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ORIGINAL ARTICLE

Comparison of 2 intravenous insulin protocols: Glycemia variability in critically ill patients☆

Marta Gómez-Garrido[a,*], Ana M. Rodilla-Fiz[a], María Girón-Lacasa[a], Laura Rodríguez-Rubio[a], Anselmo Martínez-Blázquez[a], Fernando Martínez-López[a], María Dolores Pardo-Ibáñez[b], Juan M. Núñez-Marín[c]

[a] *F.E.A Anestesiología y Reanimación, Servicio de Anestesia y Reanimación, Hospital General Universitario de Albacete, Albacete, Spain*
[b] *DUE, Servicio de Anestesia y Reanimación, Hospital General Universitario de Albacete, Albacete, Spain*
[c] *E.T.S. de Ingenieros Agrónomos de Albacete, Albacete, Spain*

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Abstract
Objective: Glycemic variability is an independent predictor of mortality in critically ill patients. The objective of this study was to compare two intravenous insulin protocols in critically ill patients regarding the glycemic variability.
Material and methods: This was a retrospective observational study performed by reviewing clinical records of patients from a Critical Care Unit for 4 consecutive months. First, a simpler Scale-Based Intravenous Insulin Protocol (SBIIP) was reviewed and later it was compared for the same months of the following year with a Sliding Scale-Based Intravenous Insulin Protocol (SSBIIP). All adult patients admitted to the unit during the referred months were included. Patients in whom the protocol was not adequately followed were excluded. A total of 557 patients were reviewed, of whom they had needed intravenous insulin 73 in the first group and 52 in the second group. Four and two patients were excluded in each group respectively.
Results: Glycemic variability for both day 1 (DS1) and total stay (DST) was lower in SSBIIP patients compared to SBIIP patients: SD1 34.88 vs 18.16 and SDT 36.45 vs 23.65 ($p < 0.001$).
Conclusion: A glycemic management protocol in critically ill patients based on sliding scales decreases glycemic variability.

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* Corresponding author.
E-mail address: gomezgarridomartas@gmail.com (M. Gómez-Garrido).

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PALABRAS CLAVE
Variabilidad glucémica;
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Cuidados intensivos;
Insulina;
Protocolo insulina;
Hiperglucemia

Comparación de 2 protocolos de insulina intravenosa: variabilidad de la glucemia en pacientes críticos

Resumen
Objetivo: La variabilidad glucémica es un predictor independiente de la mortalidad en pacientes críticos. El objetivo del presente estudio es comparar 2 protocolos de administración de insulina intravenosa en críticos en cuanto a la variabilidad glucémica se refiere.
Material y métodos: Se trata de un estudio observacional retrospectivo realizado mediante revisión de historias clínicas de los pacientes de una unidad de críticos durante 4 meses consecutivos. Primero se revisó un protocolo de insulina más simple o protocolo de insulina intravenosa basado en una escala (PIVBE), que fue comparado con los mismos meses del siguiente año donde se utilizó protocolo insulina intravenosa basado en escalas dinámicas (PIVBED). Se incluyó a todos los pacientes, adultos, ingresados en la unidad durante los meses referidos. Se excluyó a los pacientes en los que el protocolo no se siguió correctamente. Se revisó a 557 pacientes, de los cuales habían necesitado insulina intravenosa 73 en el primer grupo y 52 en el segundo. Fueron excluidos 4 y 2 pacientes en cada grupo, respectivamente.
Resultados: La variabilidad glucémica tanto del primer día (DS1) como la total de la estancia (DST) fue menor en aquellos pacientes tratados con el PIVBED frente al PIVBE: DS1 34,88 frente a 18,16 y DST 36,45 frente a 23,65 ($p < 0,001$).
Conclusión: Un protocolo de manejo de glucemia en pacientes críticos basado en escalas dinámicas disminuye la variabilidad glucémica.

Introduction

Hyperglycemia is a severity marker in critical patients, where it is associated with poor outcomes, and constitutes an independent mortality factor.[1] It has recently been demonstrated that variability in blood glucose (glycemia) levels is also a predictor of mortality in critical patients, being regarded as even more important than hyperglycemia in this regard.[1–8]

Intravenous insulin perfusion (IVP) is the best approach for blood glucose control in critical patients.[9] There are many protocols for the administration of IVP, though none have been shown to be superior to the rest,[10] mainly because of the few studies that have been carried out in this respect. The study objective was to compares glycemic variability using two IVI administration protocols.

Patients and methods

A retrospective, observational study was conducted in a 12-bed medical-surgical intensive care unit (ICU) of a regional reference hospital. Following approval from the ethics committee of our hospital, a review was made of the clinical histories of patients admitted during four consecutive months in 2011, when a simpler scale-based intravenous insulin protocol (SBIIP) was used at the unit (Fig. 1). The data of that period were compared with those of the same months of 2012, when a sliding scale-based intravenous insulin protocol (SSBIIP) was used (Fig. 2). All adult patients admitted to the unit during those months were enrolled and classified into categories: polytrauma cases, surgical cases (including elective or emergency post-surgery patients or those who had undergone surgery in the previous seven days) and medical cases. Patients in whom the protocol was not adequately followed (defined as the existence of five or more failures during the application of the protocol) were excluded. Protocol failure was defined as any action taken in relation to blood glucose other than that which should have been carried out according to the protocol. The two study groups were in turn divided into patients with hyperglycemia who required IVI and those who did not. A total of 557 patients were reviewed, of whom 73 in the first group and 52 in the second group had required IVI. Four and two patients were excluded in each group respectively. A total of 3120 blood glucose measurements were made.

The protocol used in the first period (SBIIP) (Fig. 1) was designed to keep the blood glucose level between 80 and 150 mg/dl. The measurements were made at the patient's bedside via capillary puncture or arterial blood sampling (according to nursing criterion) using an Optium Xceed glucometer® (Abbott Diabetes Care, MediSense Products, Doncaster, Australia), calibrated according to the instructions of the manufacturer. Measurements were made every hour at the start of infusion and after modification of the infusion rate, every 2 h if no changes were seen between two consecutive measurements of 1 h, and every 4 h if no changes were found between two consecutive measurements of 2 h.

The protocol used in the second period (SSBIIP) (Fig. 2) was designed to keep the blood glucose level between 140 and 180 mg/dl, in compliance with the recent recommendations of scientific bodies, which have switched from strict control to a more permissive glycemia interval.[11] The measurements were made via capillary puncture in hemodynamically stable postsurgery patients, in the absence of vasoactive drug perfusion, and in the first 48–72 h of their