DIABETES CANADA/CSEM

PROFESSIONAL CONFERENCE

November 20 – 23, 2024

Resident Clinical Vignettes
Research Project Abstracts

CSEM SCEM
The Canadian Society of Endocrinology and Metabolism
La Société canadienne d'endocrinologie et de métabolisme
Since | Depuis 1973

CSEM Resident Clinical Vignettes and Research Projects

Resident Poster Presentations

Research Hour | Exhibit Hall

Thursday, November 21, 2024 at 10:15 – 11:15

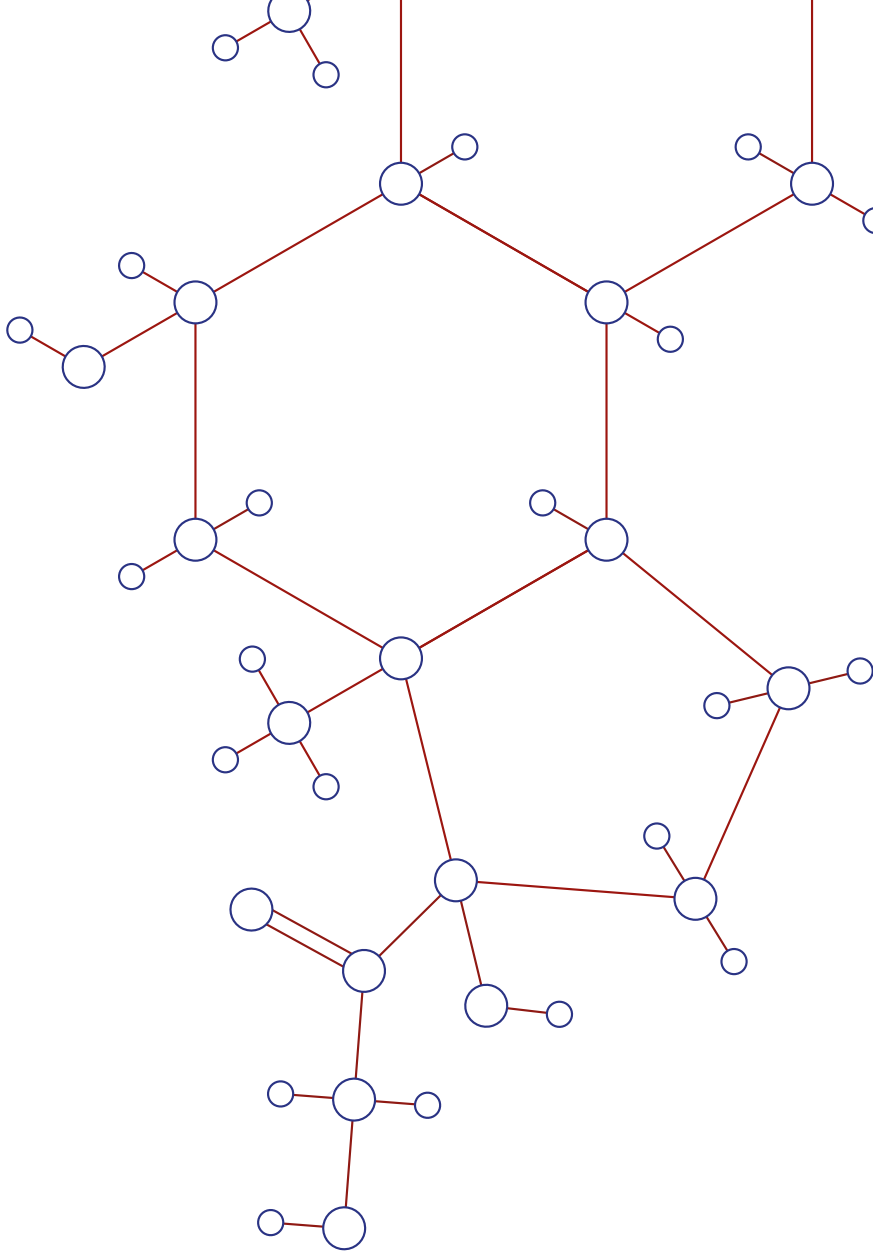
Thursday, November 21, 2024 at 15:30 – 16:30

Friday, November 22, 2024 at 17:15 – 18:30

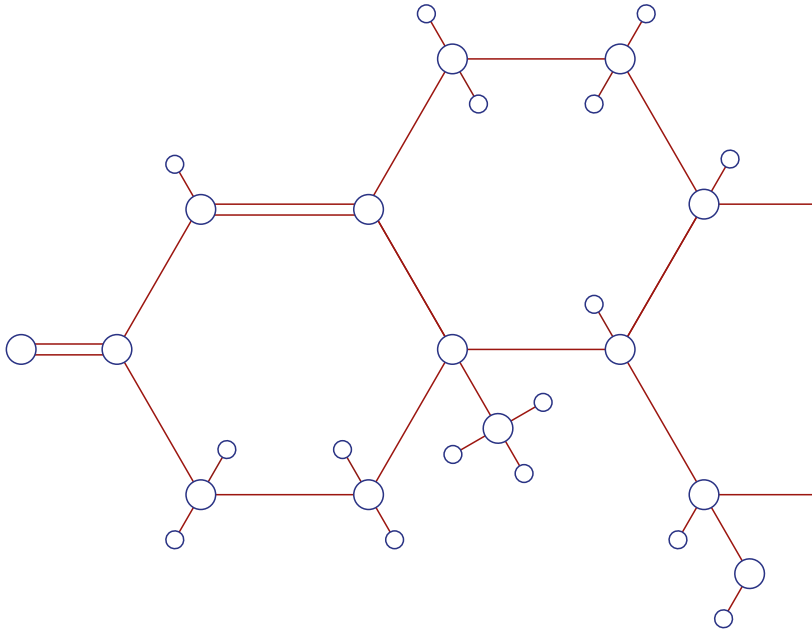
Resident Oral Presentations

Room: Argyle 3, Halifax Convention Centre

Thursday, November 21, 2024 at 14:00 – 15:15



2024 CSEM Resident Oral Abstract Presentation Agenda



THURSDAY, NOVEMBER 21, 2024, 14:00 PM – 15:15 PM AT

WELCOME AND OPENING REMARKS

Chair: Tayyab Khan, MD, FRCPC

PRESENTATIONS

A Novel PPARG Pathogenic Frameshift Variant in Familial Partial Lipodystrophy: A Case Report

Isabel Shamsudeen, MD*

Development of a Thyroid Biopsy Assessment Tool for Learner Evaluation

Melissa Ge, MD*

Lack of Utility of Adrenal Vein Cortisol Sampling in Bilateral Adrenal Adenomas with Hypercortisolemia

Kara Hawker, MD*

Optimizing Point-of-Care Capillary Blood Glucose Utilization in Hospitalized Patients: A Quality Improvement Initiative

Kyle Moxham, MD*

Atypically Typical: Incidental Atypical Femoral Fractures Found After Fragility Hip Fracture

Nadin Abbas, MD*

Outcomes in Maternal Hypertension in Pregnancies Complicated by Diabetes in Pregnancy (Type 1, Type 2, and Gestational Diabetes)

Anabel Cardenas Rivas, MD*

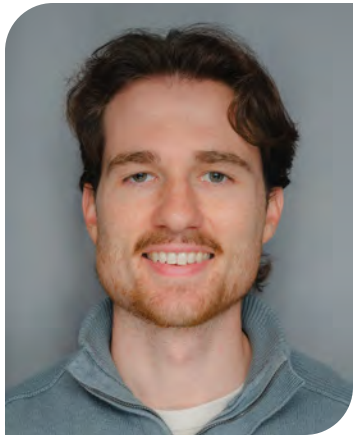
An Unusual Presentation of an Exceedingly Rare Disease: The First Ever Reported Case of Hereditary Tumoral Calcinosis in a Canadian Indigenous Patient

Joshua Low, MD*

** Award Eligibility*

CLOSING REMARKS

Abstracts



An Unusual Presentation of an Exceedingly Rare Disease: The First Ever Reported Case of Hereditary Tumoral Calcinosis in a Canadian Indigenous Patient

Joshua Low*, Sarah Alajmi, Aliya Khan

Dalhousie University

Background: Hyperphosphatemic Hereditary Tumoral Calcinosis (HTC) is a rare syndrome of phosphate metabolism caused by FGF23/GALNT3/KLOTHO mutations which compromise FGF23 action and subsequently impair renal phosphate excretion. Hyperphosphatemia leads to accumulation of CaCO3 and hydroxyapatite tumors in various tissues - classically bony surfaces subjected to trauma/inflammation. The disease is inherited in an autosomal recessive pattern and most often reported in African or Middle-Eastern populations. Treatment consists of a low-phosphate diet, phosphate-lowering medications, and anti-inflammatories.

Case presentation: MP is a 63-year-old female of the [blinded] Nation who presented with progressive neck pain and radiculopathy after a whiplash injury. Serial imaging revealed an expanding C2 mass, which yielded a "chalky fluid" on biopsy. HTC was suspected, but diagnosis was delayed 2 years due to atypical metabolic and clinical factors. Eventually, the patient developed characteristic hyperphosphatemia, impaired renal phosphate excretion, and multiple tumors. The diagnosis of HTC was made and treatment was initiated. There is no known family history of HTC and genetic investigations are underway.

Discussion: This is, to our knowledge, the first reported case of TCS in a person of Canadian Indigenous Heritage. It remains to be seen if this case will identify a de-novo mutation or a new genetic kinship. With less than 100 case reports worldwide, diagnosis and management of HTC is hindered by poor recognition and limited experimental data. This challenge is compounded by atypical presentations such as MP. It is important for providers to recognize this extremely rare disease early to prevent progression and fibrosis of tumors.

Kara Hawker*,
Amel Arnaout

University of Ottawa

Lack of Utility of Adrenal Vein Cortisol Sampling in Bilateral Adrenal Adenomas with Hypercortisolemia

Background: Among patients with ACTH-independent hypercortisolism with adrenal adenoma(s), adrenal vein sampling (AVS) may be conducted prior to management decisions. Studies evaluating AVS in hypercortisolemia to determine laterality of disease have not established efficacy of the procedure.

Case: A 60-year-old female with Cushing's and bilateral adrenal adenomas with prior non-lateralization on AVS was referred for ongoing care. Weight gain, easy bruising, hypertension requiring two medications, T2DM on treatment, and OSA had developed. Repeat investigations showed serum morning cortisol of 554 (133-547 nmol/L) after 1mg DST, 24-hour UFC of 220 (10-160 nmol/day) then 1246 (60-415 nmol/day) two years later, and bilateral adenoma growth on CT (left: 4.5 to 6.5 cm; right: 1.5 to 2.0 cm). Repeat AVS showed no lateralization. Despite this, she was offered staged left adrenalectomy first. Postoperatively, 24-hour UFC was 83 (60-415 nmol/day). No completion adrenalectomy was required. Subsequently, signs/symptoms concerning for adrenal insufficiency appeared; serum morning cortisol was 116 (133-537 nmol/L), prompting initiation of hydrocortisone 10mg daily. ACTH stimulation test showed suboptimal cortisol response: 194 nmol/L to 435 nmol/L after 60 minutes. She now takes hydrocortisone PRN only. Clinically, she lost 25 lbs, hypertension improved requiring only one antihypertensive, and HbA1c improved to < 6.0% requiring only one antihyperglycemic.

Discussion: Improvement of clinical features of hypercortisolism and normalization of 24-hour UFC after unilateral adrenalectomy suggests the larger adenoma was the source of cortisol excess, despite AVS showing no lateralization. This highlights the inconsistency of AVS protocol for lateralization in adrenal Cushing's and the need for clinical correlation.

Atypically Typical: Incidental Atypical Femoral Fractures Found After Fragility Hip Fracture

Nadin Abbas*, Christopher Tran

University of Ottawa

Background: Atypical femoral fracture (AFF) is a rare side effect of anti-resorptive therapy. Risk of AFF increases with duration of continuous therapy. If an AFF is diagnosed, it is imperative to perform a contralateral femur x-ray, since AFFs are bilateral in up to 50% of cases.

Case presentation: After falling from standing height, an 81-year-old woman sustained a left-sided intertrochanteric hip fracture treated with a cephalomedullary nail. Pre-operative x-ray reported a subtle cortical bump involving the lateral proximal shaft. This was not actioned upon until seen by Endocrinology 1 year later, where we noted that she was on alendronate for 6 years followed by denosumab for 2 years. Radiograph of the right femur demonstrated focal cortical thickening along the lateral aspect of mid-shaft with a visible lucent line, consistent with impending AFF. She was admitted to Orthopedics for treatment with right femoral intramedullary nail.

Discussion: This is a unique presentation of incidental AFFs on imaging for typical hip fracture. It highlights gaps in management of AFF. In this case, contralateral femur x-ray was not obtained at the time the left-sided AFF was detected, increasing risk of complete right-sided AFF. There is presently no treatment guideline for AFF. Teriparatide is used to promote AFF healing. However, as teriparatide has theoretical risk of malignancy, and she had a history of lung cancer, she declined. After bilateral intramedullary nailing for AFFs, risk of AFF at other skeletal sites is weighed against risk of osteoporotic fractures. In this case, denosumab resumption was advised.

Isabel Shamsudeen*,
Amanda Berberich

Western University

A Novel PPARG Pathogenic Frameshift Variant in Familial Partial Lipodystrophy: A Case Report

Introduction: Lipodystrophies are a group of rare disorders characterized by a lack or maldistribution of adipose tissue. These disorders are associated with many complications including hypertriglyceridemia, pancreatitis, diabetes mellitus, and atherosclerotic cardiovascular disease. Familial partial lipodystrophy type 3 (FPLD3) is a rare type of lipodystrophy associated with pathogenic PPARG variants. PPARG encodes peroxisome proliferator-activated receptor gamma, which is the master regulator of adipogenesis. This case report describes a patient with FPLD3 possessing a novel PPARG pathogenic variant.

Case Presentation: A 32-year-old woman with a remote history of acute pancreatitis presented with triglyceride levels as high as 19.3 mmol/L during late pregnancy. She was started on fenofibrate which lowered her triglycerides to 12.7 mmol/L. Furthermore, she was diagnosed with gestational diabetes, requiring multiple daily injections of insulin. Given significantly elevated fasting blood glucose levels in pregnancy and a low-normal pre-pregnancy body mass index, she underwent genetic testing for maturity onset diabetes of the young (MODY), which did not reveal any MODY variants. It did however identify a heterozygous, likely pathogenic frameshift variant in PPARG (Glu323Glufs*15), not previously described. Her genetic analysis also demonstrated a high triglyceride polygenic risk score in the 82nd percentile. Post-partum, fenofibrate was discontinued due to patient preference while breastfeeding, with a most recent triglyceride level of 3.1 mmol/L.

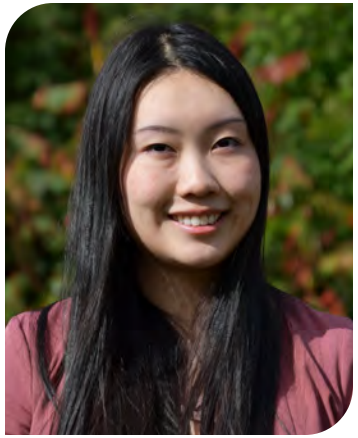
Conclusion: A case of FPLD3 with a novel, pathogenic frameshift variant in PPARG is described. This patient's genetic analysis and clinical course will aid in further understanding of FPLD3 and the genotype-phenotype relationships related to the identified PPARG variant.

Optimizing Point-of-Care Capillary Blood Glucose Utilization in Hospitalized Patients: A Quality Improvement Initiative

Kyle Moxham*, Pamela Mathura, Joseph Vong, Darren Lau

University of Alberta

Hospitalized adults commonly have routine point-of-care capillary blood glucose testing (CBG) ordered on admission. Excessive CBG may strain nursing resources without notable patient benefits. This study's objective was to reduce the frequency of unnecessary CBG in hospitalized General Internal Medicine (GIM) patients at the University of Alberta Hospital. Using the Model of Improvement with Plan-Do-Study-Act (PDSA) cycles, an evidence-based CBG rationalization algorithm was established and trialed (started in March 2024) using an educational approach targeting ordering physicians and nurses. A retrospective chart audit estimated baseline CBG utilization. The primary outcome measurement was the prevalence of patients with unnecessary CBG orders at the time of hospital discharge. Intervention impact was determined by chart audit. Descriptive statistics supported analysis. A total of 784 charts were reviewed pre- and post-intervention, with 84% (n = 655) of patients having CBG ordered on admission. The frequency of unnecessary CBG orders at discharge decreased from 28.2% (48/170) to 14.8% (72/485). The average length of stay until CBG de-escalation improved from 10.6 days to 6.7 days (difference: -3.9 days). Patients who underwent CBG de-escalation at day 3 of admission (if eligible) improved 19.3% from 20.4% (11/54) to 39.7% (58/146) post-intervention. The intervention was sustained following a 6 month follow up period. CBG measurements in-hospital are frequently unnecessary resulting in inefficient use of nursing resources. The absence of established algorithms for reassessing POCT frequency may perpetuate unnecessary testing during hospitalization.



Melissa Ge*,
Christopher Tran

Western University

Development of a Thyroid Biopsy Assessment Tool for Learner Evaluation

Introduction: Ultrasound-guided fine needle aspiration biopsy (FNA-B) is an essential diagnostic modality for thyroid nodules. While most Canadian Endocrinology residency programs offer FNA-B training, no formal resources exist to inform resident feedback on FNA-B technique. We aimed to use consensus group methods to develop an assessment tool for thyroid FNA-B.

Methods: As informed by literature review and discussion with experts, we created an initial 19-item procedure list for thyroid FNA-B. We used a modified Delphi method to establish consensus on items for inclusion within the assessment tool using 5-point Likert scales. We sent surveys to Canadian endocrinologists with expertise in thyroid FNA-B, with multiple rounds for re-rating of items not meeting consensus, and a wrap-up meeting to finalize items.

Results: After one round, seven respondents reached consensus on 15 items. Highest ranked steps included obtaining patient consent (5.0), localizing anatomical landmarks like large blood vessels (4.9), tracking the needle tip on ultrasound (4.9), and hematoma counselling/monitoring (4.9). No items met consensus to be removed. Items not meeting consensus included anticoagulation management (4.3), discussion of when to abort the procedure (3.9), and discussion of aspiration vs. non-aspiration techniques (3.9).

Discussion: Early findings highlight the essential steps for ultrasound guided FNA-B of thyroid nodules as informed by an expert panel, while revealing variations in practice across Canada. Once finalized, a formal assessment tool can help inform feedback on resident thyroid FNA-B technique following observed encounters – a timely resource given the impending transition of Endocrinology to Competence By Design.

Outcomes in Maternal Hypertension in Pregnancies Complicated by Diabetes in Pregnancy (Type 1, Type 2, and Gestational Diabetes)

Anabel Cardenas Rivas*, Jennifer Yamamoto, Christy Pylypjuk, Sarah Sigurdson, Katherine Bernier

University of Manitoba

Background: Diabetes and hypertension are chronic conditions that are common in pregnancy. However, there are limited data examining pregnancy outcomes in individuals with coexisting hypertensive disorders and diabetes in pregnancy.

Methods: We conducted a retrospective cohort study to assess maternal and neonatal outcomes in singleton pregnancies complicated by diabetes comparing individuals with and without hypertension in our center from 2011 to 2020.

Results: A total of 3170 individuals were included (2.1%, 16.3%, and 81.6% with type 1, type 2, and gestational diabetes, respectively). Fifteen percent of pregnant individuals with diabetes had comorbid hypertension. Pre-existing hypertension was most common with type 2 diabetes while pre-eclampsia was most common with type 1 diabetes. Hypertensive disorders of pregnancy were associated with a longer maternal hospital stay in type 1, 2, and gestational diabetes (5.8+/-4.3 vs. 4.0+/-2.8 days [p=0.046]; 4.8+/-4.0 vs. 3.7+/-2.8 [p=0.0005]; 3.3+/-2.4 vs. 2.6+/-3.5 days [p=0.0002], respectively) but not neonatal length of stay. Hypertension was associated with increased NICU admissions in the type 1 and gestational diabetes groups but not in the type 2 diabetes group. Additionally, hypertension was associated with small for gestational age neonates in the type 2 and gestational diabetes groups (10.4% vs. 4.4%, p=0.01; 12.3% vs. 7.5%, p=0.001; respectively) but not in the type 1 diabetes group.

Conclusions: Comorbid hypertension is associated with longer maternal hospital stay, NICU admission, and small for gestational age neonates in individuals with diabetes in pregnancy.

Ibrahim M. Ajwah*,
Heather A. Lochnan

University of Ottawa

Sky-High Thyroglobulin Level Following Thyroid Lobectomy Without Evidence of Metastatic Disease: A Clinical Vignette

Background: Thyroglobulin (Tg) serves as a crucial indicator for monitoring recurrence in patients with differentiated thyroid cancer following total thyroidectomy and radioactive iodine therapy. The utility of following Tg after thyroid lobectomy (TL) is debatable. A Tg below 30 ng/mL is a suggested threshold for predicting excellent response to therapy, in patients who have undergone TL (Momesso et al. JCEM 2016). There appears to be insufficient evidence to establish a specific Tg cutoff that can reliably detect persistent or recurrent disease after TL.

Clinical Case: A 41-year-old female underwent left TL for low-risk classic papillary thyroid carcinoma. Initial assessment indicated a stable 32mm TIRADS 4 nodule in the right lobe and normal left thyroid bed. Normal thyrotropin (TSH) (without levothyroxine) and unexpectedly elevated Tg at 4055 ng/mL were observed, with negative antithyroglobulin antibodies. This was subsequently confirmed through repeated tests using the electrochemiluminescence immunoassay (ECLIA) method. Heterophilic interference was ruled out by confirming persistently elevated Tg levels using Liquid Chromatography with tandem mass spectrometry (LC-MS-MS). Metastatic workup, including thyroid biopsy, and imaging yielded negative results Tg levels were closely monitored, stabilizing between 2500–3000 ng/mL.

Discussion: We emphasize that the significantly elevated Tg levels in this patient warrant careful consideration, although it is important to exclude potential laboratory errors and assay interference; also, it is essential to rule out underlying metastatic disease. While Tg serves as a sensitive marker for residual or recurrent disease, the conventional cutoff after lobectomy warrants careful consideration and may not universally apply to all patients.

VIEW POSTER

Nour Alhamdan*,
Christopher Tran

University of Ottawa

Can Hybrid Closed-Loop Technology Treat Hyperglycaemia in A Suspected Recurrence of Cushing Disease?

Background: Cushing Disease (CD) is characterized by autonomous ACTH secretion from pituitary corticotrophs, leading to hypercortisolemia. Glucocorticoid excess can cause metabolic comorbidities including insulin resistance, with up to 50% of cases having varying degrees of altered glucose metabolism. When managing CD treated with transsphenoidal surgery, clinicians may consider new or harder-to-manage dysglycemia as a clue for recurrent CD.

Case presentation: A 36 year-old female with type 1 diabetes began to have Cushingoid features including more difficult-to-treat diabetes. Investigations led to a diagnosis of ACTH-secreting pituitary adenoma, treated with transsphenoidal resection. Post-operatively, her insulin requirements fell by over 50%. However, two years later, her Hba1c began to rise, prompting investigations to rule out CD recurrence: whereas urine free cortisol was normal, a post 1 mg dexamethasone 8am cortisol was 62 nmol/L (thus not fully suppressed). Repeat MRI sella did not demonstrate a definite pituitary lesion. After adding hybrid closed-loop technology to her existing insulin pump, her Hba1c fell from 9% to 7%, with a time in range of 81% between 3.9-10, without any increase in basal rates.

Discussion: To our knowledge, this is the first case of concomitant CD and type 1 diabetes managed with hybrid closed-loop technology. While rising Hba1c post-transsphenoidal surgery raises concern of CD recurrence, the ability to achieve glycemic targets using hybrid close-loop technology without an increase in total daily insulin is less in keeping with insulin resistance seen in recurrent CD. This has helped inform our decision to defer repeat surgery despite biochemical hypercortisolism.

VIEW POSTER

Nada Almahmeed*,
Ahsen Chaudhry,
David Thompson

University of British Columbia

Seizures and Status Epilepticus as a Rare Presentation of Thyroid Storm

Background: Thyroid storm is a rare complication of thyrotoxicosis. The classical presentation includes cardiovascular and autonomic instability, such as fever, tachycardia, heart failure, nausea/vomiting, restlessness, and agitation.

Case presentation: A 49-year-old woman with drug-resistant epilepsy was electively admitted to the seizure investigation unit for the characterization of recurrent seizures that had been precipitously worsening in the prior weeks. On the day of admission, she developed a fluctuating level of consciousness and hyperactive delirium. Investigations revealed an undetectable TSH and markedly elevated FT4 and FT3. Grave's disease was diagnosed based on thyroid pertechnetate imaging. Her Burch-Wartofsky score was 45, raising concern for thyroid storm. She did not have major signs of cardiovascular compromise. Due to rapid neurologic deterioration, she was transferred to the ICU and intubated. EEG monitoring demonstrated diffuse encephalopathy and non-convulsive status epilepticus. She was started on hydrocortisone, propylthiouracil, propranolol, iodine, and anti-epileptics. Other investigations for causes of seizures, including MRI and antibody panels, were unrevealing. There was a close correlation between the improvement of her neurological condition and thyroid function tests. Consequently, we believe that hyperthyroidism was the driver of her neurologic deterioration and seizures.

Discussion: Central nervous system dysfunction, such as hyperexcitation, irritability, and an altered level of consciousness, may occur in patients with thyrotoxicosis. A few case reports of seizures attributed to thyrotoxicosis exist. Thus, in patients presenting with status epilepticus, seizures, or changes in consciousness, the possibility of a thyroid storm should be considered.

VIEW POSTER

Hamad Y. Almatar*

McMaster University

Discordance in Bone Mineral Density Between Spine and Hip: Applications to Clinical Practice

68-year-old female with uncomplicated postmenopausal osteoporosis not previously treated presented with lumbar T-score of -4.7 and femoral neck T-score of -2.2. Patient data entered into the Fracture Risk Assessment Tool (FRAX) revealed MOF at 9.2%, Hip fracture risk at 2.0%. FRAX without BMD gave MOF 11%, Hip 3.5%. We proceeded with IV Zoledronate due to presence of GERD. This case reveals the limitations of tools such as FRAX which assess a single site, resulting in a misclassification of the degree of disease present. Discordance in BMD occurs in 38-51% of cases and are associated with an increased risk of vertebral fractures compared to hip fractures. The discordance is due to the greater composition of trabecular bone in the spine which is associated with a higher bone turnover resulting in earlier bone loss compared to cortical bone. The velocity of bone loss is reversed after the age of 70, attributed to degenerative changes in the spine as well as vertebral deformities.1 One should also note that BMD is an indirect measurement of bone strength by using dual-energy X-ray absorptiometry (DXA). Only 60-70% of the variation of bone strength is captured by DXA, therefore, some important features in the progression of osteoporosis are not detected by this technique. A newer tool, FRAX Plus, has solved this limitation as it includes lumbar T-scores in the calculation. However, it is not public access. We conclude that cases of osteoporosis with discordance are common and require therapy to prevent associated complications.

VIEW POSTER

A Novel ATP-Binding Cassette Sub-Family G Member 8 (ABCG8) Variant, Presenting with Compound Heterozygous Sitosterolemia

Yousif Alrodhan*, Ari Morgenthau, Ritu B. Aul

University of Toronto

Background: Sitosterolemia is a rare autosomal recessive lipid disorder caused by disruption of ABCG5 and/or ABCG8, leading to abnormal plant sterol metabolism. Often characterized as a familial hypercholesterolemia-like condition, there is significant phenotypic heterogeneity, including premature atherosclerosis, xanthomas, hypercholesterolemia, hematologic abnormalities, and splenomegaly.

Case Description: In this case report, we describe a 66-year-old with sitosterolemia due to compound heterozygous ABCG8 variants. The patient had a history of unexplained splenomegaly diagnosed at age 25, thrombocytopenia, and non-immune mediated hemolysis since age 36, and premature atherosclerotic disease requiring angioplasty at ages 52 and 57 for peripheral artery disease, and PCI at 61, despite achieving target LDL levels with rosuvastatin. They were noted to have persistent stomatocytes despite normal: antiphospholipid antibody study, flow cytometry, direct antiglobulin test, and hereditary spherocytosis screen. Genetic analysis via a RBC Membrane Disorders Gene Sequencing Panel identified two ABCG8 variants: a previously reported pathogenic variant c.1083G>A p.(Trp361*) and a novel truncating variant c.280A>T p.(Lys94*), confirmed to be in trans orientation with family testing. Serum sitosterol was markedly elevated (195.7 µmol/L), confirming the diagnosis. Treatment with a low plant sterol diet and ezetimibe for three months improved her platelet levels from 54 to 78 x10^9/L.

Discussion: This case identifies a novel truncating pathogenic variant in ABCG8, c.280A>T p.(Lys94)*, presenting with sitosterolemia. With fewer than 250 cases of sitosterolemia reported in the literature, this report highlights clinical features beyond early atherosclerotic disease, specifically stomatocytosis, thrombocytopenia, and splenomegaly associated with ABCG8 biallelic disease.

VIEW POSTER

Osamah Alsagheir*

McGill University

EPAS1 Mutations in Three Adjacent Nucleotides Resulting in Different Phenotypes

EPAS1 mutations have been rarely described in patients (pts) with paragangliomas (PGL) in association with cyanotic congenital heart disease (CHD), polycythemia and some additional tumors. Here, we present three cases of PGL with closely located EPAS1 mutations. Despite the common gene location, their manifestations are different.

Case 1: A 14-year-old girl with polycythemia and hypertension was diagnosed with multiple PGLs in the mid-abdomen and urinary bladder. Her tumor testing revealed a novel heterozygous EPAS1 variant (c.1589C>T, p.A530V).

Case 2: A 32-year-old woman with complex cyanotic CHD underwent several cardiac surgeries and was diagnosed with abdominal PGLs. She later developed recurrence with metastases to the liver and spine, which were stabilized with radiotherapy. Tumor testing identified an EPAS1 mutation (c.1591C>T, p.P531S).

Case 3: A 55-year-old man with a history of upper abdominal PGLs, lung, and bone metastases underwent multiple surgeries and received MIBG therapies. He also had a non-functioning pancreatic neuroendocrine tumor (pNET). His tumor testing identified an EPAS1 mutation (c.1592C>A, p.P531H).

Discussion: EPAS1 mutations are very rare. In this series, we present 3 patients (pt) with EPAS1 mutations in 3 adjacent nucleotides (c.1589, 1591, 1592) in 2 adjacent codons (p.530-531). These mutations are located in a domain that is important for recognition by propyl hydroxylases that normally lead to inactivation and proteasomal degradation of HIF2a (EPAS1). Since EPAS1 mutations are usually postzygotic, it is possible that the variable presentations of these same domain adjacently located mutations is related to the timing of their post zygotic development.

VIEW POSTER

A Case of IgG4-related Hypophysitis Causing Hypopituitarism

Shadan Ashrafi*, Jordanna Kapeluto, Arshia Beigi

University of British Columbia

Background: IgG4-related hypophysitis, a rare cause of hypopituitarism, can manifest in a myriad of ways, though it presents more with vasopressin deficiency compared to other causes. The natural course varies but hypopituitarism is usually irreversible even with immunosuppression.

Case: A 43-year-old female with hypothyroidism (presumed primary), type 2 diabetes, and severe agoraphobia was found to have a retro-orbital mass during an admission for headaches, eye pain, and tearing. A biopsy showed findings concerning for IgG4-related disease (RD) vs granulomatosis with polyangiitis, which was untreated as she was lost to follow-up. Five years later, she presented with general malaise, worsening headaches, and hypoglycemia. A pituitary panel revealed hypopituitarism with central adrenal insufficiency, central hypothyroidism, central hypogonadism with early menopause, and low IGF-1. She did not have signs of vasopressin deficiency. Hypoglycemia was secondary to insulin use in the context of low oral intake and hypocortisolism. She was started on hydrocortisone and the levothyroxine was uptitrated. MRI sella showed an infiltrating lesion in the left orbit and cavernous sinus, favouring IgG4-RD. By using a more sensitive stain, the original biopsy showed a higher number of IgG4-positive cells. Given the diagnosis,hydrocortisone was switched to high-dose prednisone. In follow-up, her headaches and visual symptoms improved but she remains on indefinite prednisone replacement due to persistent central adrenal insufficiency. She also has ongoing central hypothyroidism and central hypogonadism.

Conclusion: We report a case of IgG4-hypophysitis resulting in hypopituitarism without vasopressin deficiency. Though her mass-related symptoms have improved with immunosuppression, she has persistent hypopituitarism.

VIEW POSTER

A Case of FSH-Secreting Pituitary Adenoma Causing Ovarian Hyperstimulation Syndrome

Priya Bapat*, Sooyoun Shin, Filomena Meffe, Michael Cusimano, Omar Saeed

University of Toronto

Background: Ovarian hyperstimulation syndrome (OHSS) is characterized by cystic ovarian enlargement and a fluid shift to the third space due to increased capillary permeability and ovarian neoangiogenesis. Typically, OHSS is a complication of assistive reproductive technologies and is rare without human chorionic gonadotropin (HCG) administration. We present a case of OHSS in the context of a pituitary gonadotroph adenoma.

Clinical case: A 41 year old female was evaluated for a pituitary macroadenoma with elevated prolactin, diagnosed 3 years prior. On further review, she had irregular uterine bleeding, significant abdominal bloating and discomfort, and no galactorrhea. She trialled cabergoline for 6 months, but stopped due to pelvic pain. Workup was notable for prolactin 67 µg/L (3.3-26.7), estradiol 6880 pmol/L (55-1103), FSH 6.6 IU/L (1.8-22.5), LH 1.0 IU/L (1.6-56.3), and beta-HCG < 1 IU/L. Pelvic ultrasound revealed an enlarged uterus (18 x 16 x 11 cm) with multiple fibroids and bilateral enlarged ovaries with multicystic structure (right ovary 9 x 4 x 6 cm; left ovary 13 x 12 x 9 cm), in keeping with OHSS. MR sella showed a 14 x 15 x 15 mm sellar lesion. Given the markedly elevated estradiol level with inappropriately normal gonadotroph levels, pituitary surgery was recommended. Immediately following surgery, her estradiol level dropped to 739 pmol/L with LH < 0.2 IU/L and FSH 0.6 IU/L. Pathology revealed a pituitary adenoma uniformly expressing FSH.

Discussion: This case highlights the importance of considering pituitary gonadotroph adenomas in the differential diagnosis of OHSS and elevated estradiol levels without exogenous HCG.

VIEW POSTER

Gabrielle Doré-Brabant*,
Patricia Olivier,
Céline Huot

Université de Montréal

Pediatric Cushing's Syndrome Secondary to Ectopic ACTH Secretion by A Pancreatic Neuroendocrine Tumor: A Case Report

Ectopic Cushing's syndrome is a rare disease, especially at the pediatric age, and is associated with significant comorbidity. We report a 10-year-old girl who presented with a 2-week history of facial edema and acne, weight gain and abdominal distension. On examination, hepatomegaly was palpable 4 cm below the costal margin. Imaging showed multiple hepatic masses, retroperitoneal adenopathies, and multiple metastatic pulmonary nodules. A liver biopsy revealed a well-differentiated neuroendocrine tumor with CDX2 positivity (jejunoileal versus pancreatic neuroendocrine origin). At the same time, investigations revealed an ACTH-dependant Cushing's syndrome confirmed by a non-suppressed elevated cortisol and ATCH levels following a dexamethasone suppression test. Finally, a dotatate PET scan was performed, followed by an abdominal MRI that showed the presence of a single uptaking lesion in the pancreas body with normal adrenal glands and normal pituitary MRI, confirming the diagnosis of a neuroendocrine tumor of the pancreas with ACTH secretion explaining the Cushing's syndrome. Prophylactically, enoxaparine and trimethoprime/sulfamethoxazole were initiated for the risk of thrombosis and infection, which she never experienced. She developed diabetes requiring insulin, hypertension and hypokalemia requiring high dose of potassium supplements and diuretics and osteopenia without fracture. Chemotherapy with temozolamide, octreotide and capecitabine were used. Cushing's syndrome was managed with lysodren and metopirone and 3 adrenal glands embolizations. 3 years after her diagnosis, she still receives chemotherapy, lesions are stable on imaging, and she is now only on metopirone with normal cortisol level and stress dose hydrocortisone only (following the last embolization).

VIEW POSTER

Leukocytosis-Induced Artifactual Hypoglycemia in the Setting of Chronic Neutrophilic

Katherine Drummond*, Nisha Gupta, Stavroula Christopoulos, Elizabeth Macnamara

McGill University

Background: Artifactual hypoglycemia occurs when there is a discrepancy between laboratory measured blood glucose and the actual blood glucose level. Hyperleukocytosis is a known cause of artifactual hypoglycemia, particularly in the setting of hematological malignancies. This results from exaggerated in vitro glycolysis by leukocytes prior to blood sample processing. Despite existing reports, this remains an overlooked cause of hypoglycemia, potentially leading to unnecessary diagnostic work-up and treatment.

Case: A 78-year-old man was admitted to our institution with newly diagnosed chronic neutrophilic leukemia associated with marked leukocytosis ranging from 34.9 to 128.1x109/L. Despite routine bloodwork revealing recurrent low plasma blood glucose values below 3.0 mmol/L and as low as < 0.1 mmol/L, he did not exhibit any signs or symptoms of hypoglycemia, and capillary blood glucose measurements remained within normal limits. Artifactual hypoglycemia secondary to hyperleukocytosis was suspected. This was confirmed by a time-dependent decline in his plasma glucose concentration with delayed sample processing: 7.5 mmol/L, 5.0 mmol/L, 3.7 mmol/L and 1.8 mmol/L at 0, 2, 4, and 6 hours after reception in the laboratory, respectively. Chemical hypoglycemia was observed only when the patient's leukocyte count exceeded 70.0x109/L, demonstrating an inverse relationship between glucose concentration and the severity of his leukocytosis.

Discussion: This report expands on the existing body of evidence on artifactual hypoglycemia caused by leukocytosis, highlighting the importance of raising awareness of this entity among healthcare professionals. In asymptomatic individuals with low glucose measurements, the possibility of spurious results should be considered prior to initiating further diagnostic work-up.

VIEW POSTER

Pheochromocytoma Crisis with Catecholamine-induced Cardiogenic Shock Managed with VA-ECMO Supported Adrenalectomy

Maria Flynn*, Lois Donovan, Alexander A. Leung

University of Calgary

Background: Extracorporeal membrane oxygenation (ECMO) has been described in the management of pheochromocytoma crisis complicated by cardiogenic shock or acute respiratory distress syndrome; however, there is limited data to guide treatment in this context.

Case: A 22-year-old male presented to a peripheral hospital Emergency Department with symptoms of chest pain, palpitations, nausea/vomiting and elevated blood pressure. A CT-angiogram completed to assess for aortic pathology discovered a 4.1cm left-sided adrenal mass, suspicious for a pheochromocytoma. Endocrinology was consulted, and transfer to tertiary care was recommended. He subsequently developed hemodynamic instability, refractory to IV fluid resuscitation and vasopressors, and respiratory failure requiring intubation. His course was complicated by a PEA cardiac arrest and severely reduced LV function (LVEF 15-20%), with refractory cardiogenic shock requiring venoarterial (VA) ECMO cannulation. Alpha-blockade was initiated, initially with Mg2+ infusion. Doxazocin was started post-ECMO cannulation and gradually titrated to 10mg twice daily, as phenoxybenzamine and metyrazine were unavailable. He underwent an uncomplicated open left adrenalectomy on VA-ECMO, and was decannulated post-operative day 1. His course was complicated by ventilator-associated pneumonia, provoked VTEs, and external iliac artery occlusion. Post-operatively, pathology found a moderately differentiated pheochromocytoma, without an identified mutation on genetic testing. Clinically and biochemically, there was evidence of complete resection of pheochromocytoma without residual disease and recovery of LV function (LVEF 55-65%).

Conclusion: This case highlights the complex management of pheochromocytoma crisis with concurrent cardiogenic shock. The use of magnesium sulphate, available alpha-blockade (doxazocin), and VA-ECMO facilitated urgent adrenalectomy and positive outcomes in a high-risk case.

VIEW POSTER

Large Bilateral Adrenal Myelolipomas and Testicular Adrenal Rest Tumor in Classic Congenital Adrenal Hyperplasia: Case Report

Harleen Ghuttora*, Vicky Parkins

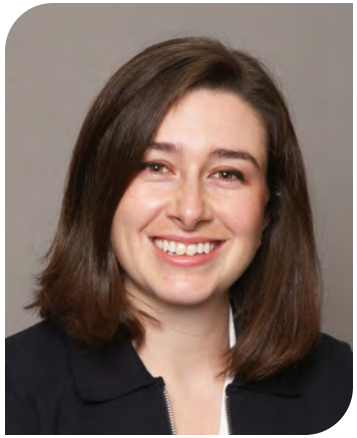
University of Calgary

Background: Adrenal myelolipomas are benign adrenal tumors, affecting 10-28% in classic congenital adrenal hyperplasia (CAH) with 21-hydroxylase deficiency (21-OHD). Testicular adrenal rest tumor (TART) affects 20-40% of CAH males undertreated with corticosteroids. We present a case of 21-OHD CAH with an improvement in TART on hydrocortisone but progressive growth of myelolipomas.

Case: 49-year-old male with 21-OHD CAH, on hydrocortisone 10mg BID and fludrocortisone 0.1mg OD presented in adrenal crisis with viral illness. He had TART with enlarged testicles, and left adrenal myelolipoma with suboptimal adherence to therapy. With improved adherence to corticosteroids, TART reduced in size clinically, but adrenal myelolipomas progressively grew with intermittent flank pain (2006- 5.4cm on left only, 2024- R – 4.7cm, L 15.9x15.1cm). ACTH levels remained elevated on hydrocortisone until recently: ACTH 248 pmol/L (2012), 121 pmol/L (2019), and 5.0 pmol/L (April 2024). Post hydrocortisone dose cortisol was 346 nmol/L, DHEAS suppressed, and normal 24-hour urine metanephrine/normetanephrine. Adrenalectomy was deferred as patient remained asymptomatic.

Discussion: This is an interesting case of large bilateral adrenal myelolipomas in classic CAH, likely due to chronic ACTH stimulation of adrenal glands. Despite physiologic hydrocortisone, ACTH remained elevated between 2012–2019, which likely contributed to progression in size. Adrenal myelolipomas > 10cm are at risk of hemorrhage and mass effect, with surgery indicated for symptoms. Guidelines recommend testicular ultrasound q1-2 years in males with CAH and adrenal imaging only if symptomatic or suboptimal control. Further guidelines are needed on frequency of imaging and biochemical monitoring for adrenal myelolipomas in CAH.

VIEW POSTER



Weakness and Pathologic Fractures: A Case Report of Tumour-Induced Osteomalacia

Megan Grundy*, Hanan Bassyouni, Nadia Moledina

University of Calgary

Background: Tumour-induced osteomalacia (TIO) is a rare paraneoplastic syndrome wherein secreted phosphaturic factors (most commonly fibroblast growth factor 23 [FGF-23]) result in renal wasting of phosphate, inhibition of 1,25-dihydroxyvitamin-D synthesis, and consequent osteomalacia and muscle weakness.

Case: An otherwise healthy 41-year-old female had multiple presentations to care over two years with progressive weakness, pain, and bony deformity. She had fragility fractures of the spine, ribs, and pelvis. Eventually, she was hospitalized to expedite work-up of her symptoms. In hospital, her phosphate ranged between 0.39-0.65 (ref 0.70-1.50 mmol/L), ionized calcium was between 1.12 to 1.15 (ref 1.15-1.35 mmol/L), and 25-hydroxyvitamin-D was 30 (ref 50-200 nmol/L). Urine studies revealed a TmP/GFR of 0.39 mmol/L, in keeping with renal phosphate wasting. 1,25-dihydroxyvitamin-D levels were undetectably low (ref 60-208 pmol/L), and FGF-23 levels were elevated at 669 (ref < 59 pg/mL). Full-body PET-CT done a year prior revealed an FDG-avid lesion in her right foot. Biopsy of this revealed a phosphaturic mesenchymal tumour. Notably, 10 years earlier, her serum phosphate was consistently normal. Overall, her presentation was in keeping with TIO. She was started on calcitriol and phosphate replacement. She underwent resection of the foot lesion, and within a week her serum phosphate had normalized. Postoperative serum FGF-23 level had also normalized.

Discussion: TIO is a rare condition that results in disabling fragility fractures, pain, and weakness. The work-up for secondary causes of osteoporosis/osteomalacia should include evaluation of serum phosphate, and if abnormal should prompt testing of urine phosphate to exclude renal phosphate wasting.

VIEW POSTER

Selective Venous Sampling for Diagnosis of Persistent Normocalcemic Primary Hyperparathyroidism

Evan M. Hagen*, Toru Tateno

University of Alberta

Introduction: Of patients with primary hyperparathyroidism (PHPT) who meet criteria for parathyroidectomy and undergo the procedure, persistent and recurrent disease is not uncommon. Prior to considering a repeat higher-risk parathyroidectomy it is important to reconfirm the diagnosis, and if possible to localize the pathologic parathyroid gland(s). First-line imaging with a SPECT/CT and neck ultrasonography have decreased sensitivity with persistent and recurrent disease, after which 4D-CT, specialized nuclear medicine scans or invasive testing can be pursued. With normocalcemic PHPT, confirming the diagnosis brings additional challenges as some causes of secondary hyperparathyroidism are difficult or impossible to modify.

Case description: A 53 year-old woman with panhypopituitarism following treatment for a silent corticotroph macroadenoma was incidentally found to have normocalcemic PHPT. Due to neuropsychiatric symptoms, age, and an elevated 24-hour urinary calcium, she underwent a parathyroidectomy which resulted in no significant effect on her PTH or calcium levels. Her neck ultrasound, 4D-CT, and OR report had inconsistent findings, and a detailed review of possible causes of secondary hyperparathyroidism was pertinent for obesity, dexlansoprazole, and hypercalciuria — which could have been idiopathic. Testing for genetic PHPT syndromes was negative. She underwent selective venous sampling for PTH localization and was found to have secretion from an ectopic mediastinal parathyroid gland. She is currently awaiting a date for her parathyroidectomy.

Discussion: In addition to localizing lesions with inconclusive imaging studies in persistent and recurrent PHPT, selective venous sampling can be a helpful tool in differentiating normocalcemic PHPT from secondary hyperparathyroidism due to non-modifiable or difficult-to-modify causes.

VIEW POSTER

Averting Thyroid Storm Amidst the Turmoil of Molar Pregnancy Management

Kara Hawker*, Amel Arnaout, Erin Keely

University of Ottawa

Background: Hyperthyroidism due to gestational trophoblastic disease is a rare but potentially life-threatening condition. Urgent surgery is the treatment, however limited literature exists to guide optimal perioperative management and the prevention of thyroid storm. Ten case reports exist describing thyroid storm occurring in this setting (1-10).

Case: A 24-year-old female was found to be biochemically hyperthyroid in context of an 11-week gestation molar pregnancy. Labs showed human chorionic gonadotropin (HCG) 47,437 (< 5 IU/L), TSH < 0.01 (0.27-4.20 mIU/L), FT4 >100 (10.0-22.0 pmol/L), and FT3 49 (2.8-6.8 pmol/L). Physical exam revealed tachycardia and diffusely enlarged thyroid. Burch-Wartofsky Point Scale score was 20 points, suggesting thyroid storm was unlikely, however empiric treatment for prevention of thyroid storm with loading doses of propylthiouracil (PTU) and Lugol's iodine, followed by maintenance doses, as well as propranolol, was initiated prior to operative uterine evacuation. One-week status-post uneventful dilation and curettage and continued PTU and propranolol, labs showed HCG 147, TSH < 0.01, FT4 35, and FT3 18. Anti-TPO antibodies and thyrotropin receptor antibody (TRAb) were both found to be positive, indicating presence of autoimmune thyroid disease.

Discussion: Empiric thyroid storm treatment was effective in preventing perioperative thyroid storm. Initially, leading differential was thyrotoxicosis secondary to elevated HCG levels from molar pregnancy. Typically HCG >100,000 sustained for several weeks is required to induce thyrotoxicosis (11), but her peak HCG was only < 50,000. Positive TRAb suggests underlying Graves' disease was likely a major contributor to her presentation. Despite HCG normalization, she will require long-term treatment with antithyroid medication.

VIEW POSTER

Long Term Use of Pasireotide in the Management of a Resistant Prolactinoma

Sarah Howse*,
Joanna Mader,
Ryan Dupere,
Tyler Adamson,
Syed Ali Imran

Dalhousie University

Introduction: Prolactinomas (PRLomas) are the commonest functioning pituitary adenomas and generally respond to dopamine agonist (DA) therapy. Approximately 10-20% of PRLomas are resistant to DA therapy. Pasireotide is a novel somatostatin receptor ligand (SSRL) which has been reported to normalize PRL levels in some cases of DA resistant PRLomas. We describe our long-term experience of a resistant PRLoma treated with pasireotide.

Case: A 68-year-old man presented in 2010 with dizziness and disequilibrium. His serum PRL was 900–1300 mcg/L. Imaging showed a 3.4cm sellar lesion with compression of the optic chiasm. He was diagnosed with a macroPRLoma and started on cabergoline 1mg twice weekly. Serum PRL was reduced to 0.4mcg/L after 4 months of therapy, but there was no tumor shrinkage or improvement in vision. Pasireotide was initiated as part of a study in 2011. A 50% reduction in the tumour size was observed. While on pasireotide, he developed hyperglycemia and was treated. PRL levels remained in the low-normal range and tumour size has been stable for >10 years.

Discussion: Pasireotide is a long-acting SSRL used for acromegaly and Cushing's disease. It has preferential affinity for SSTR5 compared to octreotide, which predominately binds to SSTR2. It has been proposed as an alternative treatment for PRLomas because lactotroph tumours can express somatostatin receptors. Previous cases have reported short-term response to pasireotide, particularly in lesions which have high SSTR5 expression, and in some co-secreting tumours. This case report highlights the longest follow up of a resistant macroPRLoma showing sustained response to pasireotide.

VIEW POSTER

Management of Autoimmune Hepatitis Under Mitotane Therapy: Reintroduction of Mitotane with High Dose Corticosteroids for Targeted Mitotane Therapeutic Levels in a Patient with Recurrent Myxoid Adrenocortical Carcinoma

Tzvetena Hristova*, Daphna Fenyves, Christine Cloutier, Mathieu Latour, Pierre Karakiewicz, Harold Olney, Zaki El Haffaf, Isabelle Bourdeau

Université de Montréal

We report the case of a 43-year-old male diagnosed with non-secreting myxoid adrenocortical carcinoma (ACC) subtype stage 2 (7x6x5,5 cm, ki67 18%, Weiss score 6/9). Multigene panel testing revealed a germline pathogenic variant in the ATM gene. Post adrenalectomy, mitotane was initiated within 2 months and increased to 2,5g daily within 6 weeks. 11 weeks after starting mitotane, liver enzymes were as follows: ALT 127 U/L (N: 10-39), AST 54 U/L (N: 13-39), ALP 165 U/L (N: 36-110), GGT 489 U/L (N: 9-47), while pre-mitotane levels were normal. Although mitotane was stopped, ALT increased to 255 U/L and remained high for 10 weeks after cessation. After liver biopsy, auto-immune hepatitis was diagnosed. Treatment with 40mg prednisone daily was initiated. 8 weeks later, liver enzyme values had decreased to ALT 74 U/L, AST 20 U/L, ALP 108 U/L, GGT 84 U/L, and prednisone was lowered. ACC recurred 3 months later, about one year after the initial adrenalectomy. After surgical resection, mitotane was restarted at 500mg daily with prednisone 40mg daily. As liver enzymes stayed within normal ranges, mitotane was slowly increased to 2.5g daily, with mitotane plasma levels of 11.3mg/L, whereas prednisone was decreased gradually to 12.5mg daily. Second ACC recurrence occurred one year later and mitotane was increased to 3g daily under prednisone 12.5mg reaching mitotane levels up to 21.2 mg/L with surgical debulking. Further therapeutic avenues are being considered for a rapid recent ACC recurrence, such as PARP inhibitors for targeted therapy in the context of ATM gene mutation.

VIEW POSTER

A Case Report of a Postpartum Pituitary Abscess with Associated ICA Arteritis

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Shadan Ashrafi,
Jessica M. Mackenzie-Feder

University of British Columbia

Pituitary abscess represents 0.2 – 1% of all pituitary lesions. An abscess occurs through hematogenous spread or direct extension from infected tissue. Most patients present with non-specific symptoms such as headache, nausea/vomiting, or vision changes. The non-specific presentation and heterogenous radiologic findings, as well as slowly progressive symptoms, make the diagnosis of this condition difficult. As a result, most pituitary abscesses are almost exclusively diagnosed intraoperatively. To date, there have been very few cases of pituitary abscesses, with only 2 previous cases published to our knowledge. We present a case of a 37-year-old woman who presented with symptoms of sepsis and hypopituitarism in the postpartum period, and required urgent neurosurgical intervention due to rapidly progressive visual deterioration and persistent altered level of consciousness. She was found to have a pituitary abscess, from hematogenous spread of Group A Streptococcus from mastitis, with associated left internal carotid artery arteritis. Despite surgical intervention, she had multiple permanent endocrinopathies, including vasopressin deficiency, central hypothyroidism, central hypogonadism, and central adrenal insufficiency.
We hope that our case highlights the importance of considering pituitary abscess as a diagnosis when working up a sellar lesion in a post-partum woman, and the pre-operative diagnostic challenges of pituitary abscesses, while also highlighting some unique aspects of this disease, including the potentially rapid progression of symptoms, infectious ICA arteritis as a complication, and permanent hormone deficiencies requiring lifelong hormone replacement.

VIEW POSTER

Compound Variants in SDH and VHL with Synchronous Paragangliomas in the Thyroid and Adrenal Glands

Mohammad Jay*, Youstina Soliman, Shereen Ezzat, Antoine Eskander, Angela Assal

University of Toronto

Background: Paragangliomas are neuroendocrine tumours that can occur throughout the body. Intrathyroidal paragangliomas comprise 0.5% of cases and are typically confined to the thyroid bed. Multiple paragangliomas suggest an underlying genetic syndrome but can also be confused with metastatic disease. Increased genome sequencing have uncovered variants in cancer susceptibility genes (CSGs). We present a case of multifocal paragangliomas associated with two CSGs.

Case: During lipoma workup, a 54-year-old man was incidentally found to have a 4.6cm right thyroid mass invading the trachea, 2.0cm left adrenal mass, and two pelvic masses on imaging, suggestive of paragangliomas. He had no symptoms of catecholamine excess or relevant family history. Bloodwork revealed elevated plasma normetanephrine (2.33nmol/L;reference< 0.90nmol/L), normal metanephrine, 3-methoxytyramine, TSH, calcium, CEA, and calcitonin. Following adrenalectomy, pathology revealed a succinate dehydrogenase B (SDHB)-deficient pheochromocytoma. Hemithyroidectomy showed another SDHB-deficient paraganglioma. Both sites had intact S100/Sox10 staining sustentacular cells, indicating primary origins. Post-operatively, normetanephrine normalized. The non-secretory pelvic lesions remain under surveillance. Genetic testing revealed a pathogenic SDHB variant (c.(?-21)(72+21_73-21)del)(exon 1), and a Von Hippel-Lindau (VHL) variant of uncertain significance (VHL c.376G>A,p.(Asp126Asn), both predicting protein translation defects. This VHL variant is associated with polycythemia (not detected in our patient), but not with paraganglioma.

Discussion: Our case extends the list of multi-locus inherited neoplasia syndromes, underscoring the importance of germline and tissue testing. The latter can establish relationships between constitutional variants and their protein expression as potential tumour drivers. Interdisciplinary management, including genetic consultation, is essential to assess the clinical relevance of variants of uncertain significance.

VIEW POSTER

A Rare but Serious Complication of Fine Needle Aspiration Biopsy of the Thyroid

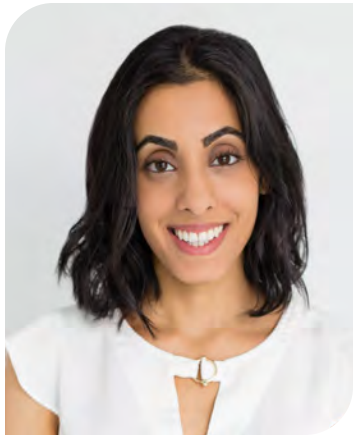
Mohammad Jay*, Jeannette M. Goguen

University of Toronto

Background: Fine needle aspiration biopsy (FNAB) is widely used to evaluate thyroid nodules for malignancy, with pain and minor hematomas being the most common complications. Large hematomas and severe hypothyroidism following FNAB are rare. We present a case of an extensive hematoma and profound hypothyroidism after FNAB. Case: A 37-year-old woman with macroprolactinoma on cabergoline and subclinical hypothyroidism presented with neck pain. Ultrasound revealed a 1.3 cm hypoechoic nodule in the right thyroid lobe, prompting an FNAB, which returned non-diagnostic results. Days later, she developed severe neck pain and swelling. Ultrasound revealed a diffuse hematoma involving the entire right thyroid lobe, extending across the isthmus into the left lobe. TSH was suppressed (< 0.01 mU/L) and free T4 (FT4) was normal. Conservative management was initiated. At three months, the hematoma resolved, but labs showed profound hypothyroidism with TSH 285 mU/L and FT4 < 2 pmol/L, along with mild symptoms of hypothyroidism. She was started on levothyroxine 50 mcg daily, which normalized her thyroid function. Remarkably, the original nodule resolved on follow-up ultrasounds. Seven years later, she continues on thyroid hormone replacement.

Discussion: This case demonstrates a rare FNAB complication – transient hyperthyroidism, from trauma-induced thyroiditis, followed by profound hypothyroidism due to extensive follicular cell loss from a large hematoma. While interventions like embolization or hemithyroidectomy may be warranted in more severe cases, our patient was successfully managed conservatively. This highlights the need for close follow-up post-FNAB, especially with persistent pain or swelling, and the importance of clear communication regarding potential complications.

VIEW POSTER



Novel Pathogenic ARMC5 Gene Variant Associated with Primary Bilateral Macronodular Adrenal Hyperplasia with Postural Response on Aberrant Receptor Testing

Simaran Kalkat*,
Joseph Leung,
Huaying (Helen) Zhao

University of British Columbia

Background: Primary bilateral macronodular adrenal hyperplasia (PBMAH) is a rare cause of adrenal Cushing syndrome, often associated with pathogenic mutations in the ARMC5 gene, and aberrant G protein coupled receptor stimulation of hypercortisolism. We report a case of PBMAH with a novel familial ARMC5 gene mutation and aberrant receptor stimulation of cortisol secretion, with transient response to beta blockade.

Clinical Case: A man in his 70s with hypertension, dyslipidemia, and type 2 diabetes was incidentally found to have bilateral adrenal nodular hyperplasia on imaging. Work up was positive for hypercortisolism via 24-hour urine (7.5x upper limit of normal, ULN), midnight salivary, and post-dexamethasone suppression testing, with suppressed ACTH. Aberrant receptor testing demonstrated a significant cortisol response to postural changes. Propranolol therapy was initiated, and 24-hour urine cortisol normalized at 6 weeks. Subsequent 24-hour urine cortisol levels rose to 2.5 and 4 x ULN at 14 weeks and 28 weeks, respectively. He underwent left adrenalectomy, and 24-hour urine cortisol decreased to 2 x ULN. Genetic testing revealed a novel heterozygous nonsense ARMC5 gene variant c.2275C>T, p.(Gln59*). This variant is predicted to truncate the peptide by 177 amino acids, rendering it non-functional. Familial variant testing in all available first-degree relatives revealed that his daughter also carries this pathogenic mutation, but none of his 4 siblings are carriers.

Conclusion: Classifying ARMC5 variants in PBMAH allows for familial screening and early disease detection. Aberrant receptor stimulation testing and antagonism may provide alternative options for medical disease management and delay surgical intervention in Cushing syndrome.

VIEW POSTER

Kimberley Lau*,
Miranda Boggild

University of Toronto

A Rare Case of Camurati-Engelmann Disease

Background: Camurati-Engelmann disease (CED) is a rare autosomal dominant hereditary condition characterized by symmetrical cortical thickening of the long bones of extremities, in addition to skull hyperostosis, caused by mutations of the transforming growth factor-beta 1 gene (TGFB1). In this clinical vignette, we highlight the radiological findings, clinical manifestations, and approach to management of a patient with CED.

Case Description: A 33-year-old woman with celiac disease was first suspected to have CED when she was in high school, following a fall on ice for which an X-ray of her upper extremity showed cortical thickening. Subsequent bone scan provided diagnostic confirmation after revealing diaphyseal dysplasia of her arms, legs, and skull, in the context of positive family history. Bone mineral density showed lumbar spine Z-score of -2.1, femoral neck +4.2, total hip +4, and forearm +14.5. Labwork was significant for C-telopeptide >2000 ng/L. She reports flares of burning pain affecting her extremities, poor exercise endurance, and restless legs, with new episodes of dizziness recently, associated with CT findings of diffuse sclerosis of the skull base and part of the frontal, temporal, and parietal bones.

Clinical Management and Discussion: Zoledronic acid was attempted to address her pain, which was ineffective and prompted consideration of steroids and/or losartan, with ongoing discussion with Rheumatology for concern of the development of a chronic pain syndrome. Limited evidence currently exists for treatment of CED, with management focused mainly on preventing secondary causes of bone loss, monitoring for progression of neurological manifestations, and bony pain relief.

VIEW POSTER

Intractable Hypoglycemia in a Pregnant Patient with Pre-Existing Type 2 Diabetes on No Anti-Hyperglycemic Medications

Sara Lukmanji*,
Gurleen Gill,
Heather A. Lochnan

University of Ottawa

Background: In pregnancy, insulin requirements typically increase in the second trimester and serious or progressive hypoglycemia is unusual. Insulin autoimmune syndrome and type B insulin resistance are autoimmune causes of hypoglycemia due to insulin autoantibodies and insulin receptor antibodies respectively, both of which are rarely reported in pregnancy.

Case: A 31-year-old with Type 2 Diabetes on no anti-hyperglycemic agents presented with progressive hypoglycemia starting at 8 weeks of pregnancy and requiring admission for dextrose infusion in the third trimester. Pre-pregnancy, she was taking glargine 80-100 units daily, lispro 0-30 units with meals, and Janumet (A1C 12.4%). She stopped this regimen when her pregnancy was confirmed since she had pregnancy-associated hypoglycemia previously. Investigations at 15 weeks gestation revealed a glucose of 3.9 mmol/L (4-11 mmol/L), insulin of 3.1 pmol/L, C-peptide of < 33 pmol/L (298-2350 pmol/L), anti-insulin antibody 0.6 kU/L (< 4 kU/L). Repeat investigations at 17 weeks demonstrated a venous blood gas with a glucose of 3.1, insulin of 370, and C-peptide of 133. An anti-insulin antibody was repeated at term, and it was elevated at 3.2.

Conclusion: The results align with exogenous insulin use, or effect of insulin antibodies on production or prolongation of insulin effect. The patient reported no insulin use since the first trimester and her oral anti-hyperglycemic screen was negative. This picture is likely due to insulin autoimmune syndrome which is concordant with her elevated anti-insulin antibody. Her hypoglycemia resolved post-delivery, and notably her newborn had to be treated for hypoglycemia consistent with transfer of maternal antibodies.

VIEW POSTER

Tiffany Mach*, Mohammad Jay, Maria Wolfs

McGill University

The Hidden Cost of Bone Strength: Unraveling Zoledronate-Induced Hypophosphatemia

Zoledronate, a third-generation bisphosphonate, is commonly used in the treatment of osteoporosis, however it is rarely associated with severe hypophosphatemia. We present a case of a 31-year-old male, admitted for multiple complications related to his stercoral colitis requiring total parenteral nutrition (TPN). He was referred for the evaluation of multiple non-traumatic vertebral fractures and bone mineral density testing confirmed low bone mass. Baseline laboratory investigations revealed normal ionized calcium, magnesium, phosphorus and renal function. His vitamin D and PTH levels were both normal. He had mild hypogonadotropic hypogonadism attributed to acute illness. Given multiple fragility fractures and ongoing risk factors for bone loss, a dose of zoledronate 4 mg was given intravenously. Two days after receiving zoledronate, repeat investigations showed serum phosphate < 0.30 mmol/L, ionized calcium 1.04 mmol/L and serum magnesium 1.11 mmol/L. His PTH increased to 28.1 pmol/L. No clinical features of hypophosphatemia were present, and the electrocardiogram was unremarkable. Due to his limited oral intake, he received daily doses of intravenous sodium phosphate, in addition to increasing the sodium phosphate concentration in his TPN bag, until normalization of his phosphate levels within nine days of receiving zoledronate. This case highlights the importance of closely monitoring phosphate levels following zoledronate administration, particularly in patients at risk of developing hypophosphatemia. Zoledronate's direct effects on bone metabolism can result in electrolyte disturbances through inhibition of osteoclasts, which prevents bone demineralization and release of phosphate into the extracellular fluid, and/or through an increase in PTH, which causes increased urinary phosphate excretion.

VIEW POSTER

Response to Pramipexole in an Ergot Derivative Intolerant Patient with Prolactinoma

Joanna Mader*, Sarah Howse, Tyler Adamson, Ryan Dupere, Syed Ali Imran

Dalhousie University

Introduction: PRLomas are common functioning pituitary adenomas that are highly responsive to dopamine agonists (DA). Currently two ergot-derived DA, bromocriptine and cabergoline, are available in Canada. We describe a case in which a non-ergot DA, pramipexole, was effective in lowering serum prolactin (PRL). This may be useful in patients unable to take ergot-derived DA.

Case: A 48 year-old male patient presented with hypogonadism in the context of elevated PRL up to 320 mcg/L. Imaging was limited to non-contrast due to his advanced chronic kidney disease (CKD), but no adenoma was found on MRI. PRL was higher than typical CKD-induced hyperprolactinemia, so he was given cabergoline 0.5 mg biweekly, resulting in improvement in PRL. However, he was intolerant to the medication due to protracted side effects. Subsequent DA trials of bromocriptine and cabergoline were once again stopped due to side effects. Over the years, his PRL climbed as high as 876 mcg/L and he opted for low dose cabergoline (0.25 mg/week) despite side effects, which stabilized PRL in the 400-600 mcg/L range. Recently, he developed restless leg syndrome and was started on pramipexole by his family physician. His PRL levels immediately dropped to 80.6 mcg/L. In view of this change, he has discontinued cabergoline while maintaining pramipexole with ongoing monitoring.

Discussion: Pramipexole has previously been shown to decrease PRL levels, and in the absence of of other non-ergot DA therapy availability in Canada, further study is needed to evaluate the use of pramipexole in ergot DA intolerant patients with PRLoma.

VIEW POSTER

Small-Size Poorly Differentiated Lung Cancer Mimicking an Adrenocortical Carcinoma Presentation: A Case Report

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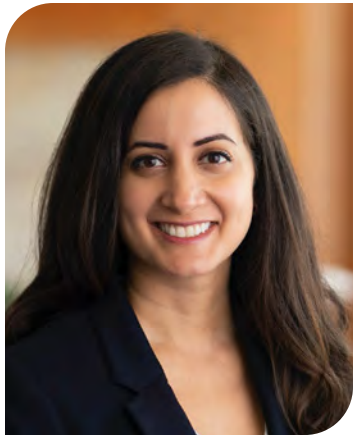
Université de Montréal

The most common causes of malignant adrenal incidentalomas are metastases of extra-adrenal cancers and adrenocortical carcinomas (ACCs). The latter is frequently metastatic on initial presentation, most commonly to the liver, lungs and bones. Imaging and hormonal studies are usually sufficient to distinguish these two entities; fine-needle aspiration biopsy is reserved for rare cases where cytological diagnosis would change management. Herein we present the case of a 62-year-old man with a history of smoking, type 2 diabetes and coronary artery disease who presented with lumbar pain. Imaging studies described an 11-centimeter necrotic right adrenal mass (SUVmax 21.5) suspected to be the primary lesion invading the liver, diaphragmatic pillar and inferior vena cava, and a unique 1.4-centimeter right upper lung lesion (SUVmax 5.6) with a 1.6-centimeter right paratracheal adenopathy (SUVmax 3.8). The left adrenal gland was normal. Biochemical workup revealed an elevated morning cortisol following 1-mg dexamethasone suppression test (1037nmol/L; N< 50), a lower-than-normal ACTH (2.5pmol/L; N3.6-13.9), a high midnight salivary cortisol (39.8nmol/L; N< 3), a low DHEAS (0.6micromol/L; N1.0-8.5), and normal potassium; the rest of the hormonal evaluation was normal. Metastatic cortisol-secreting ACC was initially considered highly likely, but results of the adrenal mass biopsy surprisingly suggested a poorly differentiated neoplasia of pulmonary origin (negative SF1 and ACTH; positive PD-L1, TTF-1 and CK7). This case highlights the usefulness of adrenal biopsy in metastatic non-adrenal cancer and that primary cancer at metastatic stage may be small despite large adrenal metastasis. It remains unclear whether hypercortisolism resulted from local effect of metastasis in the adrenal.

VIEW POSTER



Mitra Moazzami*, Afshan Zahedi

University of Toronto

Micro-Papillary Thyroid Cancer with Renal Metastasis: An Unusual Initial Presentation

Papillary thyroid cancer (PTC) is a prevalent malignancy, yet metastasis occurs in approximately 10% of cases, most commonly affecting the bone and lungs. Renal metastasis is particularly rare with only 30 reported instances. It is exceedingly unusual for renal metastasis to be the initial presentation of PTC. We present the case of a 69-year-old man who initially sought medical attention for abdominal pain and was subsequently diagnosed with a right renal mass thought to be renal cell carcinoma. He underwent a right nephrectomy revealing a mass measuring 6.5 x 5.5 x 7.0 cm that had positive staining for CK7, TTF1 and thyroglobulin and negative for CK20, confirming metastatic PTC. He had no history of exposure to radiation and no family history of thyroid malignancy. Following this, he underwent a total thyroidectomy and central neck dissection, which identified a single focus of PTC - follicular variant of 0.4 cm with no lymph node invasion and characterized as low risk with no adverse features. He subsequently underwent radioactive iodine ablation. His I131 whole body scan showed no evidence of distance metastasis. This case underscores that even small micro-PTCs have ability for distant metastasis. It also highlights the importance of considering a comprehensive diagnostic approach in such atypical presentations.

VIEW POSTER

Cushing's in Bloom: Navigating a Rare Endocrine Challenge During Pregnancy

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University of Ottawa

Background: Hypercortisolism typically results in anovulatory infertility, making pregnancy in Cushing's syndrome (CS) rare. To date, less than 250 cases of pregnancy in Cushing's have been described, most of which are caused by adrenal tumors. Pregnancy in CS carries increased risk of maternal-fetal complications.

Case: A 25-year-old female with a history of surgically-treated ACTH-producing pituitary adenoma presents 4 years later with newly elevated urinary free cortisol (UFC 710 nmol/d). Six months later, she became pregnant. A repeat UFC was 1277 nmol/d and ACTH was 11.2 pmol/L. The primary pregnancy complication was escalating insulin requirements for diabetes. Third trimester UFC was 403 nmol/d and midnight salivary cortisol was elevated at 8.8 nmol/L. At 37 weeks, she underwent a cesarean, giving birth to a healthy baby. Following delivery, UFC remained elevated but decreased from 451 nmol/d immediately postpartum to 406 nmol/d two months later. Her diabetes remains a challenge to manage. An MRI did not reveal clear evidence of recurrence. Given persistently high UFC, a dexamethasone suppression test was ordered.

Discussion: The diagnosis of CS in pregnancy is challenging. In addition to a lack of validated reference ranges, there is an overlap with pregnancy symptoms and complications. Lab interpretation is confounded by physiological changes of pregnancy including elevated UFC during second and third trimesters. Pregnancy may also induce Cushing's. This case describes a rare example of recurrent pituitary Cushing's and its management during pregnancy.

VIEW POSTER

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Ariane Godbout

Université de Montréal

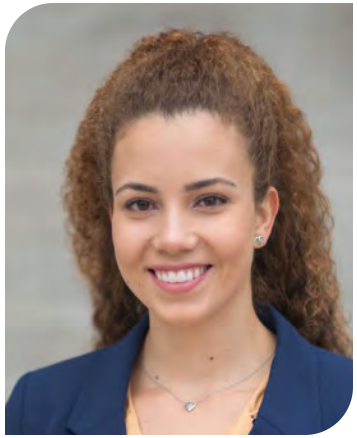
Pregnancy Recurrence in a Von Hippel-Lindau Case

Introduction: Von Hipple-Lindau disease (VHL) is a genetic condition leading to tumor development in multiple organs. Pregnant women with VHL are at higher risk of materno-fetal complications, as well as of pheochromocytoma and neurological and retinal hemangiomas.

Clinical Case: A 35-year-old woman with VHL was recently assessed at the preconception clinic. The patient presented a history of three pregnancies. The first occurred at 22 years old, when the VHL diagnosis was made. On the first trimester ultrasound, bilateral pheochromocytomas were found. Due to uncontrolled hypertension, bilateral adrenalectomy was performed at 19 weeks of gestation. 24-hour urinary concentrations of normetanephrine (NMN) and metanephrine (MN) were respectively of 18620 nmol/L and 229 nmol/L at diagnosis, and of 251 nmol/L (NMN) and 109 nmol/L (MN) post-operatively. Hypertension persisted and complicated with severe preeclampsia requiring an emergent cesarean section at 28 weeks of gestation. Hypertension resolved in post-partum (NMN of 196 nmol/L (normal < 240 nmol/L) and MN of 145 nmol/L (normal < 275 nmol/L)). A retinal hemangioma was also diagnosed during this pregnancy, which spontaneously recovered in post-partum. The second and third pregnancies of the patient occurred at 27 and 31 years old without any hypertensive event, under aspirin prophylaxis. Her annual catecholamine screening remained negative since then. At 32 years old, the patient was diagnosed with renal clear cell carcinoma treated with partial nephrectomy. VHL genetic testing in children was negative.

Conclusion: This case depicts a potentially decreased risk of complications in VHL pregnant patients with appropriate management in a specialized clinic.

VIEW POSTER



Patricia Palcu*,
Mohammad Jay,
Julie Gilmour

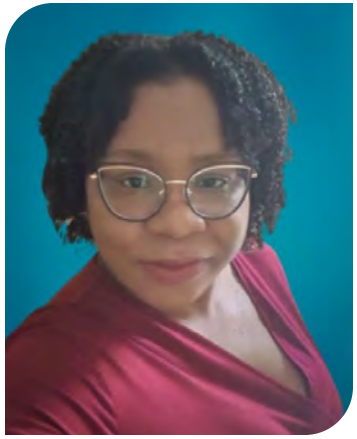
University of Toronto

The Secret is in the Supplement

Case: A 71-year-old woman presented with 50 lbs of weight gain in one year, easy bruising, hypertension, and facial plethora. Her presentation was in keeping with hypercortisolism; however, she had multiple dexamethasone suppression tests performed demonstrating an undetectable cortisol level. A random 8am cortisol and ACTH level were surprisingly also undetectable. Her medication list was searched in hopes of finding an agent that contained glucocorticoids, but none was found. The ingredients in a nutraceutical, called Rmsol, which she began using for osteoarthritis pain one year prior, were also reviewed with no identifiable steroid on the labelling. Given the correlation of her symptom onset and the initiation of the supplement, we wondered if there could be a secret ingredient in the supplement. The pill was sent to our biochemists, who found betamethasone-21-phosphate, diclofenac, and 12.8 ug of dexamethasone/tablet. She was asked to discontinue the supplement and switch to hydrocortisone 10mg/5mg. Five months later, an ACTH stimulation test was performed showing recovery of the hypothalamus-pituitary-adrenal (HPA) axis (60-min cortisol 469 nmol/L). Her hydrocortisone was then discontinued and she has had no ongoing symptoms of adrenal insufficiency. We reported the supplement to Health Canada.

Discussion: Approximately 73% of Canadians use nutraceuticals and rare cases of supplement-induced Cushing's syndrome with subsequent adrenal insufficiency have been described in the literature. This case highlights the importance of taking a good history around nutraceutical intake and to assume a high degree of suspicion when considering the "true" ingredients in an unregulated health product.

VIEW POSTER



The Case of the Salty Boy

Gabrielle G. Scantlebury,
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Daniel L. Metzger

University of British Columbia

Objective: To describe an unusual etiology of hyponatremia, hyperkalemia, and failure to thrive in infancy.

Case Description: A 6-month-old boy, born at term with an uncomplicated antenatal and postnatal course, was referred to our endocrinology clinic for assessment of hyponatremia and hyperkalemia. His medical history included severe eczema from infancy, requiring treatment with antibiotics, topical steroids, and emollients. He was also failing to thrive. His family history was unremarkable, with self-reported parental ethnicities Caucasian and Cantonese. Initial endocrine investigations revealed sodium 129 mmol/L, potassium 6.1 mmol/L, cortisol 350 nmol/L (240–618), aldosterone 48.400 pmol/L (140–2500), renin 25.09 ng/L/s (< 3.90), aldosterone/renin 1929 (< 1500), pH 7.40, normal renal ultrasound. Differential diagnoses, including pseudohypoaldosteronism, congenital adrenal hyperplasia, urinary tract infection, renal anomalies, Bartter and Gitelman syndrome, were ruled out. On follow-up, repeat electrolytes normalized with improvement of his eczema, along with improvement in his weight.

Discussion: There is an association between severe atopic dermatitis, hyponatremia, hyperkalemia and elevated aldosterone levels. This has been primarily reported in Japanese publications; Asian individuals may have higher prevalence of eczema compared to other ethnic groups. These electrolyte abnormalities are hypothesized to result from extensive sodium loss in eczematous exudates, exacerbated by exclusive breastfeeding. Elevated potassium levels are thought to stem from decreased sodium delivery to the distal nephron. Impaired Na+, K+-ATPase function (due to hypoalbuminemia associated with failure to thrive) and physiological aldosterone insensitivity in infancy also contribute to the condition. In all cases reported, electrolyte abnormalities resolved with treatment of atopic dermatitis.

VIEW POSTER

A Case of Severe Treatment-Induced Neuropathy Following Diagnosis of Latent Autoimmune Diabetes of Adulthood

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Western University

Introduction: Treatment-induced neuropathy in diabetes (TIND) is an uncommon complication of diabetes with acute-onset of severe, neuropathic pain related to small fibre neuropathy following rapid improvement in glycemic control after prolonged hyperglycaemia. TIND is thought to be an underreported phenomenon, and guidance for prevention and optimal management is limited.

Case: A 64 year-old woman was admitted to hospital with severe diabetic ketoacidosis (DKA) and COVID-19 infection. She had been diagnosed with type 2 diabetes 9 years prior and treated with metformin. Her A1C at admission was 11.8%, C-peptide was low (130 pmol/L) and anti-GAD65 antibodies were positive(186 IU/mL), consistent with latent autoimmune diabetes in adults (LADA). She was started basal-bolus insulin. Within 1 month of insulin initiation, she developed bilateral leg hyperalgesia, followed by progressive weakness and sensory deficits. Her A1C decreased to 7.9% after three months of treatment. Five months after discharge, she could no longer ambulate due to her symptoms, requiring inpatient admission. Spinal MRI showed no structural abnormality to account for her symptoms, and nerve conduction studies confirmed an axonal sensorineural peripheral neuropathy. Her presentation was attributed to TIND and muscle loss from prolonged catabolic state preceding treatment. Rehabilitation progress was limited by severe neuropathic pain, requiring 2 months of inpatient rehabilitation.

Discussion: This case illustrates a severe presentation of TIND, leading to significant morbidity after rapid glycemic improvement in a patient with newly diagnosed LADA. Clinicians must remain aware of TIND as a potential cause of acute neuropathic pain, and closely monitor patients initiating therapy.

VIEW POSTER

L-Type Amino Acid Transporter 1 Expression Levels are Associated with Pituitary Tumor Behaviours

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University of Alberta

VIEW POSTER

Given the morbidity and limited treatment options for pituitary tumors (PTs), we need better biomarkers and treatment options. Previous studies demonstrated that L-type amino acid transporter 1 (LAT1) is overexpressed in cancer and regulates cancer cell growth. Moreover, pharmacological LAT1 inhibition suppresses cell proliferation. Our previous study (Mol Cell Endocrinol. 2020 Sep 15;515:110868.) showed LAT1 is expressed in rat PT cells, and JPH203 (nanvuranlat), a specific inhibitor of LAT1, suppresses PT cell growth and hormone production. In this study, we examined the immunohistochemical LAT1 expression in 73 human PT tissues and its associations with clinical features. LAT1 expression was considered positive if distinct membrane staining was detected. Staining intensity as assessed by the Endou-score (J Surg Oncol. 2009;99:433–438.) was evaluated by two experienced neuropathologists independently: score 1: 0-10% of tumor area stained; score 2: 11 – 25% stained; score 3: 26 – 50% stained; score 4: 51% stained. Endou-score 3 and above was defined as high expression and 2 and below as low expression. Chi-squared analysis was performed to compare the clinical data between the two groups. LAT1 immunoreactivity was seen in 72/73 samples (98.6%) with high LAT1 expression in 48 vs low expression in 25 samples. High LAT1 expression was associated with a higher frequency of invasion in PTs ($p< 0.05$) but not the tumor size or the age of patient. Our data suggest that LAT1 can be a biomarker for aggressive pituitary behaviors. Together with our previous study, targeting LAT1 may serve as a new therapeutic target for PTs.

A Case of Refractory Torsades de Pointes Associated with Immune-Checkpoint Inhibitor-Related Hypothyroidism

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Decompensated hypothyroidism has been associated with prolongation of the QTc interval, which can lead to ventricular arrhythmias, which are often refractory to cardioversion. We present a case of a 34-year-old woman with BRCA1 mutation-associated breast cancer who developed pembrolizumab-induced hypothyroidism with intermittent levothyroxine adherence. During her mastectomy, she had a bradycardic arrest requiring CPR, atropine, and epinephrine. Upon ICU admission, TSH was 91.6 mIU/L, fT4 was < 0.5 pmol/L, fT3 was 0.7 pmol/L, and random cortisol was 140 nmol/L. Her echocardiogram showed a decrease in her LVEF to 10-15% from 47% three months prior. Her ECG showed sinus rhythm with a remarkably prolonged QTc interval of 734 ms. She was treated with an IV load of levothyroxine (T4) 250 mcg followed by 75 mcg daily and hydrocortisone 50 mg IV q6h. That night, she developed pulseless polymorphic ventricular tachycardia, necessitating CPR, epinephrine, four defibrillation shocks, and multiple antiarrhythmics to achieve ROSC. She was subsequently given a liothyronine (T3) 10 mg load, and her levothyroxine dose was increased to 100 mcg daily. QTc interval 6 hours later was normal at 445 ms. Over the following 5 days her thyroid indices and cardiac function improved. She was discharged on oral replacement doses of levothyroxine and hydrocortisone. This case emphasizes the importance of assessing hemodynamic risk factors, such as QTc prolongation in decompensated hypothyroidism. We propose that clinicians consider early administration of liothyronine in addition to IV levothyroxine in patients at high risk for cardiac decompensation.

VIEW POSTER

A Case of New Onset Type 1 Diabetes Presenting with Severe Hypothyroidism

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McGill University

Background: Clinical manifestations of hypothyroidism may vary widely from severe, life-threatening conditions to completely asymptomatic presentations. While the risk of hypothyroidism is elevated in children with type 1 diabetes (T1D), the simultaneous onset of both conditions remains relatively uncommon.

Case Presentation: A 9-year-ol girl was referred to endocrinology due to height deceleration with a growth velocity of 1.5 cm/year associated with obvious weight gain (+10 kg) over the past year. She was otherwise asymptomatic, with no reported changes in appetite, diet, physical activity, urination or bowel movements. Her past medical history was notable for alopecia areata. Family history did not reveal any autoimmune disease. On physical examination, height: 124.5 cm (10th %) and weight was:31.9 kg (75th %). Cheeks were erythematous and puffy but she had no dysmorphic features. Thyroid was not enlarged and visual fields were normal. Initial investigations were notable for elevated random blood glucose level:27.6 mmol/L (3.9 – 11mmol/L), normal blood gas, negative ketones, HbA1C:9.5% (5.0- 6.0%); and TSH: 473.43 (0.34–5.60 mU/L), FT4: < 2.50 (8.0-18.0 pmol/L). TPO and GAD autoantibodies were positive. Treatment was initiated with a low dose of Levothyroxine (12.5 mcg) which was progressively increased alongside insulin therapy (total daily dose 0.3 Ui/kg/day). During treatment, TSH decreased gradually and normalized after 28 weeks, HbA1C showed a 1% reduction.

Conclusion: Hypothyroidism can be challenging to diagnose clinically. When severe, hypothyroidism can lead to reduced glomerular filtration, masking concurrent onset of classic symptoms of T1D. Evaluation for T1D may warranted in children presenting with severe hypothyroidism.

VIEW POSTER

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University of Calgary

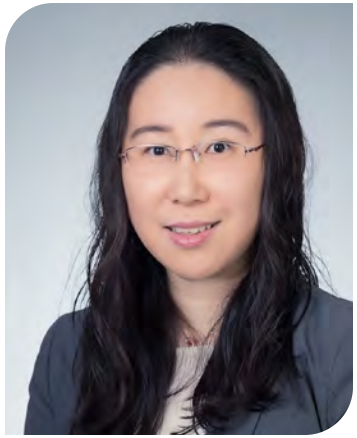
A Rare Case of IgG4-related Hypophysitis: A Clinical Vignette

Background: IgG4-related disease is an immunologic condition with multi-organ manifestations including pancreatitis, pulmonary disease and retroperitoneal fibrosis. Little is known about pituitary involvement of the disease.

Case: A 53-year-old female presented with new headaches, proptosis, diplopia and left eye ophthalmoplegia in the context of a 10-year history of chronic inflammatory steroid dependent lung disease, chronic otitis media and a middle ear mass resulting in impaired hearing. MR Sella revealed a peripherally enhancing lesion with evidence of suprasellar extension and thickening of the stalk suggestive of chronic hypophysitis. A diagnosis of multi-system IgG4-related disease was determined after a retrospective review of bronchial and middle ear biopsies. Pathology revealed a markedly inflammatory process, fibrosis and > 20 IgG4-positive plasma cells per HPF and > 40% of total plasma cells staining positive for IgG4. Importantly, there was no evidence of alternative diagnoses. Screening for sarcoid, syphilis, paraneoplastic syndromes, vasculitis and malignancy were negative. Therefore, her hypophysitis was determined to be secondary to IgG4-related disease. Endocrine labs revealed a slightly elevated prolactin of 47, normal TSH and T4 and a suppressed LH and FSH inconsistent with her postmenopausal state. There was evidence of central adrenal insufficiency due to chronic prednisone use. Treatment with high dose steroids and Rituximab resulted in rapid symptom improvement. Subsequent imaging showed reduction in the size of sellar lesion. Her neurologic exam and prolactin normalized. Three years later, pituitary function remains intact apart from gonadotropins.

Conclusion: IgG4-related disease remains an important consideration in the differential diagnosis of hypophysitis.

VIEW POSTER



A Case of Central Arginine Vasopressin (AVP) Deficiency in a Patient with Cerebral Palsy (CP)

Xing Sun*, Alexander Sorisky

University of Ottawa

Background: In patients with CP, growth hormone (GH) deficiencies are the most common and can lead to poor growth and delayed puberty. However, these patients can also present with other pituitary hormone deficiencies including AVP deficiency. Median age of presentation is 1.7 years, however as most infants are unable to report polyuria or polydipsia, the patient can be left symptomatic and untreated for many years.

Case Presentation: 29-year-old male with CP and history of GH deficiency, presented with long-standing polydipsia and polyuria which he described as “ever since I can remember”. Since teenage years, he endorses drinking >10L water daily and urinating every 2 hours, including having to wake up 2-4 times every night to urinate and drink. This was associated with severe anxiety when he did not have unlimited access to water. We documented the polyuria and a water deprivation test confirmed central AVP deficiency. MRI sella showed reduced size of the posterior pituitary. Patient was started on DDAVP and symptoms resolved immediately. He expressed to us he “has really never had a good night’s sleep until now!”

Discussion: Pituitary hormone deficiencies are frequently noted in patients with CP. As the pituitary gland is insensitive to anoxic events, these deficiencies may be associated with damage to the hypothalamus. Young patients with CP with polyuria should be investigated for hypernatremia and MRI abnormalities, as earlier diagnosis will lead to earlier treatment with DDAVP that can reduce prolonged negative impacts on quality of life, as in the case with our patient.

VIEW POSTER

A Case of New-Onset Insulinopenic Diabetes in a Patient with Median Arcuate Ligament Syndrome (MALS)

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Katherine Drummond,
Vanessa Tardio

McGill University

Background: Median Arcuate Ligament Syndrome (MALS) is a rare clinical entity caused by extrinsic compression of the celiac artery by the median arcuate ligament. This condition typically affects middle aged women. Clinical presentation is variable and symptoms are largely characterized by severe abdominal pain, nausea, vomiting and weight loss, all of which significantly impact quality of life.

Case: A 49-year old male previously known for well-controlled type 2 diabetes on single-agent oral antihyperglycemic therapy presented to endocrinology follow-up with chronic intermittent abdominal pain and symptomatic hyperglycemia with polyuria, polydipsia and blurred vision. His laboratory investigations demonstrated an elevated glycated hemoglobin (HbA1c 11.2%), and newly insulinopenic diabetes. Previously normal C-peptide levels were low (0.19 nmol/L [normal range 0.37-1.47 nmol/L]), with insulin levels at the lower end of normal (16.1 pmol/L [normal range 13.0-161.0 pmol/L]) and negative anti-GAD antibodies. Abdominal imaging was performed to evaluate the etiology of his abdominal pain, revealing marked compression of the abdominal aorta and celiac trunk by the diaphragmatic crura, consistent with MALS. His oral antihyperglycemic regimen was intensified and insulin therapy was initiated. Surgical consultation was requested to address his MALS.

Discussion: Here, we describe a unique presentation of MALS characterized by worsened diabetes control and new insulinopenia. Although the pathophysiology is unknown, theoretically celiac artery compression may have resulted in pancreatic hypoperfusion and subsequent ß-cell dysfunction. This case highlights a novel cause of auto-antibody negative insulinopenic diabetes. MALS is a rare cause of abdominal pain and its diagnosis requires a high index of suspicion.

VIEW POSTER

Persistently Elevated IGF-1 of Unclear Etiology in a Patient with Cushing's Disease Post Transsphenoidal Resection of a Corticotroph Adenoma

Hamna Tariq*, Rebecca Mitchell, Andrea Opgenorth, Jenny Souster, Karolyn Au, Vivek Mehta, Constance Chik

University of Alberta

A 34-year-old non-pregnant female with Cushing's Disease with a 4-5 mm pituitary microadenoma was concurrently found to have an elevated IGF-1 (328 ug/L, reference range 110-243) with no clinical evidence of acromegaly. A follow- up glucose tolerance test showed suppression of growth hormone to 0.4 ug/L at 120 minutes, suggesting she does not have acromegaly. Management of Cushing's Disease included cabergoline and then later ketoconazole before successful transsphenoidal resection. Pathology was consistent with corticotroph adenoma only. She was started on hydrocortisone 20-10-10 mg after the surgery, which was reduced to a physiologic dose. Serial measurements of IGF-1 continued to show elevation (271-383 ug/L), even after the patient was on physiologic replacement of hydrocortisone. Measurement of IGF-1 with liquid chromatography with tandem mass spectrometry was elevated at 307 ug/L (reference range 59-279) excluding heterophile antibody or IGF binding protein-3 interference. The most recent IGF-1 level, 11 months after successful treatment of Cushing's Disease, shows persistent elevation at 271 ug/L (reference range 110-243) in the absence of alternative etiologies such as pregnancy, chronic kidney disease, hyperthyroidism, supraphysiologic levels of cortisol, lab interference and high protein/high glycemic-index diet. Ultimately this patient may fall within the 2.5% of the population with IGF-1 levels above the upper reference range.

VIEW POSTER

Cost-Benefit Analysis of Empagliflozin in Comparison to G-CSF for Glycogen Storage Disease Ib Treatment: A Canadian Single-Center Case Series

Meng-Chiao Tsai*, Hannaneh Faghfoury, Ari Morgenthau

University of Toronto

Glycogen Storage Disease Type Ib (GSD-Ib) is a rare inborn error of metabolism characterized by hypoglycemia, neutropenia, myeloid dysfunction, and autoimmune disorders including inflammatory bowel disease. Traditional management involves granulocyte colony-stimulating factor (G-CSF), which, while effective, is costly and associated with significant side effects. Recent evidence suggests that empagliflozin, an SGLT2 inhibitor, could be a more effective and better-tolerated alternative by enhancing renal excretion of 1,5-anhydroglucitol-6-phosphate and improving neutrophil count and function. International consensus now recommend empagliflozin for GSD-Ib treatment. This case series presents two patients with GSD-Ib who transitioned from G-CSF to empagliflozin, achieving significant neutrophil recovery without side effects. Patient 1, a 25-year-old diagnosed in early childhood with neutropenia, liver abscesses, infections, and inflammatory bowel disease, and Patient 2, a 31-year-old diagnosed in infancy with recurrent abscesses and cirrhosis, began empagliflozin at ages 22 and 27, respectively. They were titrated to 20mg and 25mg daily, resulting in normalized neutrophil counts and discontinuation of G-CSF. The annual cost of empagliflozin therapy is $2,020 (20mg) and $2,525 (25mg) CAD, respectively, significantly lower than the $12,858 (60mcg daily) and $38,573 (180mcg daily) CAD for the dosing of G-CSF the patients were previously maintained on. These findings highlight the repurposing of a commonly used diabetes medication, empagliflozin, for the unrelated indication of neutropenia in GSD-Ib. Its impact on neutropenia offers a safer, more cost-effective alternative to G-CSF, aligning with international budget analyses and supporting its use in Canadian clinical practice.

VIEW POSTER

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Kirstie Lithgow

University of Calgary

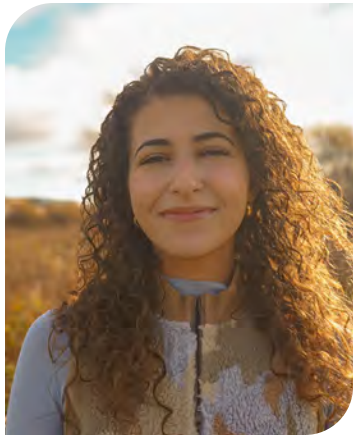
Nelson's Syndrome Caused by an Aggressive Corticotroph Macroadenoma

Background: Nelson's syndrome (NS) is a rare condition characterized by increasing ACTH and progression of corticotroph adenoma following bilateral adrenalectomy for Cushing's disease.

Clinical Case: A 71-year-old woman presented in late 2017 with clinical and biochemical features of ACTH-dependent Cushings' syndrome. MR sella demonstrated two 4 mm foci of hyperenhancement within the pituitary gland but no definitive evidence of microadenoma. The patient opted to pursue definitive treatment with bilateral adrenalectomy (BLA) without pursuing further workup for localization. Following BLA in 2018, she developed clinical hyperpigmentation and progressive elevation of ACTH levels (206-397pmol/L vs. 28-37pmol/L pre-BLA). Follow-up MR sella in December 2019 revealed a 16x17x18mm macroadenoma with suprasellar extension but no chiasmal involvement. She was referred to neurosurgery and underwent transsphenoidal resection in May 2020. Pathology revealed corticotroph adenoma with cytological atypia and elevated proliferative indices (Ki-67 8.3%, p53 51.7%), supporting a diagnosis of NS. MR sella performed on post-operative day 1 demonstrated gross total resection. However, by February 2021 bilateral recurrences within the sella were detected measuring 1.3 x 0.6 x 0.8 cm on the right and 0.8 x 1.0 x 1.0 cm on the left. The patient underwent fractionated radiotherapy (RT) completed April 2021. Since RT there has been ongoing reduction in size of residuum on follow-up MR sella (most recent in January 2024).

Discussion: NS occurs in the setting of aggressive tumour biology and may require multidisciplinary management. All patients should be monitored for this complication post-BLA, even if a pituitary adenoma has not been definitively localized.

VIEW POSTER



Cornstarch as a Treatment for Post-Bariatric Hypoglycemia During Pregnancy

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Janine Malcolm,
Amy Macdonald,
Heidi Dutton

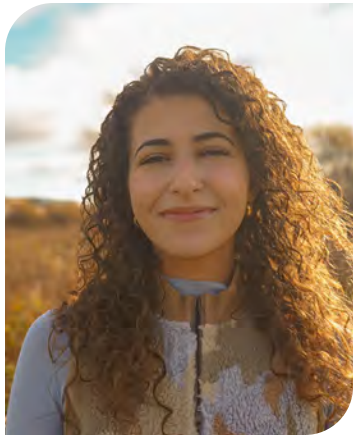
University of Ottawa

Background: Post-bariatric surgery hypoglycemia (PBH) is a common complication of bariatric surgery, with limited data on its management during pregnancy. This case describes the successful use of cornstarch in treating PBH in a pregnant patient.

Case Description: A 31-year-old female with a history of laparoscopic Roux-en-Y gastric bypass surgery in November 2020 presented with PBH in December 2022. She reported fatigue, dizziness and nausea following high glycemic-index meals, with frequent post-prandial hypoglycemia despite adherence to a low glycemic-index diet. Initial treatment with acarbose 25 mg TID provided minimal improvement. Shortly after initial assessment, she was found to be pregnant. As the pregnancy progressed, her PBH symptoms worsened, requiring a gradual increase in acarbose to 75 mg QID. Due to persistent post-prandial and nocturnal hypoglycemia, she was advised to take 3 tablespoons of cornstarch with meals and 4 tablespoons at bedtime. This intervention successfully resolved her hypoglycemia in pregnancy. Postpartum, her symptoms of PBH have improved, now requiring only occasional use of acarbose.

Discussion: The increase in bariatric surgeries among women of childbearing age highlights the importance of recognizing potential complications such as PBH during pregnancy. Early pregnancy involves a physiological increase in insulin secretion and sensitivity, heightening the risk of PBH. Dietary restriction of high-glycemic index carbohydrates is a first-line management strategy; however, it may be insufficient. Cornstarch, a low glycemic-index carbohydrate, degrades slowly, providing steady glucose absorption. This helps maintain stable blood glucose levels, effectively reducing post-prandial and nocturnal hypoglycemia.

VIEW POSTER



Sarah Zankar*,
Irena Druce

University of Ottawa

Disorders of Sex Development in Siblings: The Importance of an Individualized Approach

Background: Disorders of sex development (DSDs) are a group of congenital conditions characterized by atypical chromosomal, gonadal, or anatomical sex development. These conditions can impact physical health, psychosocial development, and gender identity. Management of DSDs requires a multidisciplinary approach tailored to each individual's unique needs.

Case Description: We report the case of two siblings, now in their early 30s, who were assigned female at birth in Iran due to their external genitalia. At puberty, they exhibited features of masculinization, such as voice deepening and hirsutism. Further investigations revealed an XY karyotype and intraabdominal testes. At age 13, they underwent masculinizing interventions, including testosterone therapy, mastectomies, and the surgical creation of a scrotum. They are now living in Canada and followed for ongoing hormone therapy. Interestingly, their treatment preferences have diverged: one sibling wishes to continue with testosterone therapy, while the other is pursuing estrogen therapy and orchiectomy. They have been referred to genetics for further differentiation of their DSD.

Discussion: DSDs present with diverse phenotypes, making diagnosis and management challenging. In individuals with an XY karyotype, DSDs may result from disorders of androgen synthesis (such as 17-hydroxysteroid dehydrogenase deficiency or 5a-reductase deficiency) or androgen action (such as Androgen Insensitivity Syndrome). This case of two siblings, who underwent masculinizing therapy at puberty and now express different preferences for ongoing treatment, underscores the importance of patient-centered care. Aligning treatment with each patient's gender identity is crucial for ensuring optimal outcomes and quality of life.

VIEW POSTER

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University of British Columbia

A Case of Aggressive Multifocal Non-Syndromic Familial Non-Medullary Thyroid Carcinoma (FNMTC)

Background: FNMTC is defined as NMTC occurring in two or more first-degree relatives with absent predisposing factors. It is classified as syndromic (associated with known genetic syndrome) and non-syndromic (unknown susceptibility gene). There is limited guidance regarding screening and management. We present a case of aggressive non-syndromic FNMTC.

Case: An asymptomatic 41-year-old female with a strong paternal history of papillary thyroid cancer (PTC) was found to have a left 2.3cm TI-RADS 5 nodule on screening ultrasound with fine needle aspiration cytology consistent with PTC. She completed total thyroidectomy followed by two doses of radioactive iodine (total cumulative dose 350 mCi). Pathology revealed 5.5cm widely invasive follicular carcinoma with foci suspicious for transformation into poorly differentiated carcinoma in right lobe (pT3a pN0a) and multifocal PTC consisting of tall cell variant, classic and follicular subtypes in left lobe (pT2 pN0a). She was classified as having ATA high risk disease. One-year post-thyroidectomy, she required bilateral neck dissection for recurrence. Despite TSH suppression, her thyroglobulin remained detectable (recently 43.7ug/L). Medical genetics confirmed her thyroid cancer was consistent with FNMTC, where an APC variant of unknown significance was identified.

Discussion: FNMTC presents a clinical challenge with conflicting evidence on the aggressiveness of FNMTC compared to sporadic NMTC. Similarly to our case, some studies demonstrated more aggressive disease characteristics, younger age of onset and increased risk of recurrence. Current guidelines recommend against active screening given lack of evidence supporting reduced morbidity or mortality. Further studies will be helpful in establishing FNMTC management guidelines.

VIEW POSTER

A 'Rare' Common Malignancy: A Case of Warthin-Like Papillary Thyroid Cancer (WLPTC)

Huaying Zhao*, Diana Lam

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Background: WLPTC is a rare variant of papillary thyroid cancer. The exact prevalence is unknown with fewer than 200 cases reported in English literature. WLPTC is associated with Hashimoto's thyroiditis, which poses challenges in cytologic diagnosis.

Case: A 45-year-old female with a family history of thyroid cancer was found to have a left 2cm TI-RADS 4 nodule. Initial fine needle aspiration (FNA) cytology revealed atypia of undetermined significance. Repeat FNA cytology 10-months later revealed follicular neoplasm. She underwent diagnostic left hemithyroidectomy and pathology revealed a 1.8cm WLPTC in the left lobe (pT1b pN0a) with Hashimoto's thyroiditis. She was classified as having ATA low risk disease. Post-surgery, she has persistent positive antithyroglobulin antibodies (378 kIU/L) with serum thyroglobulin of 0.1 ug/L and liquid chromatography-tandem mass spectrometry (LC-MS) thyroglobulin level of 0.3 ug/L. Her TSH remains above target range (between 0.5 to 2 mU/L) and levothyroxine dose is being adjusted accordingly. Recent 10-months post-surgery ultrasound showed no evidence of recurrence, no nodules in the remnant right lobe and no cervical lymphadenopathy.

Discussion: There is limited available literature regarding WLPTC. Studies suggest WLPTC is similar to classical PTC with favourable prognosis. The lymphoid infiltration is hypothesized to restrain neoplastic progression. In WLPTC, there is a higher rate of positive antithyroglobulin autoantibodies, therefore the measurement of thyroglobulin by LC-MS may be considered in these settings to determine biochemical response. Further long-term follow up studies are helpful to confirm clinicopathologic behaviour and prognosis of WLPTC.

VIEW POSTER

A Survey-Based Needs Assessment for the Creation of a Patient Education Toolkit for Insulin Self-Titration in Type 2 Diabetes Mellitus

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Background: For people living with type 2 diabetes mellitus (T2DM), insulin dose adjustment by health care providers (HCP) can be time consuming and resource intensive. Self-monitoring of glucose and insulin self-titration can be equally or more effective for DM management.

Objectives: We evaluated perceptions toward the benefit and applicability of an insulin self-titration toolkit consisting of focused patient education videos that can be used in Diabetes clinics. Toolkit effectiveness will be measured by its impact on HbA1c and time-in-range.

Methods: An electronic survey was distributed to physicians, residents, and certified diabetes educators in the Division of Endocrinology and Metabolism. The three-question survey gauged interest in and perceived barriers toward the design and incorporation of an insulin self-titration toolkit.

Results: 27 divisional members responded to the survey. 96% of participants agreed that a video explaining basal insulin titration would be useful to patients with T2DM, with responses ranging from 8 to 10 on a 10-point Likert scale. 93% of respondents reported that a video demonstrating meal-time rapid insulin titration would be helpful. 89% of participants rated their likelihood of incorporating an insulin self-titration toolkit into their clinical practice as an 8 to 10. Challenges described by respondents included lower digital literacy among older patients, and language barriers.

Conclusion: Analysis of survey responses supports a perceived need for and utility of an insulin self-titration educational toolkit. A next step will be to address barriers to its applicability, identified by responding HCPs, during its development and distribution which is currently in progress.

VIEW POSTER

Denosumab and Vascular Calcification in People Receiving Hemodialysis: A Scoping Review

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Background: Chronic kidney disease-mineral bone disorder (CKD-MBD) universally affects patients with end-stage kidney disease (ESKD) receiving hemodialysis (HD). CKD-MBD is marked by reduced bone density, low bone quality, ectopic deposition of calcium and phosphate into arterial walls, and increased risks of fragility fractures and cardiovascular disease. Denosumab (DMab), a RANKL inhibitor, has been shown to improve bone mineral density (BMD) in HD patients, but its effect on vascular calcification remains uncertain.

Objective: We aimed to identify studies on the impact of DMab on vascular calcification in dialysis and identify current knowledge gaps Methods Using the PRISMA Scoping Review (PRISMA-ScR) framework, we identified and summarized randomized controlled trials (RCTs) and observational cohort studies of adults aged 18 or older receiving dialysis who received DMab (60 mg subcutaneously every six months). We summarized the impact of DMab on surrogate markers of vascular calcification including aortic arch calcification (AoR) and coronary artery calcification (CAC).

Results: Only four published studies met inclusion criteria (3 observational cohort and one RCT) each of which included fewer than 50 participants. Studies were limited in quality. No consistent association between DMab and vascular calcification was observed.

Conclusion: There is limited and inconsistent evidence on DMab's effect on vascular calcification in dialysis. Larger, well-designed RCTs are needed to clarify DMab's role in this patient population.

VIEW POSTER

Incidence of Post-Operative Adrenal Insufficiency after Pituitary Surgery Pre- and Post-Implementation of a Protocol for Peri-Operative Glucocorticoid Use

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Background: Conventional practice around pituitary surgery involves peri-operative "stress dose" glucocorticoid replacement therapy to all patients, including those without preoperative central adrenal insufficiency. Recent studies suggest that patients with a pre-operatively intact HPA axis may not require peri-operative steroids; however, criteria for steroid use have not yet been established.

Objectives: To compare the rates of complications pre- and post-implementation of criteria limiting the use of peri-operative steroids in patients with intact HPA axes undergoing pituitary surgery.

Methods: A retrospective chart review was performed on patients who underwent pituitary surgery between January 2014 and September 2022. The retrospective cohort includes patients over 18 years-of-age who underwent transphenoidal or transcranial pituitary surgery at our centre 4 years prior and 4 years following the implementation of a protocol for peri-operative steroid use, in the form of an admission order set.

Results: 79 patients were reviewed, 58% of whom underwent surgery prior to order set implementation. Patient demographics, baseline pituitary function, and surgical approach did not significantly differ ($p>0.05$) between groups. After implementation of the order set, there was decreased peri-operative steroid use in patients with intact HPA axes ($p=0.022$). Rates of post-operative endocrine complications did not significantly differ between the groups ($p>0.05$). There was also no significant difference in length of hospital stay and readmission rates between the groups ($p>0.05$).

Summary: Withholding peri-operative stress-dose steroids in patients with intact HPA axes undergoing pituitary surgery did not result in higher rates of post-operative adrenal insufficiency or other endocrine complications.

VIEW POSTER

Interventions to Improve Diabetes Management and Self-Management for Individuals Experiencing Homelessness: A Scoping Review

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University of Calgary

Objective: To summarize the existing literature, highlight emerging evidence, and identify gaps in diabetes care for people experiencing homelessness (PEH).

Methods: We undertook a comprehensive and systematic search of 11 academic databases of peer-reviewed material. We used defined search and selection criteria to identify interventions or recommendations targeted towards diabetes care in PEH. We also conducted an extensive grey literature search. Articles were screened at the abstract and full text stages by two reviewers. We conducted descriptive analysis of the included studies.

Results: 2,091 records were identified in the literature search, of which 61 were included. In addition, 177 records were included from the grey literature sources. Most interventions were conducted in the United States (70%) and were simple program descriptions (64%). Sixteen categories of interventions were identified: the most common included mobile clinics/outreach (n=55), multidisciplinary care (n=32), recommendations for providers (n=29), and foot care programs (n=28). Of the 41 quantitative studies, 10 examined the effects of their intervention on glycemia, with 9 showing reductions in A1C by 1-2%. A metasynthesis of 18 qualitative studies emphasized the need for specialized care for PEH with diabetes, including multidisciplinary teams and longer appointment times.

Conclusions/interpretations: A broad spectrum of interventions have been implemented with the goal of improving diabetes care in PEH. There is an ongoing need for more structured evaluations of programs that provide care for this population. The implementation of new interventions should be facilitated to improve outcomes in this high-needs population.

VIEW POSTER

A Risk-adapted Approach to Postoperative Radioactive Iodine (RAI) Dosing in Differentiated Thyroid Cancer (DTC) Patients

Kara Hawker*, Sana Ghaznavi, Chris Symonds, Julie Babione

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Background: The 2015 American Thyroid Association (ATA) guidelines recommend a risk-adapted approach to postoperative RAI dosing in DTC patients. We present an interim evaluation of the real-world application of risk-adapted RAI dosing in DTC patients at a tertiary care referral centre.

Methods: We retrospectively analyzed 820 adult (≥18 years) DTC patients treated at our centre between 2016-2022. All patients were risk stratified by six endocrinologists ("triage group") and issued an RAI recommendation.

Interim Results: Among 820 patients, risk of recurrence was: low 452 (55%), intermediate 236 (29%), high 132 (16%). RAI was recommended in 23 (5%) low-risk, 198 (84%) intermediate-risk, and 132 (100%) high-risk patients. As expected, the majority (95%) of low-risk patients were not recommended RAI. Despite this, 26 (6.1%) patients received RAI. Conversely, 8 (34.8%) low-risk patients recommended RAI received none. Heterogeneity in RAI dosing was greatest within intermediate-risk patients; recommended RAI doses were: 0 mCi (16%), 30 mCi (73%), 100 mCi (11%). 43 (18%) patients received a different dose than recommended. All high-risk patients received RAI: 30 mCi for remnant ablation (n=19; 15%), 100 mCi for adjuvant therapy (n=85; 64%), and ≥150 mCi for adjuvant therapy or treatment of known disease (n=22; 17%). Sixteen (12%) patients received a different dose than recommended.

Expected Outcomes: We will explore reasons for discrepancies between ATA guideline recommendations, triage group recommendations, and actual treatments administered. Reasons for heterogeneity in RAI dosing within the same risk categories will be explored. Ultimately, our results will inform risk-adapted RAI dosing of DTC patients.

VIEW POSTER

Assessing the Impact of a Scheduled Appointment and the COVID-19 Pandemic on Postpartum Screening Rates Among Women with Gestational Diabetes: A Quality Improvement Study

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Introduction: Women with gestational diabetes mellitus (GDM) are at increased risk of impaired glucose tolerance postpartum. Canadian guidelines recommend screening with an oral glucose tolerance test (OGTT) between six weeks and six months postpartum. Despite this, only 16-45% of women complete recommended testing. This study evaluated the impact of the COVID-19 pandemic and the scheduling of a three-month follow-up appointment intervention on postpartum screening rates.

Methods: A retrospective cohort study comparing postpartum screening rates one year before and after the COVID-19 pandemic (between March 2019–March 2021), as well as pre- and post-intervention (between December 2019–March 2021), was completed among women with GDM at a community clinic in (BLINDED). Descriptive statistics were used for analysis.

Results: Of the 478 participants, 98 (20.5%) completed postpartum screening. Screening rates were 16.7% (34/203) pre-pandemic, 23.2% (64/275) post-pandemic (p=0.08), 18.1% (50/276) prior to intervention with a dedicated follow-up visit, and 23.8% (48/202) post-intervention (p=0.13). Among those offered follow-up visits, 72.5% (37/51) who attended completed the postpartum screen, compared to 7.3% (11/151) in those who did not attend (p< 0.01).

Discussion: Rates of postpartum screening remained unchanged before and after the pandemic. Offering a three-month postpartum appointment did not increase testing rates; however, participants who attended the three-month visit were more likely to complete testing. Further research is needed to identify the barriers and facilitators to postpartum screening, which could inform targeted interventions aimed at improving testing rates.

VIEW POSTER

Disparities in Technology Use Among People with Pre-Existing Diabetes Experiencing Pregnancy

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Background: Diabetes technology, including insulin pumps and continuous glucose monitors (CGM), can aid glycemic management in pregnancies with pre-existing diabetes, improving maternal and neonatal outcomes. Outside pregnancy, lower socioeconomic status (SES) correlates with decreased technology use. This study examined if similar SES discrepancies impact technology use in pregnancy and if maternal and neonatal outcomes were affected.

Methods: Using a local Diabetes in Pregnancy database, patients with pre-existing diabetes who gave birth between January 2016–June 2020 were identified. Technology use (e.g, flash, CGM, insulin pump) information was extracted. SES was measured using the Pampalon Material Deprivation Index. Groups were compared with Chi-square tests.

Results: Among 149 patients with type 1 diabetes (T1DM), 52 (35.6%) used CGM and 61 (41.8%) used an insulin pump. Of 397 people with type 2 diabetes (T2DM), 13 (3.7%) used CGM and none used an insulin pump. A Deprivation Index of < 3 correlated with increased technology use ($p< 0.001$). Analysis by diabetes type showed 194 (48.3%) people with T1DM and 122 (31.2%) people with T2DM having a Deprivation Index of 1-2 ($p< 0.001$). There were no significant differences in maternal and neonatal outcomes between technology users and non-users among people with T1DM or T2DM.

Conclusions: Lower SES corresponded with decreased technology use among people with pre-existing diabetes experiencing pregnancy in this cohort. There were higher rates of technology use among those with T1DM. However, there were no significant differences in maternal and neonatal outcomes by use of technology in pregnancy among people with T1DM or T2DM.

VIEW POSTER

Gestational Diabetes Outcomes in Adolescents and Young Adults

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Background: Few studies have examined gestational diabetes in the adolescent and young adult population compared with their adult counterparts. We aimed to compare gestational diabetes outcomes in adolescent and young adults (< 25 years of age) compared to adults.

Methods: This population-based retrospective cohort study included individuals with gestational diabetes who delivered between 2017-2021 using de-identified data through the Manitoba Centre for Health Policy repository. Outcomes included maternal and neonatal outcome data. We used a p value of < 0.05 to establish statistical significance, calculated with Chi-square tests for categorical variables and t-tests for continuous variables.

Results: The adolescent and young adult group were found to have a higher incidence of multiple maternal and neonatal outcomes, including gestational hypertension (13.7 vs 10.3%; p=0.0022), antenatal hospitalization (17.1 vs 9.4%; p=0.0001), severe maternal morbidity or maternal death (4.1 vs 2.7%; p=0.018), higher mean birth weight (3538.4±590 vs 3336.9±545.7g, p=< 0.001), large for gestational age (25.3 vs 15.3%; p=< 0.0001), extremely large for gestational age (12.2% versus 5.8%; p=< 0.0001), and shoulder dystocia (6.8 vs 3.5%; p=< 0.0001).

Discussion: The adolescent and young adult population was found to have a higher of risk several adverse maternal outcomes and neonatal outcomes. Additional research is needed to evaluate what role differences in background data on levels of deprivation and care access may contribute to these outcomes.

VIEW POSTER

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Impact of Gender Affirming Hormone Therapy on Hemoglobin Levels

Gender Affirming Hormone Therapy (GAHT) is the mainstay of treatment for patients with gender dysphoria, and can include estrogen or testosterone. Testosterone therapy is known to increase risk of polycythemia in cisgender males, however there is a paucity of literature on the effect of GAHT on hemoglobin in transgender populations. We are conducting a retrospective chart review of individuals referred for GAHT at an Endocrinology clinic. Individuals referred for initiation of GAHT were included. Data collected included hemoglobin, testosterone and estradiol at baseline, 3-month and 6-12 month follow-up, as well as patient's assigned sex at birth, and age. Results show that in patients assigned male at birth and treated with estrogen and androgen blockers, the average baseline hemoglobin and testosterone levels were 152.1 g/L, and 16.1 nmol/L. At 3 months, those averages were 139.6 g/L and 1.48 nmol/L. In patients assigned female at birth and treated with testosterone, the average hemoglobin and testosterone levels were 132.3 g/L and 1.1 nmol/L at baseline, and 137.3 g/L and 11.1 nmol/L after 3 months of therapy. There is a statistically significant correlation between the absolute change in testosterone and the absolute change in hemoglobin from baseline to 3-months for all patients (R^2 0.3982, $p < 1x10^{-13}$). Preliminary results show that patients on testosterone tend to have an increase in hemoglobin whereas patients on estrogen have a decrease in hemoglobin. These results will help provide a framework for expected changes in hemoglobin with GAHT, and will help expand on guidelines for this population.

VIEW POSTER

A Quality Improvement Initiative to Enhance Postoperative Endocrine Monitoring Following Pituitary Surgery

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Background: Pituitary surgeries carry significant risks of complications, including dysnatremia and adrenal insufficiency, which can lead to hospital readmissions and poor outcomes. Guidelines recommend outpatient sodium and cortisol monitoring on postoperative day 7 (POD7) and pituitary function assessment around 6 weeks post-surgery (POW6). However, there is no standardized postoperative protocol at our tertiary care hospital, and the frequency of recommended bloodwork is unclear.

Objectives: To evaluate the frequency of outpatient bloodwork on POD7 and POW6 before and after implementing a standardized endocrine discharge protocol.

Methods: Through collaboration with stakeholders and using quality improvement tools, we created a standardized protocol with patient instructions and pre-filled laboratory requisitions. For the baseline cohort, we retrospectively reviewed bloodwork from all pituitary surgeries at our hospital from September 2021 to August 2022. We prospectively collected data for all surgeries after implementing the protocol in January 2023. Our main outcome measure was completion of POD7 and POW6 bloodwork, defined as cortisol or sodium level by POD7, and cortisol by POD90 and free T4 between POD30-90. We compared outcomes using statistical process control charts.

Results: In the baseline cohort, only 17% of patients (9/52) completed POD7 bloodwork, and 52% (28/54) completed POW6. After the intervention, this increased to 70% (54/77) for POD7 and 66% (61/92) for POW6. Importantly, 26% (14/54) of intervention patients had hyponatremia on POD7.

Conclusions: The standardized endocrine discharge protocol at our tertiary care hospital improved completion rates of guideline-recommended outpatient bloodwork following pituitary surgery, enhancing early detection and treatment of postoperative endocrine complications.

VIEW POSTER

Impact of Multidisciplinary Care in Patients with Metabolic Dysfunction Associated Steatotic Liver Disease (MASLD)

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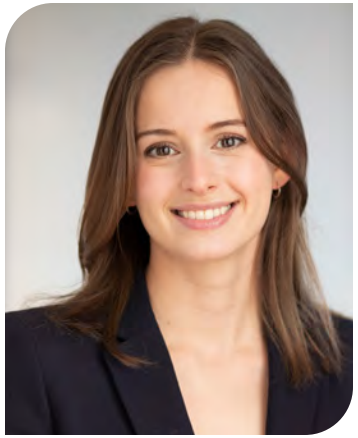
Background: Prospective evidence is lacking to assess metabolic dysfunction associated steatotic liver disease (MASLD) multidisciplinary care efficacy. We aimed to assess in a Canadian MASLD multidisciplinary tertiary care clinic including endocrinologists and gastroenterologists, the one-year evolution of cardiometabolic and liver parameters and lifestyle habits.

Methods: Adults evaluated at the clinic between October 2020 and August 2023 and without any concomitant liver disease were recruited in a 5-year prospective MASLD-registry. Patients who had liver transplant or bariatric surgery between visits were excluded. Clinical, anthropometric, biochemical and imaging data were obtained through a phone interview and from medical records prospectively (baseline, 1-year) and retrospectively (diagnosis). Questionnaires on nutrition, alcohol consumption and physical activity were completed yearly. Liver disease stage was categorized at each visit as simple hepatic steatosis, metabolic dysfunction related steatohepatitis (MASH) or cirrhosis (predefined criteria).

Results: A total of 116 participants were included (47,4% female; age 52,2±15,7 years; BMI 34,8±7,2 kg/m2; 50,9% with diabetes; time from MASLD diagnosis 3,6[1,4-6,1] years). From the baseline to the 1-year visit: more participants with diabetes were treated with glucagon-like peptide 1 agonists (49,2% to 67,2%) and with statins (84,6% to 89,6%) ; BMI (34,8±7,2 to 33,8±7,4 kg/m2, p=0,0004), HbA1C (5,8[5,4-6,7] to 5,7[5,3-6,3]%, p=0,006) and ALT (56[38-89] to 45[32-64] U/L, p< 0,0001) significantly decreased; more participants with MASH decreased to simple hepatic steatosis stage than the opposite; and most of lifestyle habits did not significantly change.

Interpretation: Our results suggest a favorable short-term impact of our MASLD multidisciplinary care management on cardiometabolic and liver outcomes.

VIEW POSTER



Prevalence and Characteristics of Adrenal Incidentalomas in Patients with Lung Transplants: A Retrospective Cohort Study

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Background: The prevalence of adrenal incidentalomas is approximately 3% in the general population. Hormonal assessment is recommended to rule out secreting lesions. Recently, chronic hypoxemia exposure was found to be a risk factor for adrenal lesions, such as pheochromocytomas, but this was not studied in chronic hypoxemic pulmonary diseases. Moreover, there is no data on adrenal incidentalomas in lung transplant patients.

Objectives: To evaluate the prevalence of adrenal tumors in lung transplant patients.

Design: Retrospective single-center study on the records of 596 adult patients who underwent pulmonary transplant at a university hospital center from 2012 to 2022. Data was collected using hospital database and adrenals were assessed using the most recent thoracic and abdominal CT-scans.

Results: We included 581 patients (F : 241, M : 340). Mean age at transplant was 54, and 94% were hypoxemic prior to transplant (mean home-oxygen duration: 4.7 years). Nineteen cases of adrenal masses were identified (3.3%) (F : 12, M: 7) (mean age at transplant: 58.6). All were hypoxemic prior to transplant. Four patients had bilateral adrenal incidentalomas. The radiologic mean mass size was 16.7 mm (range from 10 to 34 mm) and Hounsfield Units (HU) ranged from -7 HU to 26 HU (N:5). No patient had hormonal work-up according to guidelines.

Conclusions: The prevalence of adrenal incidentalomas in this cohort is similar to the general population. As in most similar cases, hormonal work-up is lacking in lung transplant patients. Further work is ongoing for hormonal characterization of these adrenal masses.

VIEW POSTER

Evaluating the Safety of the Inpatient Hypoglycemia Protocol

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Introduction & Aims: Inpatient hypoglycemia is associated with increased morbidity, mortality, and length of hospital stay. The widely-used hypoglycemia protocol was developed in a patient population which is quite different from the current inpatient population. We aimed to examine inpatient hypoglycemia treatment at a Canadian tertiary care hospital.

Methods: A retrospective chart review of adult inpatients with diabetes mellitus analysed the following from hypoglycemia events: blood glucose (BG) pre/post treatment, oral intake status, whether the hypoglycemia protocol was ordered, type of treatment given, and time to re-check. We conducted a focus group with 10 medicine ward nurses exploring reasons for unresolved hypoglycemia events.

Results: The hypoglycemia protocol was not ordered in 23% of the hypoglycemia events analysed. The hypoglycemia event was not treated as per the protocol in 34% of the cases. Patients tolerating oral intake were given IV dextrose in 8% of the cases. At 25 minutes post-event, 61% of events were resolved. In 22% of the cases, BG re-checks were not performed within 60 minutes. Focus group with nurses showed their preferences to increase carbohydrates provided and delay the time to re-check.

Conclusions: The hypoglycemia protocol is often not followed, and nursing focus group suggests changes to the protocol. When the protocol is followed, approximately 25% hypoglycemia events remain unresolved. Approximately 40% of hypoglycemia events remain unresolved at 25 minutes, when utilizing the current protocol. Future quality improvement initiatives could test the carbohydrates delivered, route of delivery, logistics of treatment, and blood glucose re-check timing.

VIEW POSTER

Monitoring and Risk Assessment in Diabetes and Hypertension: A Cross-Sectional Study of Laboratory Test Completion and Results

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Introduction: Individuals with both diabetes and hypertension are at high risk for micro- and macrovascular complications, underscoring the importance of regular monitoring of HbA1C, cholesterol, urine albumin-to-creatinine ratio (UACR) and estimated glomerular filtration rate (eGFR).

Methods: We analyzed 4,456 adult patients from primary care practices with diabetes and hypertension, each with at least two blood pressure measurements between January 1, 2013, and December 31, 2017, and at least one test (HbA1C, UACR, eGFR, and LDL-C) within two years. Test completion rates and results were compared across three blood pressure categories: controlled (< 130mmHg/< 80mmHg), stage 1 hypertension (130-139mmHg/80-89mmHg), and stage 2 hypertension (≥140mmHg/≥90mmHg).

Results: Of the 4,456 individuals, 86% had HbA1C tested, 32% had UACR, 76% had eGFR, and 83% had LDL-C. Among those tested, 43% had HbA1c >7.0%, 11% had macroalbuminuria (UACR >20mg/mmol), 20% had chronic kidney disease (CKD) (eGFR < 60mL/min/1.73m2), and 54% had dyslipidemia (LDL-C ≥2.0mmol/L). Those with stage 2 hypertension had higher rates of albuminuria, CKD, and dyslipidemia compared to those with controlled or stage 1 hypertension.

Conclusions: Our study has three key findings. First, UACR testing is underutilized among patients with diabetes and hypertension. Consistent screening is crucial for identifying patients who could benefit from antiproteinuric therapies. Second, insufficient blood pressure management may be associated with higher rates of albuminuria and dyslipidemia. Better glycemic management was not associated with better blood pressure control. Third, LDL-C management is suboptimal, with dyslipidemia in over 50% of patients, necessitating improved cardiovascular risk management in this high-risk group.

VIEW POSTER

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Telephone Survey Feedback About In-Hospital Hypoglycemia Treatment from People Living with Diabetes Mellitus

Rationale: In-hospital hypoglycemia is distressing for people living with diabetes mellitus (DM). Patients with hypoglycemia in-hospital tend to have prolonged hospitalization, and higher morbidity and mortality. People living with DM may or may not prefer one-size-fits-all hypoglycemia treatment protocols.

Study Objective: The study objective was to gather feedback about in-hospital hypoglycemia treatment from people living with DM admitted at (location). Inpatient hypoglycemia treatment protocol was designed for DM inpatients with point-of-care testing blood glucose (BG) less than 4.0 mmol/L. Hypoglycemia is treated with 15 grams of simple carbohydrates and BG re-testing 15 minutes afterwards.

Methods: People living with DM admitted at (location), who agreed to be contacted for research and experienced hypoglycemia event(s) between 01-Oct-2023 to 31-Mar-2024, were contacted from hospital landline telephones. This phone survey asked standard questions regarding patient experiences during hypoglycemia event(s).

Results: Characteristics of the 24 respondents who completed this phone survey: mean age 64.4 years (SD 12.6); 75% male; 83% type 2 DM. 96% of respondents had mild hypoglycemia (BG 3.0 to 3.9 mmol/L). 75% of respondents were treated with juice, whereas 8% had already self-treated prior to nursing assistance. 79% of respondents felt “very reassured” with the hypoglycemia treatment, and 75% felt “very reassured” with the timing of the repeat BG.

Conclusion: For in-hospital mild hypoglycemia, most people living with DM reported favorable experiences with inpatient hypoglycemia protocol. The hospital caller identification may have influenced the responses received.

VIEW POSTER

Use of Technology and Diabetes Management in Type 1 Diabetes (T1D) and Latent Auto-immune Diabetes in Adults (LADA) Across Senior Age Groups in the BETTER Registry

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Université de Montréal

Introduction: Aging brings additional challenges for people living with auto-immune diabetes. The objectives of the study were to provide an overview of technology usage, diabetes management and psychosocial aspects in people living with type 1 diabetes or LADA aged 50 and over.

Methodology: In this cross-sectional study, we performed comparative analyses between individuals aged 50–59 years, 60-69 years, and ≥70 years.

Results: Participants (n=674) were predominantly Caucasian (97-98% across groups) living in the province of Quebec (71-79%). Use of insulin pump was similar across the groups (39% for 50-59 years old vs 38% for 60-69 years old vs 36% for ≥70 years old, p=0.822), while the use of continuous glucose monitors (CGM) was lower among those aged ≥70 years (85% for 50-59 and 60-69 years vs 73% for ≥70 years, p=0.020). Most of the elder group (86%) had an HbA1c ≤8% (vs 80-82% in the younger groups, p=0.437). Reported level 2 hypoglycemia events in the last month were more frequent among people aged 50-59 years than ≥70 years (6.9 vs 3.4, p=0.001). Level 3 hypoglycemia, diabetes' good practices (ex. carbohydrates count, annual retinopathy screening), social and professional support were similar. Interestingly, diabetes-related distress was lower in older age groups. Later enrollment in the study and frequent follow-up with healthcare professionals were the most associated with CGM use.

Conclusion: Most individuals in this cohort adopted technology. However, efforts should be made to provide universal accessibility to CGM in this population at higher risk of hypoglycemia to achieve better standards of care.

VIEW POSTER

Prevalence of Primary Hyperparathyroidism and its Associated Complications in an MEN1 Cohort

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Purpose: Assess the prevalence of hyperparathyroidism in a multiple endocrine neoplasia type 1 cohort, and its associated complications. Further, to assess surgical interventions undertaken to address hyperparathyroidism, rates of recurrence post-operatively, and subsequent surgeries.

Methodology: Retrospective chart review on consented patients with genetically-confirmed MEN1, who had complete medical records for the duration of the 2008–2023 study period.

Results: Of the 64 consented patients, 41 met inclusion criteria. In this sample, 54% of patients were female and 46% of patients were male. Of the included patients, 40 had a diagnosis of primary hyperparathyroidism (98.5%). Mean age at diagnosis was 31 years old, with a range of 13-54. Of these patients, 65% underwent parathyroidectomy, with 81% having recurrence post-operatively. Secondary parathyroidectomy was completed in 38% of patients with recurrence. Average age at initial surgery was 36.8 years old. Average time between surgeries was 18.1 years. Of the patients with primary hyperparathyroidism, 35% had documented nephrolithiasis, 32.5% had fractures – with 12.5% being confirmed fragility fractures, and 37.5% had low bone mass or osteoporosis on bone mineral density scans.

Conclusions: Primary hyperparathyroidism has a high penetrance rate in this MEN1 cohort and contributes to morbidity in affected patients. On average, parathyroidectomy is completed in the third decade of life, with secondary surgery to address recurrent hyperparathyroidism occurring an average of 18 years later. Further comparison studies should be undertaken to assess the optimal strategies for surgical intervention and monitoring in MEN1 patients. (Further data analysis in progress).

VIEW POSTER

Macrophage Migration Inhibitory Factor (MIF) Expression in Human Pituitary Tumors and Its Association with Tumor Behaviour

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University of Alberta

VIEW POSTER

Pituitary neuroendocrine tumors (PTs) are prevalent, yet clinical predictors of their behavior remain limited. Some PTs will require multimodal therapy due to residual or recurrent disease which may include additional surgery, radiation, and/or medical therapy. Thus, there is a need to improve biomarkers and therapeutic options for PTs. Macrophage migration inhibitory factor (MIF), a multifunctional cytokine, is expressed in various tumors, including PTs. Prior studies demonstrated an increased MIF staining in nuclei of PTs compared with normal pituitaries and a pro-inflammatory impact on surrounding immune cells. Our experiments with AtT-20 cells revealed that MIF is more abundant in temozolomide (TMZ)-resistant AtT-20 cells. MIF-overexpressing AtT-20 cells exhibited resistance to TMZ treatment, while genetic downregulation of MIF increased p53 expression and reduced cell proliferation. Therefore, we hypothesized that higher levels of MIF expression correlate with more aggressive human PTs. Seventy-six human PT samples underwent immunohistochemical staining for MIF, scored as negative/low, modest or high expression. Chi-square testing determined the association between MIF staining levels and high-risk clinical or pathologic features of PTs. Seventy-four samples (97.3%) had positive immunoreactivity for MIF. Higher MIF staining was statistically associated with older patients, the presence of the optic chiasm compression and invasion into surrounding structures. No significant association was found between MIF staining and tumor diameter, or hormonal secretion. Our findings suggest that MIF can be a biomarker of tumor behaviors and a therapeutic target for PTs. Further analyses, such as cell proliferation assay using human primary PT cells, will be required to validate our findings.

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