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REVIEW

Hospital care in severe trauma: Initial strategies and life-saving surgical procedures



T. Monchal^{a,*}, E. Hornez^b, B. Prunet^c, S. Beaume^c,
H. Marsaa^c, S. Bourgouin^a, Y. Baudoin^b, S. Bonnet^b,
J.-B. Morvan^d, J.-P. Avaro^e, A. Dagain^f, J.-P. Platel^a,
P. Balandraud^a

^a Service de Chirurgie Viscérale, Hôpital d'Instruction des Armées Sainte Anne, BP 600, 83800 Toulon cedex 9, France

^b Service de Chirurgie Viscérale, Hôpital d'Instruction des Armées Percy, Clamart, France

^c Fédération d'Anesthésie-réanimation et Urgences, Hôpital d'Instruction des Armées Sainte Anne, Toulon, France

^d Service de Chirurgie O.R.L., Hôpital d'Instruction des Armées Sainte Anne, Toulon, France

^e Service de Chirurgie Thoracique et Vasculaire, Hôpital d'Instruction des Armées Sainte Anne, Toulon, France

^f Service de Neurochirurgie, Hôpital d'Instruction des Armées Sainte Anne, Toulon, France

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Salvage

Summary Severe trauma patients should be received at the hospital by a multidisciplinary team directed by a "trauma leader" and all institutions capable of receiving such patients should be well organized. As soon as the patient is accepted for care, the entire team should be prepared so that there is no interruption in the pre-hospital chain of care. All caregivers should thoroughly understand the pre-established protocols of diagnostic and therapeutic strategies to allow optimal management of unstable trauma victims in whom hemostasis must be obtained as soon as possible to decrease the morbid consequences of post-hemorrhagic shock. In patients with acute respiratory, circulatory or neurologic distress, several surgical procedures must be performed without delay by whichever surgeon is on call. Our goal is to describe these salvage procedures including invasive approaches to the upper respiratory tract, decompressive thoracostomy, hemostatic or resuscitative thoracotomy, hemostatic laparotomy, preperitoneal pelvic packing, external pelvic fixation by a pelvi-clamp, decompressive craniotomy. All of these procedures can be performed by all practitioners but they require polyvalent skills and training beforehand.

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* Corresponding author. Tel.: +04 83 16 25 23/06 86 98 28 90.
E-mail address: tristan.monchal@free.fr (T. Monchal).

Introduction

The receiving department of hospitals that accept severe trauma patients must be perfectly organized with multidisciplinary teams and requires anticipation of care, including pre-established protocols of diagnostic and therapeutic strategies. For patients with unstable bleeding trauma, every minute after the accident counts to improve survival. From arrival to shock treatment, the timing of each procedure must be foreseen and fully understood by all those involved in the care procedures in order to minimize the time necessary to obtain hemostasis. When the patient is in extremis, several surgical procedures can be life saving and every general surgeon or physician involved in emergency care should know how to perform them in the emergency situation. Our goal is to provide the details of these salvage procedures from the most simple to the most complex. Likewise, we highlight the importance of anticipation and routine strategies of care for severe trauma patients at the point of arrival.

Need for an organized point of reception in the hospital for severe trauma

Regional organization: role of networking for trauma care

In several countries, "trauma systems" have been set up, following the example of the United States in the 1970s, where triage criteria were standardized, levels of hospital capacity to receive the trauma patients were categorized, data banks were centralized and standard training programs were established. Such organization led to a decrease in avoidable deaths and inappropriate care [1].

In France, pre-hospital triage for multiple trauma victims was standardized according to the Vittel criteria [2] and regional networks were set up later on [3].

Thus, in the Provence Alpes Côte d'Azur region of France [4], in 2013, health-care facilities were classed into three levels, according to eight quality criteria and availability of technical capacities. Patients are stratified according to three levels of severity (unstable, critical, and potentially severe). This system was adopted to standardize the direction of the patient toward the proper establishment with an appropriate level of care, weighing the estimated transportation time and the availability of the technical facilities. Each establishment has the responsibility of adhering to this organization and of designating a local coordinator.

Criteria for patient acceptance

All severe trauma patients are proposed to either the on-call intensive care physician, preferentially, or to the emergency department physician by the regulator of the Control Center (Centre 15), who accepts the patient or not.

A level 1 trauma center should be capable of accepting all trauma patients who are unstable or critical with the necessary medico-technical capacities (CT scan available 24/7 and operating room (OR) rapidly available), as well as accept patients who are potentially severe similar to other level 2 or 3 establishments.

Whether or not an intensive care bed is available at the time of the proposal call should not constitute a motive for refusal. After initial management (shock

treatment \pm surgery), a secondary transfer to another intensive care unit can be organized if there is still no available bed at the receiving center.

Trauma team preparation

Personnel alert

Reception of a severe trauma patient implies that several principal actors be notified as soon as the patient has been accepted according to a pre-established protocol. The complete list of people includes:

- the intensive care physician, the trauma leader;
- three senior emergency physicians, responsible for the emergency room (ER);
- junior general surgeon;
- senior general surgeon;
- specialty surgeon according to findings of the initial evaluation (orthopaedist; neurosurgeon, thoracic surgeon, maxillo-facial surgeon...);
- on-call radiologist;
- radiology technician;
- ER nurse and auxiliary nurse;
- anesthesiology nurse;
- assistant anesthesiology nurse;
- junior emergency physician;
- blood bank personnel;
- security center personnel when the patient is transported by helicopter.

Preparation of the emergency room

The shock treatment area has to be prepared in advance so that all necessary equipment and personnel are ready as soon as the patient arrives, as follows:

- the ER should be checked every day: a nurse whose responsibility includes "opening" the ER at the beginning of each work shift should be present 24/7. Additionally, when arrival of a patient is announced, the nurse should prepare the equipment following a specific checklist, which should be signed by the trauma leader before the patient arrives (Fig. 1);
- temporary administrative identification of the patient should be determined by the ER secretary, according to established procedures. Identification labels should be printed and left in the vicinity of the ER;
- two O-negative units of packed red blood cell (PRC) and two units of fresh frozen plasma should be ordered and made available in the ER. The order slip for more blood units can be filled out in advance in case a massive transfusion protocol is necessary;
- a portable X-ray machine should be on hand in the ER, and two X-ray cassettes positioned on the stretcher at the level of the thorax and pelvis;
- the ultrasound machine should be switched on with the probe lubricated;
- blood collection tubes and corresponding paperwork should be prepared;
- the patient record, paper or digital, should be ready to be filled in;
- all personnel should don gowns, caps, masks and non-sterile gloves. If necessary, the junior ER intensive care physician can wear sterile gown and gloves in order to help with invasive maneuvers as soon as the patient arrives. Each person must respect the working space and organization of other members of the ER team (Fig. 2).

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