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Wrocław, Poland
June 9–11, 2022

ABSTRACT BOOK

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XIV Congress of Polish Society of Nephrology

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June 9–11, 2022

ABSTRACT BOOK

Introduction

The XIV Congress of Polish Society of Nephrology was held in Wrocław between June 9 and June 11, 2022. It was the largest triennial Nephrology Congress in Poland, welcoming over 400 of attendees, focusing on key learning features both in the clinical field as well as the scientific and latest innovations.

The Congress started from two Hands-On Courses on interventional nephrology and nutrition in kidney diseases. These tailored courses given by top Polish experts in the field offered a unique opportunity for professional development.

Lectures on modern trends in nephrology were given by 42 distinguished specialists from Poland, Ukraine, Czech Republic, Germany, and the United Kingdom. Except of inauguration session devoted to perspectives of clinical and experimental nephrology, the program included 7 sessions:

1. Glomerulopathies – advances in diagnosis and therapy;
2. Inhibition of the progression of chronic kidney disease – new players, old problems;
3. Kidney transplantation – nephrological point of view;
4. Renal replacement therapy – optimization of therapy;
5. Interdisciplinary care for patients with nephropathy;
6. Directions of development of nephrology;
7. Electrolyte disturbances in kidney diseases.

Signs of return to normality after COVID-19 pandemic can also be seen from the large number of high-quality abstracts received which are presented in this special issue of Advances of Clinical and Experimental Medicine.

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Poster presentations

αKlotho as a major regulator of podocyte function in hyperglycemia

Agnieszka Piwkowska[1,2], Marlena Typiak[1], Irena Audzeyenka[1,2], Patrycja Rachubik[3], Tomasz Kulesza[3], Stefan Angielski[3], Dorota Rogacka[1,2]

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Conflict of interest
None declared

Abstract

Background. Recently, it was demonstrated that the podocyte is an important source of alpha Klotho (αKL) expression. Reduced serum and urinary αKL levels are observed in the early stages of chronic kidney disease. Decreased blood Klotho concentration is also associated with increased albuminuria, especially in patients with diabetes. Additionally, early stages of diabetes are characterized by elevated insulin and glucose concentrations. We demonstrated that both factors stimulate the production of reactive oxygen species (ROS), which leads to the impairment of podocyte function and disruption of the glomerular filtration barrier.

Objectives. To fully examine the role of αKL on ROS production and its role in the protection of glomerular filtration barrier and podocyte function in diabetes.

Materials and methods. Podocytes were incubated with soluble Klotho (0.5 nM) in control or high-glucose medium (HG). In order to inhibit Klotho expression, we generated a human podocyte cell line, stably expressing αKL shRNA through lentiviral transduction. The expression of mRNAs and proteins was determined using real-time polymerase chain reaction (PCR), western blot and immunofluorescence. Podocyte permeability was measured with a transmembrane albumin flux assay. We also measured the activity of NADPH oxidase and ROS production.

Results. We observed an increase of NADPH oxidase activity and ROS production in podocytes exposed to the hyperglycemic environment, and we showed that the addition of αKL restores redox balance to the level observed in control cells. Klotho also decreased podocyte and glomerular albumin permeability in HG. Moreover, we observed an increase in NOX4 expression, NADPH oxidase activity and ROS production in αKL-depleted podocytes. This was accompanied with a 45% increase in albumin permeability in shαKL-expressing podocytes.

Conclusions. In this study, we showed that αKL supports redox balance and, in consequence, protects slit diaphragm of podocytes, and that this mechanism could be disrupted in diabetes.

Key words: diabetes, podocyte, klotho, NADPH oxidase, reactive oxygen species, filtration barrier permeability

Assessment of serum concentration and urinary excretions of tumor necrosis factor α receptors types I and II as markers of IgA nephropathy activity

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Abstract

Background. The activity of tumor necrosis factor α (TNF-α) in the kidney is mediated by its 2 membrane receptors (TNFRs) – TNFR1 and TNFR2. The TNFR expression increases in selected kidney diseases. However, there is little research about the association of TNFR with immunoglobulin A nephropathy (IgAN).

Objectives. To evaluate the usefulness of measurements of soluble TNFR concentrations in serum and urine as indicators of the activity of IgAN.

Materials and methods. Twenty-six patients (15 females, 11 males) with biopsy-proven IgAN were enrolled in the study. The control group consisted of 20 healthy people. Prior to the treatment initiation, serum concentrations of TNFR1 and TNFR2 (STNFR1, STNFR2) and urinary excretion (UTNFR1, UTNFR2) were measured in patients by means of the Quantkine Human sTNF RI and sTNF RII immunoassay. The statistical evaluation was performed using the MedCalc software.

Results. In patients with IgA nephropathy, STNFR1 and STNFR2 were higher than in healthy subjects (4747.87 ±1659.10 pg/mL and 2817.62 ±1638.41 pg/mL compared to 2755.68 ±1507.11 pg/mL ($p = 0.0001$) and 1437.83 ±720.02 pg/mL ($p = 0.0005$)). The test power was 98.5% for TNFR1, and 96% for TNFR2. The UTNFR1 excretion, but not the UTNFR2 excretion was significantly higher in IgAN patients than in healthy subjects (3551.29 ±1929.62 pg/mgCr compared to 2338.95 ±1414.51 pg/mgCr ($p = 0.0227$)). A positive correlation between STNFR2 concentrations and serum creatinine level ($r = 0.4359$, $p = 0.0260$) and proteinuria ($r = 0.4407$, $p = 0.0274$), in contrast to a negative correlation with serum albumin level ($r = -0.6392$, $p = 0.0004$) were found. The sensitivity (73.08%) and specificity (90%) for STNFR1 test ($p < 0.0001$) were determined using a receiver operating characteristic (ROC) curve.

Conclusions. Our study confirms the role of the TNF-α pathway in patients with IgAN. The STNFR1, STNFR2 and UTNFR1 can be promising markers of the activity of IgAN.

Key words: tumor necrosis factor α receptor, IgA nephropathy, marker of IgA nephropathy

Can MRI texture analysis replace histopathological examination in diagnostics of active and chronic kidney disease? A preliminary study

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Abstract

Background. Kidney biopsy (KB) is the gold standard in the diagnostics of nephropathies but it has its contraindications and complications. Kidney biopsy can be invaluable in assessing the extent of disease activity and chronicity (e.g., sclerosis and fibrosis), and can help in establishing prognosis and therapy. Actually, none of the noninvasive radiological techniques is sufficiently specific to differentiate active and chronic stages of nephropathies.

Objectives. To determine the link between histopathological pictures of active and chronic changes in KB and magnetic resonance imaging (MRI) texture parameters.

Materials and methods. All consecutive patients of Nephrology Department in whom the KB was performed also underwent MRI examination composed of basic MRI sequences – T1- and T2-weighted images. Based on the histopathological results, the changes in the kidney were divided into active (n = 4) and advanced/chronic (n = 6), and were then referred to MRI texture features and vectors. As a control data source, we used MRI examinations of healthy individuals without clinical history of kidney disorders (n = 4). Overall, 463 and 414 cross-sections of the left and right kidney were processed, respectively. Based on this dataset, a Support Vector Machines classifier with the radial basis function (RBF) kernel (gamma = 5) was trained and tested using 5-fold cross-validation technique.

Results. The obtained balanced accuracy ratio of created and initially verified algorithm was equal to 87%, with true positive rates for healthy individuals, patients with active glomerulonephritis and patients with advanced nephropathy equal to 92%, 82% and 87%, respectively.

Conclusions. Our preliminary study is promising in regard to the diagnostic accuracy of basic MRI sequences in distinguishing an active stage of kidney disease from an advanced stage of this condition.

Key words: active and chronic nephropathies, kidney biopsy, textures, MRI

The detection of plasmid-mediated ESBLs and PMQR genes among uropathogens isolated from non-dialysis CKD patients with pyelonephritis

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Abstract

Background. Antimicrobial resistance has been increasing in the treatment of urinary tract infections worldwide. The Centers for Disease Control and Prevention (CDC) has estimated that more than 2 million infections and 23,000 deaths are due to antibiotic resistance each year. By 2050, it is estimated that antibiotic resistance will cause 10 million deaths every year. Infection is an important cause of morbidity and mortality among patients with kidney failure and is the 2nd leading cause of death, surpassed only by cardiovascular death (CVD). Recent studies in Europe and the USA have demonstrated that steady increase in the rate of uropathogen resistance to commonly prescribed antibiotics is associated with the existence of plasmid-mediated resistance genes (PMRGs).

Objectives. To detect plasmid-mediated extended-spectrum beta-lactamases (ESBLs) and plasmid-mediated quinolone resistance (PMQR) genes among uropathogens isolated from non-dialysis chronic kidney disease (CKD) patients with pyelonephritis.

Materials and methods. A cross-sectional study of 105 adult CKD patients with pyelonephritis who were admitted to Kharkiv City Clinical Emergency Hospital, Ukraine, was carried out. Antimicrobial susceptibility of bacterial isolates was determined using the Kirby-Bauer disk diffusion method, and screening for PMRGs was performed using polymerase chain reaction (PCR).

Results. Out of 105 patients, 31 (29.5%) were infected with PMRG-bacteria. Among 81 Gram-negative isolates, 39 (48.1%) were identified to carry different types of PMRGs, among which 27 (69.2%) were found to be extended spectrum β-lactamase producers (ESBLs), and 12 (30.8%) were positive for PMQR genes. The TEM-type ESBLs and efflux pump QepA were the most common isolated ESBLs and PMQR, respectively. The global resistance for fluoroquinolones was ≥20% for ciprofloxacin, whereas the resistance rate to 3rd generation cephalosporins was above 30%. The most active antimicrobial agents were meropenem, nitroxolinum, fosfomycin, and cefepime.

Conclusions. Therapeutic alternatives for the treatment of antibiotic-resistant urinary tract infections (UTIs), particularly in CKD patients, are limited. The detection of plasmid-mediated ESBLs and PMQR genes in uropathogens is needed to control the antibiotic resistance spread and to increase the number of options available for empiric therapy of these multi-drug resistant infections.

Key words: CKD, urinary tract infections, antibiotic resistance, genes, plasmids, uropathogens

Short-term effects of losartan treatment in diabetic patients after kidney transplantation: An interim analysis of CELART study

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Abstract

Background. Diabetes mellitus (DM) is a common complication and a significant clinical issue after kidney transplantation (KTx). It occurs in up to 40% of kidney transplant recipients (KTRs) and is described as a risk factor of allograft failure and loss.

Objectives. To evaluate the short-term influence of losartan on cardiovascular (CV) risk and allograft injury biomarkers, and the safety of the therapy in diabetic KTRs.

Materials and methods. An interim analysis of a prospective, open, multicenter, controlled clinical trial CELART (Cardiovascular Effects of Losartan After Renal Transplantation) was performed. One hundred and thirty-five patients after KTx were enrolled to the trial to either losartan (L; 50–100 mg) or standard hypotensive (ST) group to reach target blood pressure (BP) <140/90 mm Hg. Thirty-three patients (24.4%) from the cohort had DM, of which 19 patients (57.6%) were diagnosed with post-transplant DM (10 and 9 patients in ST and L group, respectively). Sixteen (48.5%) and 17 (51.5%) patients with diabetes were allocated to ST group and L group, respectively. The CV risk biomarker (serum concentration of N-terminal-pro-B-type natriuretic peptide (NT-proBNP)), the intrarenal fibrosis biomarkers (urine excretion of transforming growth-factor β-1 (TGFβ-1) and procollagen-type-III-amino-terminal propeptide (PIIINP)), albuminuria, estimated glomerular filtration rate (eGFR), hemoglobin, and potassium concentration were evaluated after 6 months of treatment.

Results. The groups did not differ with respect to age, gender, time after transplantation, diabetes duration (6.9 years and 6.3 years in ST and L group, respectively), graft function, and albuminuria. The Charlson Comorbidity Index was higher in the L group ($p < 0.05$). After 6 months of treatment, patients in both groups reached the target BP. There was no difference in changes of eGFR, hemoglobin, potassium concentration, albuminuria, or urine excretion of fibrosis biomarkers between groups. There was a trend in the L group to decrease the concentration of serum NT-proBNP.

Conclusions. In short-term observation, losartan shows no effects on graft function and graft fibrosis biomarkers. It caused no significant adverse effects in diabetic KTRs. There is a tendency of losartan to decrease the CV risk biomarker.

Key words: kidney transplantation, losartan, renin-angiotensin-aldosterone system blockade, nephroprotection, diabetes mellitus

COVID-19 vaccination reduces mortality in patients on maintenance hemodialysis

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Abstract

Background. Patients on maintenance hemodialysis (HD) have a very high risk of death in the course of coronavirus disease 2019 (COVID-19). This is mainly due to impaired immune response, frailty, a high burden of comorbidity, and older age of most HD patients.

Objectives. To assess the effectiveness of COVID-19 vaccination in order to reduce the incidence of COVID-19 and the fatality rate in HD patients.

Materials and methods. A retrospective registry-based cohort study was performed in all HD adult patients in the Pomeranian Voivodeship. Vaccinations were carried out from January to April 2021 with mRNA vaccines, either BNT162b2 or mRNA-1273, with a 2-dose schedule. In the 1st analysis (during the 2nd pandemic wave), 1160 unvaccinated patients were included (59.7% males, 25.7% diabetic). In the 2nd analysis (during the 4th pandemic wave), 1131 (59.4% male, 30.7% diabetic) individuals were included, among which 1042 (92.13%) were fully vaccinated.

Results. Three hundred and fifteen HD patients (27.2%) were COVID-19-positive during the 2nd pandemic wave, and 6.9% (78/1131) during the 4th wave. Among fully vaccinated patients of the 4th pandemic wave, 60 (5.8%) were COVID-19-positive, compared to 20.2% of unvaccinated COVID-19-positive patients in the 2nd pandemic wave, respectively. The COVID-19 incidence rate ratio (IRR) was 0.21 (4th wave-vaccinated compared to 2nd wave-unvaccinated), indicating a 79% reduction of the incidence of COVID-19. The IRR among vaccinated and unvaccinated patients of the 4th pandemic wave was 0.28 in favor of vaccinated patients (72% reduction of COVID-19 incidence). In the 2nd pandemic wave, 93 patients died as a result of COVID-19 (fatality rate: 29.5%). The fatality rate of fully vaccinated patients during the 4th wave was 6.7% ($p = 0.004$), while the fatality rate observed during the 4th pandemic wave among unvaccinated patients was 11.1%.

Conclusions. A significant clinical effectiveness of COVID-19 vaccination was demonstrated in a multicenter study in HD patients.

Key words: COVID-19, SARS-CoV-2 vaccination, mortality, hemodialysis

Enoxaparin induces intravascular sclerostin release during HD

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Abstract

Background. Sclerostin (Scl) is implicated in vascular calcification (VC) and localized within endothelial glycocalyx of arterial wall. Plasma levels of this calcification inhibitor in maintenance hemodialysis (HD) patients are high, but its meaning and predictive values for VC extent, cardiovascular morbidity and survival are equivocal. It has been, however, disregarded so far that Scl molecule incorporates a heparin-binding site and its metabolism may be affected by exogenous heparin.

Objectives. To study the effect of enoxaparin (ENX) injected for HD anticoagulation on overdialytic plasma Scl levels.

Materials and methods. In 14 stable HD patients, long-term polysulfone dialyzers were switched to the anti-thrombogenic heparin-grafted HeprAN hydrogel membranes (Evodial) and the usual bolus doses of ENX were injected. Blood was collected before HD and heparinization (T0), and again after 10, 30 and 120 (T120) min. The effluent dialysate was sampled directly after the dialyzer. After 1 week, the HD sessions were performed with Evodial dialyzers but without ENX injection.

Results. During the ENX-HD treatment, plasma Scl levels increased and the increases were directly associated with the dose of ENX per kg of body weight. At T120, the Scl levels were lower than at T0. Conversely, during the NoHep-HD treatment, plasma Scl gradually and steadily decreased. In both procedures, the Scl decrease at T120 compared to T0 was directly associated with the T120 ultrafiltration (UF) volume. The predialysis plasma Scl levels did not differ between the 2 distinct HD procedures. All the overdialytic Scl levels during the ENX-HD treatment were higher than the corresponding values during the NoHep-HD treatment. The Scl levels in dialysate did not differ between the procedures.

Conclusions. During standard HD, Scl is released into circulating blood by ENX and removed from circulation via dialyzer. Such repeated procedures are likely to deplete the vascular wall from its calcification inhibitor and thus promote deleterious VC in HD patients.

Key words: sclerostin, vascular calcification, enoxaparin, hemodialysis, Evodial

Application of machine learning for the interpretation of urinary osteopontin levels data in IgA nephropathy, membranous nephropathy and lupus nephritis

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Abstract

Background. Glomerulonephritis (GN) is the 3rd leading cause of end-stage kidney insufficiency. Kidney biopsy required to diagnose GN can be costly and risky.

Objectives. To evaluate urinary markers that might be used for diagnosing and/or follow-up of GN.

Materials and methods. We compared the levels of urinary osteopontin (uOPN) between different GN types: immunoglobulin A nephropathy (IgAN), membranous nephropathy (MN) and lupus nephritis (LN). Due to a small patient sample, machine learning (ML) analysis was applied in data analysis. The uOPN concentrations were measured in 80 patients: 29 with IgAN, 20 with MN, 18 with LN, and in 13 healthy volunteers. The follow-up (27.79 ±7.85 months) included 48 participants. The OPN levels were correlated with epidemiological and clinical variables, as well as validated to peroxiredoxins, the other marker recently described. Machine learning algorithm (random forest) was applied to analyze the data. Findings were verified with the help of classical statistical analysis. We compared the importance of the variables marked as significant by the algorithm in correctly classifying a patient to a GN class.

Results. The OPN was strongly relevant (87%) for correctly placing a patient into the IgAN group compared to non-IgA GNs and healthy controls. This most important finding was achieved thanks to the use of ML. Peroxiredoxin 3 was also relevant in patient allocation into GN groups, but performed weaker than OPN. In standard modeling, higher OPN levels were also noted in the IgAN-group; however, only at baseline ($p = 0.0106$).

Conclusions. The uOPN seems to be a specific marker for IgAN patients. An application of modern mathematical methods for analyzing data, even in very small groups of patients, may result in conclusions not apparent in standard modeling. Further studies using a wider range of markers and nephrological conditions are needed to validate our findings.

Key words: machine learning, osteopontin, IgA nephropathy, membranous nephropathy, lupus nephritis

The course of pregnancy in women with chronic kidney diseases

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Abstract

Background. The incidence of kidney diseases in women of childbearing age is in the range of 0.1–3%. Due to the danger to both the mother and the fetus, such pregnancies belong to the high-risk group. In addition, pregnancy is a risk factor for chronic kidney disease (CKD) progression.

Objectives. To analyze the course of pregnancies in a group of 27 patients with various types of kidney diseases.

Materials and methods. We analyzed retrospectively 27 women who became pregnant at the age of 19–39 and were treated at the Department of Nephrology and Transplantation Medicine. The study group consisted of 20 cases of glomerulonephritides (4 focal segmental glomerulosclerosis (FSGS), 1 membranous nephropathy, 3 immunoglobulin A nephropathy (IgAN), 4 membrano-proliferative, 1 thrombotic microangiopathy, 3 lupus nephritis, 1 minimal change disease (MCD), 3 non-specified), 3 cases of diabetic kidney disease, 2 cases of autosomal dominant polycystic kidney disease (ADPKD), and 2 cases of interstitial nephritis. Four patients (14.8%) became pregnant after kidney transplantation.

Results. None of the patients presented nephrotic syndrome directly before pregnancy. Ten patients (37%) presented symptoms of nephrotic syndrome during pregnancy. Four of them suffered from primary glomerulonephritides, while in the remaining 6 cases kidney disease included systemic lupus erythematosus and diabetic nephropathy. Three patients developed diabetes during pregnancy, and 5 (18.5%) required dialysis as a result of worsening kidney function. Most of the women delivered on or after the 34th gestational week (55.5%). There were 3 pregnancy losses (after the 22nd and before 30th gestational week). Eight women delivered prematurely before the 30th gestational week. One of all born children died within the 1st week of birth. The fate of 1 child is unknown.

Conclusions. Women with kidney disease under proper care and control have a significant chance of having children, despite the significant burden associated with the disease. To establish standards of care in pregnancy and perinatal care for women suffering from kidney disease, further research is needed.

Key words: nephrology, pregnancy, chronic kidney disease

Membranous nephropathy triggered by combination of dietary supplements: A case report

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Abstract

Background. Dietary supplements are advertised as beneficial for health and are widely available over-the-counter. Ashwagandha is a herbal product with broad spectrum of effects, including immune stimulation. Although it is regarded as safe, transplanted kidney rejection and liver injury were reported. Moreover, withaferin A, a steroidal lactone present in ashwagandha, may bind to actin microfilaments and vimentin, crucial in maintaining the structure of podocyte foot processes.

Case report. We report a case of a 47-year-old man, with no significant medical history, diagnosed with severe nephrotic syndrome and arterial hypertension in July 2021. The patient was unvaccinated against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2); however, in order to boost immunity, during pandemic, he took ashwagandha root extract and 4 other dietary supplements with known immune-enhancing properties (2 containing berberine, an immunomodulating alkaloid, 1 rich in polyphenols, tannins and oxindole alkaloids, and 1 with spirulina and chlorella). In August 2021, laboratory tests showed serum creatinine level of 79.56–110.5 µmol/L, hypoproteinemia (42–44 g/L), hypoalbuminemia (23–25 g/L), daily urinary protein excretion of 5.46 g with active sediment (erythrocyturia 33–56 cells/µL and granular casts 1/µL). The results of serological tests for antibodies against phospholipase A2 receptor (anti-PLA2R) were highly positive (1:320), whereas anti-nuclear antibodies (ANA) were slightly positive (1:320), and anti-neutrophil cytoplasmic antibodies (ANCA) and anti-double stranded DNA antibodies (anti-dsDNA) were negative. The kidney specimen showed membranous nephropathy (MN) with positive PLA2R staining, confirmed also in electron microscopy. Moreover, the effacement of the podocytes foot processes was described. According to Kidney Disease: Improving Global Outcomes (KDIGO) guidelines, treatment with parenteral diuretics and ramipril was implemented. Due to a highly positive anti-PLA2R titer, the biological therapy was considered; however, as the patient was sceptic to the SARS-CoV-2 vaccination, the standard regimen consisting of both glucocorticosteroids and calcineurin inhibitors (CNI) was initiated.

Conclusions. To our knowledge, this is the 1st case report of MN in patient using ashwagandha and combination of other preparations with immunomodulatory properties.

Key words: dietary supplements, ashwagandha, berberine, spirulina, immunomodulatory, membranous nephropathy

Effect of hyperglycemia on endogenous glucose production in glomerular podocytes

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Abstract

Background. Podocyte injury is a key step in the development of glomerular disease. Currently, little is known about podocyte energetics, associated regulation and the energy substrates required for activity. Under diabetic conditions, chronic hyperglycemia disturbs cellular homeostasis, damages the podocyte actin cytoskeleton, dysregulates insulin signaling, and increases albumin permeability of the filtration barrier, foot process detachment and podocyte loss. Glucose homeostasis is controlled by endogenous glucose production and glucose utilization rates. To the best of our knowledge, no studies have reported the ability of podocytes to produce glucose. The mechanisms regulating glycogen metabolism in podocytes also remain unknown.

Objectives. To examine the effects of hyperglycemia on activity of the key rate-limiting gluconeogenic enzyme, phosphoenolpyruvate carboxykinase (PEPCK), and on glycogen levels in glomerular podocytes.

Materials and methods. Podocytes were exposed to standard glucose (SG, 11 mM D-glucose) or high-glucose (HG, 30 mM D-glucose medium). Immunodetection methods were used to detect protein expressions. Biochemical analyses were performed to assess glycolysis contribution to the total cell energy production (measurement of extracellular acidification rate (ECAR)). Colorimetric methods were employed to determine enzymatic activities and glycogen levels.

Results. We observed that glycolytic rate and glycolysis capacity of podocytes under HG conditions were both decreased. Simultaneously, the activities of major glycolytic enzymes – hexokinase and pyruvate kinase – were also decreased. However, we found that the activity of PEPCK and intracellular lactate levels were both increased in podocytes under HG conditions. We also demonstrated considerably increased glycogen particles in podocytes exposed to HG when compared with control podocytes.

Conclusions. Our data suggested that podocytes are able to produce glucose, and that gluconeogenesis and glycogen synthesis are enhanced in hyperglycemia. Additionally, lactate may fuel glucose production in HG-exposed podocytes.

Key words: podocyte, hyperglycemia, gluconeogenesis, glycogen

Characterization of the lactate transport system and lactate homeostasis in primary rat podocytes

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Abstract

Background. For many years, lactate was considered to be a waste product of anaerobic metabolism; however, nowadays lactate is known to form continuously under aerobic conditions and to be a valuable energy substrate. This fact may have a considerable significance for glomerular filtration – a highly energy-consuming process. Podocytes, epithelial cells that cover the outer surface of the glomerular capillaries, seem to have particularly high energy demands. Major metabolic enzymes and transporters, including glycolytic enzymes and transporters for lactate (monocarboxylate transporters (MCTs) and sodium-coupled monocarboxylate transporters (SMCTs)), are potential targets for a novel regulatory system controlling lactate homeostasis.

Objectives. To investigate the role of lactate as energy substrate in podocyte and the impact of lactate on cell survival and physiology.

Materials and methods. Primary rat cells were treated with and without 10 mM or 20 mM L-lactate in the presence or absence of 11.1 mM glucose for 24 h. Cell survival was assessed using Bradford protein assay. The presence of lactate transporters was determined using western blot, real-time polymerase chain reaction (RT-PCR) analysis and immunofluorescence staining method. We measured the activity of glycolytic enzymes using immunoenzymatic methods.

Results. We determined the presence of lactate transporters in rat podocytes. Moreover, we found a statistically significant increase ($p < 0.05$) of amount of lactate transporters during glucose deprivation and in lactate presence. The absence of glucose and lactate exposure did not affect the decline in cell survival. Interestingly, glucose deprivation and lactate exposure caused changes in the activity of glycolytic enzymes.

Conclusions. In brief, podocytes possess developed lactate transport system that may suggest the important role of lactate in podocyte physiology and its essential significance under glucose deprivation conditions.

Key words: podocyte, lactate, lactate transporters, glycolysis

Peroxiredoxins: A potential diagnostic and prognostic markers of IgA nephropathy, membranous nephropathy and lupus nephritis

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Abstract

Background. Glomerulonephritis (GN) represents 20% of all chronic kidney disease (CKD) cases. Immunoglobulin A nephropathy (IgAN), membranous nephropathy (MN) and lupus nephritis (LN) belong to the major causes of CKD. The clinical course and response to the treatment in these diseases are highly variable. Therefore, there is a growing need to propose an appropriate set of diagnostic and/or prognostic markers necessary for efficient diagnostics and management of patients.

Objectives. To evaluate the concentrations of the serum peroxiredoxins (PRDXs) 1–5 – the oxidative stress markers, considering their possible role in the pathogenesis and progression of GN.

Materials and methods. We assessed the serum level of PRDXs 1–5 of patients with GN of different etiology. Our study included 108 patients with biopsy-proven IgAN (47), MN (26) and LN (35), as well as 30 healthy age- and sex-matched controls. The serum samples of all individuals were tested for PRDX 1–5 with commercial enzyme-linked immunosorbent assays (ELISAs; EIAab, Wuhan, China). The study was approved by the ethical committee of the Medical University of Warsaw, Poland.

Results. We observed the difference between the PRDXs concentrations, depending on the GN type. We were able to differentiate the GN group from the healthy control with PRDX 1, 2 and 4 ($p = 0.013$; $p = 0.001$; $p = 0.01$, respectively). Additionally, the association between elevated PRDXs and proteinuria (PRDX 2 – in MN), estimated glomerular filtration rate (eGFR; PRDX 2 – in IgAN, LN), hemoglobin (PRDX 2 – in IgAN, LN, PRDX 5 – in MN), and complement components C3 (PRDX 1, 3 – in LN) and C4 (PRDX 1 – in IgAN, LN; PRDX 3 – in LN) was found.

Conclusions. The results of our study suggest that PRDXs can potentially be used to differentiate between patients initially diagnosed with IgAN, MN or LN, and prospectively as prognostic or predictive markers in these diseases.

Key words: peroxiredoxins, marker, oxidative stress, IgA nephropathy, membranous nephropathy, lupus nephritis

Artificial neural network: An effective tool for predicting the lupus nephritis outcome

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Abstract

Background. Lupus nephropathy (LN) occurs in approx. 50% of patients with systemic lupus erythematosus (SLE), and 20% of LN patients will eventually progress into end-stage renal disease (ESRD).

Objectives. To establish a clinical tool predicting remission of proteinuria among patients with LN with the use of artificial intelligence models.

Materials and methods. We focused on assessing the chance of a complete remission in LN patients, using artificial intelligence (AI) models, especially an artificial neural network, called the multi-layer perceptron. We also used AI regression methods to predict eGFR at the end of patient follow-up. We have selected an array of variables, and subsequently recursively reduced to the optimal minimum set, with the best performance.

Results. We have obtained satisfactory results creating predictive models allowing to assess, with high accuracy of 91.67%, a chance of achieving a complete remission, with a high discriminant ability (area under the receiver operating characteristic (AUROC) 0.9375). The multi-layer regressor allows an estimation of eGFR at the end of the observation with mean absolute error (MAE) of 0.6091 and root mean squared error (RMSE) of 0.7053.

Conclusions. Our solution allows an accurate assessment of complete remission achievement and monitoring of patients from the group with a lower probability of a complete remission. It also allows an estimation of eGFR at the time of follow-up completion. The obtained models are scalable and can be improved by introducing new patient records.

Key words: artificial intelligence, machine learning, proteinuria, systemic lupus erythematosus, lupus nephritis, end-stage renal disease

Assessment of vascular alterations of central nervous system in patients with ANCA-associated vasculitis with renal involvement: A preliminary study

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Abstract

Background. Data concerning vascular alterations in the central nervous system (CNS) in patients with ANCA-associated vasculitis with renal involvement (AAVR) are sparse. An occurrence of these vascular changes is estimated at 5–15%. However, the result of immunosuppressive treatment (IST) on vascular alterations in CNS was not clearly established in the population of AAVR patients.

Objectives. To evaluate the occurrence and result of IST on vascular alterations of CNS in patients with AAVR.

Materials and methods. Patients with acute onset of AAVR who qualified for the intensive IST were included in the study. The IST was based on corticosteroids and cyclophosphamide and was conducted in accordance with the CYCLOPS study. Birmingham Vasculitis Activity Score (BVAS), creatinine, urine albumin-creatinine ratio (UACR), and non-contrast cerebral magnetic resonance imaging (MRI) angiography scanning were estimated initially and after 12 months. Vascular alterations in the form of alternating narrowing and dilatation in secondary and tertiary branches of cerebral arteries were investigated using MRI angiography. McNemar's test was used to compare dependent categorical variables; otherwise, Wilcoxon test was performed. One-tailed $p < 0.05$ was considered statistically significant.

Results. A total of 15 patients were recruited for the study. The 2nd assessment was performed on 12 patients after 12 months. Two patients died during this study, and 1 was lost from the observation. Comparing data investigated before IST and at the end of the study, we found a significant decrease in BVAS score (6.2 ±2.0 compared to 0.8 ±0.9; $p < 0.001$), creatinine (4.0 ±1.8 compared to 2.9 ±1.9; $p = 0.027$) and CNS vascular alterations in secondary and tertiary arterial branches (both: 6/15 (40%) compared to 3/12 (25%); $p = 0.04$). However, the improvement in UACR (1023 ±897 compared to 569 ±911; $p = 0.054$) was not sufficient.

Conclusions. Vascular lesions of the CNS were detected in 40% of patients with AAVR. The immunosuppressive treatment significantly decreased the activity of the disease and the number of vascular alterations in the CNS.

Key words: vascular alterations, central nervous system, ANCA-associated vasculitis, kidney disease

The importance of kidney re-biopsy in lupus nephritis: Fifteen years of one-center clinical experience

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Abstract

Background. Kidney biopsy remains the gold standard for the diagnosis of lupus nephritis (LN) and determines the choice of immunosuppression treatment.

Objectives. To confirm the importance of re-biopsy in LN in a cohort of our patients.

Materials and methods. A retrospective study comprised 126 LN patients treated at our department between January 2007 and December 2021, including 98 women (77.8%; aged 32.5 ±14.7 years) and 28 men (22.2%; aged 32.6 ±14.6 years). One hundred and twenty-six reference biopsies and 36 re-biopsies were evaluated regarding diagnosis of LN and histopathological indicators of disease activity (number of glomeruli with crescents or necrosis, severity of interstitial inflammation, activity index (AcI)) and chronicity (glomerulosclerosis, severity of interstitial fibrosis, chronicity index (ChI)).

Results. Proliferative LN was the most common type in the reference biopsy (class III was diagnosed in 24 patients and class IV in 67 patients). Lupus nephritis class II was present in 8 patients, class V in 9 patients, overlapping of classes IV and V in 6 patients, and other types of glomerular injury in 12 patients. Re-biopsy was performed after 7.2 ±6.4 years on average (median: 5.5 years) because of LN flare (n = 14), increase in serum creatinine (n = 13) or proteinuria (n = 9). The diagnosis remained unchanged in 17 cases; however, 19 cases (52.3%) showed a transformation from one LN class to another (class II to III or IV+V, class III or IV to IV+V or V, submicroscopic glomerulonephritis to class IV or V). Despite the fact that there were no differences in biochemical laboratory results at the time of reference and repeat biopsy (serum creatinine p = 0.85 and daily proteinuria p = 0.27), re-biopsies revealed a higher degree of disease chronicity indicators: glomerulosclerosis (p = 0.026), interstitial fibrosis (p = 0.046) and ChI (p = 0.021).

Conclusions. The reclassification of more than half of LN biopsies and recognition of higher degree of chronicity indicators proves the value of re-biopsy in LN patients.

Key words: lupus nephritis, re-biopsy, glomerulosclerosis, interstitial fibrosis, chronicity index

Glomerular diseases pattern before and during SARS-CoV-2 pandemic

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Abstract

Background. Immune response triggered by viral infections is often implicated as a cause of autoimmune diseases, including glomerular disease (GD). Recently, several cases of new-onset GD following either severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection or vaccination have been reported.

Objectives. To assess the epidemiology of GD based on histopathological diagnoses from the period of over 4 years (data from Central Poland), and to compare the data obtained before and during SARS-CoV-2 pandemic.

Materials and methods. We have collected the results of all kidney biopsies assessed in the only pathomorphological center of Central Poland (around 2.5 million inhabitants), performed in Caucasian adults from April 1, 2018, to March 31, 2022. We have analyzed the change in frequency of individual GD types in the subsequent year quarters (16) of the analyzed period.

Results. Seven hundred and eighty-one kidney biopsies, including 675 native kidney biopsies, were performed: 63 for disease monitoring and 612 for diagnostics. Out of these, 587 results were deemed appropriate for diagnostics. Five hundred and six (81.74%) revealed glomerular changes and were classified as primary (n = 302, 59.68%) or secondary (n = 180, 35.57%) GD. The most common types were immunoglobulin A nephropathy (IgAN; 116, 29.29%), focal segmental glomerulosclerosis (FSGS; n = 76, 19.19%) and membranous nephropathy (MN; n = 30, 7.58%). Immunoglobulin A nephropathy was significantly more prevalent in the analyzed period than in the previous years, considered either as a percentage of total diagnostic native kidney biopsies (25.88% compared to 17.27%, p = 0.017) or percentage of GD (30.34% compared to 21.01%, p = 0.014). No similar changes in incidence were observed in case of other types of glomerulonephritis.

Conclusions. An increase of incidence of IgAN was observed throughout the SARS-CoV-2 pandemic period. Further research is needed to confirm the viability of this coincidence.

Key words: glomerulonephritis, kidney biopsy, nephropathy IgA, Covid, SARS-CoV-2, vaccination

Endothelial dysfunction and inflammatory parameters in patients with chronic kidney disease: Preliminary reports

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Abstract

Background. Cardiovascular disease (CVD) is the leading cause of death in the chronic kidney disease (CKD) population. Nitric oxide plays a key role in both endothelial dysfunction and the process of atherosclerosis.

Objectives. To assess the relationship of inflammatory markers with asymmetric dimethylarginine (ADMA) concentration in patients with CKD stage IIIb and IV.

Materials and methods. Thity-two patients with an average age of 54.9 ±19.7 years were enrolled in the study. The main cause of CKD in the study population was glomerulonephritis (GN; 41%). The most common comorbidities were: arterial hypertension (97%), hyperlipidemia (47%) and diabetes (28%). The antihypertensive treatments included the blockade of the renin system, angiotensin aldosterone (ACE-angiotensin converting enzyme inhibitor or angiotensin receptor blocker (ARB); 53%), calcium antagonist (44%) and β-blocker (41%). Mean creatinine concentration and glomerular filtration rate (eGFR Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI)) were 2.02 ±1.92 mg/dL and 29.9 ±14.4 mL/min/1.73 m^2, respectively. The assessment of leukocytes, neutrocytes, lymphocytes, neutrocyte-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) was performed based on the blood count. Moreover, high-sensitive C-reactive protein (hsCRP) and interleukin 6 (IL-6) levels were analyzed in the serum.

Results. The median ADMA level was 0.64 µmol/L (95% confidence interval (95% CI): 0.39–1.07). The levels of leukocytes, neutrocytes, lymphocytes, NLR and PLR were respectively: 6.9 G/L, 4.6 G/L, 1.6 G/L, 2.29, and 140, and the IL-6 concentration was 8.98 pg/mL. Statistical analysis showed no significant relationship between ADMA and selected inflammation parameters and renal function. Moreover, a significant correlation between hsCRP and age ($r = 0.48$), PLR ($r = 0.39$) and IL-6 ($r = 0.46$) was shown. Additionally, IL-6 correlated with age ($r = 0.59$) and PLR ($r = 0.39$; $p < 0.05$).

Conclusions. Inflammation has no influence on ADMA levels in patients with CKD stage IIIb and IV. The PLR index significantly correlates with hsCRP and IL-6; therefore, it can be used in everyday clinical practice as an easily accessible parameter of inflammation in the studied population.

Key words: endothelial dysfunction, kidney disease, inflammation

Calcium-phosphate metabolism disorders in the pathogenesis of deteriorated dental status in hemodialysis patients with chronic renal failure

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Abstract

Background. Calcium and phosphate (Ca-P) metabolism disorders with secondary hyperparathyroidism, vitamin D deficiency, hypersecretion of fibroblast growth factor 23 (FGF23) occur in almost all patients with end-stage renal disease. Appropriately intensified and insufficiently treated, they contribute to an increased number of cardiovascular complications and an increase in the mortality of patients.

Objectives. In order to determine the role of Ca-P metabolism disorders in the pathogenesis of deteriorated dental status in chronic renal failure (CRF), in 120 CRF patients (age: 60.9 ±14.1 years), markers of Ca-P metabolism, changes in blood counts and inflammation status (measured with C-reactive protein (CRP)) were determined.

Materials and methods. The CRF patients differed from healthy subjects in higher concentrations of phosphorus, parathyroid hormone (PTH) and FGF23, as well as in lower hemoglobin level. The CRF patients had higher parameters of insufficient oral hygiene (debris index (DI), calculus index (CI), approximate plaque index (API), and oral hygiene index (OHI)), and poorer condition of the teeth (carious, filled and extracted teeth – CFE index) and periodontium (gingival index (GI), sulcus bleeding index (SBI) and community periodontal index (CPI)), compared to controls with a lower caries frequency and a higher dental treatment index (WL).

Results. The dental status in CRF did not depend on duration and adequacy of hemodialysis (HD). Positive correlations between CRP, CI, leukocyte count, and DI, as well as correlations between leukocyte and platelet counts and the CPI emphasize the role of poor oral hygiene in inducing or sustaining the inflammation status. A positive correlation between phosphorus and CPI and a negative correlation between phosphatemia and CFE index, negative correlations between PTH, FGF23 and the CFE index or its components, as well as subsequent correlations (positive between FGF23 and the WL index, and negative for caries frequency) contradict dentition damage, as a result of hyperphosphatemia or PTH and FGF23 hypersecretion. Despite significantly lower PTH and FGF23 concentrations in diabetic patients than in others, no differences in oral cavity were observed.

Conclusions. Hemodialysis patients are characterized by worse oral hygiene and condition of the teeth and periodontium compared to controls. Hyperphosphatemia, PTH and FGF23 hypersecretion do not act as a causative agent of dentition damage in hemodialytic patients. The dental status in uremic patients is mainly influenced by insufficient oral hygiene, which is responsible for local and/or systemic inflammation.

Key words: chronic renal failure, hemodialysis, calcium-phosphate metabolism, oral hygiene, dental caries, periodontal diseases

Does orthostatic hypotension in kidney transplant recipients influence the progression of chronic kidney disease?

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Abstract

Background. Orthostatic hypotension (OH) is a frequent but rarely diagnosed clinical problem. The prevalence of OH in the general population is 5–30% and is strongly associated with age. Orthostatic hypotension is a prognostic factor of cardiovascular events and mortality. It is considered a sign of autonomic neuropathy. Multiple factors, including cardiac and vascular function, influence the progression of chronic kidney disease (CKD) in kidney transplant recipients (KTRs). So far, there are no studies analyzing the association between OH and progression of CKD in KTRs.

Objectives. To investigate the association between OH and the change of estimated glomerular filtration rate (eGFR) during 12-month follow-up.

Materials and methods. Orthostatic test (OT) was performed in 50 KTRs aged 60 ±12 years (21 females and 29 males) at a routine visit in an outpatient department. Orthostatic hypotension was diagnosed in 17 (34%) patients (the OH+ group). On the day of OT and after 12-month follow-up, serum creatinine was measured and eGFR was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Two patients did not completed follow-up – 1 patient from the OH+ group (neoplasm-associated death) and 1 patient from the OH– group (need to start hemodialysis (HD) therapy). The KTRs with OH were older and more often diabetic.

Results. In the study group (n = 48), a decrease in eGFR was found: 61 ±21 compared to 56 ±23 mL/min/1.73 m^2 (p = 0.009). In both, the OH– group (n = 32) and OH+ group (n = 16), a decrease in eGFR was observed: 60 ±21 compared to 57 ±23 mL/min/1.73 m^2 (p = 0.02), and 65 ±22 compared to 57 ±23 mL/min/1.73 m^2 (p = 0.03), respectively. The difference in eGFR decrease between the OH– group (3 ±9 mL/min/1.73 m^2) and OH+ group (9 ±19 mL/min/1.73 m^2) was not statistically significant (p = 0.25). No differences between eGFR change in OH– patients with and without diabetes, and in OH+ patients with and without diabetes were found.

Conclusions. The study demonstrated a high prevalence of OH among KTRs. Orthostatic hypotension does not influence the progression of CKD in this population.

Key words: orthostatic hypotension, kidney transplant, chronic renal disease

Use of dietary supplements in kidney transplant recipients

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Abstract

Background. The issue of dietary supplements use in kidney transplant recipients (KTRs) is an extremely serious and challenging topic because of the limitation of data, multiple drug interactions and the potentially harmful effect on allografts. Moreover, patients are not educated enough on this subject.

Objectives. To evaluate the amount of KTRs who introduced dietary supplementation into their daily routines. We investigated whether taking the supplements is associated with general well-being of the examined patients, as well as with kidney function.

Materials and methods. Our team conducted a survey among KTRs during their routine visits in the nephrology outpatient clinic. Out of 197 questioned patients, 167 were included in the study. Among them, there were 87 women and 80 men; the average age was 50.6 years, they were average 9.2 years after the transplantation. Mean serum creatinine concentration was 1.45 mg/dL.

Results. We found that 70.65% of studied recipients admitted taking supplements and 26.9% drinking herbal infusions or taking other herbs in different forms. Patients tend mostly to consume mint, chamomile and lemon balm. On the top of that, among the supplements included in the study, the most common was magnesium and vitamins C and D3. Only 23.3% of those patients actually discussed the decision of commencing the supplementation with their doctors. Moreover, only about 53.9% of the questioned recipients have actually heard about the side effects of supplements intake.

Conclusions. There is a lack of knowledge and awareness among KTRs about the way the supplements work and how they can interact with medicines they take and contribute to the function of their kidneys. A majority of patients did not consult with their doctor whether they can consume these products.

Key words: kidney transplantation, supplements interactions

Humoral response after the fourth dose of heterologous SARS-CoV-2 mRNA vaccine in kidney transplant recipients

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Abstract

Background. In kidney transplant recipients (KTRs), a seroconversion rate of only 51.4% was demonstrated after 2-dose basic vaccination. The chance to seroconversion is provided by using boosters: the 3rd or even 4th dose of the same or heterologous vaccine. A better immune response during vaccination against coronavirus disease 2019 (COVID-19) can be achieved using mRNA-1273 vaccine containing more than 3 times the mRNA than BNT162b2.

Objectives. To retrospectively evaluate the efficacy of a heterologous mRNA booster with mRNA-1273 in KTRs who were constantly seronegative after 3 doses of the BNT162b2 vaccine.

Materials and methods. Thirty-seven KTRs after 2 doses of BNT162b2 vaccine received a single, 3rd dose of the same vaccine 3 months after the 2nd one. The levels of antibodies to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) trimeric spike protein were assessed from 16 to 18 days after the 2nd and 3rd dose. After the 3rd dose of BNT162b2 vaccine, 16 patients (43.24%) became seropositive with binding antibody units (BAU) >33.8 BAU/mL. Seronegative patients with no prior SARS-CoV-2 infection were eligible for further vaccination with the heterologous 4th mRNA vaccine dose. Finally, 12 seronegative KTRs received an mRNA-1273 booster 5 months after the 3rd dose of BNT162b2.

Results. Five out of 12 patients (41.7%) seroconverted, with a mean BAU titer of 353/mL, 16–18 days after vaccination. Of note, 3 of them had a high BAU titer (>264/mL), which can be considered as neutralizing. Neither major adverse events nor graft rejections were observed after the booster.

Conclusions. The administration of a heterologous mRNA vaccine formulation with a high mRNA dose as a booster may be an effective alternative of achieving post-vaccination immunity in KTRs who remain seronegative after the primary 3-dose vaccination regimen.

Key words: humoral response, mRNA vaccine, kidney transplant recipients

Assessment of and attitude towards teleconsultations among patients of nephrology and posttransplant outpatient clinics in pandemic era

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Abstract

Background. To reduce coronavirus disease 2019 (COVID-19) infection spread and due to numerous sanitary restrictions, patients and doctors were forced to replace stationary appointments with teleconsultations (TC).

Objectives. To investigate frequency, level of satisfaction and attitude towards TC among patients of nephrology and post-transplant outpatient clinics.

Materials and methods. We created a questionnaire regarding patients' demographics, digital fluency, participation, satisfaction level, and attitude towards TC. The survey was validated and conducted during routine visits in nephrology and post-transplant outpatient clinics at 2 hospitals in Łódź, Poland.

Results. Questionnaires were completed by 217 adult patients at mean age of 57.13 years (standard deviation (SD) = 15.8 years, 126 (58.1%) males). The elderly (>60 years old) were the predominant group (44%, n = 96). Only 13.8% (n = 30) of patients never used telemedicine. Patients were divided into 2 groups: those who participated in TC in nephrology/post-transplant outpatient clinics (TC group; 65.4%, n = 142) and those who did not (nTC group; 34.6%, n = 75). In the TC group, the most common aim of the TC was a routine follow-up appointment (60.6%, n = 86) and only 26.8% (n = 38) of TC were due to new complaints. For 76.8% (n = 109) of patients, the information received during TC was comprehensible. Although 64.8% (n = 92) TC patients rated specialist TC positively (5 on a 1–5 scale), they preferred traditional visits over TC regarding laboratory results interpretation (65% compared to 21.4%), routine follow-up visits (77% compared to 15.7%) and examination of new symptoms (90% compared to 5%). These patients preferred TC for prescriptions (48.2% compared to 41%). The patients using Patient Internet Accounts were significantly more willing to contact their doctor via TC in the future (72% compared to 28%; p = 0.0169). Participation, satisfaction and attitude towards TC were unrelated to age, sex, educational status, residence, or digital fluency.

Conclusions. Most respondents rated TC positively and were willing to receive remote medical counsel in the future; however, they prefer stationary appointments. Unexpectedly, patients' demographics have no statistical significance on their opinion about teleconsultations.

Key words: teleconsultations, patients' assessment

Barriers to kidney transplantation: A perspective of ambulatory dialysis clinics' staff

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Abstract

Background. DaVita, a large dialysis provider in Poland, introduced an internal transplantation protocol in order to improve the referral of dialysis patients for kidney transplantation. Every patient undergoes transplant assessment immediately after starting dialysis program. The transplantation protocol is completed when the patient is introduced and waitlisted as „active" or diagnosed with permanent contraindication. Temporary contraindications are systematically evaluated and addressed accordingly. Reminder alerts are activated in the patient's electronic health records when more than 3 months elapse with "no-change" transplantation status. Medical and operational supervision revealed that major challenges nephrologists encounter in the process are arranging required examinations and consultations of kidney transplant candidates and annual updates of waitlisted patients. Nephrologists struggle with the lack of a practical, systematic pathway to place a transplant candidate on the waiting list. In Poland, it takes longer (913 days) than the waiting time of active patient for transplant surgery (430 days).

Objectives. This study is a review of DaVita nephrologists' handling of the evaluation and referral of kidney candidates to the waiting list.

Materials and methods. Survey data on solutions to overcoming difficulties and ensuring patient access to kidney transplantation were collected from DaVita clinics (n = 64).

Results. The data revealed that 94% of nephrologists use their private professional contacts to schedule a routine hospitalization for all necessary tests; 85% use their private professional contacts to reduce the waiting time for a specialist's consultation appointment; and 82% use private contacts to hasten candidate's outpatient examination. Candidates have the longest waiting times for cardiology consultation appointments, ultrasound and endoscopic exams (3–6 months).

Conclusions. Kidney transplant procedures could be improved in Poland if the pathway for candidates was better organized systemically or implemented. The delay in the evaluation of transplant candidates may ultimately affect the outcome after kidney transplantation.

Key words: kidney transplantation, lack of systemic solutions, waiting list

Effect of bioelements regulating mitochondrial function on the storage efficiency of isolated porcine kidneys by simple hypothermia

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Abstract

Background. The present work is part of a series of studies conducted by our team on the development of an optimal formulation of fluid intended for perfusion and preservation of organs. The bioelemental system, magnesium + manganese, was evaluated for its effectiveness in preserving isolated kidneys in hypothermia. Manganese is an antioxidant that can potentially minimize the effects of oxidative stress on the cell, while magnesium supports electrolyte balance. These bioelements affect the normal metabolism of the cell.

Objectives. To analyze the protective effect of magnesium and manganese as potential components of Biolasol fluid in the prevention of nephron damage occurring during ischemia.

Materials and methods. Pilot studies were performed in isolated porcine kidney model Polish "Large White", with the permission of II Local Ethics Committee Krakow (approval No. 1046/2013). Biolasol liquid (FZNP Biochefa, Sosnowiec, Poland) was modified with the addition of Mg^{2+} (1 µg/L) and Mn^{2+} (1 µg/L). The kidneys were washed and stored using the static method for 48 h under hypothermia (4°C). Biochemical markers of renal function were analyzed in the collected perfusates.

Results. Biolasol fluid modified with the addition of Mg^{2+} and Mn^{2+} influenced the efficiency of kidney storage. The [K+] concentration was lower by 31% compared to Biolasol and 54% compared to Biolasol+Mn^{2+} ($p < 0.05$). There was a decrease in urea concentration (by 70% compared to Biolasol and 75% compared to Biolasol+Mn^{2+}; $p < 0.05$), creatinine (by 71% compared to Biolasol+Mn^{2+}; $p < 0.05$) and protein (by 81% compared to Biolasol and 67% compared to Biolasol+Mn^{2+}; $p < 0.05$) after 48 h of storage.

Conclusions. The addition of magnesium and manganese ions to the composition of Biolasol fluid significantly improved the renal function indices.

Key words: magnesium, manganese, kidney, preservation solution

Guillain–Barre syndrome after COVID-19 in a kidney transplant recipient

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Abstract

Background. Coronavirus disease 2019 (COVID-19) is caused by a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The main clinical manifestation involves the respiratory system but also a variety of neurological symptoms, including Guillain–Barre syndrome (GBS). This syndrome is a polyneuropathy that is the most common cause of acute flaccid paralysis and is often connected with infections. The GBS has been rarely reported in heart, liver and kidney transplants recipients. Over a dozen cases of GBS after renal transplantation were mostly caused by cytomegalovirus (CMV). We present the first case of GBS caused by SARS-CoV-2 after kidney transplantation.

Case report. A 51-year-old patient with a history of left kidney nephrectomy due to vesicoureteral reflux causing frequent urinary tract infections and secondary nephrosclerosis, with glomerulonephritis with nephrotic syndrome in the right kidney, presently hemodialyzed, was qualified for a kidney transplantation. After the transplantation, delayed graft function requiring 2 hemodialysis (HD) sessions occurred. The immunosuppressive regimen included cyclosporin, mycophenolate mofetil, glucocorticoids, and induction with a rabbit antithymocyte globulin (rATG). Nineteen days after kidney transplantation, the patient was confirmed with SARS-CoV-2 infection. Due to concurrent CMV infection, ganciclovir was administered. Continuous veno-venous hemodiafiltration (CVVHDF) was performed due to renal allograft failure. Few days after recovering from COVID-19, sensorimotor polyneuropathy was observed and GBS was diagnosed based on an increased protein level in cerebrospinal fluid and electromyography. After retransferring to kidney transplant center, the treatment with plasmapheresis and intensive rehabilitation commenced. After 7 therapeutic plasma exchange (TPE) sessions, the mobility of the lower limbs improved. Kidney allograft function was restored with serum creatinine concentration of 1.2 mg/dL. The patient continued the rehabilitation in the neurological rehabilitation department, with a gradual neurological improvement.

Conclusions. The GBS should be considered in kidney transplant recipients who are convalescent after COVID-19 and exhibit a rapid development of polyneuropathy.

Key words: COVID-19, kidney transplantation, Guillain-Barre syndrome

Neutropenia and lymphocytosis as an effect of the maintenance therapy with eculizumab in a patient after kidney and bone marrow transplantation: A case report and literature review

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Abstract

Background. Eculizumab is a recombinant, humanized monoclonal IgG2/4κ antibody that binds to the human complement C5 protein. It is recommended in the therapy and prophylaxis, among other diseases, atypical hemolytic uremic syndrome in children and adults. The hematological adverse effects of the eculizumab therapy include anemia, lymphopenia, thrombocytopenia, and coagulopathy. We describe a case of a patient with neutropenia and lymphocytosis as an adverse effect of eculizumab therapy.

Case report. A 19-year-old patient with hemophagocytic syndrome (diagnosed in 2014) treated with HLH-2004 regimen, after allogenic bone marrow transplantation (2015) and treatment of graft-versus-host disease (GvHD), with end-stage renal disease (ESRD) in the course of thrombotic microangiopathy (TMA), received a kidney transplant (KTx) in June 2021. Since the KTx, the patient was treated with eculizumab as a prophylaxis of the TMA relapse. During 3 months of eculizumab treatment, good tolerance of the drug was observed; however, chronic lymphocytosis (3.25–4.1 G/L) was present. In October 2021, the patient was admitted to our clinic due to neutropenia (0.5 G/L) and lymphocytosis (4.16 G/L), with normal total leukocyte count (WBC 4.87 G/L). The patient was in a good general condition with no additional complaints and no abnormalities in physical examination. Other laboratory tests showed no significant deviations: C-reactive protein (CRP) of 1 mg/L, creatinine level of 1.28 mg/dL, hemoglobin of 14 g/dL, platelet count (PLT) of 210 G/L, lactate dehydrogenase (LDH) level of 215 U/L, and total hemolytic complement (CH50) of 15.09 U/mL. Cytomegalovirus (CMV) and Epstein–Barr virus (EBV) infections were excluded. All potentially myelotoxic drugs were previously discontinued. A bone marrow biopsy showed no lymphocyte clonality and no neoplastic cell infiltration. Furthermore, the granulopoiesis was partially suppressed. The patient was given 96 million units of filgrastim subcutaneously and the neutrocyte normalization was achieved. In the overall picture, eculizumab was suspected as a significant cause of neutropenia, thus the treatment was stopped without TMA recurrence. During 4 months observation period, the normalization of neutrocytes was still present.

Conclusions. Eculizumab was suspected as a significant cause of neutropenia.

Key words: kidney transplantation, thrombotic microangiopathy, eculizumab, neutropenia, lymphocytosis, bone marrow transplantation

Predictors of severe pneumonia and mortality in SARS-CoV-2-infected patients with chronic kidney disease on maintenance hemodialysis

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Abstract

Background. The group most at risk of death due to coronavirus disease 2019 (COVID-19) are patients on maintenance hemodialysis (HD).

Objectives. To find predictors of severe pneumonia and mortality due to COVID-19.

Materials and methods. The study was performed according to 2 protocols. In the mortality cohort study, we included all unvaccinated hemodialysis (HD) patients from the Pomeranian Voivodeship with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, hospitalized between October 6, 2020, and February 28, 2021, in 7th Naval Hospital in Gdańsk, Poland (n = 135). To find determinants of severe COVID-19 pneumonia we included only individuals with available chest computed tomography (CT) scan on admission (n = 85). Clinical data were extracted from the hospital records. Computed tomography (CT) scans were evaluated using Siemens Healthineers software which calculated pneumonia total severity score (TSS). The median TSS of 7 points was used as the cutoff value to divide the cohort into a severe inflammatory changes group and a mild changes group. Multivariable logistic regression was used to explore the risk factors associated with 3-month mortality.

Results. On admission, 29.14% of patients did not present any symptoms. In 28.81% of patients, pulmonary parenchyma was involved in ¼ of its volume. The factors associated with severe pneumonia include fever, low oxygen saturation and arterial partial pressure of oxygen, increased C-reactive protein (CRP) and ferritin serum levels, low blood count of lymphocytes, as well as chronic treatment with angiotensin-converting enzyme inhibitors (ACEI), while the chronic active vitamin D treatment was associated with the mild pneumonia. Three-month mortality was 39.08%, including an in-hospital case fatality rate of 33.08%. Multivariable logistic regression showed that the frailty clinical index of 4 or greater, D-dimer of 1500 ng/mL or greater and CRP of above 118 mg/L at admission were predictive of mortality.

Conclusions. The study identified potential predictors of COVID-19 severe pneumonia and fatality, which might be helpful in individualizing the management of HD patients and improving clinical outcomes.

Key words: COVID-19, SARS-CoV-2, pneumonia, chronic kidney disease, hemodialysis

Right internal jugular vein recanalization with balloon-assisted puncture for tunneled hemodialysis catheter placement: A case series

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Abstract

Background. Despite arteriovenous fistula being the first choice, many patients choose tunneled hemodialysis (TDC) catheters as a vascular access mode. In many patients, previous catheter placement results in central vein occlusion, rendering catheter insertion difficult.

Objectives. To test the feasibility of right internal jugular vein (RIJV) recanalization with balloon-assisted puncture for TDC placement.

Materials and methods. Six patients featuring chronic occlusion of RIJV and requiring TDC placement were recruited (TDC insertion through left IJV was contraindicated or impossible due to thrombosis or occlusion). Patent upper (defined as suprahyoid) portion of the RIJV and patent superior vena cava (SVC) and cavoatrial junction were required. Upper portion of RIJV was punctured directly with ultrasound guidance. The 5F vascular sheath was advanced over the wire into upper portion of the RIJV. Hydrophilic guidewire and angioplasty balloon catheters were used to recanalize and dilate an occluded lower portion of RIJV and innominate vein (if needed). For balloon-assisted puncture, a catheter with balloon extending from the lower portion of the RIJV to the SVC was inflated to low pressure (<1 atm). Previously inflated balloon was punctured through the skin under ultrasound guidance at the lower portion of the neck required for the placement of TDC. Immediately after a successful puncture, a guidewire was inserted through the needle into the lumen of the balloon. The deflated balloon was pushed down into the inferior VC, thus releasing from its lumen a guidewire inserted by the puncture of balloon at the lower portion of the RIJV. The balloon catheter was then withdrawn. The TDC was inserted with standard technique using guidewire with balloon puncture at the lower portion of RIJV.

Results. The described technique was successful in 5 patients and failed in 1 case due to the inability to recanalize RIJV. No major adverse events were observed.

Conclusions. Presented technique enabled placement of TDC through the typical entry site into the occluded RIJV.

Key words: balloon-assisted vein puncture, angioplasty, recanalization, tunneled hemodialysis catheter

Restrictive pericarditis as a rare cause of arteriovenous dialysis fistula ulceration: A case report and review of the literature

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Abstract

Background. Chronic hypotension affects 5–10% of all hemodialysis (HD) patients; it can be caused by hypovolemia, infection or low cardiac output. Therefore, a diagnostic process must be conducted and aimed at introducing the optimal treatment.

Case report. A 36-year-old hemodialyzed patient with end-stage renal disease (ESRD) of unknown etiology and chronic heart failure (HF) was admitted to the department of nephrology in March 2022 for HD catheter placement and treatment of an inactive dialysis fistula ulcer on the left forearm that had been present for several months. The patient had been on HD since 2018. On admission, the patient was circulatory and respiratory stable, despite a blood pressure of 71/42 mm Hg; systolic blood pressure (SBP) values in the range of 70–80 mm Hg were present for the last 2 years, according to the patient. Lower extremity edema and ascites had been present for over a year. Laboratory tests revealed elevated inflammatory parameters (C-reactive protein (CRP) level of 181 mg/L, polymerase chain reaction (PCR) 4.4 ng/mL) and high N-terminal prohormone brain natriuretic peptide (NT-proBNP) levels (20946 pg/mL). Blood cultures were negative, but nevertheless empirical antibiotic (piperacylin and tazobactam) was administered. As a result, the inflammation reduced, CRP levels decreased, but ulceration was not healing. During hospitalization, Fabry disease, myeloma and amyloidosis were taken into consideration as a cause of hypotension, and were excluded. High-resolution computed tomography (HRCT) of the chest revealed features of calcified pericardial plaques located mainly over the right heart cavities. The cardiological assessment showed normal right ventricular systolic function with weak right and left ventricular filling, hyperkinetic left ventricle and decreased inferior vena cava mobility; a diagnosis of constrictive pericarditis was reached and the patient was qualified for pericardiectomy. The above diagnosis was confirmed intraoperatively. Postoperatively, the ulceration began to heal properly.

Conclusions. Constrictive pericarditis should be considered in dialysis patients as a rare cause of chronic hypotension. Perfusion abnormalities caused by low cardiac output can cause ulceration in a limb with a dialysis fistula.

Key words: chronic kidney disease, hemodialysis, arteriovenous fistula, ulceration, constrictive pericarditis

Adherence to antihypertensive drugs in hemodialysis patients: Does the drug class matter?

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Abstract

Background. Arterial hypertension is present in a majority of hemodialysis (HD) patients, but the effectiveness of this treatment is unsatisfactory. It appears that nonadherence to antihypertensive therapy can be a significant cause of poor blood pressure control.

Objectives. To evaluate the adherence to antihypertensive therapy in HD patients.

Materials and methods. We used high-performance liquid chromatography (HPLC) coupled with time-of-flight (TOF) mass spectrometry of blood to detect nonadherence to antihypertensive treatment in 59 HD patients. Blood samples were taken before dialysis in the middle of the week. Blood collections and information about this were provided at the same day. Obtained results were compared with medical prescriptions.

Results. Twenty eight (47%) patients were completely or partially nonadherent to antihypertensive drugs. We found that nonadherence was significantly associated with certain drug class prescriptions. The most commonly omitted drugs were renin-angiotensin-aldosterone system (RAAS) inhibitors, which were not detected in 13 out of 22 patients (59.1%), while the lowest rate of nonadherence was shown for diuretics and β-blockers (19.4% and 21.3%, respectively). In a post hoc analysis, we found that the RAAS inhibitors were taken less likely than diuretics ($p < 0.001$) and β-blockers ($p = 0.002$). Interestingly, we failed to detect at least 2 drugs classes in 11 out of 29 nonadherent patients (37.9%). Six patients (20.7%) did not take RAAS inhibitors only, 4 patients (13.8%) omitted β-blockers only, and 3 patients did not take both calcium-channel blockers and diuretics (10.3%), while 2 patients omitted clonidine (6.9%).

Conclusions. Adherence to prescribed anti-hypertensive therapy in HD patients is poor, which explains unsatisfactory results of the treatment. The class of prescribed drug is a risk factor for biochemically confirmed nonadherence to blood pressure therapy.

Key words: adherence, hypertension, dialysis, treatment, drug class

Associations between mortality and saturated fatty acid content in dialysis patients

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Abstract

Background. Cardiovascular (CV) mortality in dialysis population remains very high. Saturated fatty acids (SFAs) contribute to atherosclerosis and CV risk.

Objectives. To evaluate the relationship between mortality in dialysis patients and the serum content of SFAs.

Materials and methods. Survival of 56 patients on dialysis was assessed. A total of 21 SFAs from patients' sera were measured using gas chromatography-mass spectrometry (GC-MS). The diet was assessed with food frequency questionnaire (FFQ-6). The SFA content is presented as fatty acid proportion (percentage).

Results. The median of observation time was 66 months (range: 2–76 months). During the observation period, 22 patients died. The Kaplan–Meier analysis revealed a significant relationship between elevated SFAs (above SFA mean) and mortality (log-rank test 3.13; $p = 0.0017$). In Cox regression model, the hazard ratio (HR) for mortality associated with increased SFA content equaled 4.47 (1.63–12.26). The addition of age and inflammation (high-sensitivity C-reactive protein (hsCRP) >5 mg/L) into the Cox model did not modify this relationship. However, SFA content turned out to be significantly higher in diabetic patients, as compared to patient free from diabetes mellitus (DM) (35.2 ±1.6 compared to 33.3 ±2.8; $p = 0.03$). Similarly, SFAs were elevated in patients with cardiovascular disease (CVD), compared to patients without this disease (34.9 ±1.8 compared to 32.6 ±2.9; $p < 0.001$). Indeed, the addition of these 2 comorbidities to the model attenuated the relationship between SFA and mortality, making it statistically insignificant. According to food questionnaires, SFA content was associated with the ingestion of food rich in saturated fat, although these relationships did not reach statistical significance.

Conclusions. The serum content of SFAs turned out to be a strong predictor of mortality in dialysis patients. However, given the significant associations between SFAs, DM and CVD, interventional studies are needed to evaluate the causal links between SFAs, comorbidities and survival.

Key words: saturated fatty acids, lipids, dialysis, mortality

Assessment of the variability of oxygen saturation and the incidence of hypoxia during hemodialysis

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Abstract

Background. Hemodialysis (HD) may cause inadequate oxygen supply at the cellular level, leading to hypoxia. Hypoxia in turn may be associated with a progression of multiple organ dysfunction. Other acute and chronic consequences of hypoxia include the cardiovascular system diseases, central nervous system (CNS) diseases, impaired wound healing, and inflammation.

Objectives. To evaluate the changing pattern of oxygen saturation during HD.

Materials and methods. The study involved 54 patients treated with chronic HD. Continuous measurement of oxygen saturation and heart rate (HR), as well as systolic and diastolic blood pressure (SBP and DBP) for 30 min were performed during a single dialysis session. The coefficient of variation (CoV) was considered a measure of the variability of oxygen saturation, SBP, DBP, and HR. Correlations between these parameters were analyzed. Intradialytic hypoxia was defined as arterial oxygen saturation below 90%.

Results. There was no significant difference in oxygen saturation CoV between men and women. Age, dialysis duration and duration of chronic dialysis did not correlate with oxygen saturation variability. Intradialytic hypoxia was observed in 24 of 54 patients. Hypoxia was present during 1.71% of the whole dialysis duration on average. This percentage was higher in women (1.71%) than in men (0.24%) ($p = 0.0041$). There was no correlation between the duration of interdialytic hypoxia and age or variability of SBP, DBP, HR, and oxygen saturation.

Conclusions. Variability of oxygen saturation is not correlated with intradialytic hypoxia.

Key words: hypoxia, oxygen saturation, hemodialysis

Etiology and bacterial susceptibility in peritoneal dialysis-associated peritonitis

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Abstract

Background. Peritonitis is the most common complication of peritoneal dialysis (PD). It requires immediate, empirical antibiotic therapy at the moment of diagnosis. Recommendations suggest intraperitoneal usage of cephalosporines, vancomycin or aminoglycosides as the first-line treatment, with modifications according to microbiological peritoneal fluid culture (PFC) results.

Objectives. To assess the etiology of peritonitis in PD patients (P-PD) and to estimate antibiotic susceptibility of microorganisms.

Materials and methods. All PFCs made from 2007 to 2021 in patients suspected with P-PD, treated in one dialysis center, were collected. The types of microorganisms and their antibiotic susceptibility were analyzed.

Results. Seventy-two PFCs were collected from 44 patients (18 females, 26 males, mean age: 57.01 ±15.35 years (females: 55.89 ±13.87 years, males: 57.69 ±16.31 years)). Twenty-eight patients suffered from PD once, recurrent/relapsing episodes were diagnosed in 16 patients (mean amount of PFCs per patient: 1.64 ±1.1). The analyzed PFCs contained 74 bacterial samples: 53 (71.6%) Gram-positive and 21 (28.4%) Gram-negative. Fungal infection was identified in 1 patient. The most frequently occurring microorganisms in PFCs were: *Staphylococcus epidermidis* (n = 15; 20.3%), *Staphylococcus haemolyticus* (n = 5; 6.8%), and *Staphylococcus hominis* (n = 5, 6.8%). Among patients suffering from PPD only once, the most often occurring microorganisms were Gram-positive bacteria, represented chiefly by *Staphylococcus hominis* and *Enterococcus* spp. (30.9%), and among recurrent/relapsing patients the most prevalent bacterium was *S. epidermidis* (n = 12, 31.1%). The antibiotic susceptibility of the abovementioned bacteria was similar – *S. epidermidis* presented 100% susceptibility to linezolid, 100% to vancomycin, 100% to teicoplanin, 84.6% to gentamicin, 81.8% to doxycycline, and 60% to ciprofloxacin. It was resistant to third-generation cephalosporins: ceftriaxone (50%) and cefotaxime (42.9%). The most often occurring Gram-negative bacteria were *Escherichia coli* (n = 4, 5.4%), and *Klebsiella pneumoniae* (n = 4, 5.4%), highly sensitive to carbapenems. Cefazolin susceptibility was not tested.

Conclusions. The most frequent cause of P-PD was *S. epidermidis*, which presented high susceptibility to antibiotics recommended as a first-line treatment.

Key words: peritonitis, dialysis, antibiotics, susceptibility

Organizational support, training and equipment are key determinants of burnout among dialysis physicians during the COVID-19 pandemic

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Abstract

Background. Burnout was an important factor in the professional landscape of nephrology already before coronavirus disease 2019 (COVID-19) outbreak and is expected to worsen during the pandemic. As a life-saving procedure, hemodialysis (HD) care could not undergo profound organizational adjustments. It was the case especially in outpatient settings, which largely turned towards telemedicine services. It makes dialysis staff probably the most vulnerable population among healthcare professionals amidst pandemic.

Objectives. To assess pandemic experiences, perceptions and burnout among Polish dialysis unit physicians in the COVID-19 era.

Materials and methods. A survey consisting of Pandemic Experiences and Perceptions Survey, as well as Maslach Burnout Inventory was distributed online to Polish dialysis units. The study group comprised 148 physicians (52% females, mean age 50.2 ±10.4 years).

Results. The pandemic largely affected or completely dominated the work of dialysis units according to 55.5% and 15.4% of the study participants, respectively. Personal protection equipment (PPE) was assessed as completely or mostly adequate by 33.3% and 24.4% of physicians, respectively. Information about procedures and safety measures received from management was described as completely or mostly adequate by 35% and 40.2% of participants, respectively. A serious or life-threatening risk was perceived by 70.1% and 11.9% of dialysis physicians, respectively. Moreover, 69.2% of the study participants stated that their work in dialysis setting amidst pandemic was associated to at least serious risk for their relatives. Burnout levels in terms of emotional exhaustion ($p = 0.011$), depersonalization ($p = 0.019$) and personal accomplishments ($p = 0.0004$) were lower among participants who felt more in control over their contact with virus because of training, equipment and support.

Conclusions. Coronavirus disease 2019 pandemic has largely affected work in dialysis units. Providing staff with a proper training, equipment and organizational support gives a sense of control over the risk of infection, while such prolonged risk may lead to lower burnout among dialysis physicians.

Key words: burnout, COVID-19, dialysis units, pandemic perceptions

Effect of low frequency magnetic field on calcium-phosphate metabolism of hemodialysis patients with chronic renal failure

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Abstract

Background. Beneficial effects of magnetostimulation in reduction of chronic pain complaints, objectified using Visual Analogue Scale (VAS), as well as an increase IN hemoglobin (Hb) levels, and changes in calcium (Ca) and phosphate (P) concentrations were observed in hemodialyzed uremic patients with chronic renal failure (CRF).

Objectives. To determine the relationship between Ca and P metabolism and reduced pain sensation.

Materials and methods. The Ca and P concentrations and the levels of related hormones – parathormone (PTH) and fibroblast growth factor 23 (FGF23) – as well as interleukin 6 (IL-6), were determined before 20-min intradialytic treatment with a low-frequency magnetic field (MF), and 3 months after such treatment.

Results. The use of MF resulted in a reduction of VAS (3.7 ±2.1 compared to 5.23 ±2.41; $p < 0.001$), increase in Hb content (11.5 ±1.57 g/dL compared to 10.6 ±1.34 g/dL; $p < 0.001$) and Ca concentration (2.3 ±0.2 mmol/L compared to 2.16 ±0.22 mmol/L; $p < 0.001$), and a decrease in P concentration (1.52 ±0.50 mmol/L compared to 1.78 ±0.6 mmol/L; $p < 0.001$), PTH concentration (338.1 ±270.9 ng/mL compared to 394.6 ±261 ng/mL; $p = 0.0023$), FGF23 concentration (563 ±380.3 ng/mL compared to 639 ±373.6 ng/mL; $p = 0.0078$), and IL-6 concentration (10.4 ±7.53 UI/mL compared to 14.63 ±13.2 UI/mL; $p = 0.0026$). Positive correlations were found between FGF1 and P1 ($R = 0.2442$) and K1 and P1 ($R = 0.4018$). After magnetostimulation, a correlation between sodium and PTH levels ($R = 0.2567$) was observed. Patients with IL-6 level >6 UI/mL were characterized by a correlation between IL-6 and P1 ($R = 0.3677$). After magnetostimulation, a negative correlation between Ca and PTH ($R = -0.4952$) and absence of correlation between IL-6 and P was noted.

Conclusions. The chronic pain score ≥3 according to the VAS is indicated by 87% of hemodialyzed CRF patients. The use of 3-month magnetostimulation reduced the pain complaints declared by the patients and decreased the disturbances of calcium-phosphate metabolism. The occurrence of a correlation between IL-6 and P and its absence after treatment, points to the involvement of inflammation and phosphate in the pathogenesis of pain. The role of the Ca-P-related hormones as uremic toxins in the pathogenesis of chronic pain in hemodialysis (HD) patients has not been documented. The reduction of pain is closely associated with the reduction of inflammation and phosphate levels.

Key words: chronic kidney disease, hemodialysis, magnetostimulation, calcium phosphate metabolism disorders

Urgent-start peritoneal dialysis: A case report

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Abstract

Background. Urgent-start dialysis is the term used to describe an early-start dialysis after a replacement catheter insertion. The method which is mainly chosen for early-start dialysis is hemodialysis. The reason for that choice is the availability and medical staff experience. In pediatric nephrology, peritoneal dialysis (PD) is well-known, because children below 15 kg are usually not qualified for hemodialysis or continuous renal replacement therapies. Adult medical knowledge about urgent-start PD is based mainly on observational studies and case reports. The example of our patient depicts one of the situations when PD seems to be the safest choice. The study aimed to evaluate the safety and effectiveness of PD as the equivalent method to urgent-start dialysis.

Case report. A 26-year-old woman, Jehovah's Witness with a history of chronic kidney disease, hypertension and moderate intellectual disability, was hospitalized in Nephrology Department with extremely high serum creatinine (23 mg/dL) and deep anemia (hemoglobin – 3.5 g/dL). Moreover, she had birth asphyxia, vesicoureteral reflux and recurrent urinary tract infections in her medical history. The last contact with a nephrologist was 8 years ago. Physical examination showed paleness, peripheral edema, diminished breath sounds in the lower parts of the chest, and pericardial friction rub (in echo signs of tamponade). Given her medical condition, deep anemia, lack of permission for blood transfusion, and pericardiocentesis, the patient qualified for PD. On the day of catheter implantation, the patient started automated PD with low volume exchanges, with a solution of 1.36% glucose. Initially, we observed dialysate leakage, further course was uneventful. On the 44th day of hospitalization, the patient was discharged with clinical improvement and a higher level of hemoglobin (7.8 g/dL).

Conclusions. Based on the case described above, it can be concluded that PD is the equivalent method to urgent-start dialysis. Unfortunately, one of the most important limitations is the time needed by a surgeon for catheter insertion.

Key words: urgent-start dialysis, anemia

The influence of enoxaparin on Gremlin-1 release among hemodialyzed patients

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Abstract

Background. Gremlin-1 acts as an antagonist of bone morphogenetic proteins and a ligand of heparin and vascular endothelial growth factor receptor-2 (VEGFR-2), thereby regulating physiological and pathological processes, including embryogenesis, tissue fibrosis and cancer.

Objectives. To evaluate whether an intravenous injection of enoxaparin during hemodialysis (HD) affects the release of Gremlin-1 from endothelium in chronically hemodialyzed patients.

Materials and methods. The study included 14 patients. Before the first HD session, a single intravenous dose of enoxaparin (mean: 0.68 mg/kg body weight) was administered. Blood samples were collected to check the plasma concentration of Gremlin-1 before the injection of enoxaparin (T0), after 10 (T1), 30 (T2), and 120 min (T3) of HD. During the second HD, blood samples were aspirated, following the same schedule with no enoxaparin injections. A dialyzer with a heparin-grafted membrane was used in all procedures.

Results. After injecting enoxaparin, in comparison with baseline T0 (median: 34.14 ng/mL), a significant increase of Gremlin-1 plasma T1 (median: 58.45 ng/mL) and T2 (median: 52.26 ng/mL) was observed (all $p < 0.0001$). The enoxaparin dose did not correlate with the concentration of Gremlin-1.

Conclusions. Enoxaparin may have a noticeable stimulating effect on the release of Gremlin-1 from endothelial source. The clinical significance of this finding remains unverified.

Key words: Gremlin-1, enoxaparin, hemodialysis

Characteristics of different types of acidosis in patients with chronic kidney disease stages IV and V

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Abstract

Background. In patients with chronic kidney disease (CKD), metabolic acidosis with a normal anion gap (non-AGMA) is a common complication. However, other types of acidosis, including acidosis with a high anion gap (HAGMA) and mixed metabolic and respiratory acidosis are also observed.

Objectives. To evaluate the proportions of different types of acidosis in CKD patients and their characteristics.

Materials and methods. In a group of 100 patients with CKD stages IV and V, and a mean age of 64 ±16 years, the sample of arterial blood was taken during the arteriovenous fistula procedure for the point-of-care testing (POCT), which enabled the assessment of the most important parameters of acid-base balance, including pH, bicarbonate (HCO_3^-), pCO_2, chloride (Cl^-), creatinine, and urea concentration. The patients were classified into particular types of acidosis, according to the test. Mixed metabolic and respiratory acidosis was estimated using the Winters' formula.

Results. Decompensated acidosis with pH ≤ 7.35 was found in 56 (56%) patients. Mixed metabolic and respiratory acidoses were found in 9% of patients. Metabolic acidosis, defined as the concentration of HCO_3^- ≤ 22 mmol/L, was found in 80 (80%) patients. In this group, HAGMA and non-AGMA were observed in 39% and 61% of patients, respectively. In the non-AGMA group, a statistically significant smaller concentration of anion gap (AG) (8.40 compared to 11.67 mmol/L, $p < 0.05$), higher Cl^- concentrations (115 compared to 113.1 mg/dL, $p = 0.045$), higher concentrations of ionized calcium (Ca^{++}) (1.21 compared to 1.13 mmol/L, $p < 0.05$), higher concentrations of hemoglobin (10.2 compared to 9.44 g/L, $p = 0.03$), higher glomerular filtration rate (GFR) (12.55 compared to 9.66 mL/min, $p < 0.05$), lower creatinine concentrations (4.83 compared to 6.08 mg/dL, $p < 0.05$), and lower concentrations of urea (134 compared to 166 mg/dL, $p < 0.05$) were found. Chloride (Cl^-) concentrations correlated negatively with HCO_3^- concentrations ($r = -0.72$, $p < 0.05$).

Conclusions. The most common type of acid-base disturbance in patients with CKD stages IV and V is metabolic acidosis with a normal AG, which is observed in patients with higher GFR and is associated with compensatory hyperchloremia.

Key words: acidosis, acid-base balance, anion gap, HAGMA, non-AGMA, CKD

Which approach is most patient-centered for creating an arteriovenous fistula in patients starting hemodialysis with cuffed catheter?

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Abstract

Background. In patients urgently starting hemodialysis (HD) with cuffed central venous catheter (cCVC), the construction of arteriovenous fistula (AVF) synchronously with the start of HD appears to be more patient-centered than the next planned procedure following discharge.

Objectives. To determine which strategy of establishing AVF – early (close to HD initiation; strategy A) or later (second hospitalization; strategy B) one results in fewer hospitalizations and vascular access (VA) complications, including catheter-related bloodstream infections (CRBSI).

Materials and methods. Hospital medical records from January 2019 to December 2020 were obtained. Inclusion criteria were HD initiation through cCVC and subsequent AVF creation within 2 years.

Results. Out of 208 incident HD patients, 79 patients met the inclusion criteria. Group A (n = 32, mean age: 55.5 years) and B (n = 47, mean age: 59.3 years) showed comparable characteristics in terms of age, gender, Charlson Comorbidity Index (CCI), albumin, frailty syndrome, and nephrotic syndrome. Arteriovenous fistula-related complications were comparable and rare in both groups. A substantial reduction in hospitalizations was seen in group A (mean: 2.8 compared to 3.3 days/2 years). A total of 8 CRBSIs, 2 in group A and 6 in group B were found; CRBSI incidence of 0.29 in group A, 0.38 in group B of infections per 1000 catheter days were noted. Patients with fewer comorbidities (CCI of 6 or less) and younger (less than 66 years) developed CRBSI at a lower rate while using strategy A than strategy B (0.19 compared to 0.50). Patients without nephrotic syndrome benefited the most from strategy A in terms of hospitalization reduction (2.6 compared to 3.5 hospitalizations/2 years; p = 0.01).

Conclusions. Among incident HD patients who begin with cCVC and appear to be candidates for AVF, the "early" method appears to be more patient-centered than the "delayed second admission" strategy.

Key words: urgent dialysis, AVF, cuffed catheter

Lung ultrasonography may aid in the differential diagnosis and dry weight assessment in post-COVID-19 period

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Abstract

Background. Coronavirus disease 2019 (COVID-19) symptoms are frequently moderate or nonexistent in dialysis patients. Beside the identification of COVID-19-infected patients, post-COVID clinical monitoring can also be challenging. In this scenario, lung ultrasonography (LUS) may be critical in assessing lung involvement in hemodialysis patients during the COVID-19 pandemic.

Objectives. To examine the importance of LUS in assessing lung involvement in hemodialysis patients during the COVID-19 pandemic.

Materials and methods. The case of COVID-19 in a young hemodialysis patient in whom LUS was critical in the differential diagnosis of exercise intolerance 3 weeks post COVID was described. There were no typical infection signs, chest discomfort or cough. The patient did not gain weight between dialyses. Ultrasound pictures demonstrated a bilateral pattern with several confluent B lines and fluid in the pleura.

Results. Despite clinical appearance being euvolemic and afebrile, the patient arrived with exercise intolerance and an oxygen saturation level of 92%. The clinical symptoms of our patient were nonspecific. Eventually, it was possible to identify the main problem at the outpatient dialysis center by means of LUS. Four days later, after daily dialysis sessions and reducing body weight by 5 L, the patient condition significantly improved with concomitant disappearing of hydrothorax and a majority of B lines.

Conclusions. While there are numerous reasons for a patient on dialysis to present with shortness of breath or exercise intolerance, the recognition of fluid overload in an oligosymptomatic patient (lack of edemas, no weight gain, atypical lung sounds) was possible using LUS. Lung ultrasonography may play a critical role in the screening of hemodialysis patients not only during the COVID-19 (like-COVID pneumonia) period, but also in post-COVID-19 period, when correction of ultrafiltration amount are needed. Following COVID-19, we recommend using additional methods for dry weight measurement in all HD patients, emphasizing the importance of LUS.

Key words: lung ultrasound, COVID-19, hemodialysis

Immune status against varicella zoster virus (VZV) and measles virus in hemodialysis patients and kidney transplant recipients

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Abstract

Background. Patients on renal replacement therapy are susceptible to viral diseases, including chickenpox/herpes zoster and measles.

Objectives. To analyze the immune status against varicella zoster virus (VZV) and measles virus (MV) of hemodialysis patients (HD) and kidney transplant recipients (KTR).

Materials and methods. The study group included 88 HD (45 female (F), 43 male (M), aged 64.9 ±15.6 years, median: 3.9 (interquartile range (IQR): 1.6–6.7) years on hemodialysis), and 93 KTR (41 F, 52 M, aged 51.6 ±13.5 years, median: 4.6 (IQR: 1.0–13.3) months after transplantation). Anti-VZV and anti-MV immunoglobulin G (IgG) titers were measured with enzyme-linked immunoassay (ELISA) (U/mL, Demeditec, Kiel, Germany).

Results. Anti-MV IgG were detected in 75 (85%) HD and 72 (77%) KTR. The anti-MV IgG titers were age-related. Hemodialysis patients and KTR more than 50 years old presented higher levels of anti-MV IgG compared to younger patients (HD > 50: 92.7 ±51, median: 95 (IQR: 40–129) compared to HD ≤ 50: 48.9 ±60.6, median: 15 (IQR: 7–107), $p < 0.001$; KTR > 50: 76.3 ±48.9, median: 71 (IQR: 31–116) compared to KTR ≤ 50: 36.1 ±45.7, median: 17 (IQR: 5–46), $p < 0.001$). No difference between the anti-MV IgG titers on HD compared to KTR in older ($p = 0.075$) nor younger patients ($p = 0.734$) was observed. In both groups, anti-MV IgG titers did not differ between male and female patients. Anti-VZV IgG were detected in 80 (90%) HD and 91 (98%) KTR. In most of the KTR, the titers exceeded the assay range (>150). Anti-VZV IgG titers were higher in KTR compared to HD and were gender-related (HD_{males}: 98.1 ±43.6, median: 108 (IQR: 65–134); $HD_{females}$: 75.2 ±46.6, median: 81 (IQR: 29–109); KTR_{males}: 135.9 ±31.0, median: >150 (IQR: 141–150); $KTR_{females}$: 103.6 ±53.8, median: 135 (IQR: 41–150); F/M: HD $p = 0.020$, KTR $p = 0.018$; HD/KTR: male $p < 0.001$, female $p = 0.031$). No significant correlations between antibody titers and time on hemodialysis, time after transplantation or transplant function (estimated glomerular filtration rate (eGFR)) were observed.

Conclusions. Younger patients (most probably measles-vaccinated) presented lower anti-MV IgG titers compared to the older individuals. The majority of patients presented anti-VZV antibodies, with lower titers observed in hemodialysis patients. The monitoring of the anti-VZV and anti-MV immune status enables the identification of particularly susceptible patients who can get vaccinated.

Key words: dialysis, kidney transplantation, measles, varicella zoster virus, immune status

NDM-producing *Klebsiella pneumoniae* infections in patients with kidney diseases

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Abstract

Background. New Delhi metallo-β-lactamase (NDM)-producing *Klebsiella pneumoniae* was isolated for the first time in India in 2008. Since then, it has spread all over the world.

Objectives. To investigate local epidemiology and clinical relevance of NDM infections in patients with various kidney diseases, including kidney transplant recipients.

Materials and methods. Medical data of all hospitalized patients in 1 nephrology department in 2021 were collected. In the Department of Nephrology and Transplantation Medicine, from a total of 4047 (3243 in Nephrology Department, 834 in Transplantation Medicine Department) hospitalizations in 2021, 37 positive cases were confirmed. Among them, there were 9 symptomatic patients (3 nephrology, 6 transplant recipients) with *K. pneumoniae* NDM who were treated with antibiotics. Remaining 28 patients were asymptomatic with NDM detected in the urine or in the gastrointestinal tract, and received no antibiotics.

Results. Five out of 9 symptomatic patients were successfully cured (3 of them with intravenous colistin, 2 of them with oral fosfomycin), which was confirmed by negative urine/blood/fecal cultures. One patient experienced acute kidney injury (AKI) during NDM infection. One patient, whose urine culture remained positive after the antibiotic therapy was classified as a chronic carrier. He also experienced AKI. Three elderly patients with many comorbid chronic illnesses and severe state before hospitalization (concurrent cytomegalovirus (CMV) infection or sepsis) died. Asymptomatic patients were classified as chronic carriers during 12 months of observation, on the condition that they did not present any pathological symptoms. One of them died late after NDM diagnosis because of gastrointestinal tract hemorrhage. New Delhi metallo-β-lactamase infections appear to be a global problem. Although *K. pneumoniae* NDM is a multi-drug resistant microbe, a vast majority of infected patients have responded to antibiotic therapy.

Conclusions. Even among patients with several serious comorbidities (diabetes, advanced age, bladder catheterization, chronic kidney failure, immunosuppression, frequent hospitalization) NDM infection is usually treatable, however, it may worsen a critical state when coexisting with other conditions.

Key words: NDM-producing Klebsiella pneumoniae, urinary tract infection, nephrology, AKI, graft loss, antibiotic therapy

Late complications after COVID-19 in kidney transplant recipients

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Abstract

Background. Patients infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) may develop a post-coronavirus disease 2019 (COVID-19) syndrome, defined by symptoms that appear during or after COVID-19, last for more than 12 weeks and cannot be explained by an alternative diagnosis.

Objectives. To assess the incidence of persistent symptoms after COVID-19 in kidney transplant recipients (KTR), their quality of life and the graft function 6 months after the disease.

Materials and methods. A total of 67 KTR (38 male (M), mean age: 53.6 ±14 years, 7.3 ±6.4 years after transplantation) were included in the cohort longitudinal study. Thirty-nine (58.2%) of them were hospitalized, but none of them required invasive ventilation therapy. They were interviewed 6 months after infection, with a series of standardized questionnaires: a self-reported symptoms questionnaire, the modified Medical Research Council (mMRC) dyspnea scale, the EQ-5D-5L questionnaire, and the EQ-VAS scale. The influence of COVID-19 on graft function was evaluated by comparing serum creatinine levels 3 months before the onset and 6 months after COVID-19.

Results. Post-COVID-19 syndrome was diagnosed in 70.1% of KTR and 26.9% of them reported at least 3 persistent symptoms. The most common symptoms were fatigue (43.3%), hair loss (31.3%), memory impairment (11.9%), muscle aches, and headaches (11.9%). Dyspnea with an mMRC scale grade of at least 1 was reported by 34.3% patients compared to 14.9% before the infection; 47.8% feel worse than before the disease. Mean EQ-VAS scores were 64.83, as compared to 73.34 before the infection. The persistent symptoms are more frequent in older patients and those with greater comorbidity. The median (interquartile range (IQR)) values of serum creatinine levels 3 months before the onset and 6 months after COVID-19 were: 1.25 (0.98–1.86) and 1.26 (1.03–1.78) mg/dL, respectively (a nonsignificant difference).

Conclusions. Symptoms of post-COVID-19 syndrome are still present 6 months after the disease in the majority of KTR, indicating the need for a long-term follow-up, diagnosis and rehabilitation of these patients.

Key words: post-COVID-19 syndrome, quality of life, graft function, kidney transplant recipients

Impact of patient education about recommended vaccines on vaccination readiness among chronic hemodialysis patients

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Abstract

Background. Pneumococcal and meningococcal vaccines are recommended for patients with chronic kidney disease due to impaired immunity.

Objectives. To evaluate the awareness of invasive pneumococcal (IPD) and meningococcal diseases (IMD), their health consequences, willingness to vaccinate, as well as to identify the sources of vaccination hesitancy among chronic hemodialysis (HD) patients. We also wanted to assess the effect of the patient education program on their knowledge of the abovementioned infectious diseases and immunization opportunities.

Materials and methods. The leaflets were used to educate 209 patients from dialysis centers in Łódź Voivodeship on IPD and IMD. The participants were divided into 2 groups: educated before (group "E") and after (group "NE") completing the anonymous questionnaire.

Results. Only 2.4% of interviewees had been previously vaccinated against IPD, and none against IMD. The main reason for being unvaccinated was the lack of knowledge about this possibility (73.2% – IPD, 76.1% – IMD). Among other reasons were unawareness of IPD and IMD, belief in unnecessity of vaccination and expected high cost of the vaccines. Majority of the respondents (87.1%) acknowledged that they had been informed by a doctor about their impaired immunity. Nevertheless, the patients reported that they had never heard from any doctor about IPD (90.9%) or IMD (94.7%), nor about the vaccines (95.2% and 96.7%, respectively). The education program resulted in more declarations of willingness to vaccinate against IPD (43.1% of "E" compared to 12.6% of "NE" group, $p < 0.001$) and IMD (44.7% compared to 12.5%, $p < 0.001$). The awareness of IPD, IMD and immunization opportunities were also raised. A total of 80.9% of the patients claimed that doctors are a reliable source of information concerning vaccination.

Conclusions. Vaccination rates against IPD and IMD in the population of Polish HD patients are very low. Patient education programs about these diseases and immunization opportunities may raise vaccination rates and protect against serious infections.

Key words: end-stage kidney disease, hemodialysis, pneumococcal vaccines, meningococcal vaccines, vaccine hesitancy, patient education

A rare case of perforation of the ureter

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Abstract

Background. Spontaneous perforation of the ureter is a very rare condition with few reports in the medical literature. The majority of cases are caused by ureteral calculi. In this paper, we present a case of a patient suffering from colorectal cancer who during an adjuvant therapy developed ureter perforation associated with, invisible in imaging tests, tumor recurrence in the retroperitoneal space with infiltration of the ureter. According to our knowledge, the presented case is the first one ever to be described.

Case report. A 73-year-old man, with a diagnosis of small lymphocytic lymphoma (SLL) and adenocarcinoma of hepatic flexure, was admitted for the administration of the 12th cycle of FOLFOX-4 adjuvant chemotherapy. On admission, the patient reported nausea and periodic severe pain in the right hypochondrium. The ultrasound examination of the abdominal cavity revealed an undefined, hypoechogenic structure in the retroperitoneal space. The diagnostics was extended to the abdominal computed tomography (CT) scan which visualized the spontaneous perforation of the right ureter with the formation of urinoma. The patient was transferred to the Urology Department as a matter of urgency, where the lesion was successfully treated with D-J probe insertion and the peritoneal cavity drainage. The cause of this perforation remained unclear even despite the positron emission tomography (PET)-CT examination. A surgical procedure performed few months later due to a developed obstruction of the small intestine revealed a tumor infiltration in the retroperitoneal space, confirmed by a pathologist. A retrospective analysis of CT images showed the presence of discrete changes in the retroperitoneal cavity on the right side, which may correspond with tumor recurrence.

Conclusions. This unique case presents a spontaneous perforation of the ureter, which led to diagnostic difficulties despite the use of all available imaging methods. The presented problem emphasizes the need to maintain an appropriate diagnostic criticism in the assessment of the results of any additional tests.

Key words: ureter, perforation, colorectal cancer, chemotherapy, case report

Diurnal blood pressure profile and progression of chronic kidney disease stage 1–3 during 6-month follow-up

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Abstract

Background. Chronic kidney disease (CKD) is associated with abnormal diurnal blood pressure profile (DBPP), which is a risk factor for hypertension-mediated organ damage. Ambulatory blood pressure monitoring (ABPM) allows for the assessment of DBPP.

Objectives. To assess the relationship between DBPP and progression of stage 1–3 CKD during the 6-month follow-up.

Materials and methods. The study group consisted of 87 stage 1–3 CKD patients, 40 women and 47 men, aged 34–79 years. At baseline, ABPM was performed in all participants. At baseline and after 6 months, glomerular filtration rate (GFR) was estimated using Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula. Based on ABPM, 4 types of DBPP were defined: "dipper" with systolic blood pressure (SBP) reduction at night of 10–20%, "extreme dipper" with SBP decrease >20%, "non-dipper" with SBP decrease <10%, and "reverse dipper" with SBP night increase.

Results. Hypertension was present in 69 (79%) patients. "Dipper" profile was found in 29 (33.3%) patients, "extreme dipper" in 2 (2.3%) patients, "non-dipper" in 41 (47.2%) patients (ND group), and "reverse dipper" in 15 (17.2%) patients (RD group). The "dipper" and "extreme dipper" patients were analyzed together (DE group). At baseline, GFR did not differ significantly between the DE, ND and RD groups (analysis of variance (ANOVA) $p = 0.07$). After 6 months, the difference was statistically significant (ANOVA $p = 0.02$). Glomerular filtration rate did not change significantly during the follow-up in the DE group (81 ±23 compared to 80 ±24 mL/min/1.73 m^2) and the ND group (75 ±24 compared to 71 ±26 mL/min/1.73 m^2), while in the RD group it decreased significantly (63 ±21 compared to 58 ±22 mL/min/1.73 m^2). In the entire population, no statistically significant correlation was found between the SBP decrease during the night and GFR change.

Conclusions. Abnormal DBPP is common among stage 1–3 CKD patients. "Reverse dipper" DBPP is associated with the progression of CKD. Ambulatory blood pressure monitoring should be a standard diagnostic tool of identification of abnormal DBPP as a risk factor of CKD progression in CKD patients.

Key words: diurnal blood pressure profile, chronic kidney disease, glomerular filtration rate

Nephrological and urological problems among TMAS (Telemedical Maritime Assistance Service) consultations at the University Centre of Maritime and Tropical Medicine in Gdynia: An analysis of ten years of activity

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Abstract

Background. In the 1960s, the International Labor Organization passed the convention according to which all countries with national shipping were obliged to create a 24-h telemedicine center for ships. According to the convention, Telemedical Assistance Service centers were to provide a permanent access to medical advice given by qualified doctors and create an international platform for the exchange of information and experience. In Poland, the Telemedical Maritime Assistance Service (TMAS) was established in 2012, and its duties are carried out in a 24-h system by doctors from the University Center of Maritime and Tropical Medicine (UCMTM) in Gdynia.

Objectives. To determine the reasons for medical officers' reporting for help due to nephrological and urological problems to the TMAS doctor on duty and to create a database of the most common diagnoses and actions undertaken, in particular, evacuation.

Materials and methods. In the presented work, we analyzed TMAS telephone and e-mail advice provided by doctors of the UCMTM from 2012 to the end of 2021. In this period, UCMTM doctors gave 349 TMAS advice, recommending evacuation in over 18% of cases.

Results. Illness was the most common cause of contact in the entire period observed – 265 cases were recorded, which accounts for as much as 75.9% of all applications. Urological and nephrological problems resulted in contact with TMAS 29 times, which constituted 10.9% of all reports due to disease symptoms, and 5 times they were the reason for evacuation from the ship. The second most frequent reason for seeking help of TMAS were injuries – 19.5% TMAS applications (68 cases) were related to trauma.

Conclusions. Obtained data show that TMAS service doctors face various medical problems. Therefore, providing proper medical assistance to patients requires close multidisciplinary cooperation between medical officer, TMAS doctor and emergency services.

Key words: nephrological and urological problems, telemedicine, ship, maritime rescue system, evacuation

Vitamin D metabolism in hemodialysis patients

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Abstract

Background. Hemodialysis patients have markedly higher rates of severe vitamin D deficiency and reduced ability to metabolize 25-hydroxyvitamin D ($25(OH)D_3$) by *CYP27B1* into the active form – 1,25-dihydroxyvitamin D_3 ($1,25(OH)_2D_3$). This could be partially overcome by supplementation with alfacalcidiol (1-hydroxyvitamin D). However, it seems that the inactivation of vitamin D by *CYP24A1* resulting in formation of 24,25-dihydroxyvitamin D_3 ($24,25(OH)2D_3$) may also be impaired in patients with kidney dysfunction.

Objectives. To evaluate vitamin D status among our prevalent dialysis population.

Materials and methods. This cross-sectional study included 75 (69% male (M)) patients randomly selected from prevalent dialysis population. Patients were subjected to complete history taking, and peripheral blood samples were analyzed for the concentrations of vitamin D metabolites including $25(OH)D_2$, $25(OH)D_2$, $24,25(OH)_2D_3$, 3-epi-$25(OH)D_3$, and $1,25(OH)_2D_3$.

Results. The average level of $25(OH)D_3$ was 19.59 ng/mL. There was a large group of patients (29.3%) with a severe deficiency (less than 10 ng/mL), and a group with normal and high levels (30–85 ng/mL). Most importantly, almost 50% of patients showed a very high ratio of $25(OH)D_3$ to $24,25(OH)_2D_3$ (more than 100×). Furthermore, the measurements of the levels of active form of vitamin D ($1,25(OH)_2D_3$) also indicated high variations among patients, with unexpectedly low (<18 pg/mL) and very high (>78 ng/mL) values.

Conclusions. Vitamin D deficiency, including severe deficiency, was observed in hemodialysis (HD) patients. Both impaired deactivation and production of $1,25(OH)_2D_3$ were noticed. Our observations underline the necessity of evaluation of vitamin D metabolism, including $25(OH)D_3$, $24,25(OH)_2D_3$ and $1,25(OH)_2D_3$, in HD patients.

Key words: vitamin D, hemodialysis, metabolism

Hypovitaminosis D changes the proportion of the contribution of different mechanisms of corrected hyperphosphatemia in patients with nephrolithiasis

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Abstract

Background. Calcium and phosphorus (Ca-P) homeostasis has tight hormonal regulation by 3 major hormones: vitamin D, parathyroid hormone (PTH) and fibroblast growth factor 23 (FGF23). Abnormalities of PTH and FGF23 secretions may cause Ca-P metabolism disorders in nephrolithiasis. Post-phosphate-load alterations in serum Ca, P and PTH, phosphaturia and calciuria enable monitoring hormonal regulation of Ca-P homeostasis.

Objectives. To determine the differences in secretion of Ca-P-related hormones in normo- and hypercalciuric stone forming patients with low and normal/high serum concentrations of 25-hydroxyvitamin D ($25(OH)D_3$).

Materials and methods. A total of 100 mmol of sodium phosphates NaH_2PO_4/Na_2HPO_4 were administered orally for 5 days in 19 hypercalciuric stone formers (HSF; urinary Ca (U-Ca) 6.5 ±1.7 mmol/day), 35 normocalciuric stone formers (NSF; 2.5 ±1 mmol/day) and 19 controls (CG; U-Ca 2.5 ±1.4 mmol/day). On days 1 and 5, PTH, FGF23, Ca, and P levels were determined before and after Na-P load. The areas under curves (AUCs) of PTH and FGF23 were calculated. The levels of urinary calcium, phosphate (U-P) and sodium (U-Na) were also determined.

Results. Following Na-P load, stone forming patients and controls exhibited expected alterations in Ca-P homeostasis. Despite changes in phosphate and PTH, no differences in FGF23 concentrations were observed. Patients with nephrolithiasis with a low $25(OH)D_3$ level (19 ±3.9 compared to 39 ±11.5, $p < 0.0001$) are characterized by a higher FGF23 (49.3 ±28 compared to 36.3 ±23.5, $p = 0.0413$) concentration, as well as a higher AUC of FGF23 secretion both on the 1st (1214.5 ±605.5 compared to 766 ±315, $p = 0.0457$) and 5th day (1211 ±640.5 compared to 776.5 ±298.5, $p = 0.041$) of Na-P loading, compared to normal/high $25(OH)D_3$ patients. In hypercalciuric patients with urolithiasis and low $25(OH)D_3$ levels compared to normal/high subjects (17.6 ±3.3 compared to 39.1 ±12.5, $p < 0.0001$), higher serum phosphate concentrations (1.21 ±0.14 compared to 1.14 ±0.17) and decreased phosphaturia (17.5 ±4.25 compared to 25.3 ±6.49) (at baseline) were noted. Additionally, in these patients, a higher AUC of PTH secretion on the 5th day of Na-P load (1005.4 ±401.4 compared to 835.2 ±219.5, $p = 0.0341$) was noted.

Conclusions. In hypercalciuric kidney stone formers with low $25(OH)D_3$, FGF23 engagement in reduction of hyperphosphatemia increased hypovitaminosis D. It may change the proportion of the contribution of different compensatory mechanisms of corrected hyperphosphatemia.

Key words: nephrolithiasis, hypercalciuria, calcium-phosphate metabolism, vitamin D3 deficiency, parathyroid hormone, fibroblast growth factor 23

Laboratory analysis of pathogenic mechanisms of renal performance changes in a male subject exposed to long-term extremely low ambient temperatures

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Abstract

Background. The study subject was a healthy, 47-year-old man, a low temperature Guinness record holder. He spent 50 days alone in Rovaniemi, Lapland and functioned in the temperature range from –20°C to –35°C. He did not use sources of heat, did not eat warm meals, did not drink hot water, did not dry clothes. He slept in an igloo, on an ice cover of 20–30 cm. He was spending 10 h a day in the sleeping bag and in the remaining time, he was walking, skiing or bicycle riding, and ice swimming.

Objectives. The aim of the study was a laboratory assessment of renal capacity in a man exposed to long-term extremely low ambient temperatures.

Materials and methods. Twice during the observation, urine and blood were collected and analyzed: before and after the prolonged exposure to extremely low ambient temperatures.

Results. Changes were seen in many blood and urine parameters, but changes in urine were more significant. The decreased values of sodium (by 53.9%), potassium (by 22.6%), creatinine (by 65.5%), urea (by 61.3%), uric acid (by 58.4%), and protein (by 50%) were observed in urine. Neutrophil gelatinase-associated lipocalin (NGAL) increased by 34%. The absence of calcium oxalate excretion relative to the value was observed before the exposure to cold. The increased values of interleukin 6 (IL-6) (by 60%) and β-2-microglobulin (by 26.9%) were observed in the blood. Erythropoietin (EPO) decreased by 22.4%. No changes were observed in estimated glomerular filtration rate (eGFR). The study subject lost 10 kg of body weight.

Conclusions. Based on the results obtained during the observation, it can be determined that the probable cause of changes in the laboratory results of the subject was the diet used, and not the dysfunction of the excretory system. The loss of body weight and activation of compensating mechanisms focused on saving vitally important diet components, caused by the insufficient diet, exclude the theory of the negative effect of exposure to extremely low temperatures for renal filtration functions.

Key words: kidney function, extremely low temperature

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