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REVIEW

Crystalloids and colloids in critical patient resuscitation☆

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Abstract Fluid resuscitation is essential for the survival of critically ill patients in shock, regardless of the origin of shock. A number of crystalloids and colloids (synthetic and natural) are currently available, and there is strong controversy regarding which type of fluid should be administered and the potential adverse effects associated with the use of these products, especially the development of renal failure requiring renal replacement therapy. Recently, several clinical trials and metaanalyses have suggested the use of hydroxyethyl starch (130/0.4) to be associated with an increased risk of death and kidney failure, and data have been obtained showing clinical benefit with the use of crystalloids that contain a lesser concentration of sodium and chlorine than normal saline. This new information has increased uncertainty among clinicians regarding which type of fluid should be used. We therefore have conducted a review of the literature with a view to developing practical recommendations on the use of fluids in the resuscitation phase in critically ill adults.

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PALABRAS CLAVE
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Cristaloides y coloides en la reanimación del paciente crítico

Resumen La reanimación con fluidos es esencial para la supervivencia del paciente crítico en shock, independientemente de la causa que lo origine. Hoy en día disponemos de diversos cristaloides y coloides (sintéticos y naturales), existiendo una viva controversia sobre qué tipo de fluidos debemos emplear y los posibles efectos adversos asociados a su uso, especialmente el desarrollo de fracaso renal con necesidad de técnicas de reemplazo renal. Recientemente se han publicado varios ensayos clínicos y metaanálisis que evidencian que el empleo de hidroxietilalmidón (130/0,4) se asocia a un mayor riesgo de muerte e insuficiencia renal, así como datos que muestran un beneficio clínico con el empleo de cristaloides que contienen menor concentración de sodio y cloro que el suero salino. Ello ha contribuido a aumentar la incertidumbre de los clínicos sobre qué tipo de fluido emplear. Por ello, hemos realizado una revisión narrativa de la literatura con el fin de elaborar unas recomendaciones prácticas sobre el empleo de fluidos en la fase de reanimación del paciente crítico adulto y que se presentan en este documento.

Introduction

The administration of fluids is one of the most common therapeutic practices in the routine care of critically ill patients. Such administration largely takes place in the first hours and days of admission, which is when resuscitation care is provided in patients who are often admitted to the Intensive Care Unit (ICU) due to shock or hypotension of any cause.

It must be clearly kept in mind that fluid administration requires the same caution and knowledge (indications, contraindications, adverse effects) as when any kind of drug is used.[1]

There are two questions in relation to fluid therapy which clinicians ask themselves daily, and which are reflected in the working hypotheses of the different clinical trials and studies: ''What fluid should be provided?'' and ''How much fluid should be administered and for how long?''

Regarding the first question (on which the present document is centered), it must be mentioned that new solutions are currently found on the market, and recent information is moreover available on the adequacy and suitability of the different solutions in different clinical scenarios. These new data are sometimes contradictory, and firm conclusions are often lacking. This in turn explains the great variety in prescription practices referred to fluid therapy; indeed, while the use of colloids is practically anecdotal in some countries, in others they constitute first line treatment for hypotension.[2]

The use of synthetic colloids in critical patients is currently subject to strong controversy, due to the adverse effects and even increased mortality associated to the use of some of these products. In fact, a recent consensus report auspiced by the European Society of Intensive Care Medicine (ESICM) considers that synthetic colloids should not be used in the critically ill outside the investigational setting.[3] This recommendation consequently limits the treatment options to crystalloids and albumin. The exclusive use of crystalloids is not without risks, particularly the development of interstitial edema.[1] On the other hand, it must be taken into account that the term ''crystalloid'' encompasses a series of solutions with different compositions.

Objectives

In view of this situation, a group of specialists in Intensive Care Medicine have conducted a review of the literature with the purpose of establishing a series of practical recommendations on the use of fluids (crystalloids and colloids) in the resuscitation phase of the adult critical patient with hypotension. The review specifically focuses on those studies that evaluate mortality or the impact upon the development of renal failure or the need for extrarenal filtration techniques. This document does not consider pediatric patients, maintenance fluid therapy or the management of hemorrhagic shock.

Methodology

A PubMed literature search was made of all the observational studies and clinical trials (excluding pediatric patients), using the following key words: fluid therapy, colloids, crystalloids, sodium chloride, Ringer, albumin, balanced solution, hetastarch, pentastarch, hydroxyethyl starch, gelatin, AND hyperchloremic acidosis, resuscitation, shock, severe sepsis, septic shock, trauma, major surgery, kidney, renal, mortality, injury, failure, complication, anaphylactoid reactions, adverse, illness, renal replacement therapy, outcome, clinical trials, prospective study, observational study, and metaanalysis. The review was limited to articles published in English or Spanish, with no restrictions regarding the time period covered. The full texts of all the selected articles were retrieved.

On occasion of a meeting held on 30 September 2013, the group reviewed the state of the art of resuscitation with fluids in the critical patient, and debated the identified studies and metaanalyses. All the participants completed a questionnaire addressing different practical aspects of resuscitation therapy. The structure of the present