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Hormonal response following hemorrhagic shock in severe trauma: an observational study.

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Position du problème et objectif(s) de l'étude:

Following traumatic hemorrhagic shock, several physiological mechanisms are involved to maintain blood pressure and organ perfusion in response to hypovolemia and vasoplegia. Several hormonal systems contribute to these adaptative mechanisms but remain not well described yet. The main goal of this study was to explore pituitary and adrenal hormone responses to severe trauma.

Matériel et méthodes:

We conducted a prospective and observational study in a French level I trauma center. Patients admitted to the trauma bay following severe trauma with an Injury Severity Score (ISS) of more than 9 were included. Vasopressin assessed through copeptin secretion, cortisol, renin and aldosterone were measured at intensive care unit (ICU) admission, and at 6-, 12-, 24- and 48-hours following ICU admission. Mineralocorticoid deficiency was defined as renin/aldosterone levels ≤ 2 . Hormone concentrations were compared over the first 48 hours of admission between patients transfused with at least one pack of red blood cells (pRBC) and non-transfused patients with a mixed-effect model. This study is an ancillary study of one on femoral venous to arterial difference in carbon dioxide pressure as a surrogate of hypovolemia and was approved by the ethics committee ("Comité de Protection des Personnes") of the hospital (SC13-014 RCB: 2013-A01171-44).

Résultats & Discussion:

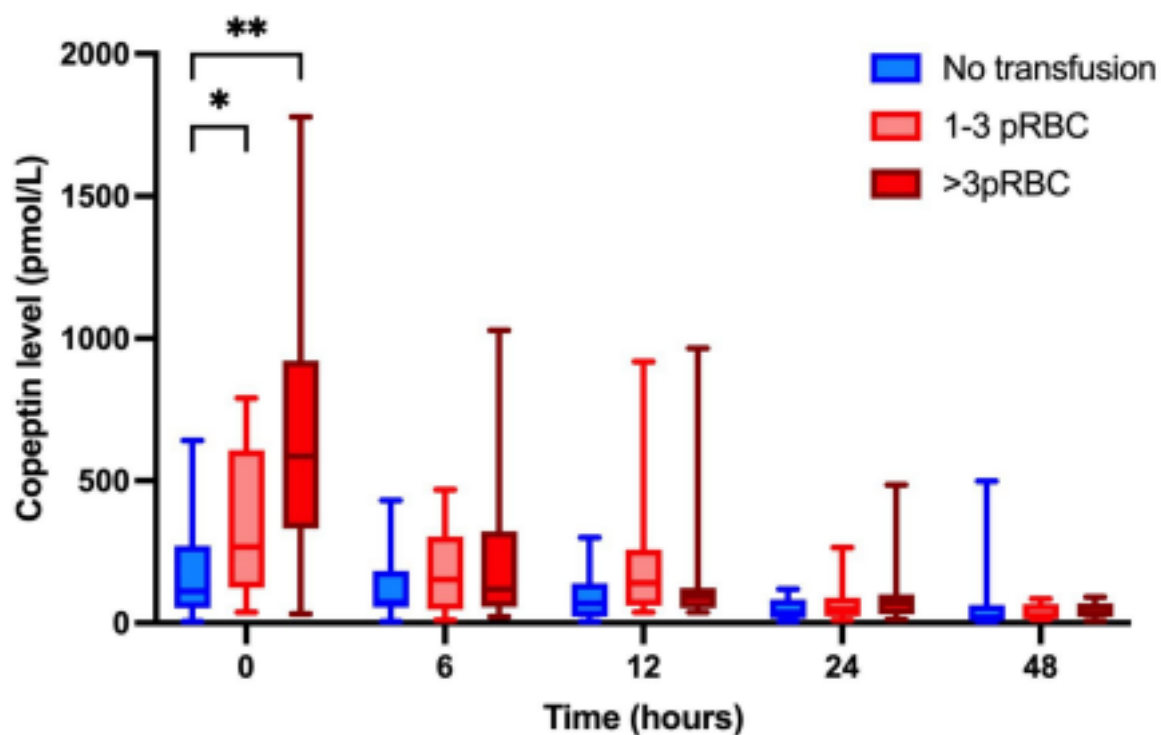
Sixty-six patients were included with a median Injury Severity Score of 25 (19-30) and 28 (43%) patients received at least one pRBC. Evolution of copeptin level was different over the 48 hours between transfused and non-transfused patients ($p < 0.001$). Copeptin was maximum at hospital arrival and was greater in transfused than in non-transfused patients (486 ± 433 pmol/L vs. 208 ± 206 pmol/L; $p < 0.001$). Copeptin decreased rapidly thereafter, without difference between groups from H6. Admission copeptin was significantly greater in patients receiving higher quantity of pRBC (0 pRBC: 208 ± 206 pmol/L vs. 1-3 pRBC: 346 ± 283 pmol/L vs. >3 pRBC: 606 ± 509 pmol/L, $p < 0.001$). There was no difference between transfused and non-transfused patients regarding levels of cortisol ($p = 0.06$), renin ($p = 0.3$) and aldosterone ($p = 0.3$) over the first 48 hours of admission. Eleven (19%) patients had low cortisol and 44 (67%) patients presented mineralocorticoid deficiency over the first 48 hours of ICU.

Conclusion:

In this observational study on severe trauma patients, vasopressin secretion is the predominant and earliest hormonal response to traumatic hemorrhagic shock. Its level is increased in patients requiring transfusion at ICU admission and is associated with the need of red blood cell transfusion in the six first hours of ICU admission. Vasopressin decreased rapidly in the six following hours despite a persistent need for vasopressors. Furthermore, glucocorticoid and mineralocorticoid deficiencies seem common and need further exploration.

Thus, in the first hours of ICU admission for severe trauma, pituitary and adrenal hormone measurements could have a prognostic and therapeutic interest for hemorrhagic shock management.

	All patients (n=66)	Non-transfused patients (n=38)	Transfused patients (n=28)	p
Age - years	46± 20	47 (20)	46 (21)	0,88
Women – n (%)	18 (27)	10 (26)	8 (29)	0,84
ISS	25 (19-30)	25 (20-32)	25 (18-30)	0,90
Parameters on admission to trauma bay				
HR – bpm	86 (75-102)	84 (72-100)	90 (84-119)	0,01*
MBP – bpm	80 ± 18	89 (76-96)	69 (62 -84)	0,006*
Hb – g/dl	11,8 ± 2,3	12,8 (1,6)	10,3 (2,27)	<0,001*
Lactate – mmol/l	2,1 (1,4-3,6)	1,7 (1,3-2,9)	2,5 (2-5,4)	0,01*
Catecholamine – n (%)	17 (25)	9 (24)	8 (29)	0,65
Evolution				
Fluid balance>4 L H6	17 (25)	8 (3)	14 (50)	<0,001*
Hemostatic surgery	20 (30)	2 (5)	18 (64)	0,01*
Embolisation	7 (11)	0 (0)	7 (25)	0,001*
Mortality	14 (21)	10 (26)	4 (14)	0,24



Les auteurs déclarent ne pas avoir toute relation financière impliquant l'auteur ou ses proches (salaires, honoraires, soutien financier éducationnel) et susceptible d'affecter l'impartialité de la présentation.