

47.4 months (IQR 10.8 to 93.7). Most were female (64.3%). The mean age at diagnosis was  $46.3 \pm 14.48$  years. The most frequent insulinomas (59.5%), followed by (12.7%) carcinoid tumors, gastrinomas (11.1%), ACTHomas (10.3%), VIPomas (2.4%) glucagonomas (2.4%) and PPomas (1.6%). Nineteen subjects (15.1%) had genetic syndromes, mainly MEN1 (89.5%); and 8.7% had other neoplasms, most frequently non-functional gastrointestinal (GI) carcinoids (36.3%) and thyroid cancer (18.8%). The median duration of symptoms prior to diagnosis was 24 months (IQR 7.75 to 48). The most common locations were, the GI tract (86.5%), whereas 7.1% were outside the GI tract and 6.4% were of unknown primary origin. Functional NETs outside GI tract were localized primarily in lungs (66.6%). Functional pancreatic NETs occurred more commonly in the tail (39.6%). 24.6% had locoregional or distant metastasis during follow-up. The most frequent metastatic sites were liver (86.5%), regional lymph nodes (59.8%) and bone (13.5%). The most common treatment was surgery (87.3%, with 13.6%  $\geq 2$ ), followed by 18.3% somatostatin receptor analogues and 11.1% cytotoxic chemotherapy. Most subjects (73%) had complete remission with first line therapy, but 14.1% had recurrence at a median of 50.7 months (IQR 15.4 to 97.6). Subjects with an incomplete remission progressed after a median of 14.85 months (IQR 10 to 38.9). Conclusions: The clinical characteristics of functional NET treated at a tertiary center in Mexico are similar to those in other population and geographic locations described in the literature.

## Reproductive Endocrinology

### OVARIAN FUNCTION — FROM OLIGOMENORRHEA TO AMENORRHEA

#### *Increased Caloric Intake Improves Regularity of Menses and Is Associated with Increased $TT_3$ and Leptin in Exercising Women with Oligo/amenorrhea: The “REFUEL” Randomized Controlled Trial*

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#### OR31-07

Exercising women often fail to consume adequate energy intake relative to energy expenditure and are thus susceptible to menstrual disturbances and poor bone health secondary to energy deficiency. Ideal treatment plans are to increase energy intake to reverse energetic suppression. The purpose of this study was to determine if REFUEL, a 12-month randomized controlled trial (RCT) of increased energy intake, improves menstrual frequency and markers of energetic status in exercising women with oligo/amenorrhea. Young, exercising women with oligo/amenorrhea were randomized into two groups. The treatment group (Oligo/Amen+Cal, n=32) increased energy intake 20-40% above baseline energy needs and the Oligo/Amen Control group (n=30) maintained exercise and eating habits for the 12-month intervention. Menses was tracked throughout the intervention by menstrual calendars and daily urine samples, energetic status was assessed by body composition

and total triiodothyronine ( $TT_3$ ) and leptin concentrations. Conditional recurrent events Cox Proportional Hazards model tested the effects of the intervention and multi-level modelling assessed relationships among variables. There was a significant group\*time interaction for body mass, percent body fat, fat mass, and  $TT_3$  concentrations ( $p < 0.03$ ), such that Oligo/Amen+Cal women gained more body and fat mass and had a greater increase in  $TT_3$  during the study compared to Oligo/Amen Controls. Specifically, Oligo/Amen+Cal women (21.6 yrs, BMI: 20.2 kg/m<sup>2</sup>) increased energy intake by 353 kcal/d and gained 1.9 kg of body mass, corresponding to increased fat mass (1.2 kg) and leptin (64%). Oligo/Amen Controls (20.9 yrs, BMI: 21.3 kg/m<sup>2</sup>) had no change (-32 kcal/d) in energy intake ( $p < 0.001$  vs. Oligo/Amen+Cal) and minimal change in body mass (0.8 kg;  $p = 0.04$  vs. Oligo/Amen+Cal), fat mass (0.4 kg;  $p = 0.08$  vs. Oligo/Amen+Cal), and leptin (21% increase,  $p = 0.07$  vs. Oligo/Amen+Cal). Controlling for baseline BMI and menstrual status, the intervention increased the likelihood of experiencing menses ( $p < 0.001$ ) such that Oligo/Amen+Cal women were twice as likely (104% increase) to experience menses during the intervention compared to Oligo/Amen Controls. Further, the higher the BMI at baseline, the greater the likelihood of experiencing a menses such that for every kg/m<sup>2</sup> increase in BMI the likelihood of menses increased by 10%. Overall, a nutritional intervention designed to increase energy intake by a moderate amount in exercising women with oligo/amenorrhea successfully improved body mass and fat mass, concentrations of metabolic hormones, and the likelihood of experiencing menses compared to oligo/amenorrheic women who maintained exercise and eating habits. As such, treatment plans designed to increase energy intake can be successful in reversing energetic suppression and recovering menses.

## Pediatric Endocrinology

### PEDIATRIC PUBERTY, TRANSGENDER HEALTH, AND GENERAL ENDOCRINE

#### *Prenatal and Post-Natal Influence of Androgens in the Psychosexual Development in Individuals with 21-hydroxylase Congenital Adrenal Hyperplasia*

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**Introduction:** Congenital Adrenal Hyperplasia (CAH) is defined as a group of autosomal recessive disorders characterized by a deficiency of the enzyme required to synthesize cortisol by the adrenal cortex. Defects in the 21-hydroxylase enzyme make up of 90% of CAH. It is caused by several mutations in the *CYP21A2* gene. These defects impaired cortisol synthesis leading to an ACTH increase resulting in androgen excess, either with salt-wasting or simple virilizing forms. Androgens play a crucial