentional injuries (sometimes referred to as "accidents") are those caused by motor vehicles and other forms of transportation, drowning, poisoning, burns, and falls.
- Intentional injuries (also called "violence") are homicides, suicides, interpersonal assaults, and intergroup violence resulting from war, rape and domestic violence are considered intentional injuries.
- Occupational injuries are those unintentional and intentional injuries that occur at work or while traveling to or from a work setting ***(Mashaly AY et al., 1994).***

The picture of sports induced trauma has changed in recent years. A strong trend towards high velocity can be observed nowadays. Pelvic injuries with unstable pelvic fractures-dislocations are responsible for approx. one third of all early traumatic deaths. These need to be

recognized early in order to take appropriate on-site prophylactic measures ***(Stiel IG et al., 2004).***

The heaviest toll of traumatic deaths occurs within the first hour following trauma, often defined as "the golden hour of trauma". This is to say that the on-site rescue team play a tremendous role in insuring overall victim's survival chance. The key to successful rescue is preliminary organization, with teams whose members have been assigned a precise mission during the preparation phase ***(Bazzoli GJ and MacKenzie EJ, 1995).***

The principles of the medical rescue have been defined with the American College of Surgeons ATLS (Advanced Trauma Life Support). The ATLS principles defined as the "ABCDE" aim to secure Airway, Breathing, Circulation, Disability and Exposure. During this preliminary phase, there is no point to establish a diagnosis; the goal is to secure the victim's physiology allowing for safe referral & transfer ***(Carmont MR, 2005).***

What are the survival chances of a polytraumatized patient if he is first transferred to the closest local district hospital, and then later referred to a large trauma center, as compared to a direct referral to the larger trauma center? Published literature now clearly shows that a direct referral to the larger level one Trauma Center provides the best chances of survival by a significant margin. Obviously communication between the on-site medical team and the receiving hospital play a tremendous role in coordination and preparation ***(Lee C et al., 2007).***

Again, organization of the trauma team is the key to success. The missions of the trauma team are to stabilize the patient, list the problems, establish priorities and finally transfer the patient to the care of specialized surgical teams. Specialized surgical teams most frequently involved are general surgeons, neurosurgeons, osteoarticular surgeons. These must be available at all times within minutes. Initial workup involves a systematic radiologic workup. Development in CT scan technology dramatically reduces the time required to carry out the initial x-ray workup ***(Bazzoli GJ and MacKenzie EJ, 1995).***

The role of a teaching hospital in preparing trauma team leaders and educating younger doctors is an important one. It has been previously

identified that errors occuring in the early part of trauma resuscitations can contribute significantly to avoidable deaths ***(McDermott et al., 1997).***

Trauma team leaders with greater clinical experience yield more optimal resuscitations, teaching programs and trauma audit meetings Performance improvement initiatives and quality assurance filters are strategies to give the trauma team members the best clinical experience possible. This has permitted both training and assessment of new trauma team leaders prior to their assumption of the team leader role ***(Hoff W et al., 1997).***

Back in 1999 the role of internet and reputable web sites in trauma education was just beginning to be realized and didn't reach its full potential ***(Ryan J et al., 1999).***

Management of trauma requires broad knowledge, sound judgment, technical skills and leadership capabilities. Most trauma victims are healthy, young individuals who, if salvaged, have a normal life expectancy. Critical care specialists play a vital role in stabilization and diagnostic phases of trauma care. We must believe that what happens in this prehospital period often determines the outcome of care ***(Capizzani AR et al, 2010).***

Trauma Mortality has a Trimodal Distribution:

- Immediate deaths

· Occur within first hour (half of all trauma related deaths). Major vascular, brain & cardiac injuries are usual causes.

- Early deaths

· Occur within hours after injury. Hemorrhage and breathing problems are common causes.

- Late deaths

· Occur after 3 days and peak at 3-4 weeks. Sepsis & multi organ failure are causes of death.

Mechanism of Traumatic Injury includes:

- Blunt Trauma

· Distributed dissipation of kinetic energy either by concussion or by deceleration.

· Leads to direct contusive injury, shearing, vascular disruption, & indirect laceration secondary to fractures.

- Penetrating trauma

· More focal dissipation of a projectile's kinetic energy.

· Leads to direct impact laceration and fractures ***(Liberman M et al., 2000).***

Trauma Score (TS) evaluates:

· Respiratory rate and expansion.

· Systolic blood pressure.

· Capillary refill.

· Glasgow coma scale score.

Numbers assigned to each parameter, with higher number representing normal function.

Underestimations of head injury severity lead to revision of the score.

Revised Trauma Score (RTS)

RTS has been shown to be a more reliable predictor of outcome

RTS is based on three physiologic measures:

· Glasgow coma scale score.

· Respiratory rate.

· Systemic blood pressure.

Trauma Index (TI)

Contains five variables:

· Region of body injured.

· Type of injury.

· Cardiovascular status.

· CNS status

· Respiratory status.

Low scores correlated with minor injuries, whereas multiple system trauma victims scored higher with higher mortality rate ***(Osler T et al, 1997).***

Although there are always variations in the algorithms that are used to resuscitate and treat trauma patients, the "ABC" principles of immediate care of the poly-trauma patients have remained remarkably static. With specific mechanisms and patterns of injury, there are alterations to these algorithms that can be made to better optimize patient care. These include hospital credentials and verification of all hospitals accepting trauma patients and not just the larger centers, the expansion of website for trauma scenario teaching and team leadership skill development, as well as the use of video for resuscitation audit and performance improvement ***(Mittal A et al., 2001).***

The chances of survival of a poly-trauma patient depend upon the hospital to which he will be primarily referred to. In complex trauma situations, referral of the patient to a center lacking the adequate resources will negatively impact upon his chances of survival. Some countries such as the United States have been pioneers in implementing a trauma care system relying on reference centers (level I trauma centers), specialized in the care of severely injured patients ***(Osterwalder JJ, 2002).***

Resuscitation and evaluation of the trauma patient begins at the injury site. The goal is to get *the right patient to the right hospital at the right time* for definitive care. First responders provide rapid basic trauma life support (BTLS) and are followed by paramedics with advanced trauma life support (ATLS) skills. Medical control is ensured by pre-established field protocols, radio communication with a physician at the base hospital, and subsequent trip audits. Management priorities of BTLS on the scene are: To assess and control the scene for the safety of the patient and the pre-hospital care providers, to tamponade external hemorrhage with direct pressure, to protect the spine after blunt trauma, to clear the airway of obstruction and provide supplemental inspired oxygen, to extricate the patient and to stabilize long-bone fractures ***(Bazzoli GJ and MacKenzie EJ, 1995).***

Whereas the benefits of BTLS are undisputed, the merits of the more advanced interventions remain controversial. Airway access, once considered a major asset of the care provided by paramedics, has now

been questioned, not only because missed tracheal intubation is a concern but also because unintentional hyperventilation (hypocarbia) is detrimental in the setting of traumatic brain injury (TBI) and during cardiopulmonary resuscitation (CPR). Moreover, the value of I.V. fluid administration remains controversial ***(Grossman DC et al., 1995).***

Time is important in the on-scene treatment of severely injured trauma patients. Applying organized trauma systems and protocols help us to carry out a correct patient assessment, resuscitation, stabilization and transportation within a short timeframe. Every action must have lifesaving purpose. Any actions that increase scene time but are not potentially lifesaving must be omitted. If you fail something twice do not attempt it a third time. Use the simplest and fastest method first to ensure the best for your patient within the shortest time ***(Osterwalder JJ, 2002).***

ATLS (Advanced Trauma Life Support

ATLS was born in 1976, the idea came from an unfortunate, tragic incident. James K. Styner MD, an orthopedic surgeon, after crash landing his own plane in Nebraska with his family on board, he had to face the real trauma service in the U.S. at that time. His wife died instantly after the crash, and 3 out of his 4 kids were severely injured. On the field he provided what he could with basic medical equipment and brought his kids to the nearest hospital. To his surprise the hospital was totally incapable to handle trauma, even on a very basic level. So, he gave up his carrier as an orthopedic surgeon and started out the courses, known today as ATLS. The course gives a universal language to those who work with trauma patients, might it be a trauma surgeon, general surgeon, anesthesiologist or emergency physician. The course teaches the way to examine, treat and reevaluate in a time and severity centered way. The patient management has been divided into two parts, the primary and the secondary survey part. In the primary survey, the most important steps are to manage life threatening conditions such as airway obstruction, tension pneumothorax, heavy bleeding, etc., in a time sensitive choreography. We treat first, what kills first as they say. We start with airway, breathing, circulation, disability and finally exposure. These give the well-known ABCDE of the primary survey. At this stage we use only limited equipment. After the necessary lifesaving surgeries, only on a hemodynamically stable patient we can continue to the secondary survey. This latter is a top to toe examination, this stage we get a very detailed picture of the patient's current condition and injuries after solving the immediate life threatening diseases in the primary survey, the key is

always the hemodynamic stability. Instability in this matter is usually the indication for surgery, however a stable patient can undergo a lot more examinations and usually ends up without surgery ***(National Association of Emergency Medical Technicians, 1994).***

Prehospital trauma scores

Pre-hospital trauma scores have been devised to identify critically injured trauma victims, who represent about 10% to 15% of all injured patients. When it is geographically and logistically feasible, critically injured patients should be taken directly to a designated level I trauma center or to a level II trauma center if a level I trauma center is more than 30 minutes away. The currently available field trauma scores, however, are not entirely reliable for identifying critically injured patients To capture a sizable majority of patients with life-threatening injuries, a 50% over triage is probably necessary. Advance transmission of key patient information to the receiving trauma center facilitates the organization of the trauma team and ensures the availability of ancillary services ***(American College of Surgeons Committee on Trauma, 1999).***

Physiologic scores:

These scores depend on changes in blood pressure, heart rate, respiratory rate, and level of consciousness that occur in the presence of serious injuries. Information required for their calculation is routinely available to field personnel. In theory, physiologic scores are useful for pre-hospital measurement of injury severity and helpful during triage decision-making processes.

Glasgow Coma Scale:

The Glasgow Coma Scale (GCS) is a clinical index for assessing the degree of impaired consciousness.

The GCS is calculated by determining the patient's best motor, verbal, and eye opening responses (Table 1). These parameters reflect the function of the central nervous system (CNS), its degree of integration, and brainstem function, respectively.

Table (1): The Glasgow Coma Scale (GCS):

Glasgow coma scale	Score
Verbal response	
Oriented and converses	5
Confused mentality	4
Inappropriate words	3
Incomprehensive sounds	2
No sounds	1
Motor response	
Obeying commands.	6
Localizing to pain.	5
With drawing.	4
Flexion.	3
Extension	2
No response	1
Eye opening	
Spontaneous	4
To speech	3
To pain	2
No response	1

(Beers M and Berkow R, 1999)

Scores range from 3 to 15, increasing as the level of consciousness and integration capabilities improve. Scores 8 indicate coma.

As initially described, the G.C.S. did not account for the patient who was intubated or pharmacologically paralyzed. The patient with a G.C.S. score of 3 due to head injury can be very different from the patient who was pharmacologically paralyzed and intubated for airway control, but who then has a G.C.S. score of 3.

The motor component is the most important value in the G.C.S. The motor component score correlates highly with the total G.C.S. score.

Champion trauma score:

The Champion trauma score (T.S.) is based on assessments of respiratory rate and effort, systolic blood pressure, capillary refill, and the G.C.S. Scores range from 1 (most seriously injured) to 16 (least seriously injured). Similar to the G.C.S., the TS is derived from inpatient data and not as a pre-hospital tool. Nonetheless, it is widely used as a pre-hospital prediction rule to facilitate triage decisions ***(Ali J et al., 1997).***

Revised trauma score:

The revised trauma score (RTS) was developed to limit the need to assess certain ambiguous findings included in the T.S., such as respiratory expansion and capillary refill. Furthermore, the T.S. underestimated the effect of head injury on outcome.

The R.T.S. improves the accuracy of outcome predictions and requires assessment of fewer physiologic parameters. It incorporates the G.C.S., systolic blood pressure, and respiratory rate, using coded values ranging from 4 (normal) to 0 for each of the physiologic parameters. The final R.T.S. ranges from 12 (normal) to 0 (Table 2). A lower than normal coded value for any variable suggests the possible need for care at a Trauma Center.

Table (2): The Revised Trauma Score (RTS):

Respiratory rate (breaths/min)	Systolic blood pressure (mmHg)	Glasgow Coma Scale (GCS)	Revised trauma score coded value
10-29	> 89	13-15	4
> 29	76-89	9-12	3
6-9	50-75	6-8	2
1-5	1-49	4-5	1
0	0	3	0

Group score:

Severely injured: RTS ≤ 6

Moderately injured: RTS 7-11

Minimally injured: RTS = 12