

Title : HYPOKALEMIA AFTER TRAUMA AND COMPONENT TRANSFUSION THERAPY

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Following traumatic shock, intracellular potassium (K^+) may leak out of the cell resulting in hyperkalemia. The K^+ levels may be further raised by massive blood transfusion. However, a recent report¹ suggests that hypokalemia is more common following traumatic shock in aggressively resuscitated patients. We therefore reviewed the laboratory and anesthesia records of 185 trauma patients 1) To find if serum K^+ levels following traumatic shock differed from a control group of patients who were stable and recovering from trauma 2) To determine if serum K^+ differed in patients hypotensive and nonintensive on admission following trauma 3) To compare serum K^+ in patients who arrived alive but died within one hour and those who were receiving cardiopulmonary resuscitation (CPR) on admission.

Method and Material. Blood samples were taken from 185 trauma patients admitted from arterial and venous cannulae before any treatment or intravenous fluid infusion, and were analyzed for arterial blood gases, serum electrolytes, blood glucose and hemoglobin. During resuscitation and subsequent anesthesia these investigations were repeated. All patients received plasma protein fraction (PPF) up to 1.5 liters as part of an admission protocol. If systolic blood pressure (SBP) remained < 90 torr packed red blood cells (RBC) were transfused. In patients with stable blood pressure (BP) crystalloid was infused after PPF. Patients were divided into four groups. Group I, 56 patients with SBP < 90 torr on admission; Group II, 129 patients with normal BP on admission; Group III, 9 patients admitted receiving CPR; Group IV, 18 patients arrived alive but died within one hour. The serum K^+ of these groups was compared to the mean K^+ of 100 stable recovering patients.

Results. Admission serum K^+ levels, mean (\bar{x}) \pm standard deviation (SD) of Group I and II patients were significantly ($*p \leq 0.05$) lower than Group III and control patients as shown in Table 1:

	No. of Patients	K^+ : $\bar{x} \pm$ SD mEq/L
Control	100	4.3 ± 0.50
Group I	56	$*3.5 \pm 0.58$
Group II	129	$*3.6 \pm 0.55$
Group III	9	4.9 ± 1.40
Group IV	18	3.4 ± 0.86

There was no correlation between serum K^+ levels on admission and pH, $PaCO_2$, and blood glucose. During resuscitation and anesthesia, serum K^+ of the Group I patients decreased to mean 2.9 ± 0.47 mEq/L. Compared to their admission K^+ this fall was significant ($p = 0.05$). In contrast, the serum K^+ of Group II patients showed no change throughout resuscitation and anesthesia (Table 2).

	Group I	Group II
Admission serum K^+	$3.5 \pm SD 0.58$	$3.6 \pm SD 0.55$
Resuscitation serum K^+	$2.9 \pm SD 0.47$	$3.5 \pm SD 0.49$
RBC units transfused when K^+ taken	$6.5 \pm SD 4.9$	$1.5 \pm SD 1.9$
Serum K^+ after KCl	$3.7 \pm SD 0.74$	

Despite the severe hypokalemia, electrocardiographic abnormalities were not documented in Group I patients. Of the 56 patients in Group I, three had serum $K^+ < 5$ mEq/L during anesthesia and all were undergoing repair of traumatic rupture of the thoracic aorta.

Discussion. The higher serum K^+ levels seen in patients receiving CPR may suggest that hyperkalemia appears only as a terminal event in the aggressively resuscitated patient. Patients who were alive on admission but were hypotensive (Group I) requiring infusion of large fluid volumes showed hypokalemia. This group received about four times as many units of packed RBCs than the normotensive patients whose K^+ remained the same throughout resuscitation and surgery. It is thought that during storage K^+ leaks out of the RBCs into the plasma which is then removed by packing. Transfusion of RBCs and PPF together with other low K^+ containing solutions may accentuate the hypokalemia. During heavy blood loss and aggressive resuscitation serum K^+ should be routinely measured since hypokalemia if it persists causes muscle weakness, increased sensitivity to muscle relaxants and digoxin, paralytic ileus, polyuria and arrhythmias.

Conclusion. Hypokalemia is more frequent in trauma patients, particularly in patients receiving component transfusion therapy.

Reference.

1. Smith JS: Hypokalemia in Resuscitation from Multiple Trauma: Surg Gynec & Obstet 147: 18-20, 1978.