



Research Paper

Hypoalbuminemia in surgical septic subjects: prognosis and risk factors

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I. INTRODUCTION:

Serum albumin is the most abundant protein of plasma; it represents approximately 60% of plasma proteins. It is a marker objective of nutritional status and index reflecting inflammatory status and condition immune. It also plays an important role in healing wounds and Collagen synthesis.

Sepsis can induce hypoalbuminemia by several pathophysiological mechanisms, which can pathophysiological mechanisms, and may exacerbate the severity of sepsis.

In fact, previous studies reveal that low albumin levels are an independent risk factor and an indicator of mortality in critical patients. Other studies have reported that low albumin level (<2 g/dL) was a risk factor for mortality (risk > 80%) in burn patients.

The measurement of serum albumin is suitable and inexpensive, which makes a potential candidate for the practical predictive index.

However, it is still unclear whether mortality depends solely on albumin concentration. Moreover, rare studies are in course of investigation of the effects of different levels of albumin on the severity of the disease and its evolution for adults in sepsis, especially surgical sepsis.

In order to allow a better control of the question, we carried out this study, whose objectives will be based on the following points:

Evaluate the impact of hypoalbuminemia and normal serum albumin on the prognosis and mortality of surgical septic patients.

To study the risk factors for the development of hypoalbuminemia at the time of admission in order to identify patients at risk of premature death and optimize clinical decision making procedures to improve clinical outcomes in these improve clinical outcomes in these patients

II. MATERIAL AND METHODS:

This is a retrospective study, that has been carried out over eighteen months , including all septic patients admitted to Ibn Tofail hospital-Marrakech, surgical resuscitation, between January 2018 and July 2019. Various parameters were collected and compared between two groups, those with normal albumin levels and those with hypoalbuminemia.

III. RESULTS:

324 patients were admitted during this period, of which 78 patients met the inclusion criteria. The mean age was 60.48, with extremes ranging from 18 years to 90 years.

Of the patients studied, 79,83% were male and 20.17% were female; sex ratio of 3,95.

40 of the patients had sepsis of abdominal origin, i.e. 51.2%, 12 of cutaneous origin, i.e. 15.38%, 11 of urinary origin, i.e. 14.1%. And 10 patients had sepsis of pulmonary origin or 12.82%. 6,41% of other origins.

Concerning the medical history, diabetes remains the most common medical condition frequently encountered in our patients (42%), followed respectively by hypertension (33.33%) (39.33%), followed by heart disease (16.66%), chronic bronchopneumonia (1.66%), asthma (1.66%) and chronic renal failure (3.33%).

In addition, 5% of the patients were followed for neoplasia and 3.33% had paraplegia or had post-traumatic paraplegia or tetraplegia.

The severity scores, represented by APACHE II and SOFA in our patients, had a mean value of 14,83 and 6,7 . Of the 78 patients admitted, mechanical ventilation was used in 46 patients (58.9%). 54 patients required the administration of Noradrenaline as vasoactive drug, i.e. 69%, in addition 36 patients received adrenaline, i.e. 46%. Only 1 patient received a combination of dobutamine as vasoactive drug. In 78 patients admitted to the Surgical Intensive Care Unit, there were 66 patients with hypoalbuminemia, i.e. 85% (of which 81% were hypoalbuminemia \leq 25g/dl), and only 11 patients who had a normal albumin level, i.e. 15%. On analysis of WBC data, 75% of patients had hyperleukocytosis, 20% had normal WBC levels and only 5% had leukopenia. With an average of 19.75 10³ /UL. We note that the majority of our patients (73.3%) had a procalcitonin level > 2 ng/ml with a mean of 20.64 ng/ml, and a mean CRP level: 252 mg/l. In our study, we noted 31 deaths out of 78 patients, i.e. a 39.74% mortality rate.

IV. DISCUSSION:

The new proposal defines sepsis as life-threatening organ dysfunction life-threatening organ dysfunction caused by a dysregulated host response to infection host response to infection . This new definition abandoned the use of the criteria of host inflammatory response syndrome (HIRS) in the identification of identification of sepsis and eliminated the term severe sepsis.

The predictive validity of SIRS criteria and SOFA scoring of mortality in septic patients were compared by analyzing data from the University of Pittsburgh University of Pittsburgh health records and Kaiser Permanente databases. Permanente databases . Among critically ill patients with suspected infection, the predictive validity of the SOFA score for in-hospital mortality was superior than the SIRS criteria (area under the function curve 0.74 vs. 0,64). Patients who complete SOFA have a predicted mortality score of \geq 10%.

When a patient is admitted to the ICU, his prognosis depends on both factors present on the first day and events occurring later. The score must allow a prognostic evaluation, independent of, or only slightly influenced by the diagnosis of the pathology, justifying the passage to the intensive care unit.

Numerous generalist severity scores have been developed, but only a limited number are routinely used. only a limited number are used routinely, namely the APACHE, IGS and MP scoring systems, to which must be added the scores of visceral failures the interest of which lies more in the daily follow-up of a patient than in the prediction of the final prognosis .

During our study, we were particularly interested in the APACHE score (Acute Physiologic and Chronic Health Evaluation) (Appendix 2) which is historically the first of these three systems developed and described by Knaus in 1981.

In patients confronted with an invasive pathogen, a balanced combination of a pro- and anti-inflammatory immune response contributes to the elimination of the infection and the recovery of the tissue and the patient. Although the pathogen itself may be directly destructive to the host, the pathophysiology of sepsis is related to the subsequent dysregulation of the immunologic response. When a pathogen enters a sterile site after having crossed the first line of defense (mainly the epithelial barrier), an innate immune response is triggered based on cells such as cells such as macrophages, monocytes, neutrophils and dendritic cells. This immune response can lead to a well-adjusted reaction to response to eliminate the pathogen and restore the host, an unbalanced immune response can lead to exaggerated pro-inflammatory mechanisms inflammatory mechanisms causing collateral damage to tissues and organs and anti-inflammatory damage to tissues and organs and extensive anti-inflammatory responses leading to dampening of systemic inflammation, potentially contributing to increased susceptibility to secondary infections. The heterogeneity of the disease is subjective to pathogen and host characteristics and may influence the intensity and direction of the immune response over time.

Advances in care have led to an increase in the number of patients surviving the early sepsis phase, resulting in more than 70% of sepsis deaths after the first 3 days. Even though the actual cause of organ failure and death is not yet known, overzealous activation of the innate immune system in response to acute infection is presumed to play a crucial role. The majority of deaths in sepsis occur more than one week after admission. Prolonged illness with a shift to an immunosuppressive state has been postulated to increase susceptibility to secondary infections, thus contributing to late mortality in sepsis .

Albumin is the most abundant protein in plasma; it represents about 60% of plasma proteins. Its concentration varies between 35 and 50g/l and its half-life is about 15 to 19 days. Albumin is made up of a group of simple proteins formed from hydrogen carbon oxygen, nitrogen and a small percentage of sulfur. It is a protein of single-stranded protein of low molecular weight (kDa) with 585 amino acids. Its large serum size allows it to diffuse through capillary membranes.

Redox balance is involved in the regulation of the inflammatory response. In an experimental model of hemorrhagic shock, 25% hyperoncotic albumin controls neutrophil infiltration in the bronchopulmonary lavage and to limit the occurrence of pulmonary lesions.

Between 60% and 80% of the plasma oncotic pressure depends on the concentration of plasma albumin influencing the movement of between the different sectors. The global electrical charge resulting from the presence of charged amino acids on the surface of the molecule ensures a very high hydrophobicity: one gram of albumin retains about 18ml of water. This explains the importance of the prolonged (six to eight hours) obtained after albumin administration.

Albumin has no specific effect on hemostasis, either in vitro or in vivo, apart from those related to hemodilution. Hypoalbuminemia in the intensive care unit raises several questions: what is its incidence, its mechanism and its impact on prognosis?

Several studies have reported that the incidence of hypoalbuminemia (<30-35 g/L) was between 60_80% in critically ill patients .

When considering resuscitation patients, and particularly septic patients, hypoalbuminemia is consistently found. Several mechanisms contribute to this hypoalbuminemia:

- **Prior chronic malnutrition**

Albumin is a visceral protein with a long half-life. In chronically malnourished patients, albumin levels are lowered, but rarely below 30 g/L if this mechanism alone is involved.

- **Decreased hepatic synthesis**

In septic resuscitation patients, hepatic synthesis is redirected towards the production of inflammatory proteins at the expense of albumin. Gene expression and hepatic albumin synthesis are decreased by proinflammatory cytokines via increased activation of the nuclear transcription factor NF-kB, which is a critical mechanism in the development of LPS-induced hypoalbuminemia in sepsis.

- **Capillary hyperpermeability .**

In resuscitation patients with an inflammatory syndrome, and particularly in septic patients, there is endothelial activation. The endothelial cells take on a pro-inflammatory and pro-coagulant phenotype. Functional and anatomical changes in endothelial cells promote capillary hyperpermeability with leakage of plasma components into the interstitium.

- **Hemodilution induced by prefilling**

The majority of resuscitation patients have received vascular filling prior to vascular filling before their admission. This vascular filling must be analyzed (EMS transport sheet, anesthetic monitoring sheet of the operating room, emergency sheet). This analysis makes it possible to identify the sometimes large volumes of perfusion that can induce hemodilution, which is reflected by a drop in total protein, hematocrit and albumin.

When synthetic colloids have been used, the oncotic pressure pressure can be preserved, even though total proteins and albuminemia are significantly lowered.

- **Loss of albumin**

Albumin loss may result from digestive disorders or renal loss. Albuminuria is a common finding in severe septic patients and reflects hyperpermeability of the glomerular membrane.

Hypoalbuminemia may contribute to increased morbidity and mortality of patients through several interrelated mechanisms:

- Increased drug toxicity related to increase in free forms of drugs with a narrow therapeutic index. Index drugs.

- Decrease in plasma oncotic pressure responsible for the the formation of edema and particularly pulmonary edema.

- Increase in blood loss.

- Decrease of the cardiac contractility via the modification of the ionized Calcium.

- Decreased immune response.

- Decreased protection against root aggression via the decrease in thiol groups.

Hypoalbuminemia should also lead to a cautious interpretation of :

- the dosage of drugs, which concerns the total drug concentration and not only the free form, blood

- calcium levels, which must be analyzed on the basis of ionized calcium,

- the cortisol level

- The calculation of the anion gap, which is reduced by the decrease in albumin.

Several studies have reported that the incidence of hypoalbuminemia is between 40% - 80% in critically ill patients.

In our study, we revealed that the use of vasoactive drugs and mechanical ventilation on the one hand and APACHE II score, SOFA score and CRP on the other hand are risk factors for the development of hypoalbuminemia. But only APACHE II and CRP are independent factors.

V. CONCLUSION:

Recently, there has been increasing interest in assessing the impact of hypoalbuminemia on the incidence of mortality in the resuscitation setting.

This study looked for these risk factors in hypoalbuminemic patients in order to identify the population at risk of premature death at the time of admission and to optimize clinical decision making procedures to improve clinical outcomes in these patients.

It is important to note that prospective studies of different albumin levels in the late albumin levels in the late stage of sepsis and early enteral feeding could undoubtedly answer with more precision the question of the impact of patient hypoalbuminemia on mortality, in the hospital setting in general and in intensive care in particular

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