Correlation Between Cortical Thickness and Stages of Chronic Kidney Disease

Maha Farah Osman, Mohammed Eltayeb, Selma Saeed Ibrahim, Mustafa Elameen, Dalia Younis, Elfadil Mohammed Osman, Omar Abboud
Soba University Hospital

Background: To objective is to determine the correlation between cortical thickness by Ultrasound and the stage of chronic kidney disease and to assess the correlation between bipolar length of the kidney and parenchymal thickness, and eGFR in chronic renal disease patients.

Materials and Methods: Ultrasonography (US) was performed in 100 chronic kidney disease patients. The scans were performed by one independent and blinded radiologist. The estimated GFR was calculated using the Cockcroft-Gault equation.

Data was entered into computer program, statistical package of social sciences (SPSS, version; 21). ANOVA test was used as test of significance; in addition, Pearson’s correlation was used to assess the correlation. P Value was considered significant if less than 0.05.

Results: The correlation between GFR and measurements in this study showed that there was significant strong correlation between renal cortical thickness and eGFR (r = 0.775; P < 0.0001), also there was significant but weak correlation between bipolar length and eGFR (r = 0.344; P = 0.014), and significant strong correlation between parenchymal thickness and eGFR (r = 0.621; P < 0.0001). Concerning the correlation between eGFR and US findings, the strongest correlation was found for cortical thickness (r = 0.775; P < 0.0001) followed by parenchymal thickness (r = 0.621; P < 0.0001) and bipolar length (r = 0.344; P = 0.014).

Conclusion: The cortical thickness measured on ultrasound appears to be significantly correlated to the stages of CKD. It may assist in patients’ follow up by monitoring the reduction in renal cortical thickness with time. The parenchymal thickness was found to be significantly correlated to the stages of CKD; thus, it can be used in patients with poor cortico-medullary differentiation instead of RCT in Ultrasound.

Acute Kidney Injury in a Patient with Multiple Sclerosis

Eva M. Seiringer, Friedrich C. Prischl, Astrid Teufel, Ludwig Wimmer, Martin Windpessl, Manfred Wallner
Department of Internal Medicine IV, Nephrology, Klinikum Wels-Grieskirchen, Wels, Austria

Background: Hypercalcemia may be asymptomatic or may present with serious clinical symptoms. It may result from numerous causes, and among others may coincide with acute kidney injury (AKI). We report vitamin D intoxication as a rare cause of hypercalcemia and AKI.

Methods and Results: A 46-year old woman with a long-term history of multiple sclerosis (MS) presented to the emergency department with generalized weakness and a brief episode of unconsciousness and confusion. At admission she was somnolent, wheelchair-bound, and in a hemodynamic and respiratory stable condition. Blood tests revealed AKI with a serum creatinine of 2.5 mg/dL. Marked electrolyte disturbances in serum (S) were seen: S-calcium 3.82 mmol/L, S-phosphate, 1.14 mmol/L, S-sodium 128 mmol/L, S-chloride 89 mmol/L, S-magnesium 1.33 mmol/L. Parathyroid hormone was within the normal range (32 pg/mL). The patient showed a mild metabolic alkalosis (pH7.47, S-bicarbonate 45 mm Hg). Surprisingly, the 25-OH vitamin D level was 566 ng/mL, almost 20-times above upper limit of normal. Initial treatment included intravenous fluid, furosemide, steroids, and denosumab. Over the following 2 days the patient’s hypercalcemia was largely non-responsive and her creatinine level increased to 2.8 mg/dL. We decided to start hemodialysis, resulting in a decline of calcium to 2.58 mmol/L after two dialysis sessions. No further hemodialysis was done. The kidney function and calcium levels returned to normal within 2 weeks (creatinine 0.8 mg/dL; calcium 2.35 mmol/L). While 25-OH vitamin D levels remained grossly elevated (520 ng/mL).

Because of prior reports of a rare association between MS and hypercalcemia we extensively interviewed the patient and her husband. They reported chronic intake of vitamin D3 at a daily dose of 150,000 IU combined with 1000 mg calcium pantothenic acid (equivalent to 154 mg elemental calcium) over a period of at least 18 months. This treatment had been prescribed by a general practitioner (GP) and was loosely based on the Coimbra protocol (https://www.coimbraprotocol.com/), a purported treatment for multiple sclerosis. Additionally, the patient took choline (500 mg/d), magnesium (600 mg/d), methylfolate (100 mg/d), multivitamins, selen (200 µg weekly), pyridoxal-5-phosphate (20 mg/d), vitamin K2 (200 µg/d), riboflavin (200 mg/d), zinc (15 mg/d), L-lysine (3 g/d), and famciclovir (500 mg/d). The patient’s lab data had been monitored by her GP and showed slightly elevated S-calcium (2.62 mmol/L) and normal S-creatinine (0.57 mg/dL) over weeks before admission.
**Conclusion:** This unusual case highlights several important aspects: first, a careful patient history, including attempts to gather a detailed medication history (with over-the-counter remedies) is crucial in evaluating potential AKI causes; second, ultra-high dose vitamin D can cause AKI within weeks; third, this treatment calls for very careful and frequent monitoring and vigilance towards even the slightest upward trends of serum creatinine and calcium levels.

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**3 Heparin Induced Thrombocytopenia may Recover with Intermittent Heparin in Dialysis Patients**

*R. Ullah, M. Akhter, N. Mirza, H. Anj, Z. Ahmed*

Medicine, Drexel University College of Medicine, Rose Valley, PA, USA

**Topic:** Hemodialysis.

**Keyword(s):** Dialysis, HIT, Thrombocytopenia.

**Background:** The incidence of Heparin antibody (HA) in dialysis patients varied widely but incidence of Heparin induced thrombocytopenia (HIT) is low. HA is transient and may disappear within 100 days of stopping heparin. Few reported no new episodes of HIT with re-exposure to heparin after the disappearance of HA. We are presenting a series of cases where patients developed HIT during daily or continuous heparin infusion but improved during intermittent HD.

**Methods:** A case of a 40-year-old African American male (AAM) with recently diagnosed End Stage Renal Disease (ESRD), with sickle cell disease, developed HIT after starting heparin infusion for deep venous thrombosis. His platelets improved significantly after stopping. Dialysis was started with heparin at the outpatient center since HIT diagnosis was misplaced. After two months his platelet count was found within normal range. A second case of a 65-year-old African female (AAF), with ESRD for 5 years, diabetes mellitus and hypertension. Patient was admitted due to a pulmonary embolus and started on IV heparin and developed HIT. She was transitioned to coumadin. Heparin was started during HD and her platelets remained normal. A third case of a 68-year-old AAM with ESRD on hemodialysis, underwent coronary artery bypass surgery. The patient developed HIT few days after surgery due to heparin therapy for deep vein thrombosis. The anticoagulation was changed to Argatroban. HIT improved and patient was discharged. Patient started HD with heparin at the dialysis center and after three months his platelets were found to be normal. The last case is of a 71-year-old AAF with ESRD on HD for 10 years, who was admitted for pneumonia. The patient developed HIT and was thought to be due to heparin flush for her IV lines. Thrombocytopenia improved after changing to saline flush. She was discharged and her HIT diagnosis was lost to follow up. The platelets remained normal despite her receiving heparin during dialysis treatments.

**Results:** All the ESRD patients who developed HIT during daily and or continuous heparin improved when the heparin was switched to every other day during intermittent HD. All patients were positive for anti-PF4/heparin antibody by ELISA (PF4-Enhanced, GTI, WI) and the platelet aggregation test (PAT), thus confirming the diagnosis of HIT. HA was not repeated during intermittent HD after recovery of thrombocytopenia.

**Conclusions:** It seems that re-exposure to heparin may improve platelets count when it is not administered in a daily basis. It is not known if intermittent heparin therapy may be helpful in recovering from thrombocytopenia despite the presence of heparin antibody. Further studies need to evaluate this process.

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**4 Ovarian Reserve and Vascular Dysfunction in Women with Chronic Kidney Disease**

*S. Dumanski, T. Anderson, K. Nerenberg, J. Holroyd-Leduc, J. MacRae, C. Kalenga, A. Metcalfe, R. Sharanya, S. Ahmed*

University of Calgary, Calgary, AB, Canada

**Topic:** Chronic Kidney Disease.

**Keyword(s):** Vascular, Kidney, Fertility.

**Background:** Women with chronic kidney disease (CKD) have low fertility, associated with high cardiovascular (CV) risk. Serum anti-Mullerian hormone (AMH) levels is associated with CV events in the non-CKD population. AMH levels are lower in CKD patients, but whether AMH levels are associated with CV risk in an already high CV risk population is unknown. The objective of this study was to determine the association between AMH levels and measures of vascular function (validated makers of CV risk) in women with CKD.

**Methods:** An exploratory cross-sectional study was performed in ten women with CKD between the ages of 18–50. Baseline demographics, metabolic measurements and AMH levels were collected. Using standardized protocols, endothelial function (flow mediated dilation and hyperemic velocity time integral) and arterial stiffness (aortic augmentation index and pulse wave velocity) were measured. Linear regression analyses were used to evaluate the association between AMH levels and measures of vascular function.

**Results:** Seven women with CKD and seven women with end stage kidney disease (ESKD) with an average age of 40.2 years were enrolled. AMH levels ranged from 0.2–38 pmol/L and did not differ between CKD and ESKD groups. Over two thirds of the women were amenorrheic (14% CKD, 67% ESKD), which corresponded between CKD and ESKD groups. Over two thirds of the women were amenorrheic (14% CKD, 67% ESKD), which corresponded to lower AMH levels (P = 0.005). A significant association between AMH and hyperemic velocity time integral was observed in the women with CKD (R² = 0.91, P = 0.0007). No significant associations were noted between AMH levels and measures of arterial stiffness.

**Conclusions:** Low ovarian reserve may be associated with abnormal endothelial function, a marker of CV risk, in women with CKD. Given the high CV risk in this population, further investigation into this female-specific risk factor is warranted.
Relationship Between Vascular Calcification, Protein-Energy Wasting Syndrome, and Sarcopenia in Maintenance Automated Peritoneal Dialysis

G. Leal Alegre¹, G. Leal Escobar¹, C. Lerma González², K. Martínez Vázquez², S. Vazquez Olvera², K. Cano Escobar¹, B. Moguel González¹

¹Nephrology, Instituto Nacional de Cardiología “Ignacio Chávez”, Ciudad de México, Mexico; ²Department of Electromechanical Instrumentation, Instituto Nacional de Cardiología “Ignacio Chávez”, Ciudad de México, Mexico.

Topic: Peritoneal Dialysis.
Keyword(s): Peritoneal dialysis, sarcopenia, protein energy wasting syndrome, vascular calcification.

Background: Chronic kidney disease is a risk factor for cardiovascular disease. Vascular calcifications affect 80 to 90% of these patients and are a predictive factor for cardiovascular mortality. Sarcopenia and protein energy wasting syndrome are also associated with mortality. The aim was to assess the relationship between vascular calcification, sarcopenia, and protein energy wasting syndrome in automated peritoneal dialysis patients.

Methods: This single center cross-sectional observational study enrolled 51 maintenance automated peritoneal dialysis patients. Vascular calcification was assessed by abdomen, pelvis, and hands radiographs. Sarcopenia was assessed with bioimpedance analysis and a hand grip test. Protein energy wasting syndrome was assessed by the Malnutrition Inflammation Score. Patients were compared regarding the presence of vascular calcification in at least one vessel. Examples of radiographs with vascular calcification are shown in Figure 1.

Results: The participants had a mean age (± standard deviation) = 39 ± 14 years, median time in automated peritoneal dialysis (percentile 25 - percentile 75) = 25 (6–48) months, and 14 were diabetic. Vascular calcification was present in 21 patients (41.2%). Univariate logistic regression analysis showed that age (p = 0.001), malnutrition inflammation score (p = 0.022), protein energy wasting syndrome (p = 0.049), sarcopenia (p = 0.048) and diabetes (p = 0.010) were associated to vascular calcification. Multivariate logistic regression analysis showed that age (p = 0.006) was the only variable associated independently with vascular calcification.

Conclusions: There is association between vascular calcification, protein energy wasting syndrome and sarcopenia in patients with maintenance automated peritoneal dialysis. These associations are not independent of age.

Prevalence of Metabolic Syndrome in Hemodialysis Program Patients


Nephrology Service, Hospital General de Mexico, Mexico City, Mexico

Topic: Hemodialysis.
Keyword(s): Hemodialysis, Metabolic Syndrome.

Background: The prevalence of metabolic syndrome (MS) in end stage kidney disease (ESKD) in hemodialysis patients is not well studied. International studies have reported a 30% prevalence approximately of MS in this population, however, in Mexico there are no reports. The aim of this study was establishing the prevalence of MS and cardiometabolic risk factors in patients of the hemodialysis program of Hospital General de Mexico (HGM), a third level hospital in Mexico City.

Methods: A cross-sectional study done in the hemodialysis unit in the HGM. The MS was defined by ATP3 criteria. We also determined cardiometabolic risk factors, as hyperuricemia (more than 6 mg/dL) and high LDL-c (more than 100 mg/dL). We used descriptive statistic, absolute and relative frequencies.

Fig. 1. Examples of vascular calcification. a) Lateral abdomen radiograph that shows vascular calcification in the aorta. b) Pelvis radiograph that shows the presence of vascular calcification in iliac arteries. c) Hands radiograph showing vascular calcification in radial and interdigital arteries (for Abstract no 5).
Results: 67 patients of the HD program were evaluated. 54% women (36), mean age 40.16 ± 16.12 years. Mean of dry weight was 56.11 ± 9.66 kg, BMI 22.16 ± 3.2 kg/m², systolic blood pressure 134.24 ± 21.93 mm Hg and diastolic of 76.04 ± 15.24 mm Hg. Abdominal perimeter 84.39 ± 11.46 cm, (women 82.53 ± 11.75 cm and men 86.55 ± 10.9 cm). Cholesterol 139.39 ± 31.9 mg/dL, triglycerides 139.69 ± 74.14 mg/dL, LDL-c 70.02 ± 28.11 mg/dL, HDL-c 41.48 ± 9.18, glucose 112.85 ± 41.34 mg/dL, albumin 3.95 ± 0.6 g/dL and uric acid (UA) of 6.98 ± 2.15 mg/dL. 13% of patients were underweight; 73% (49) normal weight and 13% (9) overweight and obesity. 19.4% (13), had diabetes mellitus; 26.9% (18) high blood pressure; 34.3% (23) low c-HDL (<50 mg/dL); 17.9% (12) glucose >100 mg/dL; 34.3% (23) hypertriglyceridemia; 47.7% (32) abdominal obesity (men 13.4% (9) and 34.3% (23) women). Only the 7.5% (5) of patients didn’t have MS criteria, 22.4% (15) 1 criteria, 34.3% (23) 2 criteria; and 36% (24) 3 or more criteria. The prevalence of MS was 36% (24); and we could identify the 74.6% (50) patients with hyperuricemia (UA ≥6 mg/dL) and 16.4% (11) with LDL >100 mg/dL, finding a prevalence of having cardiometabolic risk factors of 56%.

Conclusions: The prevalence of MS in hemodialysis patients in our population is high compared with other reports. The most common element was abdominal obesity, the opposite has been reported in the bibliography. We identified a high prevalence of hyperuricemia (UA ≥6 mg/dL) and high LDL-c (≥100 mg/dL), as cardiometabolic risk factors. HD by itself, increases the risk of cardiometabolic risk factors.

Methods: We used descriptive statistic, absolute and relative frequencies. and permanent hemodialysis catheter placement, among others. placement, kidney biopsy, peritoneal dialysis catheter placement and permanent hemodialysis catheter placement, among others. We used descriptive statistic, absolute and relative frequencies.

Results: 865 procedures were done during the study period. The mean age was 48.33 ± 15.38 years. Of the invasive procedures, 44% (378) were in women. We made 66.33 ± 8.17 procedures monthly on average. Those procedures were: ultrasound-guided temporal hemodialysis catheters 55% (476); real-time ultrasound-guided percutaneous renal biopsy 17% (146); percutaneous peritoneal dialysis catheter placement 16% (137); permanent hemodialysis catheter placement 2% (19); percutaneous peritoneal dialysis catheter removal 3% (24); permanent hemodialysis catheter removal 1% (11); central venous catheter placement 3% (27); peritoneal dialysis catheter permeabilization maneuvers 1.5% (13); temporal femoral hemodialysis catheter placement 1% (12). 17% (150) of the procedures were done by PGY-1; 72% (624) PGY-2; 10% (87) PGY-3 and 1% (4) by nephrologist from the staff. Successful in 98% (843). Immediate complications were placement/technique failure: 2% (17); haematomas 0.2% (2); and 0.3% (3) others (abdominal wall haematoma and hemoperitoneum). 84% (727) of the procedures were as a treating service and the others as interconsultation 12% (103). From each procedure we obtained signed informed consent and the study was performed in accordance with institutional protocols previously established, with time-out checklist made, and supervised by a nephrologist from the staff and supported by a nurse.

Conclusions: Interventional nephrology is a reality in many countries. Because of the incidence and prevalence of End Stage Kidney Disease, all of the nephrology fellow programs in our country must establish supervised guidelines in the acquisition of skills and abilities based on patient safety.

7 Evaluation of Procedural Skills Acquired by Nephrology Fellows

J.C. Trimino1, R. Valdez-Ortíz1, L.M. Perez-Navarro1, N. Minor2, D.F. Argudo1

1Nephrology Service, Hospital General de Mexico, Mexico City, Mexico; 2Internal Medicine Service, Hospital General de Mexico, Mexico City, Mexico

Topic: Patient Safety. Keyword(s): Interventional nephrology, fellow’s skills, catheter.

Background: The growth of nephrology has given rise to interventional nephrology. Currently, fellows must acquire skills and abilities to perform invasive procedures. In Mexico, there is no information on the procedures that fellows should perform during their training. Our aim was to evaluate the invasive procedures and skills performed by nephrology fellows at the Hospital General de Mexico; which is a university program affiliated to the Universidad Nacional Autonoma de Mexico (UNAM).

Methods: A cross-sectional retrospective study; we reviewed the registry’s procedures collected during the period of August 2018 to August 2019. We analyzed temporal hemodialysis catheter placement, kidney biopsy, peritoneal dialysis catheter placement and permanent hemodialysis catheter placement, among others. We used descriptive statistic, absolute and relative frequencies.
Clerks and Unit Nurses. Provide a check list to check the quality of records. Unit Clerks are instructed to send the records to scan room immediately upon their arrival.

**Results:** After the first round of measures, the number of medical records scanned increased from 22% to 54%. Duplication of labs decreased to 50%. Reasons for not meeting the anticipated success rate was due to unit clerks burdened by the need to review the records with checklist, and fax machine being far away. Fax machine was moved into the same room as clerks, and they were instructed to send the documents to scan room as soon as they arrive without reviewing. This increased the percentage of scanned records to 96%, and the quality and completeness improved to 80% (Fig. 1 and 2).

**Conclusions:** Our project improved the quality of care for patients not only in terms of accurate dialysis treatments, but also helped to treat ESKD complications in a timely manner. Additionally, it decreased financial burden by avoiding repeating lab tests. Closed loop communications, teamwork, and adaptability to the circumstances are the core strengths of this project.

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**Fig. 1.** Graph showing the improvement in the number of scanned records before and after intervention (for Abstract no 8).

**Fig. 2.** Graph showing the improvement in the quality of records before and after intervention (for Abstract no 8).
68 mg/dL, Cr 3.0 mg/dL, GFR 14) and no known neurologic conditions other than chronic back pain from traumatic T3-T4 fracture. However, its uremia-mimic presentation is underreported in the literature.

Methods: Prior to admission at our tertiary referral center, a 28-year-old man was diagnosed with extensive metastatic non-seminoma germ cell cancer and was treated with cisplatin-based chemotherapy. Due to continued recurrence, he was later admitted for high dose carboplatin and etoposide chemotherapy followed by autologous stem cell rescue with peripheral blood stem cell transplant. He soon developed persistent diarrhea and testing for C. difficile and candida were positive. He was started on empiric antimicrobial therapy and required extensive blood product transfusions and IVFs for pancytopenia and diarrhea. On Hospital day seven, Nephrology was consulted for management of AKI from a baseline of 1.1 to 1.5 mg/dL along with hypernatremia, hypokalemia and 9 L of polyuria despite repletion of free water and potassium. The patient was febrile, hypotensive with diffuse anasarca and pitting edema. Urine studies showed new onset glucosuria, hematuria, trace proteinuria and a pH of 8 supporting a diagnosis of proximal tubular dysfunction or Fanconi’s syndrome. CVVH was initiated to control electrolytes and volume in the setting of ongoing polyuria and worsening sepsis. He was maintained on RRT for 8 days and afterwards showed renal improvement. After a prolonged and complicated hospital course, the patient was discharged from our facility without the need for RRT.

Results and Conclusions: This case highlights an interesting use of RRT. While this patient suffered AKI from a variety of factors, the onset of proximal tubule dysfunction indicates direct nephrotoxicity likely from platinum-based therapy. Given his multiple electrolyte abnormalities and anasarca, CVVH was initiated early to provide additional stability with ongoing significant gastrointestinal and renal losses. While his electrolyte abnormalities could have been initially managed with traditional IV repletion, a more proactive strategy was taken with starting CVVH earlier before an emergent need. This decision was made easier given that he retained a central venous catheter from his stem cell transplant and thus bypassing the need for an additional procedure. Interestingly, we initiated CVVH in the setting of polyuria rather than oliguria which proved prudent as he quickly became oliguric with worsening sepsis. Fortunately, he was already on RRT.

7
A Resourceful Use of Continuous Veno-Venous Hemofiltration
C. Meshberger
Indiana University Nephrology, Indianapolis, IN, USA

Topic: Acute Kidney Injury.
Keyword(s): CVVH, Fanconi, AKI.
Background: The optimal timing of initiating renal replacement therapy (RRT) in the setting of acute kidney injury (AKI) remains unclear and is largely guided by the Nephrologist’s clinical judgment. Here we report an interesting case for the timing and use of continuous veno-venous hemofiltration (CVVH) for the management of Fanconi syndrome and sepsis.

Methods: Prior to admission at our tertiary referral center, a 28-year-old man was diagnosed with extensive metastatic non-seminoma germ cell cancer and was treated with cisplatin-based chemotherapy. Due to continued recurrence, he was later admitted for high dose carboplatin and etoposide chemotherapy followed by autologous stem cell rescue with peripheral blood stem cell transplant. He soon developed persistent diarrhea and testing for C. difficile and candida were positive. He was started on empiric antimicrobial therapy and required extensive blood product transfusions and IVFs for pancytopenia and diarrhea. On Hospital day seven, Nephrology was consulted for management of AKI from a baseline of 1.1 to 1.5 mg/dL along with hypernatremia, hypokalemia and 9 L of polyuria despite repletion of free water and potassium. The patient was febrile, hypotensive with diffuse anasarca and pitting edema. Urine studies showed new onset glucosuria, hematuria, trace proteinuria and a pH of 8 supporting a diagnosis of proximal tubular dysfunction or Fanconi’s syndrome. CVVH was initiated to control electrolytes and volume in the setting of ongoing polyuria and worsening sepsis. He was maintained on RRT for 8 days and afterwards showed renal improvement. After a prolonged and complicated hospital course, the patient was discharged from our facility without the need for RRT.

Results and Conclusions: This case highlights an interesting use of RRT. While this patient suffered AKI from a variety of factors, the onset of proximal tubule dysfunction indicates direct nephrotoxicity likely from platinum-based therapy. Given his multiple electrolyte abnormalities and anasarca, CVVH was initiated early to provide additional stability with ongoing significant gastrointestinal and renal losses. While his electrolyte abnormalities could have been initially managed with traditional IV repletion, a more proactive strategy was taken with starting CVVH earlier before an emergent need. This decision was made easier given that he retained a central venous catheter from his stem cell transplant and thus bypassing the need for an additional procedure. Interestingly, we initiated CVVH in the setting of polyuria rather than oliguria which proved prudent as he quickly became oliguric with worsening sepsis. Fortunately, he was already on RRT.

11
Chronic Gabapentin Toxicity Mimicking Uremia
A. Akinjero, F. Daccueil, C. Estrada
Stony Brook University, Stony Brook, NY, USA

Topic: Pharmacokinetics, Pharmacodynamics, and Pharmacogenetics.
Keyword(s): Gabapentin, Pharmacokinetics, Clearance.
Background: Gabapentin toxicity is a known cause of worsening neurologic symptoms in patients with chronic kidney disease. However, its uremia-mimic presentation is underreported in the literature.

Methods: A 75-year-old woman presented with 2 months of episodic body tremors with associated gait abnormalities. The tremors previously lasted 5–8 minutes but had worsened in duration to 10–15 minutes. Her medical history included hypertensive nephropathy with chronic kidney disease stage V (baseline BUN 68 mg/dL, Cr 3.0 mg/dL, GFR 14) and no known neurologic conditions other than chronic back pain from traumatic T3-T4 fractures for which she is being treated with gabapentin 300 mg daily orally. She was afebrile, alert, and oriented. Heart, lung, and abdominal exams were normal. Cranial nerves II to XII were intact. Muscles had normal bulk and tone. Her gait was wide based with
small steps. Resting tremors worsened with activation and intention. Upper extremity tremors were coarse and initially reported as possible asterixis at presentation, but asterixis was not replicated on subsequent examinations. Head CT scan demonstrated chronic microvascular ischemic changes. BUN and Cr at admission were 75 mg/dL and 3.30 mg/dL respectively. Hemodialysis was started on day 3 of admission for possible uremia. However, tremors persisted despite dialysis. Hence, Gabapentin toxicity was considered, and Gabapentin was held on hospital day 4, with subsequent resolution of tremors. Hemodialysis was subsequently withheld, and she was discharged on hospital day 7 with resolution of neurologic symptoms. She remained tremor-free at the six-month outpatient follow-up.

**Results:** Gabapentin, a gamma-aminobutyric acid analogue, is often used for neuropathic pain. Gabapentin is not protein bound and readily crosses the blood-brain barrier. Gabapentin clearance depends solely on kidneys and is linearly proportional to Cr clearance. Its half-life is 7 hours in patients without renal failure and up to 132 hours in patients with renal failure. Gabapentin toxicity in the setting of renal disease causes dose-independent neurologic abnormalities including confusion, unsteady gait, myoclonus, ataxia, asterixis, and coma. Gabapentin discontinuation is the first line of management. Refractory cases may require hemodialysis.

**Conclusions:** This case illustrates the importance of recognizing gabapentin toxicity as a reversible cause of neurologic abnormalities that can profoundly affect patients, especially geriatric patients. Including drug toxicities in differential diagnoses and stopping the drugs as a first line approach, may prevent unnecessary dialysis.

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**12 Exploring Intracellular Labile Iron and Biomarkers of Inflammation in Peritoneal Dialysis Patients**

G. Costello1, M. Dean1, A. Barton Pai1, L. Yessayan2, S. Mukherjee1

1College of Pharmacy, University of Michigan, Ann Arbor, MI; 2Department of Nephrology, University of Michigan, Ann Arbor, MI, USA

**Topic:** Peritoneal Dialysis.  
**Keyword(s):** Peritoneal dialysis, inflammation, intracellular labile iron.

**Background:** Dialysis access-related infections, particularly gram-positive bacterial infections, are a common and potentially life-threatening issue in dialysis. Previously, we showed that lipoteichoic acid (LTA), a component of gram-positive organism’s cell wall, is detectable in the serum of hemodialysis (HD) patients of all access types and may be a viable biomarker for access-related biofilm. A positive correlation between monthly administration of intravenous iron (IV iron) and the labile iron pool (LIP) in peripheral blood mononuclear cells (PBMCs) was also observed. In the current study, we aimed to explore the concentration of LTA and the LIP within the serum, dialysis effluent and PBMC of peritoneal dialysis (PD) patients.

**Methods:** PD patients were enrolled during standard monthly visits at a University of Michigan Ann Arbor dialysis facility. Sample collection included 15 mL of whole blood by blood draw and 10 mL of dialysis effluent removed during a dwell. Whole blood samples were processed for serum and isolation of PBMCs. An Aviva Systems ELISA assay was used to detect LTA in serum and effluent, and the fluorescent probe Phen Green SK was used to detect LIP in PBMCs. Statistical analysis was performed to evaluate correlations between the LIP, LTA, and laboratory results related to inflammation and infection. We also explored differences between PD data and prior HD data.

**Results:** A total of 17 PD participants were enrolled. LTA was detectable in serum, with a mean concentration of 8.2 ng/mL ±3.1 ng/mL. LTA was not detectable in most participants, with a single detectable value of 1.6 ng/mL. Among PD participants who had received IV iron within 6 months, positive correlations were found between LTA and average monthly ferritin (0.91, p-value = 0.03), most recent ferritin values (−0.90, p-value = 0.03), and most recent WBC values (0.87, p-value = 0.05). Among PD participants who had not received IV iron, a significant negative correlation was found between LIP and average monthly TSAT (−0.65, p-value = 0.03). LIP was significantly lower in HD participants receiving load IV iron dosing as compared to PD participants (910 vs. −8043, p-value = 0.94).

**Conclusions:** LTA was not detectable in PD effluent and is likely not a viable non-invasive marker of biofilm for PD patients. Despite lower exposure to IV iron and lower serum ferritin, the LIP is higher in PBMCs of PD patients. Further studies should explore cellular mechanisms driving differences in iron uptake into PBMCs in HD and PD patients.
Abstracts

**Blood Purif**

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(GSH) by Thiol Tracker Violet probe (Thermo Scientific). Both markers were analyzed using flow cytometry.

**Results:** S-HD significantly increased ROS production and reduced GSH concentration in RBC compared to S-CON. AA and 3-HT normalized ROS levels and GSH in RBC incubated with S-HD (Figure 1), thus restoring the redox balance in RBC comparable to that observed with S-CON.

**Conclusions:** Our results suggest that both AA and 3-HT antioxidants were able to significantly attenuate uremia-induced damage to erythrocytes by restoring redox balance. The signaling pathways that lead to this effect need further clarification to determine potential intervention targets.

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**Evaluation of Impact of Two Intravenous Iron Formulations on the Metabolome in Healthy Rats**

M. Dean, G. Costello, L. Yeomans, K. Stringer, A. Pai

College of Pharmacy, University of Michigan, Ann Arbor, MI, USA

**Topic:** Dialysis: Anemia and Iron Metabolism.

**Keyword(s):** Intravenous iron, metabolomics.

**Background:** Treatment of anemia with intravenous (IV) iron-carbohydrate nanoparticle formulations is increasing. The available IV iron nanoparticle formulations are classified as complex drugs and differ widely with regard to particle size distribution, polydispersity, stability profile and pharmacokinetic disposition. Labile plasma iron induces deleterious redox reactions leading to oxidative stress, inflammation and disruption of cellular homeostasis. This preliminary study in rats sought to evaluate impact of Venofer and Injectafer on the metabolome of healthy rats.

**Methods:** Twenty healthy male rats were split into equal groups and treated with 40 mg/kg of Venofer and 10 mg/kg Injectafer. Whole blood samples were obtained pre-dose, 30 minutes, 4, and 24 hrs. Untargeted 1H-NMR metabolomics were performed at UM NMR core facility on a Varian (now Agilent, Inc, Santa Clara, CA) 11.75 Tesla (500 MHz) NMR spectrometer. Chenomx Compound Library was used to identify and quantify 33 metabolites. Within drug and between drug comparisons were evaluated using paired and unpaired students t-test, respectively. P-values were corrected for false discovery by calculating a corresponding false discovery rate.

**Results:** Most significant changes in metabolome with Venofer were observed at 24 hrs. Injectafer appeared to have a greater effect on metabolites related to cell energy and metabolism (ADP, AMP) while Venofer was associated with increases in amino acid production (phenylalanine, leucine, isoleucine, valine) which could be due to enhanced cell uptake of the nanoparticles and altered intracellular labile iron pool. When the formulations were compared, Venofer produced greater increases in 5 metabolites (choline, glucose, lactate, malonate, and succinate) and all significant changes were observed at 30 minutes when labile iron is likely circulating. Venofer, sucrose was only detectable at 30 minutes, which likely suggests the separation of the iron-oxide core from the sucrose coating.

**Conclusions:** Commercially available IV iron formulations have different particle size distributions and labile iron release profiles. Venofer induced greater change in the metabolome in healthy male rats than Injectafer, with the most significant changes observed at 24 hours. Between drugs, the most significant changes occurred at 30 minutes, likely as the result of increase direct labile iron release from the nanoparticle after administration.

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**Fig. 1.** Reactive oxygen species (ROS) and glutathione (GSH) levels in erythrocytes from dialysis patients after treatment with L-ascorbic acid (AA) or 3-hydroxytyrosol (3-HT) with either healthy serum (S-CON) or autologous HD serum (S-HD). Data are shown as mean±SD of the Mean Fluorescence Intensity (MFI). * Represents the difference compared to the same group without AA/3-HT (Buffer). & Represents the difference between S-CON vs S-HD (for Abstract no 13).
**Chronic Kidney Disease and Current Features of Acute Pneumonia**

D.K. Muminov

Internal Therapy, Tashkent Pediatric Medical Institute, Tashkent, Uzbekistan

**Topic:** Chronic Kidney Disease.

**Keyword(s):** Chronic kidney disease, pneumonia.

**Background:** Pneumonia is one of the most important problems of modern healthcare. This is a comparative study of the clinical and radiological features of acute pneumonia in patients with initially normal renal function, versus patients with a background of chronic kidney disease (CKD).

**Methods:** The study included 120 patients with acute pneumonia (AP). The average age was 48.46 ± 3.78 years. 40 patients had no history of renal pathology, 80 patients suffered from CKD (GFR for 3 months before pneumonia developed 30–60 ml/min/1.73 m², group AP + CKD). Control group: 20 healthy individuals. In the group of AP + CKD, the distribution of patients according to the etiology of CKD: chronic glomerulonephritis 64 (80%), chronic pyelonephritis 4 patients (5%), gouty nephropathy – 7 patients (8.75%), unknown etiology – 5 patients (6.25%). Radiological signs were classified as lobar infiltrate and focal drain.

**Results:** X-ray in all patients revealed one-sided limited infiltration of lung tissue with the phenomenon of “air bronchography” on the background of infiltrate. In the group of AP + CKD, focal drainage pneumonia with a large volume of infiltrate (p < 0.001) was significantly more common, which explains the difference in physical data: so in this group of patients, most rales were classified as lobar infiltrate and focal drain.

**Conclusions:** CKD in patients with AP is associated with the development of focal confluent pneumonia with large foci, a hyperergic reaction of the body, and an unfavorable prognosis of acute pneumonia.

**A Masked Diagnosis: Euglycemic Diabetic Ketoacidosis on Continuous Veno-Venous Hemofiltration and Intravenous Insulin**

E. Kotzen, G. Hladik

UNC Kidney Center, Chapel Hill, NC, USA

**Topic:** Electrolytes, and Acid-Base.

**Keyword(s):** euglycemic, CVVH, ketoacidosis.

**Background:** We present a case of diabetic ketoacidosis (DKA) obscured by serum glucose normalization by continuous veno-venous hemofiltration (CVVH).

**Methods:** A 33-year-old male with type I diabetes mellitus (DM) and ESRD was admitted with cardiac ischemia and had urgent coronary artery bypass grafting. Postoperatively, he required continuous renal replacement therapy (CRRT) because of persistent hypotension. CVVH was initiated at 25 ml/kg/h using Nx-Stage PureFlow dialysate (glucose 100 mg/dl). His diabetes was managed with an intravenous insulin infusion titrated via Endotool, a computerized glucose management system. On postoperative day 5, the patient developed worsening metabolic acidosis. Laboratory studies revealed arterial pH 7.17, PaCO2 38 mm Hg, sodium 141 mEq/L, potassium 5.0 mEq/L, chloride 109 mEq/L, total CO2 15 mmol/L, glucose 140–185 mg/dl, anion gap 17, albumin 3.2 g/dl, and lactate 1.0 mmol/L. Despite glucose levels <200 mg/dL, the serum beta-hydroxybutyrate (BHB) level was found to be elevated to 7.9 mmol/L, consistent with euglycemic DKA. Further review of his record revealed that the Endotool had been erroneously set to a Type 2 rather than a Type 1 setting, and the rate of the insulin infusion rate averaged only 0.2 Unit/hr over the preceding 72 hours. This was complicated by receiving minimal calories via tube feeds. The insulin infusion rate was increased, and the patient was started on dextrose infusion until tube feeds could be advanced. His acidosis resolved and the BHB level normalized.

**Results and Conclusions:** Euglycemic DKA describes the clinical triad of anion gap metabolic acidosis, positive serum and/or urine ketones, and serum glucose <250 mg/dl. Coutrot *et al.* described 18 cases of euglycemic DKA in patients receiving CRRT with glucose-free replacement fluids. We are not aware of previously described cases in which CRRT using glucose-containing replacement fluid yielded euglycemic DKA. In this case, the development of DKA was due to inadequate provision of insulin and carbohydrates. The use of a computerized insulin titration protocol likely delayed the team’s recognition that IV insulin provision was inadequate. The diagnosis was initially missed by an experienced critical care staff because glucose levels were normal to only mildly elevated, partially masked by CRRT driving the serum glucose towards the glucose of the replacement fluid (100 mg/dL). An increased suspicion for DKA is warranted in patients with type 1 DM on CRRT even when glucose levels are <200 mg/dL.
Intravenous Cyclophosphamide plus Oral Steroids is Effective and Safe as a First-Line Treatment in Moderate and High Risk Primary Membranous Nephropathy. Monitoring at 24 Months


Hospital Especialidades CMN La Raza, Ciudad de Mexico, Mexico

**Topic:** Glomerular and Tubulointerstitial Disorders.

**Keyword(s):** Membranous Nephropathy, Proteinuria, Cyclophosphamide.

**Background:** Primary membranous nephropathy (PMN) is a common cause of nephrotic syndrome in adults. Standard treatment includes oral cyclophosphamide and prednisone scheme known as modified Ponticelli; however, there are a few studies about the efficacy of intravenous cyclophosphamide (CF-IV) treatment in this pathology. Although these studies with CF-IV were conducted with small populations.

**Methods:** A retrospective cohort study was conducted in patients with PMN who received treatment with monthly CF-IV boluses plus oral prednisone for 6 months. The proportion of most complete partial remission, complete alone and partial alone was calculated taking into account remission criteria of KDIGO guidelines. Frequency of relapses and adverse effects associated with the treatment was determined. Quantitative variables were presented as mean ± standard deviation, categorical variables as simple frequencies and proportions. We performed a comparison of means through student t evaluating the differences between the group that reached remission and the group that did not. A p < 0.05 was considered statistically significant. Odds ratio (OR) was calculated to identify factors associated with treatment failure, with a 95% confidence interval (CI).

**Results:** 60 patients were included, of which 66.7% (40 patients) were male, with a mean age of 46.42 ± 11.49 years. Proteinuria decreased from 9.15 ± 5.35 to 1.91 ± 2.87 g/24 hrs 24 months after treatment. Total remission rate (complete plus partial) at 24 months was 80.0% (48 patients), complete remission 45.0% (27 patients) and partial remission 35.0% (21 patients). Treatment failure was observed in 12 patients (20.0%) and relapse in 7 patients (11.5%) during follow-up. Factors associated with treatment failure were peak proteinuria greater than 8 g/day (OR: 1.515, CI: 1.242–1.849) and no 50% reduction in proteinuria at the third month of treatment (OR: 2.632, CI: 1.847–3.750) as well as IFTA greater than 25% (OR: 2.308, IC: 1.204–4.424). One or more adverse events related to treatment were reported in 10 patients (16.6%). Total cumulative dose of CF-IV was 8 ± 1.26 grams and prednisone 5.4 grams.

**Conclusions:** Treatment with CF-IV plus oral prednisone is an effective therapeutic alternative in management of PMN, with a low incidence of adverse events related to a lower cumulative dose of alkylating agents and steroids.

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Acute Kidney Injury in Renal Trauma Patients

A. Aranda, J.J. S. Chavez, G. Garcia

Nephrology, Hospital Civil Fray Antonio Alcalde, Guadalajara, Mexico

**Topic:** Acute Kidney Injury.

**Keyword(s):** Acute kidney injury, renal trauma, AKI.

**Background:** Kidney is the most commonly injured organ of the genitourinary system during trauma, but little is known about the relationship that this event has with the incidence of acute kidney injury (AKI). In this cohort we describe the associated risk factors for the development of AKI in patients with renal trauma (RT).

**Methods:** In a prospective cohort, we analyzed patients with RT during 2015 to 2019 at the Hospital Civil de Guadalajara. We describe their demographic, clinical characteristics and risk factors for development of AKI with univariate and multivariate analysis.

**Results:** During the study period 65 patients were analyzed, sixty (92.3%) were men, mechanism of trauma was firearm in 26 (40%), transfusion was indicated in 18 (25%), and 46 (70%) required emergency surgery, nephrology was consulted in 12 (18%) cases. AKI was present in 39 (60%) patients, only 1 required dialysis. Creatinine and urea at hospital admission was highest in AKI group (1.56 ± 0.91 mg/dL vs. 0.85 ± 0.24 mg/dL, p < 0.001 and 56 ± 41 mmol/L vs 34 ± 20 mmol/L, p = 0.005; respectively). Nephrectomy was not different between those with 14 (35.9%) and without AKI 5 (19.2), (p = 0.15), left kidney is the most affected (57%), intestine and liver were the most common organs affected (37 and 32%, respectively), there were only 4 deaths, all in the AKI group. RT was considered high-grade (4–5) in 37 (56.9%), which has a significant association (p = 0.04) with the incidence of AKI in the univariate analysis, but this association was lost in the multivariate analysis (p = 0.05). We built a model for prediction of AKI with the most relevant variables: firearm injury, shock, emergency surgery, high grade RT, and liver injury (p = 0.02, AUC 0.74).

**Conclusions:** RT occurs mainly in young men, 60% of cases are complicated with AKI, the most significant risk factor is high grade RT. It is necessary to confirm this association in other populations and larger sample sizes, which could lead to an earlier and proactive management of AKI.
Treatment of Recurrent Focal Segmental Glomerulosclerosis Post-Kidney Transplantation in a Pediatric Patient: A Case Report

A.C. Navarro Ramirez1, C.I. Rodríguez-CueLLa2, A. Bojorquez Ochoa3, M. Garcia Nájera3, L. Reyes Morales3, E. Osorio Contla1, X. Cortés Nuñez1

1Pediatric Nephrology, Instituto Nacional de Pediatría, Mexico City, Mexico; 2Pediatric Nephrology, Fundación Clínica Shaio Colombia, Bogotá, Colombia

Topic: Pediatric Nephrology.
Keyword(s): Kidney transplant, FSGS recurrence, Rituximab.

Background: Primary focal segmental glomerulosclerosis (FSGS) is a major cause of nephrotic syndrome and end-stage kidney disease (ESKD) in pediatrics. It recurs after kidney transplantation in 5 to 60%.

Methods: 11-year-old boy, with ESKD secondary FSGS reached in <5 years. Live donor kidney transplant, crossmatch negative, induction with basiliximab, methylprednisolone and cyclophosphamide. Nephrotic range proteinuria detected in the 1st day 42 g/d with serum albumin 1.7 g/dl. No creatinine elevation, hypertension or fever was found. We performed allograft biopsy, with acute tubular necrosis and negative C4d. With methylprednisolone pulses and 5 plasma exchange (PE) sessions, partial response was achieved, continuing with rituximab 375 mg/m² with complete remission after the 4th weekly dose. Out-patient follow-up creatinine 0.63 mg/dL, albumin 4 gr/dL and proteinuria 150 mg/day, with prednisone, mycophenolate and tacrolimus as maintenance immunosuppressives.

Results and Conclusions: Recurrent FSGS post-replacement remains an enigmatic clinical-pathologic entity, and treatment in the pediatric population is controversial, not standard-ized. Most of the therapeutic regimens commonly use PE plus intensified immunosuppressive regimen, none reported consistently beneficial and with remissions in 70–80%. Rituximab can be used as 3rd line treatment; however, there is no number of doses or frequency to establish efficacy. Published literature suggest that children have a higher likelihood of responding to rituximab compared to adults (81 to 50%). The lack of proper prospective clinical assays in the treatment of FSGS recurrence in the allograft, leads to clinical making decision based in clinical experience within the medical centers. FSGS itself should not be a cause for postponing kidney transplantation, however in order to achieve proper treatment and successful outcomes, risk factors should be identified, and close monitoring is needed.

Fibrillar Glomerulonephritis: A Report of 4 Cases in Hispanic Patients

E.C. Vasquez Jimenez1, M. Madero1, V. Soto Abraham2

1Nephrology, Instituto Nacional de Cardiologia, Mexico City, Mexico; 2Pathology, Instituto Nacional de Cardiologia, Mexico City, Mexico

Topic: Glomerular and Tubulointerstitial Disorders.
Keyword(s): Fibrillar glomerulonephritis, kidney biopsy.

Background: Fibrillar glomerulonephritis (FGN) consists of glomerular accumulation of randomly organized deposits of straight fibrils measuring 10–30 nm thick. The diagnosis of FGN can be established only by kidney biopsy. Patients with FGN typically present with nephritic/nephrotic syndrome with proteinuria, hematuria, renal insufficiency, and hypertension. We report the characteristics, treatments and outcomes of 4 patients diagnosed with FGN in one third level medical centers in Mexico.

Fig. 1. Proteinuria, creatinine and treatment evolution. PE, plasma exchange; RTX, rituximab (for Abstract no 19).
Methods: Between 2009 and 2019, a total of 4 patients had FGN diagnosed at the National Institute of Cardiology. The patients debuted with arterial hypertension, active sediment and edema; three (patients 1–3) with nephrotic proteinuria; one (patient 2) with nephrotic syndrome and two (patients 3 and 4) with impaired renal function. The immunological approach was negative, and one patient had a low complement (patient 2) at diagnosis. The study for monoclonal gammopathies and cryoglobulins in all cases was negative. The biopsies of the patients showed double contours secondary to duplication of glomerular basement membranes with cellular interposition, segmental endocapillary proliferation. Red stains of Congo Red and Thioflavin T were negative. Electron microscopy found deposits of material in the form of fibrils with a size of 12–20 nm, without a P component, without central lights in cross sections that suggest microtubules. All patients were treated with drugs that act on the renin angiotensin aldosterone system; Patient 2 received steroids, mycophenolate mofetil and cyclophosphamide; however, no improvement in proteinuria was observed. Therefore, after corroborating the diagnosis with electronic microscopy, treatment with rituximab was offered 375 mg/m² per week for 4 doses.

Results and Conclusions: We report our experience with a series of 4 patients with FGN during the last 10 years. We assume that the few cases of FGN are because the condition is rare and may be more infrequent in patients of Hispanic ethnicity. All the cases were considered idiopathic, at least according to the diagnostic approach performed in our center. Patients with FGN respond poorly to corticosteroids and cytotoxic drugs, with an incidence of chronic kidney disease of around 50%. Treatment is challenging and approximately half of all patients progress to end stage kidney disease within 4 years of diagnosis.

21 Lipid Profile Improvement in Chronic Kidney Disease Patients using a Symbiotic Supplement with Agave Inulin, Lactobacillus Rhamnosus and Bifidobacterium Longum. A Post-Hoc Analysis from a Randomized Controlled Trial

L. Prado1, K. Aguilar2, J. Arellano1, L. Mariscal1, I. Campos1, F. Tuz1, V. Gómez1

1Nefrologia, Hospital General “Dr Miguel Silva”, Morelia, Mexico;
2Nefrologia, Hospital General “Dr Miguel Silva”, Morelia, Mexico;
3Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, México City, Mexico

Topic: Chronic Kidney Disease.
Keyword(s): ESKD patients, gut microbiota, symbiotic supplement, biomarkers.

Background: End stage kidney disease (ESKD) is a worldwide unsolved problem. Access to renal replacement therapies (RRT) is limited. Gut microbiota is involved in uremic toxins serum concentrations. Current evidence suggest that symbiotic treatment could improve gut microbiota environment, these ultimately may improve serum uremic toxin concentrations. The objective of the study was to explore the effect of a symbiotic supplement on biomarkers from ESKD patients.

Methods: A double blinded randomized control trial was performed in KDIGO grade 4 & 5 ESKD patients. Two groups were compared, the first group (SyG) received daily a symbiotic supplement with agave inulin, Lactobacillus rhamnosus and Bifidobacterium longum, a second group (PG) received a placebo. Both groups received nutritional advice (a diet of 35 Kcal and 0.8 gm of protein per Kg of pound was calculated for all participants), blood sample (creatinine, urea, C reactive protein, albumin, and lipids) were completed every 2 weeks during the following 2 months.

Results: 56 subjects completed the study (26 in the SyG). No baseline and final differences were detected on creatinine, urea, C reactive protein, albumin, estimated glomerular filtration rate. We explored the differences in baseline total cholesterol level, cholesterol-HDL and cholesterol LDL in SyG vs PG, 158 ± 45 vs 136 ± 23 mg/dL (p = 0.08), 40.57 ± 12 vs 47.6 ± 11.8 mg/dL (p < 0.05), 112 ± 60.3 vs 95.4 ± 28.1 mg/dL, (p = NS) respectively. We analyzed the change in lipid profile at the end of the study, final total cholesterol level, cholesterol-HDL and cholesterol LDL in SyG vs PG, 163 ± 52 vs 156 ± 58 mg/dL, (p = NS), 40.9 ± 12.8 vs 45.9 ± 11.9 mg/dL (p = NS), 97.1 ± 37.3 vs 100.7 ± 36.3 mg/dL, (p = NS) were found respectively, finally delta from baseline to final cholesterol profile were analyzed, a significant decline in cholesterol LDL were found (−14.9 ± 35.8 vs 5.3 ± 28.2 mg/dL, p = 0.02).

Conclusions: In the post-hoc analysis, we found a higher baseline cholesterol LDL in the PG, at the end of the study this difference was lost, a significant decrease from baseline to final cholesterol LDL was observed in the SyG. Further research analyzing lipid profile as primary outcome in ESKD patients using symbiotic supplements would be the next step.

22 Association Between the Variability of Phosphorus and Mortality in Patients with Chronic Hemodialysis at 2 Years
J. Bahena, M. Sebastian, M. Carmona, M. Wasung, D. Escamilla
Pemex, Mexico City, Mexico

Topic: Hemodialysis.
Keyword(s): Phosphorus, Mortality, Variability.

Introduction: Hyperphosphatemia confers several negative consequences, which result in increased morbidity and mortality. Of the 3 measures to avoid it: reduced phosphorus diet, chelators and elimination by renal replacement therapy; hemodialysis has a limited ability to eliminate it, so hyperphosphatemia is a frequent complication. The objective was to evaluate the association between the fluctuation of phosphorus levels (variability) and the risk of mortality in our hemodialysis population for 2 years.

Materials and Methods: Retrospective cohort of patients included in the hemodialysis program of two centers of our institution in Mexico City in the period from January 2017 to December 2018. Patients with a follow-up of less than 3 months were excluded and those who changed to peritoneal dialysis. The monthly phosphorus measurement was recorded, and its variability was calculated by an absolute change model by means of the average of the arithmetic variation (tested in a previous pilot study). It was documented if the patient reached the primary outcome (mortal-
ity) and Mantel-Cox was performed for the Kaplan-Meier survival curves according to the phosphorus variability grouped in quartiles from least to greatest variability. A p < 0.05 was considered significant.

Results: 134 patients were included, of which 3 were excluded and 1 patient was eliminated. 130 patients included in the analysis, 56.2% were men, aged 62.8 ± 15.3 years and a hemodialysis time of 23.8 ± 31.7 months. During the follow-up, 13.8% of the patients died. Phosphorus variability was calculated and divided into quartiles from least to greatest variability. Higher mortality was observed in the quartile that has the greatest variability in phosphorus levels compared to the rest of the groups (p = 0.001).

Conclusions: Within the multifactorial model of Chronic Renal Disease, the control of all the variables allows the progression of the disease to be delayed. Phosphorus variability increases mortality in hemodialysis patients, however, the absolute value of a variable such as phosphorus does not reflect the balance of mineral metabolism; So, it is important to have a dynamic approach. The low mortality rates in our units also limit the number of cases analyzed. It is necessary to continue evaluating the criteria considered treatment goal so that they adequately reflect the real state of the patient.

Evaluation of the Nutritional State in Geriatric Patients in Hemodialysis: A Two Year Follow-Up Study

A. Baca1, M.G. Rodriguez2, F. Salazar3, J. Medina3, J. Ramirez1, M.A. Sebastian1, C.A. Uribe2, J. Lazaro2, D. Escamilla3

1Nephrology, HCSAE Pemex, Mexico City, Mexico; 2Geriatrics, HCN Pemex, Mexico City, Mexico; 3Nephrology, HCN Pemex, Mexico City, Mexico; 4Nephrology and kidney transplant, HGM, Mexico City, Mexico

Topic: Hemodialysis.

Keyword(s): Malnutrition, geriatric patients, hemodialysis.

Background: Demographic aging has increased the prevalence of CKD in older adults, where there is a high risk of malnutrition in those included into hemodialysis program. The primary outcome was to determine the nutritional impact of hemodialysis in geriatric population during two years of follow up.

Methods: A prospective cohort of geriatric patients on hemodialysis at our hospital was recruited. Mini Nutritional Assessment Screening (MNAS) Evaluation (MNAE) and Geriatric Nutritional Risk Index (GNRI) were applied during May 2017, June 2018 and June 2019; excluding patients who died in this period, change to peritoneal dialysis (PD) or who refused to participate. Nutritional rating scales were reported in means with standard deviation.

Results: In 2017, 53 patients (49% men), mean age of 70.6 ± 7.1 years and a previous hemodialysis time of 3.4 ± 2.4 years were included. By 2019, 54.7% (28) had died, 3.8% (2) migrated to PD, 9.4%(4) refused to participate in the third measurement, leaving a total of 17 patients, (41.1%(7) men), with a mean age of 69 ± 6.7 years at the beginning of the study. The MNAS scale evolved from the initial measurement of 11.6 ± 2.1 to 9.9 in 2018 ± 3.2 and finally to 11.0 ± 2.9. For MNAE, the initial value of 22.7 ± 3.8 was modified to 19.7 ± 3.3 in 2018 and 22.1 ± 4.0 in 2019. While GNRI moved from the initial measurement of 100.7 ± 7.5 to 110.2 ± 10.3 and remains at 110.2 ± 10.2 in the last measurement in 2019. When comparing the means, only a significant difference is observed between the 3 values obtained from GNRI (p = 0.005), without differences between MNAS and MNAE.

Discussion and Conclusion: Elderly patients have a higher risk of malnutrition and morbidity, which gives a negative predictive value of survival in those undergoing renal replacement therapy. At the end of our study, we observed nutritional deterioration during the first year that improves at the second; probably associated with the integral treatment in our unit. It is a priority to establish measures that allow an integral approach for elderly patients, as well as to implement in this population group already tested measures in young Mexican population with nutritional supplement along with intradialytic exercise.

Clinical and Biochemical Changes in Living Kidney Donors after Kidney Donation

K. Espinosa, J. Quiroz, L. Mariscal, J. Arellano, V. Gómez, I. Campos

Nephrology, Hospital General Dr. Miguel Silva, Morelia, Mexico

Topic: Transplantation.

Keyword(s): Living, kidney, donors.

Background: Kidney transplant is the preferred renal replacement therapy (RRT) in many patients with end stage kidney disease (ESKD). Living kidney donation is currently a challenge. In Mexico, deceased kidney donation is not well accepted, most of our patients received a kidney from living donors (LKD). Outcomes in LKD after kidney donation (KD) are not clear, opposite results have been published. Transient decline in glomerular filtration rate (GFR) is expected after nephrectomy in LKD. The objective of this study was to explore the differences in clinical and biochemical markers after at least one year from KD in LKD based on the relative decline in GFR during the first 24 hours after nephrectomy.

Methods: We analyzed the data from LKD. Current GFR, serum creatinine, and blood pressure between two groups (GFR decline 24 hours after kidney donation <50% vs >50%) were compared, changes in serum creatinine (sCr), GFR, systolic (SBP) and diastolic blood pressure (DBP), body mass index (BMI) and uric acid (UA) between pre-KD vs current (at least 1 year post donation) values were explored.

Results: From a total of 34 LKD during the period August 2018 to July 2019, we included 28 subjects with complete data, 50% female, mean age 41.3 ± 12.1 y, pre-KD sCr 0.75 ± 0.13 mg/dL, pre-KD GFR 106.4 ± 13.1 mL/min. The change between pre-KD to current values (after at least 1 year from donation) for sCr, eGFR, BMI, SBP and DBP was 0.75 ± 0.13 vs 1.0 ± 0.25 mg/dL (p < 0.05), 106.4 ± 13.1 vs 80.4 ± 21.6 mL/min (p < 0.05), 26.6 ± 3.5 vs 27.4 ± 3.3 (p < 0.001), 118 ± 11.5 vs 117.9 ± 14.7 mm Hg (p = NS), 69.4 ± 9.7 vs 74.3 ± 8.3 mm Hg (p < 0.05) respectively. When we compare the differences between subjects with post nephrectomy GFR decline >50% vs <50% we found a mean GFR after 1 year from KD of 69.5 ± 6.3 vs 82.3 ± 22.8 mL/min (p < 0.05) (Figure 1), mean
current DBP of 81.8 ± 2.0 vs 72.1 ± 8.2 mm Hg (p < 0.05) respectively (Figure 2).

Conclusions: In LKD we found a rise in sCr, a decline in GFR, an increase in BMI as well as DBP after 1 year of KD. Patients with a relative GFR decline >50% during the first 24 hours of nephrectomy have a lower GFR as well as a higher DBP 1 year after KD. These results warrant an exhaustive exploration and follow up outcomes in our LKD.

Fig. 1. Comparing GFR decline (>50% vs <50%) post nephrectomy and after 1 year (for Abstract no 24).

Fig. 2. Diastolic blood pressure post nephrectomy and after 1 year and estimated GFR decline (>50% vs <50%) (for Abstract no 24).

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Ocular Calcifications by Echography in Renal Replacement Therapies. A Comparative Study in Peritoneal Dialysis and Chronic Hemodialysis Patients
I. Campos, B. Limon, A. Mariscal, V. Gomez, J. Arellano, J. Quiroz
Hospital General “Dr. Miguel Silva”, Morelia, Mexico

Topic: Hemodialysis.
Keyword(s): Ocular Calcifications, Hemodialysis, Peritoneal dialysis.

Background: Vascular damage (VD) is common in end stage kidney disease (ESKD). Calcium and phosphorus metabolism imbalances are frequent in ESKD. Calcification rules a main role in VD in this population. Dialysate calcium concentration has been associated with poor clinical outcomes. In our center, a standard dialysate calcium concentration of 3.0 mEq is applied in hemodialysis (HD) patients, while a 3.5 mEq dialysate calcium concentration is used in peritoneal dialysis (PD) patients. Ocular echography is a non-invasive, low cost and low risk method that allows to detect ocular calcification (OC) in the retina and choroids. The objective of this study was to explore the differences in the number of OC between HD and PD patients.

Methods: Single Center Cross-sectional study in chronic HD and PD patients during November 2018 to March 2019. Ocular echography with a linear probe at 7.5–10 MHz was performed in a cohort of PD and HD patients from the outpatient Nephrology Clinic at Hospital General Dr. Miguel Silva in Morelia, Mexico. We compared clinical and biochemical data between groups and explored the differences in total OC by echography.

Results: A total of 40 subjects were included (48% female), mean age 43.5 ± 1.3 years, 23 subjects on HD, 17 subjects on PD. Diabetes
was found in 57.5% and hypertension in 42.5%. No differences were found in diabetes, hypertension, renal replacement therapies (RRT) vintage, ESKD vintage, serum calcium, phosphorus, age and gender between HD and PD patients. We found differences in the presence of OC in PD vs HD, 64.7% vs 17.4% (p < 0.05) respectively, as well as the total number of OC in both eyes between PD vs HD patients, 3.06 ± 1.9 vs 1.6 ± 1.6 (p < 0.05) (Figure 1).

**Conclusions:** In our population, PD patients have more OC detected by echography compared to HD patients, this association was independent of age, gender, comorbidities, ESKD and RRT vintage, serum calcium and phosphorus. Ocular ultrasound could be an easy, non-invasive, low-risk, inexpensive method to explore calcification in ESKD patients. Further research in larger populations should be performed to validate our results.

### Table 1. Correlation between baseline Arterial Line Pressure (ALP) and ALP at different time points through HD treatment (for Abstract no 26)

<table>
<thead>
<tr>
<th>Baseline ALP vs ALP at different time points</th>
<th>R value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 vs 30 min</td>
<td>0.37</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>10 vs 60 min</td>
<td>0.42</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>10 vs 90 min</td>
<td>0.49</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>10 vs 120 min</td>
<td>0.5</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>10 vs 150 min</td>
<td>0.48</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>10 vs 180 min</td>
<td>0.34</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

ALP, Arterial line pressure.

Intradialytic ALP at different time points (30, 60, 90, 120, 150 and 180 minutes) were explored.

**Results:** 36 HD treatments were analyzed, 28 patients (39% women), age 38 ± 19 years were included. HD vintage was 38 ± 4 months and current temporary catheter vintage was 13.9 ± 2.7 months. The average effective QS was 271.7 ± 15.28 mL/min. The mean ALP in all treatments at 10, 60, 120 and 180 minutes was, −125.2 ± 3.8 mm Hg, −131.1 ± 6.0 mm Hg, −137.22 ± 7.2 mm Hg, −128.33 ± 9.4 mm Hg respectively. There were 3 dysfunction events (8.3%) defined as ALP higher than −250 mm Hg at QS 300 mL/min. Baseline ALP and different intradialytic timepoints correlations are reported in Table 1.

**Conclusions:** Baseline ALP at 10 minutes after HD initiation correlates with ALP measured at 30, 60, 90, 120, 150 and 180 minutes after HD initiation. It is not yet standardized timing for CF evaluation, the 10-minute ALP measurement could be used for this purpose.
Changes in the State of Hydration Evaluated by Bioimpedance and its Association with the Ocular Volume by Ultrasound in Patients with Chronic Kidney Disease

L.E. López-Vilchis, L.A. Mariscal, I.D. Campos
Nefrología, Hospital General Dr. Miguel Silva, Morelia, Mexico

Topic: Chronic Kidney Disease.
Keyword(s): CKD, Body Composition Monitor, Overhydration.

Background: Overhydration (OH) in pre-dialysis patients is a predisposing factor for an increase in comorbidities and loss of glomerular filtration rate. There are studies that have reported morphological changes in the eye of patients with chronic kidney disease (CKD) on hemodialysis (HD), it has not been analyzed whether these changes are related to the volume status. Objective: To analyze the association between hydration status and ocular volume of patients with CKD grades 3, 4 and 5 pre-dialysis.

Methods: Prospective, observational and cross-sectional study where adult subjects were included with CKD grades 3, 4 and 5 of pre-dialysis. Spectral bioimpedance (BCM, Fresenius Medical Care) was performed to determine the state of hydration and the ocular volume in both eyes was evaluated by ultrasound. A one-way ANOVA was performed to assess the differences between the degrees of CKD and a post-hoc analysis was performed using the Bonferroni method for differences between groups. Pearson’s correlation analysis was performed to determine the degree of association between bioimpedance hydration status and eye volume.

Results: 95 patients were evaluated. The average age was 57.4 ± 17.4 years. The median relative overhydration (OH) between groups was –0.2 L [–2.4–5.8] for stage 3, 0.25 L [–8.9–7.3] for stage 4 and 1.4 L [–1.5–11.7] in Stage 5 pre-dialysis (p < 0.01) (Figure 1a). The average ocular volume was 5.28 ± 0.7 mL for stage 3, 5.61 ± 0.6 mL for stage 4 and 5.85 ± 0.8 mL for stage 5 pre-dialysis (p < 0.01) (Figure 1b). The volume of the posterior segment of the right eye was 5.28 ± 0.7, 5.61 ± 0.6 and 5.85 ± 0.8 mL for each degree of CKD analyzed (p < 0.05). No correlation was found between the state of OH and the ocular volume (r = 0.013, p = NS).

Conclusion: The higher the stages of CKD there is an increase in OH, similarly, at advanced CKD stages there is an increase in the volume of the eye; however, there is no correlation between the degree of hydration and the eye volume. Other factors that may explain the increase in ocular volume of patients with CKD, such as osmotic changes, should be investigated.

Management of Severe Neonatal Hyperammonemia with CVVHD via an ECMO Circuit

E.S. Kotzen, K.D. Westreich
UNC Kidney Center, Chapel Hill, NC, USA

Topic: Pediatric Nephrology.
Keyword(s): Hyperammonemia, CVVHD, neonatal.

Background: We present a case of severe neonatal hyperammonemia with cardiogenic shock, initially managed with extracorporeal membrane oxygenation (ECMO) with continuous venovenous hemodialysis (CVVHD).

Methods: A 3-day-old full term male infant presented to the emergency department with lethargy and was found to be in cardiogenic shock, requiring rapid deployment of VA-ECMO. Ammonia level was >1000 mmol/L. In addition to provision of intravenous 10% dextrose, CVVHD was initiated at a very aggressive prescription, using NxStage with an initial dialysate flow rate of 2000 mL/hr (approximately 16,000 mL/1.73 m²/hr). The ammonia level improved from 796 to 263 mmol/L over the first 12 hours of CVVHD. CVVHD was discontinued in favor of metabolic management without overlap, and the ammonia level rebounded.

Fig. 1. a Overhydration according to the CKD stage. b Average ocular volume of each CKD stage (for Abstract no 28).
quickly to 683 mmol/L. Subsequently a tapering CVVHD prescription was overlapped with metabolic management including ammonia-scavenging medications, without rebound of the ammonia level. The CVVHD was successfully discontinued on day of life 5.

The initial plasma organic acid assay revealed very low citrulline with elevated glutamine, consistent with a proximal urea cycle disorder. Urine orotic acid was absent, suggestive of carbamyl phosphate synthetase I (CPS I) deficiency. Genetic testing confirmed a diagnosis of CPS I deficiency. The infant was maintained on a low protein diet, arginine, and sodium phenylacetate-sodium benzoate (Ammunol) until he received definitive treatment with living donor liver transplantation at age 3 months.

**Results:** n/a.

**Conclusions:** Management of severe neonatal hyperammonemia is complex, multidisciplinary, and must be performed quickly and correctly to protect neurologic prognosis. Many institutions, including ours, see severe hyperammonemia only rarely. This case highlights the importance of initiation of ammonia-scavenging medications prior to the withdrawal of CVVHD to prevent rebound hyperammonemia. After this case our institution elected to coordinate a consensus-based multidisciplinary protocol for management of severe hyperammonemia.

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**30**

**Quantification of Dietary Behaviors and Low-Sodium Dietary Adherence in Hemodialysis Patients**

L. Perez

Nutrition Sciences, University of Illinois, Urbana, IL, USA

**Topic:** Hemodialysis.

**Keyword(s):** Hemodialysis, dietary sodium, behavior.

**Background:** A low-sodium diet is one component of the hemodialysis (HD) dietary recommendations meant to prevent excessive fluid intake and retention. Chronic volume overload can subsequently exacerbate hypertension and contribute to cardiovascular disease and mortality. Despite routine dietary education and counseling, HD patients still have difficulty adhering to a low-sodium diet. The purpose of this study is to evaluate low-sodium dietary knowledge, attitudes, and behaviors and their impact to low-sodium dietary adherence.

**Methods:** We recruited 11 subjects (53 ± 14 years, BMI 39.1 ± 13.2 kg/m², 64% male, 55% AA, 82% AA, 55% CVD) from a HD clinic in central IL. Subjects were administered four questionnaires related to: 1) low-sodium attitudes & behaviors (DSRQ), 2) self-efficacy (SEHD), 3) problems with the HD diet (PHHD), and 4) sodium knowledge (SKQ). We also collected data (dialysis, non-dialysis, and weekend) of dietary recalls (USDA automated multiple-pass method). Our definition of a low-sodium diet was <2,300 mg/day. Each questionnaire was standardized to a cumulative 0 to 100-point scale for analysis.

**Results:** The mean scores were DSRQ = 75, SEHD = 82, PHHD = 50, and SKQ = 75. Average sodium consumption was 3384 ± 1303 mg/day. A total of N = 10 reported following a low-sodium diet, but only N = 2 met the definition cutoff. PATH analysis (Figure 1) revealed significant (p < 0.05) positive regression weights for DSRQ (0.58), SEHD (0.44), PHHD (0.35), except SKQ (−0.51 p < 0.05) for intention to follow a low-sodium diet. Intention to follow a low-sodium diet had no impact on actual sodium consumption (−0.28 p = 0.36).

**Conclusion:** In general, better attitudes and behaviors, higher self-efficacy, and less HD diet problems were associated with a higher intention to follow a low-sodium diet. However, higher sodium knowledge was surprisingly associated with lower intention to follow a low-sodium diet. It is also concerning that intention to follow a low-sodium diet did not translate low-sodium dietary adherence. These findings may warrant further investigation into the challenges and actions that translate to lower dietary sodium intake.

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![Ammonia trend over time in response to interventions](image-url)
A Workplace Wellness Program Results in Improvements in Physical Activity and Blood Pressure in the Staff of a Hemodialysis Clinic

A.C. King¹, A.P. Harris¹, L.M. Perez², K.R. Wilund³

¹Kinesiology and Community Health, University of Illinois at Urbana Champaign, Urbana, IL, ²Nutrition Sciences, University of Illinois at Urbana Champaign, Urbana, IL, USA

Topic: Hemodialysis.
Keyword(s): Physical Activity, Hemodialysis.

Background: Evidence indicates that health and wellness programs in the workplace provide numerous benefits with respect to altering indices of health.

Purpose: The purpose of this study was to assess the feasibility of a workplace wellness program (WOW) as a means of improving blood pressure by participation in habitual physical activity and improving dietary choices among the staff at a hemodialysis clinic.

Methods: 26-staff members (age: 46.8 ± 12.2; BMI: 28.7 ± 5.6 kg/m²) from a hemodialysis clinic (nurses, technicians, social workers, dieticians, and administrative staff) participated in the 12-week WOW program that consisted of weekly counseling sessions, the provision of educational resources, physical activity incentive challenges, and healthy dietary choices challenges. Body weight (kg), height (cm), blood pressure, BMI (kg/m²), 24-hr dietary recalls, physical activity behaviors (IPAQ), and waist/hip circumference (cm) were collected at weeks 0 (baseline), 6, and 12 following the conclusion of the intervention. All primary and secondary outcomes were assessed by one-way Analysis of Variance (ANOVA), with significance at (p < 0.05).

Results: The program resulted in improvements in several health-related metrics, including reductions in body weight (1.07 ± 21.4 kg; p < 0.05), body mass index (26.8 ± 4.8; p < 0.05), waist circumference (96.9 ± 14.8 cm; p < 0.05), and hip circumference (111.7 ± 13.6 cm; p < 0.05). Diastolic blood pressure was also reduced (give data; p < 0.05), while there was a trend for a reduction in systolic blood pressure (show data; p = 0.08). There were significant changes in physical activity behavior, specifically walking behavior (p < 0.05), as indicated by the IPAQ.

Conclusion: The WOW program increased staff’s physical activity and improved health outcomes including body weight reductions, BMI improvements, lowered hip and waist circumference, and improved diastolic blood pressures values. The study suggests that a workplace wellness program has the potential to improve health indices of the staff of hemodialysis clinics. Further studies are needed to determine if these changes in clinic staff health behaviors can positively impact the health behaviors in the hemodialysis patients under their care.
Babesiosis-Associated Collapsing Glomerulopathy in a Pediatric Patient

E. Benz
Nephrology, Children’s Hospital of Philadelphia, Philadelphia, PA, USA

Topic: Pediatric Nephrology.
Keyword(s): Pediatrics, Glomerulopathy.

Background: Collapsing focal segmental glomerulosclerosis (FSGS) is a severe and rapidly progressive glomerulopathy that has a high risk of leading to end stage renal disease. A number of associated conditions have been described with collapsing FSGS ranging from infections to medications to underlying chronic medical conditions. We describe a new association of babesiosis and collapsing FSGS in a 16-year-old male with sickle cell disease.

Methods: A 16-year-old boy with sickle cell disease presented to the emergency department with 2 weeks of fevers without a source and acute kidney injury. He underwent an extensive infectious work-up and was diagnosed with transfusion acquired babesiosis. He was then started on azithromycin and atovaquone. During treatment, he developed severe non-oliguric AKI (peak Cr 3.2 mg/dL). His AKI began to improve after a week of antimicrobials, however he developed symptomatic nephrotic syndrome during the recovery phase of his AKI. His AKI resolved but his nephrotic syndrome persisted on antimicrobial therapy, so he underwent a renal biopsy. His biopsy revealed collapsing FSGS. He was initially started on angiotensin receptor blocker therapy and discharged. His symptomatic edema improved over the next few weeks, but his proteinuria and hypoalbuminemia persisted. During this time, his antimicrobial therapy was completed and there was no longer any detectable babesiosis in his blood. His ARB dosing was maximized, then he was started on tacrolimus therapy. After starting tacrolimus, his hypoalbuminemia and proteinuria improved, and he went into remission. He continues tacrolimus and losartan therapy while in remission of his nephrotic syndrome.

Results: na.

Conclusions: This case report adds a new association, babesiosis, to the diverse spectrum of clinical conditions that are associated with collapsing glomerulopathy.

Quality Initiative: Establishing Safe Ultrafiltration Rates (UFR) and Fluid Balance Management in Young Hemodialysis Patients

Pediatric Nephrology, University of Miami, Miami, FL, USA

Topic: Pediatric Nephrology.
Keyword(s): Optimal UFR.

Background: Increased morbidity and mortality are associated with chronic fluid overload in hemodialysis patients. In order to control chronic fluid excess, hemodialysis patients are asked to avoid excessive interdialytic weight gain (IDWG) and are prescribed ultrafiltration rates (UFR) targeting fluid removal towards a dry weight. However, excessive UFR >13 ml/kg/hour, have been shown to cause cardiac stunning and increased morbidity. This has not been well studied in pediatric patients who are more vulnerable due to their smaller size.

Methods: A quality improvement initiative was designed to examine the many aspects of fluid balance management in our Pediatric Dialysis Unit at the University of Miami/Holtz Children’s Hospital during the period from January to November 2019. We increased awareness of the adverse effects of excessive UFRs among patients, dialysis nurses, and dieticians primarily by including an algorithm in each patient dialysis order in the electronic health system to extend dialysis time or add extra dialysis sessions for UFR >13 ml/kg/hr. We then conducted a needs assessment over 11 months and collected data including patient demographics, IDWG, UFR, weekly dialysis time, intra-dialytic symptoms (hypotension, cramping, chest pain), cardiomyopathy by echocardiography, and cardiac enzymes.

Results: Over the course of the 11-month needs assessment period, there was variability in the percentage of patients who had excessive UFR (>13 ml/kg/hr) and IDWG (>5%) with a trend towards improvement. In addition, by multiple regression analyses, the R2 for IDWG as a predictor of increased dialysis time and decreased UFR increased from 78% in January to 99% in November. This may reflect a change in patient behavior related to the ongoing intervention efforts by nursing and dietary staff.

Conclusions: The initial needs assessment of our quality improvement project related to improving fluid balance management in pediatric hemodialysis patients has shown promising results in reducing the exposure to excessive UFR and IDWG by increasing awareness and adjusting dialysis time for high risk patients. However, these improvements were not sustained and result in increased cost and resource burden. The next steps of this project will include structuring a more intensive and longitudinal behavioral modification and educational program in our center to improve patient behavior and incentivize a sustained decrease in IDWG.

Fully Immersive Virtual Reality for Hemodialysis Patients: Is It Safe?

B. Burrows, K. Wilund, R. Hernandez

1Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Urbana, IL; 2School of Social Work, University of Illinois at Urbana-Champaign, Urbana, IL, USA

Topic: Hemodialysis.
Keyword(s): Virtual Reality, Hemodialysis, Mindfulness.

Background: Virtual reality (VR) is an established technology that is becoming more accessible and is currently being used to treat psychological phobias. VR has also been used in trials involving hemodialysis (HD) patients, however these VR programs utilize non-immersive VR technology (e.g. Nintendo Wii). To the best of our knowledge, no studies to date have used fully immersive VR (i.e. use of a headset) as a tool for intervention delivery in HD patients. Both dialysis treatments and immersive VR have similar...
potential adverse side effects, including nausea, dizziness, and headaches, among others. Therefore, our aim was to determine if a fully immersive VR program would exacerbate these symptoms, making it unsafe for HD patients.

Methods: HD patients (n = 20) were enrolled in a single-arm pre-post pilot study. During regularly scheduled HD treatments, participants were exposed to our fully immersive VR program which centered on mindfulness. Participants utilized an Oculus Rift to experience our VR program on two separate HD treatments. The total duration for each VR exposure was 20 minutes, which included a combination of educational material and meditation exercises. Each participant recorded their level of sickness pre and immediately following VR exposure using the Simulator Sickness Questionnaire to determine any exacerbation of symptoms. Following the intervention, participants were surveyed for their assessment of our VR program.

Results: Mean age was 55.3 (±13.1) years; 80% male; 60% African American; and mean dialysis vintage of 42.7 (±44.9) months. Of the participants, 80% enjoyed it and thought it was beneficial. Following the 1st VR exposure there was a significant decrease in symptoms (p = 0.02) and following the 2nd VR exposure no change in symptoms (p = 0.15) was recorded. In addition, participants experienced no worsening of symptoms whether VR exposure occurred during hour 1, 2, 3, or 4 of their HD treatments.

Conclusion: Although HD patients routinely suffer from nausea, dizziness, and headaches during dialysis, our fully immersive VR program did not exacerbate these symptoms. Surprisingly, patients had a significant decrease in symptoms following a single 20 min meditation-based VR program, indicating a state of enhanced well-being. In addition, our findings suggest that patients are not limited to VR exposure during only the first 2 hours of dialysis treatments. Our data suggests that a fully immersive VR program is a safe mode of intervention delivery for HD patients.

Second Line Treatment of Membranous Nephropathy: Rituximab or Tacrolimus


1Hospital Especialidades CMN La Raza, Ciudad de Mexico, Mexico; 2Instituto Nacional de Cardiología Dr. Ignacio Chavez, Ciudad de Mexico, Mexico

Topic: Glomerular and Tubulointerstitial Disorders.

Keywords: Membranous Nephropathy, Glomerular Disease, Treatment.

Introduction: Primary membranous glomerulopathy (PMN) is a common cause of nephrotic syndrome in adults. Standard treatment includes oral cyclophosphamide and prednisone according to KDIGO guidelines. Patients refractory to cyclophosphamide (CF) represent a great challenge and the treatment alternatives are rituximab (RTX) and calcineurin inhibitors (CNI). However, in randomized clinical studies they have been used as a first-line strategy and there are few studies where they have been used in cases of refractory treatment. The objective was to evaluate the efficacy of treatment with RTX or CNI as a second-line treatment in PMN refractory to CF.

Methods: A retrospective cohort study was conducted in clinical records of patients with PMN who received intravenous cyclophosphamide (CF-IV) plus oral prednisone as the first line of treatment. Cases refractory that received as a second-line strategy RTX or CNI were identified. The proportion of complete, partial and global remission (complete more partial) was calculated. Quantitative variables were presented as medians and interquartile ranges (Q1-Q3), categorical as simple frequencies and proportions. For the comparison of means groups treated with tacrolimus or rituximab, the Mann-Whitney U test was used. A value of p < 0.05 was considered statistically significant.

Results: We included 12 patients refractory to CF-IV treatment, 75% (9 patients) were male, with a median of age of 49.5 years with Q1-Q3 (46.25–53.50). 6 patients (50%) were treated with Tacrolimus with 0.05 mg/kg/day divided into two doses with target levels (3–7 ng/ml), the other 6 patients (50%) received IV RTX of 375 weekly mg/m² (4 doses). Proteinuria decreased from a median of 10.1 (4.3–10.6) g/24 hrs at baseline to 6.3 (5.1–7.8) g/24 hrs in CNI and 7.7 (5.9–8.5) g/24 hrs in the RTX group at 24 months of treatment. The partial plus complete remission at 24 months was 50% (6 patients). In CNI group were 4 patients (33%) with partial or complete remission, in the RTX group were 2 patients (17%) with partial remission and none with complete remission (p = 0.149). Treatment failure was observed in 6 patients (50%) between both groups.

Conclusions: Apparently, there is no significant difference between these two treatments at 24 months in the management of PMN refractory to intravenous cyclophosphamide.
Results: We present three patients with an average iPTH levels of 2500 pg/mL prior to initiation of Etelcalcetide. There was significant reduction in intact PTH levels to less than 600 pg/mL with in a 6-months with average dose of 12.5 mg of Etelcalcetide TIW. Hypocalcemia (<7.5 mg/dl) was noted in one patient, corrected with increase calcium in dialysate and oral calcium.

Conclusions: Significantly elevated iPTH levels in tertiary HPTH can be managed medically and may obviate the need for surgical parathyroidectomy. All patients with tertiary HPTH should be given a trial of Etelcalcetide for six months before considering invasive therapy.

Data Sonification: A Novel Way to Analyze “Big Data” from Kidney Patients

Carrie Reid-Knox¹, Thomas C. Blanchard¹, Len Usvyat¹, Peter Kotanko²,³

¹Fresenius Medical Care North America, Waltham, Massachusetts, USA; ²Renal Research Institute, New York, New York, USA; ³Icahn School of Medicine at Mount Sinai, New York, New York, USA

Topic: Hemodialysis.

Keywords: Electronic Health Records, dialysis patients, algorithm, auditory signals.

Background: Electronic health records allow the collection of unparalleled rich data sets. For exploratory analysis, data is usually presented graphically. However, data visualization is challenging with high-dimensional data. We explored transforming data into auditory sensory inputs (sonification) as a novel means to represent data.

Methods: We used routinely collected data from 35,146 dialysis patients followed during their terminal 100 weeks before death (Usvyat, Kidney Int, 2013). Each parameter (interdialytic weight gain (IDWG), systolic blood pressure (SBP), albumin and C-reactive protein (CRP)) had an instrument assigned to it for sonification. We developed algorithms that used tonal ambiguity and variations in pitch, octave, dynamic, and texture to represent parameter dynamics, and a strong beat to represent the passage of time. We disassociated emotional reactions by avoiding the use of major/minor, consonance/dissonance, familiar harmonic progressions, and tonal center.

Results: In sonification #1 (https://youtu.be/IarHnxPmHeE) parameters are represented by flute (IDWG), cello (SBP), guitar (albumin), and trombone (CRP). We chose the whole tone scale because of its perfect symmetry, its lack of tonal center/absence of a leading tone, and its lack of emotional associations of other musical modes. Pitch represents the changing parameter levels. In sonification #2 (https://youtu.be/IE4-159pwGE) instrumentation was the same as in #1, except for albumin (drum). We used chord alternation with two chords that are a whole step apart, which have no associations with cadence or familiar harmonic progressions that would imply suspense and/or relief to the listener. We used pitch and texture (expressed by number of instruments and instruments being played on the off-beats) to represent changes in parameters.
Conclusion: Our results show, for the first time, that longitudinal data from kidney patients can be represented as auditory signals, complementing graphic data representation. We avoided musical modes and patterns that carry emotional associations, allowing listeners to approach the sonification without bias. Multisensory data representation will become particularly important when applied to high-dimensional, “big” data. Future research needs to address questions of optimal data representation.

39 Chronic Fluid Overload Assessment in Hemodialysis Patients Close to Dry Weight

J.S. Lopez Gil¹, O. Garcia¹, G. Leal¹, F. Brito², H. Perez-Grovas¹

¹Nephrology Department, Instituto Nacional de Cardiologia Dr Ignacio Chavez, Mexico City, Mexico; ²Postgraduate, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico

Topic: Hemodialysis.

Keyword(s): Fluid overload, dry weight, hemodialysis.

Background: Chronic fluid overload is associated with adverse cardiovascular events in hemodialysis (HD) patients. Lung ultrasound (LUS) has been validated in patients with excessive fluid overload and acute scenarios, nevertheless in patients close to dry weight the results have been controversial. The aim of our study is to evaluate the utility of diverse methods in volume assessment in patients close to dry weight.

Methods: We examined 3 sessions of 27 consecutive patients undergoing hemodialysis (81 hemodialysis sessions). All patients were free of antihypertensive treatment. We performed a lung ultrasound (scanning for B-lines protocol of 28 quadrants), determination of NT-proBNP and total body and thoracic extracellular water/total body water ratio (ECW/TBW) by bioelectrical impedance analysis (BIA) immediately before and after dialysis. Blood pressure, heart failure symptoms (dyspnea, orthopnea), hemoglobin delta and relative blood volume were measured by blood volume monitoring in BVM module of 5008 Fresenius machine and correlated with the parameters mentioned above.

Results: Of total of patients 63% were female, mean age was 42 ± 16 years. The patients had a mean HD vintage of 3.6 ± 2.9 years. Main comorbidities were of unknown etiology 9.9% (n = 8), diabetic kidney disease 3.7% (n = 3) and lupus nephritis 3.7% (n = 3) (Table 1). There was a significant correlation in the weight change and the ECW/TBW ratio pre and post dialysis sessions (r = 0.39, p = 0.001) (Table 2). On the other hand, there was no correlation in B lines reduction and delta NT-proBNP with weight change (Table 3).

Conclusion: In hemodialysis patients close to dry weight, the use of ECW/TBW ratio by BIA seems to be the most useful assessment tool in chronic fluid overload when compared to lung ultrasound and NT-proBNP.

Table 1. Baseline patients’ characteristics (for Abstract no 39)

<table>
<thead>
<tr>
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<th>Value ± SD</th>
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<tbody>
<tr>
<td>Number of patients</td>
<td>27</td>
</tr>
<tr>
<td>Age</td>
<td>42.4±16.4</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>10/17</td>
</tr>
<tr>
<td>Dialysis vintage (yr)</td>
<td>3.6 ± 2.9</td>
</tr>
<tr>
<td>Etiology of ESRD</td>
<td></td>
</tr>
<tr>
<td>Unknown etiology n (%)</td>
<td>8 (29.6)</td>
</tr>
<tr>
<td>Diabetic kidney disease n (%)</td>
<td>3 (11.1)</td>
</tr>
<tr>
<td>Lupus nephritis n (%)</td>
<td>3 (11.1)</td>
</tr>
<tr>
<td>Focal segmental glomerulosclerosis n(%)</td>
<td>3 (11.1)</td>
</tr>
<tr>
<td>History of chronic heart failure</td>
<td>10 (37)</td>
</tr>
<tr>
<td>Systolic BP (mm Hg)</td>
<td>145.1±27.1</td>
</tr>
<tr>
<td>Diastolic BP (mm Hg)</td>
<td>78.7±19.6</td>
</tr>
</tbody>
</table>

ESRD, end stage renal disease; BP, blood pressure.

Table 2. Linear regression with weight change (for Abstract no 39)

<table>
<thead>
<tr>
<th>Correlation between weight change with</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ ECW/TBW total</td>
<td>0.39</td>
<td>0.001</td>
</tr>
<tr>
<td>Δ ECW/TBW thoracic</td>
<td>0.01</td>
<td>0.9</td>
</tr>
<tr>
<td>Δ NT-proBNP</td>
<td>0.05</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Δ, delta; ECW/TBW, extracellular water/total body water ratio.

Table 3. Linear regression with B lines changes (for Abstract no 39)

<table>
<thead>
<tr>
<th>Correlation between B lines changes with</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ ECW/TBW total</td>
<td>0.03</td>
<td>0.7</td>
</tr>
<tr>
<td>Δ ECW/TBW thoracic</td>
<td>0.05</td>
<td>0.6</td>
</tr>
<tr>
<td>Δ NT-proBNP</td>
<td>0.02</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Δ, delta; ECW/TBW, extracellular water/total body water ratio.
Cross-Sectional Assessment of Fluid Status in an US Dialysis Population Using Bioimpedance Spectroscopy

Ulrich Moissl¹, Rachel Bartels¹, Lemuel Rivera Fuentes², Mohamad Hakim², Manuel Hassler¹, Dewangi Kothari², Laura Rosales Merlo², Stephan Thijssen², Fansan Zhu², Peter Kotanko²
¹ Fresenius Medical Care, Global Research and Development, Bad Homburg, Germany; ² Renal Research Institute, New York, New York, USA; ³ Icahn School of Medicine at Mount Sinai, New York, New York, USA

Topic: Hemodialysis.
Keyword(s): Fluid overload, hemodialysis therapy, bioimpedance spectroscopy.

Background: Despite many technological advances in dialysis therapy, inadequate fluid status remains one of the main reasons for increased cardiovascular morbidity and mortality in chronic hemodialysis patients. Quantification of fluid status using bioimpedance spectroscopy (BIS) has become standard routine in many countries outside the United States. However, due to unavailability of FDA-cleared BIS devices in the renal field, no cross-sectional assessment of fluid status has yet been undertaking in the US. Aim of this study was to measure fluid status for the first time in an US dialysis population and to assess the prevalence of fluid overload (FO) and depletion (FD), respectively.

Methods: Fluid status was measured in 127 chronic HD patients from four Avantus Renal Therapy Clinics in New York using the body composition monitor (BCM; Fresenius Medical Care). Measurements were performed once in each patient before the dialysis treatment.

Results: Pre-dialysis FO was found to be 2.1 ± 2.3 L, or 10.1% ± 10.3% when normalized by extracellular water (ECW). A total of 34% of patients presented FO >2.5 L, and 5% were fluid depleted by less than –1.0 L before dialysis (Figure 1).

Conclusion: Large studies outside of the US have found that mortality increases significantly in patients presenting with a pre-dialysis FO >2.5 L. The prevalence of FO and FD in this cross-sectional study was significant, suggesting that more adequate measures to assess fluid status are warranted to support the clinician in identifying and treating abnormal fluid states to improve outcome.

Fig. 1. Distribution of pre-dialysis fluid status (OH = overhydration) in 127 patients (for Abstract no 40).