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A Patient with Combined Metformin-Induced Lactic Acidosis and Euglycemic Diabetic Ketoacidosis

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	Case 1	Case 2	Case 3	Case 4	Case 5
Bicarbonate & Anion Gap prior to initiating CRRT	12;26	14; 25	16; 20	21;15	19;17
Bicarbonate & AG on day 1 of CRRT	15; 26	20; 26	19; 18	23;11	23;14
Bicarbonate & AG on day of [illegible]	17; 17	13; 24	17; 16	15; 20	19; 19
Lowest Bicarbonate and Associated Anion Gap	14;25	10;25	16;20	15;20	18;19
Glucose prior to initiating CRRT	127	137	190	113	93
Lowest Glucose after initiation of CRRT	92	84	88	85	94
Lactate	1.3 (day 3 of CRRT)	1.2 (day 3 of CRRT)	1.3 (Day 3 of CRRT)	1.2 (Day 1 of CRRT)	0.8 (Day 3 of CRRT)
Beta Hydroxybutyrate	4.8 (Day 3)	5.4 (Day 10)	3.7 (Day 2) 0.5 (Dav 6)	3.7 (Day 4 of dextrose-free solution)	1.5 (Day 3)
CRRT Fluid	Prismasate 0 K/3.5 Ca/0	Phoxillum BK 4 / 2.5	Prismasol 4K /2.5 Ca	Phoxillum BK 4 / 2.5 Ca	Phoxillum BK 4 / 2.5 Ca
Effluent dose	31 (Day 0) 44 (Dav 3)	29 (Day 0) 41 (Day 7-	28	26	31
Treatment	dextrose 5% + sodium chloride	N/A	dextrose 10% at	Discontinuation of dextrose-free solution	dextrose 5% at 50cc/hr and discontinuation of
Bicarbonate & Anion Gap after initiation of	19; 15	N/A	20; 10	23;9 (1 day after discontinuation of	22;12

PO1174

A Patient with Combined Metformin-Induced Lactic Acidosis and Euglycemic Diabetic Ketoacidosis

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Introduction: Metformin is a small, non-protein-bound molecule that can cause lactic acidosis in 6 out of 100,000 patients with a mortality rate of 30-50%. Concurrent euglycemic diabetic ketoacidosis (DKA) from sodium-glucose co-transporter-2 (SGLT2) inhibitor has been reported in one case. We report a unique case of a patient with acute kidney injury (AKI) in the setting of metformin-induced lactic acidosis and osmotic diuresis due to euglycemic DKA complicated by celecoxib use.

Case Description: A 66-year-old female with a past medical history of type 2 diabetes mellitus for 21 years on metformin 1000 mg twice daily and empagliflozin 25 mg daily with baseline eGFR 51 mL/min/1.73m^2 5 months prior, who was also on celecoxib 200 mg daily for 40 days presented for elective cervical discectomy which was canceled due to AKI. On exam, blood pressure was 119/59 mmHg, pulse was 92 beats/min, and the temperature was 36.1°C. She was tachypneic at 24 breath/min. Labs showed sodium 136 mg/dL, potassium 8.4 mg/dL, bicarbonate 9 mg/dL, BUN 83 mg/dl, creatinine 8.78 mg/dL, and glucose 117 g/dL. Lactic acid was 13.5 mmol/L, beta-hydroxybutyrate 5.9 mmol/L, serum osmolality 336 mOsmol/kg with no osmolar gap. She underwent conventional hemodialysis (HD) for 3 hours followed by 18 hours of continuous kidney replacement therapy (CKRT). She required an insulin drip with 5% dextrose in normal saline for 24 hours. Lactic acid was 3.8 mmol/L after 24 hours. Creatinine improved to 2.46 mg/dL on day 4 without further intervention. She was discharged home off metformin, empagliflozin, and celecoxib.

Discussion: Metformin is readily dialyzable but has a large volume of distribution. There is no specific antidote available to reverse the toxic effects of metformin or consensus on the modality of renal replacement therapy. Previously demonstrated biphasic elimination pattern of metformin intoxication suggests that a brief HD session is not sufficient to eliminate metformin due to a rebound phenomenon, but it is essential to correct severe acidosis and electrolyte derangements. Hyperkalemia required the use of HD which needed to be followed by CKRT as a more physiological way to maximize metformin removal and prevent ongoing lactic acid production. We suggest prudence in the combination of metformin with SGLT2 inhibitor use, specifically in patients exposed to nephrotoxic drugs or procedures.

PO1175

Mind the Gap: An Anion Gap of 52 Fully Explained

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Introduction: The Anion Gap (AG) remains the main clinical tool to elucidate acid-base disturbances in patients with metabolic acidosis. We present a case with an extremely elevated AG of 52 mmol/L, and describe our search for its biochemical explanation.

Case Description: A 66-year-old female was admitted with loss of consciousness, shock, and severe acute kidney injury. She had type 2 diabetes mellitus, treated with metformin. At presentation, she had an AG of 52 mmol/L and osmolal gap of 34 mOsm/kg. Her arterial blood gas showed: pH <7, HCO3 7.5 mmol/L, pCO2 16 mm/Hg. Phosphorus level was unusually high, 21.3 mg/dL, with unknown etiology. There was no history of enema or laxative use. A significant contributor of AG was lactate at 14.5, given her history of metformin use. Urine drug screen was positive for amphetamines. The volatile alcohol panel was positive for acetone; methanol, ethanol, ethylene glycol and isopropyl alcohol were not detected. Continuous venovenous hemofiltration (CVVH) was initiated. After 3 days, renal function started recovering, lactate and phosphorus levels normalized and AG closed. The patient did not need CVVH thereafter. Two months later, the patient was discharged to a nursing facility in a stable condition.

Discussion: Extremely elevated AG of 52 in this patient can be explained by a rise in concentrations of organic acid anions, lactate, ketoacids, hyperphosphatemia, and retention anions.

AG 52 **Albumin cAG 55**	Lab values **Sodium 135 mmol/L, Chloride 76 mmol/L, Bicarb 7 mmol/L, Phosphorus 21.3 mg/dL, Albumin 3.2 g/dL, Lactate 14.5 mmol/L, β-hydroxybutyrate 8.17 mM**
Contributions to Anion Gap, mmol/L	Explanation
P/ 12.36	([Lab phosphorus, mg/dL*10] / 31 (molecular weight of phosphorus)) * 1.8 (average valency depending on pH) [(21.3 *10)/31] * 1.8 = 12.36 mM/L
Lactate 14.5	Lactate is univalent and not influenced by pH Measured lactate = contribution to AG=14.5 mM/L
βHB 8.17	β-hydroxybutyrate is univalent and not influenced by pH Measured βHB = contribution to AG = 8.17 mM/L
Normal AG 12	Unmeasured anions Various inorganic and organic anions
Remaining AG 7.97	Accumulated anions due to severe Acute Kidney Injury (creatinine 12.4 at presentation) (sulphate and hippurate)

Explanation of the high AG: The Figure describes the calculation of AG. In this patient, phosphate was a major contributor to the AG.

PO1176

Is an Increase in Anion Gap a Predictor of Hemodialysis Initiation in Patients with Advanced CKD?

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Background: Because uremic symptoms and manifestations vary among patients with advanced chronic kidney disease, it is sometimes difficult to decide on the timing of dialysis initiation only from them. Thus, we attempted to investigate whether anion gap (AG) that may reflect the accumulation of total organic acids in uremia can be a marker of uremia and may predict the timing of dialysis initiation.

Methods: This study included pre-dialysis patients who attended to our hospital for more than six months prior to the beginning of hemodialysis (HD), and retrospectively analyzed the relationship between their serological data, AG, and various uremic symptoms. The AG was calculated as the corrected AG (cAG) = Na-Cl-HCO_3 [nmol/L]+2.5 x (4-serum albumin concentration [g/L]). The statistical analysis was performed by logistic regression analysis, correlation analysis, and factor analysis using SPSS®.

Results: A total of 283 patients [diabetes mellitus: 136 (48.1%), nephrosclerosis: 66 (23.3%), glomerulonephritis: 36 (12.7%)] were included in this study. The most common clinical symptom before dialysis initiation was fluid overload, which was seen in 134 patients (47.3%), followed by anorexia 104 patients (36.7%) and general malaise 96 patients (33.9%). The cAG began to increase 3 months before the initiation of HD (14.2 mmo/L), which showed a rapid increase just before the initiation, and was correlated with anorexia and fatigue, better than fluid retention. Of note is that cAG was most significantly associated with dialysis initiation among various factors. The ROC of cAG for dialysis initiation showed the highest value of AUC 0.797 (95% CI=0.72 to 0.85, p=0.05), with a cutoff value of adjusted cAG 15.975 (sensitivity 0.689, specificity 0.786).

Conclusions: Uremic symptoms and some serological markers including azotemia, metabolic acidosis, and hyperphosphatemia have been usually used to predict the magnitude of uremia and the timing of dialysis initiation. In our study, it is suggested that a rapid increase in cAG over 16 mEq/L may also be a good predictor of dialysis initiation within the subsequent 3 months.

PO1177

Mysterious Case of Recurrent Life-Threatening Lactic Acidosis

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Introduction: Patients living with diabetes are prone to type-B lactic acidosis, often presenting with profound acid-base derangements. The reason for lactate production is not obvious hence management can be challenging. We present a case of life-threatening recurrent lactic acidosis in a diabetic patient.

Case Description: A 67-year-old man with type 2 diabetes, hypertension, presented to the hospital with malaise for 2 days. He had been on metformin in the past but had recently switched to insulin. There was no history of alcohol ingestion nor use of herbal supplements. The lactic acid level was 24.2 mmol/L with Ph of 6.82, PCO2 of 27 mmHg, serum bicarb of 7 mEq/L, anion gap of 28, and serum Cr of 1.4 mg/dL with baseline of 1 mg/dL. No evidence of infection or ischemia found. Toxicology screen was negative and serum metformin level was undetectable. Lactic acidosis resolved with continuous renal replacement (CRRT) for 24 hours. A month later he returned with similar complaints