

MANAGEMENT OF BLEEDING AFTER MAJOR TRAUMA: A EUROPEAN GUIDELINE – WHAT’S NEW?

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In February 2007 a *European Guideline for Management of Bleeding after Major Trauma* was published in the prestigious *Critical Care* [1]. It emerged from a multidisciplinary *Task Force for Advanced Bleeding Care in Trauma* formed in 2005 with the aim of developing evidence-based recommendations. Relying upon a systematic review of published literature recommendations were formulated after group discussions and according to GRADE (Grading of Recommendations Assessment, Development and Evaluation) hierarchy.

Certainly in the modern world trauma is a topic of major interest. It is the leading cause of death for young people and is correlated with high costs, loss of lives or long-lasting disabilities. Uncontrolled bleeding is responsible for 30-40% of trauma-related death, but of most interest it is the major potentially preventable cause of early in-hospital mortality [1]. Persistent blood hypotension (systolic blood pressure less than 70mmHg) is associated with coagulopathy and poor outcome.

Not only trauma is responsible of uncontrolled bleeding, but also the therapeutic intervention. Early aggressive volume repletion may lead to pathophysiological disturbances, which perpetuate haemorrhage: *the bloody vicious cycle*.

On one hand, aggressive volume loading results in increased systolic blood pressure and a mechanical effect on early clotting. Before surgical repair of tissue damage this will aggravate blood loss.

On the other hand aggressive volume administration will induce haemodilution and dilution coagulopathy, which will impede physiological hemostasis and will promote further bleeding. Severe anemia, as a result of bleeding and hemodilution, combined with decreased tissue perfusion will result in severe tissue hypoxia, which will further promote bleeding. Hypothermia, which is constantly associated with severe injury, will contribute to ongoing blood loss.

Taking all these into account the European Guidelines for the management of bleeding in case of major trauma emerged as a response to an obvious problem. But what’s new in these recommendations?

First, emphasis is placed on minimizing the time delay between trauma and surgical interventions (grade 1A recommendation). *The speed by which the exsanguinating trauma patient moves from the prehospital arena to the emergency department, operating room and intensive care unit is important to survival* [2]. Any severe trauma which needs surgical repair should be referred as soon as possible to the operating theater in order to successfully control bleeding. Delays in transport, emergency room resuscitation and investigations will aggravate bleeding and will make more difficult haemorrhage control.

Using American College of Surgeons Advanced Trauma Life Support classification of haemorrhage severity during the initial evaluation of the bleeding patient will identify those at risk for coagulopathy.

In case of obvious bleeding or penetrating injuries the patient is usually early referred to the operating theater. In case of blunt trauma the time delay between injury and surgery is usually unacceptable longer. The guidelines describe the recommended steps for investigations (grade 1C recommendations). The hemodynamically instable patient should

undergo ultrasound examination according to the FAST protocol. If significant free intraabdominal fluid is detected, the patient should be immediately sent to surgery. In the hemodynamically stable patient with suspected bleeding after high-energy injury computed-tomography examination should be performed without delay for the decision of surgical interventions. Laboratory data may estimate and monitor the extent of bleeding. The initial haematocrit determination is unreliable. Serum lactate and base deficit are more sensitive markers of bleeding and shock severity (grade 1C recommendation).

The second important point of the European Guidelines regards the surgical approach. Rapid control of bleeding may be achieved by packing, direct surgical bleeding control and the use of local haemostatic procedures. In the exsanguinating patient aortic cross-clamping is employed (grade 1C recommendation).

In case of severely injured patient with deep haemorrhagic shock, signs of ongoing bleeding and coagulopathy *damage control surgery* is recommended (grade 1C). Additional factors that should trigger a damage control approach are hypothermia, acidosis, inaccessible major anatomic injury, a need for time-consuming procedures or concomitant major injury outside the abdomen.

Damage control surgery includes abbreviated laparotomy for bleeding control, restitution of blood flow where necessary and control of contamination, all of these performed as quickly as possible, *without spending unnecessary time on traditional organ repairs that can be deferred to a later phase*. Thus, damage control is a concept, in which the initial surgery becomes part of the resuscitation process rather than part of the curative process.

The third important point of the European Guidelines regards resuscitation. In order to avoid deleterious effects of high-volume resuscitation „permissive hypotension” is recommended. The end-point of initial resuscitation in the bleeding patient without brain injury is a systolic blood pressure of 80-100 mmHg until blood loss control is performed (grade 2C recommendation). The concept of low-volume resuscitation is a compromise between avoidance of serious consequences of aggressive fluid administration and maintenance of an acceptable level of tissue perfusion. Crystalloid solutions are recommended for the initial volume replacement combined with colloids within prescribed limits.

During initial resuscitation hyperventilation and PEEP (positive end-expiratory pressure) should be avoided (grade 2C recommendation).

Early and aggressive treatment of hypothermia should be performed in any patient after major injury. It should be started at the accident scene and should be continued throughout transportation, emergency department, operating room and intensive care. This implies measures to reduce heat loss and to warm the hypothermic patient in order to achieve and maintain normothermia (grade 1C recommendation).

The fourth important point of the European Guidelines regards substitution of blood components. Circumstances and end-points of substitution are specified for each blood product. Some recommendations already raised controversies. For instance, the recommended haemoglobin level according to the guidelines is 7-9 g/L (grade 1C recommendation).

Two months after publishing the European Guidelines *Critical Care* hosted a commentary [3] with some critical remarks. The recommended haemoglobin level applies to the stabilized (postoperative) patient and not to the ongoing bleeding patient. In this later case the decision to transfuse is made on sound clinical judgment, rather than fixed laboratory values.

In conclusion, the European Guidelines for management of bleeding in major trauma integrate older concepts into a new algorithm. Modern medicine and accumulating experience and expertise in trauma management allow nowadays survival of severely injured

patients, which years ago would be „condemned” to death. The European Guidelines offer an evidence-based frame for the successful treatment of such patients.

REFERENCES

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