Stress Hyperglycemia: An Incidental Finding or a Clinical Clue?

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Stress hyperglycemia (SH) is a familiar finding in children presenting to pediatric emergency departments (PED). SH is usually defined by blood glucose levels that exceed 150 mg/dl and later return to normal values in the context of acute illness or injury [1]. SH in hospitalized adults is common, with incidence increasing with age [2]. SH in adult sepsis, systemic inflammatory reaction, and traumatic brain injury has been shown to be both a marker of illness or injury acuity and, if left unchecked, a prognostic indicator predicting morbidity and mortality [3].

Understanding the implications of SH may serve to better assess the acuity of the child presenting to the PED. Since a quick dextrose check (Glucocheck) is readily available in most healthcare settings worldwide the implications of using SH as a marker of illness severity are profound.

In this issue of the *Israeli Medical Association Journal* (*IMAJ*) Levmore-Tamir and colleagues [4] reported on the incidence of SH among children evaluated in the PED. They reviewed 1245 children with SH from among almost 50,000 patients who had blood glucose measured. Over half of the SH cases in their series were found in children with respiratory illness (mostly pneumonia) and neurologic illness (mostly seizure). The authors showed that SH predicted increased rates of hospitalization, pediatric intensive care unit (PICU) admission, and mortality. Length of hospital stay in their series increased by 2 days for every 100 mg/dl increase in blood glucose. Of the children with blood glucose levels < 400 mg/dl, two were hospitalized in the PICU and another was resuscitated. Their results support the correlation between SH and disease severity. Interestingly, they did not find a relationship between blood glucose levels and steroid or beta-agonist administration in asthmatics but did find higher blood glucose levels among asthmatics treated with adrenalin (either systemic or inhalation).

As the authors noted in their discussion, SH is a marker of illness severity and is associated with a poorer prognosis after medical illness such as myocardial infarction [5] and surgical illness, predicting a more complicated postoperative course [6]. In a multi-center review of pediatric near-drowning, my colleagues and I found that 45% of children presenting with near-drowning and 100% of those who drowned, presented with hyperglycemia, lending further support to the correlation between SH and increased acuity. This finding may be explained by stress-related release of mediators that elevate blood glucose levels abruptly. Thus, checking blood glucose at the beginning of the evaluation may serve as an additional clue in detecting the more severe cases [7].

Similarly, and as noted by Costea et al. [8], SH was found more frequently in children with prolonged febrile seizures (> 15 minutes), recurrent febrile seizure (> 1 seizure), focal seizure, body temperature ≥ 39.5°C, and higher lactate values. Thus, in evaluation of patients with febrile seizures SH may serve as an indicator of complexity.

While Levmore-Tamir et al. [4] reference a source correlating SH with major trauma, a recent analysis showed that this may not be the case. Tsai et al. [9] reported that in pediatric trauma patients with SH, patient outcomes, in terms of length of stay in hospital, rate of intensive care unit admission, and in-hospital mortality rate, were not significantly higher. Thus, SH in the setting of trauma may not be a useful marker of acuity. Levmore-Tamir and colleagues noted the absence of major trauma in their own series. However, the literature to date, including the work by Levmore-Tamir and co-authors, supports the use of SH as a marker of acuity in medical illness, and can facilitate the improved allocation of staff and resources to children who show SH and may indeed be more complicated than they appear.

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