

(49%) and 25 women (51%), median age 58 years [48; 70], BMI 26.4 kg/m² [24.3; 30.5]. All patients were diagnosed with pneumonia due to SARS-CoV-2 with median percent of lung involvement equal to 29% [14; 37], 22 patients (45%) required oxygen support upon admission. Median SpO₂ was equal to 95% (92; 97), median NEWS score was equal to 3 [2; 6]. Participants were tested for vitamin D metabolites (25(OH)D₃, 1,25(OH)₂D₃, 3-epi-25(OH)D₃, 24,25(OH)₂D₃ and D₃) by UPLC-MS/MS, free 25(OH)D and vitamin D-binding protein by ELISA, as well as PTH by electrochemiluminescence immunoassay and routine biochemical parameters of blood serum (calcium, phosphorus, albumin) at the time of admission. **Results:** patients had in general very low 25(OH)D₃ levels - median 10.9 ng/mL [6.9; 15.6], corresponding to a pronounced vitamin D deficiency in half of the patients. Levels of 24,25(OH)₂D₃ were also low - 0.5 ng/mL [0.2; 0.9], and resulting vitamin D metabolite ratios (25(OH)D₃/24,25(OH)₂D₃) were high-normal or elevated in most patients - 24.1 [19.0; 39.2], indicating decreased activity of 24-hydroxylase. Levels of 1,25(OH)₂D₃, on the contrary, were high-normal or elevated - 57 pg/mL [46; 79], which, in accordance with 25(OH)D₃/1,25(OH)₂D₃ ratio (219 [134; 266]) suggests an increase in 1 α -hydroxylase activity. Median level of 3-epi-25(OH)D₃ was 0.7 ng/mL [0.4; 1.0] and D₃ metabolite was detectable only in 6 patients. Median DBP level was 432 mg/L [382; 498], median free 25(OH)D was 5.6 pg/mL [3.3; 6.7], median calculated free 25(OH)D was 2.0 pg/mL [1.4; 3.3]. Most patients had albumin-adjusted serum calcium level in the lower half of reference range (median 2.24 mmol/L [2.14; 2.34]). Seven patients had secondary hyperparathyroidism and one patient had primary hyperparathyroidism, the rest of the patients had PTH levels within the normal range. 25(OH)D₃ levels showed significant negative correlation with percent of lung involvement ($r = -0.36$, $p < 0.05$) and positive correlation with SpO₂ ($r = 0.4$, $p < 0.05$). 1,25(OH)₂D₃ levels correlated positively with 25(OH)D₃ levels ($r = 0.38$, $p < 0.05$) and did not correlate significantly with PTH levels ($p > 0.05$). Conclusion: Our data suggests that hospitalized patients with COVID-19 infection have significant impairment of vitamin D metabolism, in particular, an increase in 1 α -hydroxylase activity, which cannot be fully explained by pre-existing conditions such as vitamin D deficiency and secondary hyperparathyroidism. The observed profound vitamin D deficiency and association of vitamin D levels with markers of disease severity indicate the importance of vitamin D supplementation in these patients.

Bone and Mineral Metabolism

VITAMIN D, DIABETES AND ENERGY METABOLISM

Vitamin D Status as a Potential Modifiable Risk Factor for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)

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In March 2020, the infection COVID-19 spread as a pandemic emergence. Among multiple biological and environmental factors, hypovitaminosis D is a credible candidate.

The aim of this study is to shed light on the pathogenic role of vitamin D deficiency in the susceptibility to SARS-CoV-2 and in the aggressive immune and inflammatory response by the host. We retrospectively analyzed the biochemical panel of immune system markers and the tandem mass spectrometry coupled to liquid chromatography (LC-MS-MS) measured vitamin D, in the serum samples of patients with SARS-CoV-2 studied in all aspects of clinical relevant parameters. RESULTS between 18th March and 20th April 2020 we enrolled 29 consecutive patients with COVID-19. They were 17 (58.6%) males and 12 (41.4) females, and the median age was 79 (69–88) years. Mean 25OHD was 17.3 \pm 2.1 ng/ml, with a median of 15.7 1 ng/ml (i.r. 6.7–25). Twenty-five patients (86.2%) had 25OHD levels <30 ng/ml, 18 patients (62.0%) had 25OHD levels <20 ng/ml and 10 patients (34.5%) had severe vitamin D deficiency (<10 ng/ml). In the group of patients with severe disease (ARDS, cardiovascular complications, CID) 69.2% (n=9/13) of patients presented hypovitaminosis D (<20 ng/ml). All patients who died for COVID-19 during hospitalization (n=6) had 25OHD \leq 30 ng/ml and 5/6 had 25OHD \leq 20 ng/ml. IL-6 and CRP were measured in all patients and were considered surrogate markers of cytokines storm. The majority of patients had levels of IL-6 (n=22, 75.8%) and CRP (n=25, 86.2%) above the upper limit of the reference range of our laboratory (IL6 6.59 and CRP 1 mg/dl) and the median was IL 6=16.1 (i.r. 7.3–36.3) and CRP=6.67 (2.64–11.52). Patients with 25OHD <20 ng/ml had higher levels of IL-6 ($p=0.004$; 19.9 vs 10.4) and CRP ($p=0.009$, 9.85 vs 1.40) and did not differ for the other clinical and biochemical variables. If we considered as 25OHD cut-off the mean value in our population (17.3 ng/ml), patients with lower levels of 25OHD had higher age ($p=0.033$) and higher levels of IL6 ($p=0.016$), CRP ($p=0.04$), troponin ($p=0.04$) and D-dimer ($p=0.017$), compared to the others. An inverse correlation was found between 25OHD levels and IL-6, CRP, and troponin. In a univariate regression analysis hypovitaminosis D (<20 ng/ml) was a predictive factor for IL6 (expressed as LnIL6) levels ($\beta=0.57$, $P=0.003$) and for PCR levels ($\beta=0.42$, $P=0.034$). We also performed a multivariate regression analysis with hypovitaminosis D (<20 ng/ml), sex, BMI, age (<70 years) and ARDS as independent variables. Notably, hypovitaminosis D ($\beta=0.49$, $P<0.02$), BMI ($\beta=0.4$, $P=0.04$) and ARDS ($\beta=0.44$, $P=0.02$) were confirmed to be significant variables for IL6 (expressed as LnIL6) level prediction. In the same multivariate model hypovitaminosis D ($\beta=0.49$, $P=0.034$) was confirmed as independent predictor of CRP levels. In conclusion, hypovitaminosis D is related to the negative prognostic inflammatory status in patients with SARS-Cov2.

Cardiovascular Endocrinology

CARDIOVASCULAR ENDOCRINOLOGY

Androgen and Estrogen Receptor Activation Impacts Cardiac Function in a PCOS-Prone Rodent Model

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Introduction: The global risk and incidence of cardiovascular disease (CVD) is increased in polycystic ovary

syndrome (PCOS). Early risk factors and subclinical CVD includes atherogenic dyslipidemia, obesity, insulin resistance, blood pressure, atherosclerosis and impaired cardiac function. Androgen exposure is associated with onset of adiposity, impaired insulin-glucose and lipid metabolism, and cardiac dysfunction. The mechanisms of increased risk of CVD and cardiac dysfunction in PCOS related to hyperandrogenemia, AR and estrogen receptor (ER) activation remain unclear. **Aim:** The aim of this study was to investigate the effect of androgen treatment on cardiac AR and ER activation, fatty acid metabolism and cardiac function in a PCOS-prone rodent model. **Methods:** A PCOS-prone rodent model at 6 wks of age with obesity, apoB-remnant lipemia and insulin resistance, and controls were treated with testosterone for 12 weeks. Cardiac function was assessed using transthoracic doppler echocardiography (M-Mode 2D-imaging), lipogenic, AR, ER and other metabolic gene and protein expression were assessed using RTPCR and SDS-PAGE western blot. **Results:** PCOS-prone animals exhibited left ventricular (LV) hypertrophy, with increased LV mass to body weight (551.6 ± 38.85 mg vs 999 ± 96.17 mg, $p < 0.05$), LV posterior wall diastolic diameter and LV internal diastolic diameter compared to controls. Isovolumetric relaxation time (IVRT) was prolonged (15.91 ± 1.591 msec vs 23.75 ± 0.722 msec, $p < 0.05$). Mild systolic dysfunction was evidenced by increased isovolumetric contraction time (IVCT; 22.5 ± 1.348 msec vs 28.96 ± 1.248 msec, $p < 0.05$) and decreased % ejection fraction and % fractional shortening in PCOS-prone compared to controls. T treatment increased LV mass, IVCT and IVRT in controls but did not exacerbate cardiac function in PCOS-prone animals. T treatment increased cardiac protein expression of PPAR- α in PCOS-prone and controls, and T increased ACC in controls. AR protein expression tended to be reduced, and ER- α was reduced in both T treated control and PCOS-prone animals. **Conclusions:** The PCOS-prone rodent model demonstrates early cardiac LV hypertrophy and diastolic-systolic dysfunction and T treatment alters fatty acid metabolism, and AR and ER activation are associated with altered cardiac morphology and function in the PCOS-prone and control conditions.

Cardiovascular Endocrinology

CARDIOVASCULAR ENDOCRINOLOGY

Association Between Thyroid Hormones and Lipids Stratified by Race and Sex

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It has been well-established that thyroid hormones play a role in cholesterol and lipoprotein metabolism. However, there is limited data assessing the variability in the association between thyroid hormones and lipids across sex and race. We hypothesized that thyroid dysfunction is associated with changes in lipids and lipoproteins with no substantial variability in this association between races and sex. The electronic medical record of a large county hospital in Dallas, TX was queried to obtain data on all patients who had lipid panels and thyroid function tests checked on the same day from 1/1/2013 to 1/1/2018. The results were

stratified into hypothyroid (TSH greater than 4.5 mcIU/L and Free T4 less than 0.8 ng/dL), hyperthyroid (TSH less than 0.5 mcIU/L and Free T4 greater than 1.8 ng/dL) and normal (TSH between 0.5 and 4.5 mcIU/L, Free T4 between 0.8 and 1.8 ng/dL). Results consistent with subclinical thyroid disease were excluded from further analysis. There were 25,290 unique results for thyroid hormones and lipid panels checked on the same day. The results were further stratified by race and sex, and the relationship between thyroid function and lipids was assessed. The correlation coefficient (r) was compared between sexes within each race for the following variables: TSH vs HDL-C, TSH vs LDL-C, TSH vs Total Cholesterol, TSH vs triglycerides, FT4 vs HDL-C, FT4 vs LDL-C, FT4 vs Total Cholesterol, and FT4 vs triglycerides. Among black males with hypothyroidism, there was a notably stronger correlation when compared to black females in the relationship between TSH vs LDL-C, and TSH vs Total Cholesterol. Specifically, the correlation coefficient of TSH vs LDL-C among Black males with hypothyroidism was 0.582, compared to 0.133 among Black females with hypothyroidism ($P = 0.0053$). Furthermore, the correlation coefficient of TSH vs Total Cholesterol among Black males was 0.567 compared to 0.184 among Black females ($P = 0.016$). In contrast, no difference in any of the relationships between thyroid and lipids was demonstrated between sexes amongst Whites, Asians, and Hispanics. Overall, we found differences in Black patients compared to patients of other races with regards to the association between thyroid and lipids. Specifically, it was found that Black males with hypothyroidism had a stronger positive correlation in TSH vs LDL-C and TSH vs Total Cholesterol than Black females. This type of difference between sexes was not found amongst any other race. These findings suggest that thyroid dysfunction is associated with changes in lipids, and the way these changes manifest may vary depending on the race and sex. This further highlights the importance of checking lipid panels in patients with thyroid dysfunction. Further research is needed to more clearly characterize the variation that is seen in thyroid and lipid function amongst races.

Cardiovascular Endocrinology

CARDIOVASCULAR ENDOCRINOLOGY

Black Women Have a Worse Cardio-Metabolic Risk Profile Compared to White Women with Polycystic Ovary Syndrome in the United States: A Systematic Review and Meta-Analysis

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Health disparities may influence cardio-metabolic risk in women with polycystic ovary syndrome (PCOS). The magnitude and direction of differences in cardio-metabolic risk between Black and White women with PCOS remain uncertain due to inconsistent reports. We conducted