Limitation of Portable Glucose Meters

Hand-held glucose meters are routinely used for measuring point of care (POC) glucose in special care nurseries and emergency departments because of their portability, immediacy of results, and minimal blood volume requirements. These devices use one of the following test methods: glucose dehydrogenase pyrroloquinolinequinone (GDH-PQQ), glucose dehydrogenase nicotinamide adenine dinucleotide (GDH-NAD), glucose oxidase, or glucose hexokinase methods. Accucheck® (Roche) that uses the GDH-PQQ method cannot distinguish glucose, maltose, galactose or xylose from each other, and thus may provide higher anomalous readings. However MediSense Optium glucose analyzer® and the HemoCue B-Glucose analyzer® which also utilize GDH are not affected by galactose(1). This has serious implications and may result in irreversible brain damage following aggressive insulin treatment for elevated glucose reading(2). We report a child with classical galactosemia, in which we commenced insulin drip due to falsely elevated blood sugar levels. Timely thinking for a possibility of error due to portable glucometers prevented a catastrophe from happening.

A two-month old infant, product of non-consanguineous marriage with birth weight of 2.54 kilograms presented with failure to thrive. Clinical examination revealed a malnourished (weight 2.6 kg), irritable child with icterus, mild pallor, cataract in the left eye and firm hepatosplenomegaly. Initial glucose using Accu-check® was elevated (442 mg/dL). Urine for reducing sugars was strongly positive. Child was commenced on insulin drip, thinking of a possibility of diabetes mellitus. There was marked discordance in paired evaluation of sugars using GDH-PQQ method and laboratory estimations using glucose oxidase method (442 and 91 mg/dL and 391 and 42 mf/dL, respectively).

Other investigations suggested conjugated hyperbilirubinemia and deranged liver function test (total bilirubin of 5.24 mg/dL, direct bilirubin 4.22 mg/dL, SGOT 195, SGPT 101 alkaline phosphatase 1420). Urine culture grew *Escherichia coli.* A diagnosis of galactosemia was anticipated and confirmed by plasma galactose level of 30 mg/dL and markedly reduced galactose transferase enzyme levels 2.34 unit/g (normal value 15-30 unit/g). Epimerase and galactokinase levels were normal. Child showed dramatic improvement on galactose free diet and was discharged with weight of 3.2 kg.

Hand held glucose meters can have marked variability ranging from 3.9 to 10.9% in the mid-l00 mg/dL glucose range and 6.2 to 13.3% in the hypoglycemic range(1,3). Reducing sugars such as galactose, as described in the case above, can interfere with true readings and paradoxically produce higher readings(1,3). Intravenous immunoglobulin solutions, oral xylose, and peritoneal dialysis solutions may contain or be metabolized to maltose, galactose or xylose and thus interfere with the results of glucometers.

We stress the importance of laboratory confirmation of all unexpectedly high readings using hand held glucose meters before initiation of treatment to prevent catastrophes. We also urge the pediatricians to know the method of estimation of their glucometer.

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All-Trans-Retinoic Acid (ATRA) Induced Myositis

Acute promyelocytic leukemia (APML) is a rare entity constituting 1% of all acute leukemias in the pediatric age group. All-trans-retinoic acid (ATRA) is a standard therapy used for its remission. We report a rare adverse event of severe myositis associated with tretinoin (an ATRA preparation) in a child with acute promyelocytic leukemia.

A 5-year-old girl presented with fever, skin and mucosal bleeds, and pallor. Her hemoglobin was 3.6 g/dL, total white cell count 4.5×10^3/µL and platelet count 13×10^3/µL. Peripheral smear revealed 30% blasts, confirmed as APML on bone marrow examination. Cytogenetic analysis showed the typical translocation of t(15:17) with 77% of interphase cells expressing PML:RARA gene fusion. Child was started on combination chemotherapy with etoposide (VP16), 6-thioguanine (6TG) and prednisolone. ATRA was added in the dose of 45 mg/m^2/day on day 3. On day 10 of treatment, child had severe calf muscle pain restricting her physical activity. There was no fever, joint pain, joint swelling or bleeding. However, there was a mild swelling of the limb in the region of pain. *X*-ray limbs and sonography of the calf muscles were inconclusive. Magnetic resonance imaging (MRI) of limbs done 2 days later showed edema in muscles of posterior compartment and fluid in the intermuscular planes suggestive of myositis. A diagnosis of ATRA-induced myositis was made. ATRA was discontinued and intravenous dexamethasone was given. Child improved dramatically and ATRA was restarted after 2 days in a lower dose.

The common side effects of ATRA include ATRA syndrome (in 25% of patients), hyperleucocytic syndrome (acute respiratory distress syndrome), isolated fever, weight gain, headache, pseudotumor cerebri, raised aminotransferases, hypertriglyceridemia, myalgia, hypercalcemia, erythema nodosum, fournier gangrene, Sweet syndrome and necrotizing vasculitis. Isolated muscle involvement due to ATRA therapy in APML has been rarely described(1-4). Most of the reported cases are in adults(4). Till date, to the best of our knowledge, only 2 pediatric cases of ATRA-induced myositis have been reported(4). Our patient developed muscular symptoms on day 7 of ATRA, whereas reported cases in adults had a median time of onset around 18 days (range 9-23), except in one pediatric case where the onset was within 5 days of starting ATRA(1,4). A high index of clinical suspicion coupled with modern imaging methods are required to diagnose this condition. Timely treatment is important to prevent further life threatening complications(5).

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