LUMEN ET VIRTUS

Strict blood glucose control in patients in the ICU after orthopedic surgery

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ABSTRACT

Introduction: Blood glucose control in patients hospitalized in the ICU requires special attention. Hyperglycemia, a condition that has the potential to increase the risk of morbidity and mortality from various pathologies, is often associated with metabolic disorders in critically ill patients in the ICU. Thus, several randomized studies were conducted to understand whether glycemic control had a significant improvement in the patient's evolution. There is strong evidence of strict glycemic control

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since 2001, where a study was conducted with 1548 patients showing that there was a significant improvement in the outcome of morbidity and mortality in patients who received intense insulin therapy (IIT) to maintain blood glucose within the normal range: 80-110 mg/dl. Methods: The present study is a literature review that used the Scielo and Pubmed databases. The article selection period was from 2001-2023 and 10 articles in Portuguese and English were selected to be reviewed. The following health descriptors (DeCS) were used: "hyperglycemia", "UTI", "blood glucose", "glycemic control". Discussion: Hyperglycemia can occur in patients who are not diabetic, usually occurs in critically ill patients in intensive care, and is associated with morbidity and mortality factors. Hyperglycemia in those without a history of diabetes is associated with a worse prognosis and therefore its control must be carried out rigorously. The discussion about blood glucose control in critically ill patients is currently a matter of debate and there is still no consensus on the subject. The critically ill patient presents several metabolic variations and nuances and thus the glucose control model has also been taking shape, respecting the variability of each patient. Hyperglycemia is caused by constant exposure to stress in the body, in the critically ill patient this relationship varies slightly. Conclusion: Strict blood glucose control should be adopted as basic care for critically ill patients. The consequences and frequency of hyperglycemia are contributing factors to the patient's prognosis.

Keywords: Hyperglycemia, UTI, Glycemic control.

INTRODUCTION

Blood glucose control in ICU hospitalized patients requires special attention due to hyperglycemia, a condition that increases the risk of morbidity and mortality in various pathologies. This condition is frequent in critically ill patients, mainly as a response to metabolic stress induced by severe diseases, leading to endothelial dysfunction, reduced immunity, and increased risk of infection. Since 2001, studies have shown that strict glycemic control can significantly improve the clinical outcomes of these patients. A pioneering study with 1,548 patients showed that maintaining blood glucose between 80-110 mg/dL through intensive insulin therapy (ITI) reduced mortality and serious complications associated with metabolic disorders.

Glycemic control in the ICU, however, presents challenges due to variations between hyperglycemia, hypoglycemia, and glycemic variability, all of which are associated with a worse prognosis. Hyperglycemia in critically ill patients can occur regardless of a history of diabetes and is strongly related to the severity of the disease. On the other hand, the use of insulin to control glucose can result in episodes of hypoglycemia, which also increase mortality. Thus, the goal is to achieve a balance in glycemic control that minimizes the risks of complications, respecting the individual characteristics of each patient.

Several studies and international guidelines, such as those of the Surviving Sepsis Campaign, recommend that the ideal glycemic target in ICU patients should be 150-180 mg/dL, with strict and continuous control to avoid complications. The use of advanced devices, such as the Continuous Glucose Monitoring System (CGMS), has shown promise, allowing continuous monitoring of blood glucose levels in real time. However, there are still controversies about the ideal level of glycemic control and adequate management, which makes the debate on the personalization of treatment a relevant topic in intensive care medicine.

METHODOLOGY

The present study is a literature review that used the Scielo and Pubmed databases. The article selection period was from 2010-2023 and 11 articles in Portuguese and English were selected to perform the review. The following health descriptors (DeCS) were used: "hyperglycemia", "UTI", "blood glucose", "glycemic control".

DISCUSSION

The condition of hyperglycemia may occur in patients who are not diabetic, usually occurs in severe patients in intensive care, and is associated with morbidity and mortality factors. Hyperglycemia without a history of diabetes is associated with a worse prognosis and therefore its control must be carried out rigorously. [1]

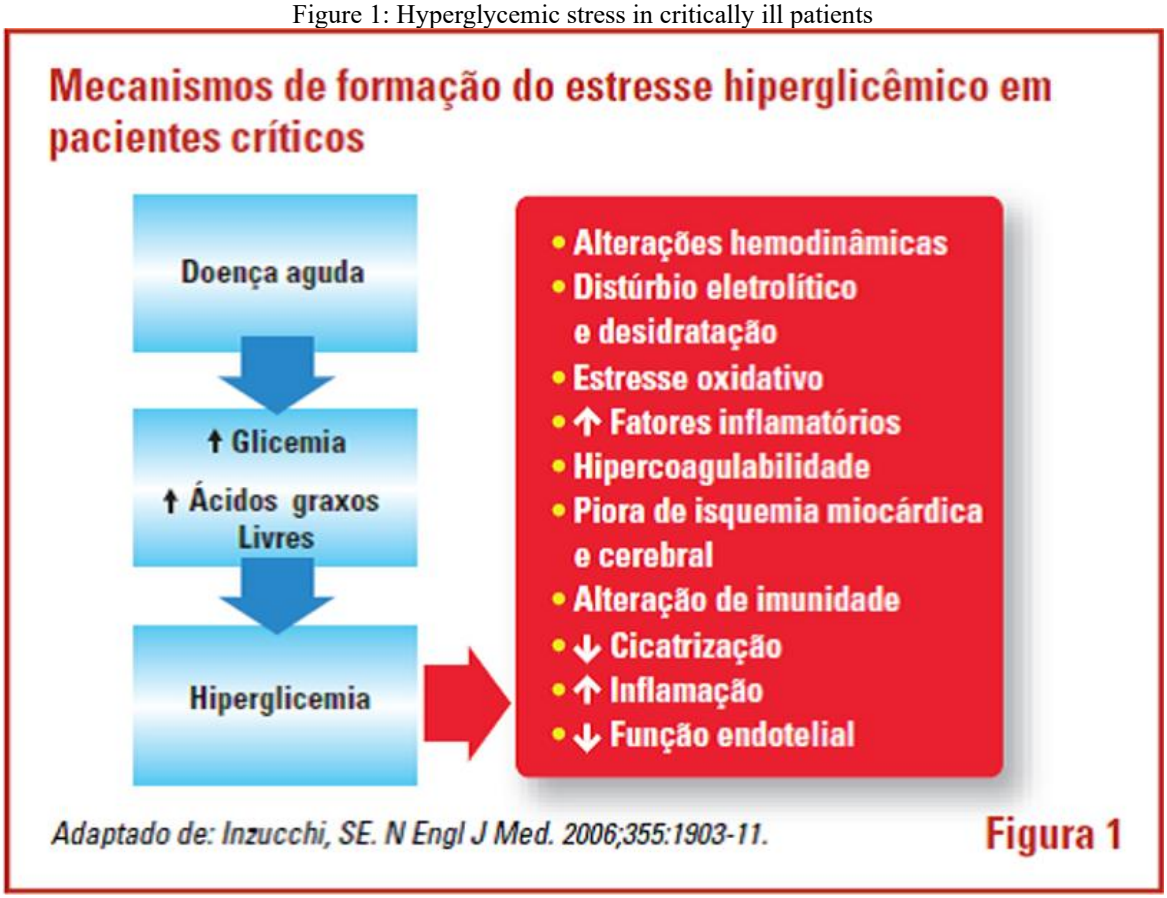
The discussion about blood glucose control in critically ill patients is currently a matter of debate and there is still no consensus on the subject. The critically ill patient presents several metabolic variations and nuances and thus the glucose control model has also been taking shape, respecting the variability of each patient. Hyperglycemia is caused by constant exposure to stress in the body, in the critically ill patient this relationship varies slightly. [3,4]

The state of hyperglycemia in ICU patients is induced due to insulin resistance. Counterregulatory hormones such as catecholamines, cortisol and glucagon associated with high levels of inflammatory cytokines such as interleukins IL-1, IL-6 and TNF-a that induce hyperglycemia by the mechanism of insulin resistance. This insulin resistance generates peripheral glucose damage, which leads to an endogenous production of glucose, mainly by hepatic glycogenesis and glycogenolysis. When the patient is fasting for many hours, glycogen stores are consumed. [1,2,3]

Hyperglycemia has several effects at the cellular level, it causes a reduction in bactericidal activity, a reduction in opsonic activity, in addition to reducing innate immunity. These cellular changes develop, as hyperglycemia acts as an immunomodulator; produces anti-inflammatory cytokines such as interleukin IL-10, and impairs neutrophil action. These alterations inhibit the immune system, generating several deleterious effects that can occur in critically ill patients. [5]

At the systemic level, the increase in blood glucose generates an increase in free fatty acids and consequently causing hyperglycemia. As a result, in critically ill patients, there are systemic repercussions with hemodynamic disorders, coagulation disorders, increased inflammatory proteins, decreased healing process, increasing inflammation and decreasing endothelial function. Figure 1 shows the hyperglycemic stress scheme.

Figure 1: Hyperglycemic stress in critically ill patients



The crucial component of glycemic control is glucose variability, which may be a reflection of high changes in blood glucose levels due to physicians' inability to regulate blood glucose or dysglycemia caused by severe disease. In addition, hypoglycemia is more common in patients with elevated glucose variability, which makes it difficult to determine the relative importance of its correlations with death. [3]

In ICU patients who are not diabetic, blood glucose can change for several reasons, such as the use of vasopressors, corticosteroids, and parenteral diets. So glycemic control should be carried out following the main guidelines in the world that indicate the target of 150-180mg/dL. The blood glucose goal should be this, as smaller targets in randomized studies show that clinically patients who achieved a lower glycemic goal had more hypoglycemic episodes when compared to patients with a higher glycemic goal. In diabetic patients, the conduct changes since diabetics have greater tolerance to hyperglycemia, so the ideal glycemic target is between 180-252mg/dL, this target in intensive care revealed no change in the incidence of ketonemia or ketoacidosis in the ICU. {1}

In order to effectively control blood glucose, it has been suggested by randomized studies that before the admission of patients to intensive care, glycated hemoglobin (HbA1c) should be measured so that the baseline blood glucose of that patient is taken into account. In this way, the glycemic variability mentioned above is understood by avoiding medication ineffectively. [1]

A device called "Continuous Glucose Monitoring Syst (CGMS)" is capable of measuring glucose in real time, and thus predicting situations of hypo or hyperglycemia. The methodology consists of sensors that are inserted in the subcutaneous tissue that is capable of measuring interstitial glucose levels every 10 seconds and the monitor processes the information in 5 minutes. Thus, glycemic control would be extremely precise and effective in intensive care units. [3]

CONCLUSION

Strict blood glucose control should be adopted as basic care for critically ill patients. The consequences and frequency of hyperglycemia are contributing factors to the patient's prognosis. That said, knowing the glycemic targets, as well as understanding the new devices for measuring glucose, is essential for the care of the patient in the ICU. This control is not restricted to diabetic patients and should be instituted for all patients who are severely ill, since several mechanisms lead to hyperglycemia.

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