Fluid Resuscitation in Low Intensity Conflict: When Theory Meets Reality

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The Israel Defense Forces Medical Corps has adopted the Advanced Trauma Life Support guidelines of the American College of Surgeons. The ATLS advocates fluid administration to trauma patients in order to maintain perfusion of the brain and other vital organs [1]. Every trauma patient should receive a primary bolus of 1–2 L of isotonic electrolyte solution, followed by additional fluids according to the patient's response. As a rule of thumb, patients should receive three times the amount of blood lost. These guidelines, however, are for a physician in a hospital setting, where blood administration is possible and an operating room handy.

The dilemma of "Scoop and run" or "Stay and stabilize," a basic dilemma of pre-hospital caregivers, cannot be solved using ATLS guidelines alone. Clinical studies on this problem were lacking until the study published by Bickel et al. [2] in 1994. This study showed that for hypotensive patients with penetrating torso injuries, delay in fluid infusion until bleeding is controlled improves outcome. However, since the study deals with trauma patients in a civilian setting, their injuries and evacuation times differ from those seen in a military context such as southern Lebanon.

Based on the theoretical information we had, the IDF Medical Corps published its guidelines. These emphasized early rapid evacuation of military trauma casualties after resolving immediate airway problems, performing life-saving procedures for breathing impairment, and controlling external hemorrhage. Fluid administration is to be started before, but without delaying, evacuation.

ATLS = Advanced Life Trauma Support

These guidelines were challenged recently when experimental studies showed a fundamental dissimilarity in the hemodynamic response to fluid resuscitation between controlled and uncontrolled hemorrhagic shock. It was observed that attempting to increase blood pressure to normal levels by aggressive fluid resuscitation resulted in increased bleeding from injured blood vessels, hemodynamic deterioration and increased mortality [3]. The bleeding that ceased due to a thrombus formation re-occurred as a result of vasodilatation, elevated blood pressure, hypothermia or coagulopathy following fluid administration. These studies changed the strategy of fluid resuscitation in civilian trauma to what is known as "hypotensive resuscitation."

Attempting to perform "hypotensive resuscitation" in the battlefield has several pitfalls. The first relates to diagnosis of shock. When treating a pale tachycardic hypotensive patient with an abdominal gunshot wound, the diagnosis of shock is obvious. However, in the battlefield at night, when illumination is lacking due to tactical considerations, a thorough examination of the patient is impossible. Heart rate is measured qualitatively only and blood pressure is seldom measured. Under these conditions, reaching a diagnosis of shock can be difficult. The second problem is diagnosis of uncontrolled bleeding. When treating a patient with multiple shrapnel torso injuries in the pre-hospital setting and without imaging capabilities, diagnosing continuous internal bleeding is impossible. The third concerns the "intensive care" environment. In order to perform hypotensive resuscitation, close monitoring of the patient is necessary, which requires special equipment and skilled medical staff. Continuous measurement of arterial blood

pressure — the cornerstone of the concept of hypotensive resuscitation — cannot be performed in the military prehospital arena. Finally, frequent reassessment of the patient, another demand that must be met, is difficult to perform on the battlefield.

The data in the Medical Corps' database regarding the treatment of 84 consecutive soldiers injured in South Lebanon during a two year period were recently analyzed. This group consisted of moderately and severely injured soldiers (Injury Severity Score 9–14, and ≥16, respectively). Mean evacuation time of all casualties was 103 minutes. Evacuation time was not significantly different between the two groups, implying that evacuation time did not depend on severity of injury but rather on tactical considerations. Evacuation time did not influence core body temperature or prothrombin time measured upon arrival at the hospital. The patients received a mean of 2.5±1.5 liters of fluids prior to hospital arrival, independent of severity of injury. Only a minority of patients received blood transfusion before arriving at the hospital. There was no correlation between the amount of fluids given to the patients and core body temperature or prothrombin time measured at the emergency department upon arrival. The difference in mean core body temperature of patients injured during summer and winter seasons (36.7 and 36.2C, respectively) was not statistically significant. Mean core body temperature of moderately and severely injured patients (36.8 and 35.8C, respectively) was found to be statistically different. To summarize, the time of evacuation and the amount of fluid given to casualties in a low intensity conflict situation, as in South Lebanon, appeared to have no effect on their core body temperature and coagulation factors as measured upon hospital arrival. Core body temperature was affected by the severity of injury.

It should be noted that physicians treating combat casualties in the IDF come from various backgrounds. Some are general physicians recently graduated from medical school, while others are experts in a variety of medical disciplines. The Medical Corps' guidelines, therefore, must be clear and not trauma-expert oriented. Using the term "½C," as suggested by Krausz [4], could create misunderstandings. This term emphasizes the control of external hemorrhage, while it underestimates the importance of hemodynamic assessment and fluid administration. It may lead medics and physicians to believe that giving fluids to casualties is detrimental. We have shown that the amount of fluids given to casualties in South Lebanon, at evacuation times of 1–2 hours, did not cause the side effects described in the literature on massive fluid infusion [5].

Evacuation time of less than 30 minutes is infrequent in the military setting. It can be achieved in units situated close to medical facilities, resembling urban trauma situations, and in such circumstances patients should be treated according to the "Scoop and run" philosophy. But it is almost impossible to evacuate a wounded soldier from South Lebanon in less than an hour.

Since "hypotensive resuscitation" in the military prehospital setting is not feasible and "maximal fluid resuscitation" potentially harmful, we propose the strategy of "smart fluid resuscitation." This means that while arrangements for evacuation are being made, the patient should have at least one IV line, and fluid administration should start as soon as possible. Ground or air evacuation should not be delayed for an IV line, which can be done en route. Additional fluids, after a primary bolus, should be given according to the patient's response. It is our contention that these simple guidelines can bridge the gap between theory learned from experimental studies and reality. This protocol is thus applicable to low intensity conflicts.

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Government is not reason. Government is not eloquence. It is force. And, like fire, it is a dangerous servant and a fearful master.

George Washington