



Traumatic Shock III

Treatment of Shock with Fluids in WWI Military Medicine

Part I of this series of briefs discussed the definition of shock. This article will describe fluid therapy in traumatic shock treatment during WWI by the American military. Transfusion therapy will be discussed in a separate article.

Many of the soldiers and marines on the battlefield in WWI became dehydrated due to poor fluid intake and sweat-related fluid loss. Water was hard to come by. When a man's canteen was empty, he had to survive until a refill was possible. With water in short supply, many of those wounded were already relatively "dry." In this condition, it took much less blood loss from a wound to cause shock than would be the case in someone who was normally hydrated at the time of their injury.

The need for fluid resuscitation was well recognized in WWI military medicine. The problem was not recognition but the ability to do anything about it. This related to delivery systems, types of fluids, and also the time it took to evacuate casualties.

Experimental studies were conducted using warm normal (0.9%) saline ($\text{Na}^+=154$ mEq/L, $\text{Cl}^-=154$ mEq/L) and Ringer's solution ($\text{Na}^+=147$ mEq/L; $\text{K}^+=4$ mEq/L; $\text{Ca}^{++}=4.5$ mEq/L, $\text{Cl}^-=155.5$ mEq/L, with bicarbonate added to adjust pH—the acidity of the solution). These showed temporary benefit in the treatment of shock, though the volumes of fluids given in these early studies are not always clear. Hypertonic saline and bicarbonate solutions were tried with unsatisfactory results.

Since saline (crystalloid in our current parlance) solutions didn't lead to lasting improvement, colloidal solutions were tried. The most common one used was a gum acacia solution. This was 6-7% gum acacia in normal saline. This had the same viscosity as blood and the same osmotic pressure as plasma. For those in the medical world, this appears to be where the crystalloid/colloid debate began. Various studies found benefit with colloid, while others did not.

One of the truths that emerged was that the earlier fluid resuscitation was begun, the better the results, regardless of the fluid type. The other was that fluids used in the volumes infused were of variable benefit, but part of this could have been related to the actual volume infused. The massive volume replacement techniques currently used in trauma care were not known in WWI.

The biggest problem was the lack of IV infusion capability where it counted the most: the field or the aid station. In the field, oral fluids were limited to what the troops carried in their canteens. The same was true in the company aid station, the first place casualties were brought when evacuated from the field. These were austere settings with little to offer except a relative degree of shelter from direct fire, dressings, and morphine for comfort. Company aid stations evacuated to battalion aid stations. These were often in buildings or some sort of shelter, as near to the front as possible. These provided hot coffee or cocoa to those who could consume liquids by mouth. There was nothing they could give to a casualty who was not awake enough to safely drink, nor to those with chest or abdominal wounds. They didn't have intravenous therapy equipment.

Regimental aid stations were used early in the American involvement in the war, but later fell out of favor. They didn't have IV therapy capability, either. The next step from the battalion or regimental aid station was the ambulance dressing station, located at the most forward position ambulances could be brought. They were often the site of triage, and didn't offer any specific fluid therapy capability other than additional hot beverages.

Field hospitals were 3-6 miles behind the front, beyond enemy artillery range. These did only life-saving emergency surgery, usually without intravenous access or fluids. We need to remember, though, that during that era, it was routine to do surgery under general anesthesia without intravenous access. As far as I can tell, these were probably the first hospitals in the evacuation chain that may have had intravenous sets, though this is not entirely clear. The time from a wound to an evacuation hospital under the best of circumstances later in the war could be hours. However, in the Battle of Belleau Wood and others, it could take many hours, a day, or sometimes even longer. There is no reliable record the author could find to determine how many men died from wounds due to the lack of intravenous access, fluids, or transfusion. However, the number must have been very significant.

Reference:

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