area and colloid compartment but no thyroid nodules or hyperplasia was detected. Keap1KD also showed primary hypothyroidism already in early adult life that was eventually well-compensated over time by increased TSH levels (at age of 12 months: WT TSH=47.7±9.1 mU/L, Keap1KD TSH=460±74 mU/L). This was also reflected in the pituitary gland of Keap1KD where *Tshb* mRNA was ~3-fold higher than WT. Despite a known stimulatory effect of Nrf2 on Tg gene transcription and Tg protein abundance, these measures were decreased in the thyroid of Keap1KD mice. No clear patterns were observed in the expression profiles of other thyroid hormone synthesis-specific factors, such as *Duox1, Duoxa1, Duox2*, *Duoxa2, Tpo, Nis, Dio1, Dio2, Dehal1* mRNA levels, with the exception of Tg-processing and Tg-degrading cathepsins, including an increase in mature forms of cathepsins D, L and S. **Conclusions:** Keap1KD mice showed age-dependent diffuse goiter and compensated hypothyroidism. The precise mechanism accounting for the thyroidal phenotype remains to be elucidated, but it may involve enhanced Tg solubilization and excessive lysosomal Tg degradation. This study unravels novel roles of the druggable Keap1/Nrf2 pathway in thyroid function and economy. Subclinical hypothyroidism in Keap1KD mice may have broader implications regarding their use in metabolic research.

Diabetes Mellitus and Glucose Metabolism

DIABETES COMPLICATIONS I

Euglycemic Diabetic Ketoacidosis in Type 2 Diabetes Mellitus

Kevin A. Arao, MD[1], Harikrashna Bhatt, MD[2], Christina M. Capistrano, MD[1], Hui Zhang, MD[1], Christopher Cosgrove, MD[1].
[1]Kent Hospital / Brown University, Providence, RI, USA, [2]Rhode Island Hospital / Brown University, Providence, RI, USA.

SAT-LB118

Introduction

Diabetic ketoacidosis (DKA) is a potentially life-threatening complication of diabetes. It is characterized by the triad of hyperglycemia (>250mg/dL), high anion gap metabolic acidosis (HAGMA), and ketonemia. Rarely, it would present with normal or mildly increased glucose levels (<200mg/dL) making it a diagnostic challenge. We present a case of euglycemic DKA in type 2 diabetes mellitus (T2DM).

Case Presentation

A 77-year-old woman living in a nursing home with a history of T2DM treated with insulin glargine, but for the past three days refused medications with decreased caloric intake. There were no new medications or ingestion of alcohol or toxic substances. She then developed worsening altered mental status hence admission to the hospital. Her vital signs were within normal limits. Physical examination revealed no abdominal tenderness. Initial laboratory studies showed glucose 83 mg/dL, bicarbonate 10 mmol/L, and anion gap 23 meq/L. Urinalysis significant with trace ketones. The following day, further work-up was done remarkable with beta-hydroxybutyrate 8.3 mmol/L, lactic acid 0.8 mmol/L, and toxicology panel negative. Arterial blood gas showed pH 7.137, pCO2 14 mmHg, and bicarbonate 4.8 mmol/L. DKA protocol was initiated and she was treated with insulin drip, bicarbonate drip, and intravenous fluid administration with D5W. After two days, DKA resolved and was subsequently transitioned to subcutaneous insulin.

Discussion

Similar to the findings of Burge et al, our case showed that decreased caloric intake predisposes patients with diabetes mellitus to euglycemic DKA during periods of insulin deficiency. A proposed mechanism for the accelerated ketosis is due to the effects of elevated levels of glucagon or catecholamines on lipolysis. Other causes of euglycemic DKA include pregnancy, heavy alcohol use, SGLT2 inhibitors, cocaine abuse, pancreatitis, sepsis, and chronic liver disease. It is also important to rule out other causes of HAGMA. In our case, although she has decreased caloric intake, starvation ketoacidosis usually leads to serum bicarbonate levels >18mmol/L. Management is similar to DKA but important difference is the dextrose administration to prevent hypoglycemia.

Conclusion

Euglycemic DKA is a medical emergency that may be overlooked as patients present without marked hyperglycemia. Physicians should have a high suspicion as this may result in delayed management and potential adverse metabolic consequences.

Neuroendocrinology and Pituitary

CASE REPORTS IN SECRETORY PITUITARY PATHOLOGIES, THEIR TREATMENTS AND OUTCOMES

Chronic Opioid Use as a Cause of Severe Hypothyroidism: A Case Report

Daniel Slack, MD, Danielle Brooks, MD, Alice C. Levine, MD.
Icahn School of Medicine at Mount Sinai, New York, NY, USA.

SAT-LB45

Background: Hypogonadism and hypocortisolism are present in a sizeable proportion of chronic opioid users. (1) An association with hypothyroidism, however, has not been demonstrated.

Clinical Case: A 56-year old woman with chronic pain syndrome on opioids presented from a nursing home with decreased level of consciousness and was found to be hypotensive requiring ICU admission. Several weeks prior to her presentation, she was hospitalized for progressive weakness and was found to have evidence of panhypopituitarism: low TSH (0.209 uIU/mL, nl 0.400 – 4.200), low free T4 (0.76 ng/dL, nl 0.80 – 1.50), low LH (<0.12 mIU/mL, nl 10.9 – 58.6), low FSH (1.7 mIU/mL, nl 16.7 – 113.6), and abnormal ACTH stim test (ACTH 6.4 pg/mL, nl 7.2 – 63; cortisol 0-min 3.8 mcg/dL, nl 6.7 – 22.6; 60-min 13.10). She was discharged on levothyroxine 25 mcg daily and prednisone 7.5 mg daily. On admission, her exam was notable for symmetric, non-pitting edema of the lower extremities to the knees with peau d'orange appearance. Initial tests revealed profound hypothyroidism with low TSH (0.381 uIU/mL), low free T4 (0.60 ng/dL), undetectable total T4 (<0.9 mcg/dL, nl 5 – 12.2), and undetectable free T3 (<1.00 pg/mL, nl 2.5 – 3.9). Thyroglobulin and TPO

antibodies were within normal limits. Thyroxine binding globulin was low (6 mcg/mL, nl 13 -39). Additional biochemical studies re-demonstrated panhypopituitarism with low LH (<0.12 mIU/mL) and FSH (0.9 mIU/mL). Cortisol was elevated (73.2 mcg/dL) as she had received hydrocortisone. Despite fluid resuscitation and use of vasopressors, her hypotension persisted and she remained in critical condition. She was treated as a case of myxedema coma and started on full replacement dose thyroid hormone with 120 mcg IV levothyroxine daily and liothyronine 5 mcg every 8 hours. Over the next several days, the patient's hemodynamics and mental status improved dramatically. A contrast-enhanced pituitary-protocoled MRI was notable for a moderately flattened sella (pituitary 3.5 mm in height) and absence of usual T1 bright signal in the posterior lobe. A work-up for causes of panhypopituitarism was mostly unremarkable: low IgG 4 (0.82, neg <1.50), indeterminate quant gold, negative HIV, low serum iron (35 mcg/dL, nl 50 – 200). Urine toxicology was positive only for opioids, reflective of the patient's chronic pain regimen consisting of MS-Contin 60 mg twice daily and methadone 10 mg twice daily.

Conclusion: This case demonstrates the potential for chronic opioid use to suppress the hypothalamic-pituitary-thyroid axis and highlights the importance of maintaining an index of suspicion for hypothyroidism in this population.

Reference: (1) de Vries, F., Bruin, M., Lobatto, DJ., Dekkers, OM., Schoones, JW., van Furth, WR., Pereira, AM., Karavitaki, N., Biermasz, NR., Najafabadi, AHZ. Opioids and their endocrine effects: A systematic review and meta-analysis. JCEM. 2019. Doi: 10.1210/clinem/dgz022

Bone and Mineral Metabolism

BONE DISEASE FROM BENCH TO BEDSIDE

Advanced Glycation Endproducts Are Associated With Worse Bone Material Strength in Older Adults With and Without Type 2 Diabetes

Parinya Samakkarnthai, MD[1], Jad G. Sfeir, MD[1], Elizabeth J. Atkinson, MS[2], Sara J. Achenbach, MS[2], Amanda J. Tweed, CRC[1], Tammie L. Volkman, RN[1], Matthew T. Drake, MD, PhD[1], Joshua N. Farr, PhD[1], Sundeep Khosla, MD[1].

[1]Robert and Arlene Kogod Center on Aging and Division of Endocrinology, Mayo Clinic College of Medicine, Rochester, MN, USA, [2]Department of Health Sciences Research, Mayo Clinic, Rochester, MN, USA.

SUN-LB68

Patients with Type 2 Diabetes (T2D) are at increased fracture risk despite having relatively normal or even increased BMD by DXA. The critical aspect of bone quality deterioration in T2D patients could explain this clinically important discrepancy. Material composition is a component of bone quality that has emerged as a potential factor contributing to fragility fractures in T2D patients. However, there is sparse evidence regarding whether T2D patients have decreased bone material properties compared with non-diabetic controls. We hypothesized that increased production of advanced glycation endproducts (AGEs) has an important role in reducing bone material strength in patients with and without diabetes. Thus, we used the OsteoProbe®, a bone microindentation device that provides an index of cortical bone material properties (Bone Material Strength index – BMSi) in men with T2D age ≥ 50 yrs or postmenopausal women with T2D and nondiabetic controls. We also utilized a non-invasive measure of skin AGEs (AGE Reader®) to evaluate AGEs accumulation through skin autofluorescence. Linear regression models were used to assess group differences with and without adjusting for age, Body Mass Index (BMI), and sex. Relationships between variables were assessed using adjusted Pearson correlations. A total of 152 T2D patients (mean age 68.5 ±7.6 yrs.; 59.2% men; HbA1C=7.7 ±1.0%; mean diabetes duration 15.5 yrs.) and 105 non-diabetic controls (mean age 67.2±8.8 yrs.; 41.0% men; HbA1C =5.4 ±0.3%) were recruited to the study. Overall, there was no difference in BMSi between T2DM and control subjects: unadjusted (p= 0.636); adjusted (p= 0.695). However, skin AGEs were negatively correlated with BMSi (r= -0.23, p <0.001). In subgroup analyses, skin AGEs were also negatively associated with BMSi in both T2DM (r= -0.23, p=0.004) and control (r= -0.21, p=0.033) subjects. In conclusion, these findings demonstrate that a higher burden of AGEs is associated with worse bone quality. Our findings may explain the conflicting findings regarding reductions in BMSi in T2D because only T2D patients with a high level of AGEs accumulation have impaired BMSi. Moreover, the association of skin AGEs with BMSi in non-diabetic subjects emphasizes the important role of AGEs in decreasing bone quality and potentially contributing to fracture risk. Collectively, our data indicate that non-invasive skin AGEs measurement could be used as a tool to evaluate bone quality in patients with T2D as well as in the non-diabetic population.

Adrenal

ADRENAL CASE REPORTS III

A Severe Case of Pheochromocytoma Presenting as Classic Takotsubo's Cardiomyopathy With Rapid Resolution

Shohinee Sarma, MD MPH[1], Karen Ester Gomez Hernandez, MD[2].

[1]UNIVERSITY OF TORONTO, TORONTO, ON, Canada, [2]Toronto General Hospital, Toronto, ON, Canada.

MON-LB034

Abstract

Background: Inverted Takotsubo's cardiomyopathy requiring extra-corporeal membrane support (ECMO) with pheochromocytoma is well described. Classic Takotsubo's cardiomyopathy, however, is rarely described in this setting.

Clinical Case: A 50-year old woman with no previous comorbidities presented with pulmonary edema and cardiogenic shock. She required rapid escalation of vasopressor, inotrope, and intra-aortic balloon pump then ECMO with consideration of cardiac transplant. Initial echocardiogram showed an ejection fraction of 17%. Coronary angiography showed apical ballooning in keeping with classic Takotsubo's cardiomyopathy. Abdominal ultrasound for transplant screening showed a 4.6 cm abdominal mass. Computed tomography confirmed a 4.6 cm mass with classic radiologic features of pheochromocytoma. Plasma free normetaphrine and metanephrine were