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Medical Sciences

PHARMACOLOGICAL AND INTERDISCIPLINARY THERAPEUTIC APPROACH OF A PATIENT WITH CARDIAC DISEASE, SEPSIS AND CHRONIC KIDNEY DISEASE

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ABSTRACT:
CHRONIC KIDNEY DISEASE (CKD) IS A PATHOLOGY THAT CAN LEAD TO SLOW LOSS OF NEPHRONS AND RENAL FUNCTION, WITH THE ONSET OF TERMINAL CKD. THE PATHOPHYSIOLOGICAL CHANGES ARE COMPLEX, AND THE ASSOCIATION, ADVERSE, WITH A LARGE CARDIO-VASCULAR PATHOLOGY, CAN LEAD TO THE DEVELOPMENT OF SEPSIS LATER WITH THE RAPID DECLINE OF RENAL FUNCTION.
THE CASE OF A MALE PATIENT WITH KNOWN CARDIAC PATHOLOGY, RECENTLY DISCHARGED FROM THE CARDIOLOGY CLINIC, WHO PRESENTS AT THE ER (EMERGENCY ROOM), WITH A VERY SERIOUS GENERAL CONDITION, WITH RESPIRATORY PATHOLOGY, DYSPNEA WITH ORTHOPNEA, OEDEMA OF THE LOWER LIMBS, PALE TEGUMENTS, SWEAT, BILATERAL SUCCESSIVE RALES, REASONS FOR BEING ADMITTED TO THE CARDIOLOGY SECTION, FALL INTO THIS CATEGORY.
AFTER MULTIPLE CLINIC-PARACLINICAL INVESTIGATIONS WERE PERFORMED IN THE CLINIC, THE GENERAL CONDITION OF THE PATIENT WORSENED AFTER APPROXIMATELY 10 DAYS, WHICH IS WHY HE IS TRANSFERRED TO THE INTENSIVE CARE CLINIC, WHERE FURTHER INVESTIGATIONS ARE CARRIED OUT, TREATING THE FACTORS THAT HAVE WORSENED THE PATIENT'S CONDITION, INCLUDING TREATMENT OF ACUTE CKD AND CARRYING OUT THERAPY FOR RENAL FUNCTION REPLACEMENT BY HEMODIALYSIS (HD).
HEMODIALYSIS WAS A USEFUL AND LIFE-SAVING THERAPEUTIC MEASURE, CHRONIC KIDNEY DISEASE, ASSOCIATED WITH A SERIOUS CARDIAC PATHOLOGY, FAVOURING THE ONSET OF SEPSIS.

KEY WORDS: RESPIRATORY FAILURE, SEPSIS, CHRONIC KIDNEY DISEASE, CARDIAC PATHOLOGY

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INTRODUCTION

Chronic kidney disease (CKD) belongs to the category of severe pathologies, which can lead to slow loss of nephrons and renal function, with the onset of terminal CKD. The pathophysiological changes described in this disease are complex and consist of: anaemia, coagulation disorders, cardio-vascular manifestations, hydro-electrolytic and acid-basic disorders, uremic encephalopathy, atherosclerosis and arteriosclerosis, pericarditis, protein-caloric malnutrition, intolerance carbohydrate[7].

Regarding the hydro-electrolytic and acid-basic homeostasis, it is known that water is the main constituent of the organism, divided into 3 sectors, which are maintained by mechanisms that act on metabolism and elimination systems. Liquid compartments contain sodium in the extracellular space and potassium in the intracellular space. Potassium is the one that, for the most part, is bound to plasma proteins, and acidosis favours its exit from the cell. Increased plasma potassium, besides other causes, may be caused by: decreased renal elimination, drug therapy, renal failure, acidemia, decompensation of diabetes mellitus, leukocytosis, insulin deficiency, beta blockers, etc. In critically ill patients, the risk of developing acid-base disorders is increased, of which metabolic acidosis is most commonly encountered, occurring after exhaustion of compensatory mechanisms[8].

In addition to this pathology are other cardiac pathologies, associations that generate complications and increase the patient's risk of life, and sepsis can trigger either acute renal failure or acute exacerbation of chronic kidney disease: after MI (myocardial infarction) may occur LV (left ventricular) dysfunction, embolism and pericarditis, arrhythmias, mitral regurgitation, recurrent; mild to moderate K (potassium) growth may cause electrocardiographic changes with T waves increasing in amplitude. At the renal level, the elimination of K is compensated, up to a certain threshold, but when oliguria occurs, it is sometimes necessary to initiate extrarenal treatment methods.

These manifestations may occur separately or in combination, with different occurrences or concomitant with the underlying disease, having duration and response to drug therapy different from case to case.

In these conditions, the identification of the factors favouring the occurrence of these incidents, in correlation with aspects related to the type and duration of the pharmacological treatment, the establishment of optimal measures for effective prevention and treatment, both of the heart disease, and of the complications that have occurred, are important for the care team, the internist, nephrologist and cardiologist.

CASE PRESENTATION:

This paper presents the case of a male patient, aged 60, obese, hypertensive, dyslipidemic, with episodes of paroxysmal AFib (atrial fibrillation) in the background, with lower MI and RV (right ventricle), in 2016, coronarographic reassessment, with CKD stage 5, recently discharged from the cardiology clinic, is presented in ER, accusing dyspnoea of rest, orthopnea and volume increase of the lower limbs.

The clinical examination reveals the general altered state of the patient, with sweaty pale skin, bilateral bladder murmur and sub-repeating rales disseminated in both lung areas, BP = 115/70mmHg, AV = 90 beats/minute, creatinine clearance = 25.7 ml/min, lower limb

[7] Covic A. Nefrologie, ed. Demsung 2011; Malhotra, V. Anestesie du patient insuffisant renal-in Anesthesie sub red Miller RD ,1996 ed Flamarion Paris; Mercatello A. Anestesie de Linsufisant renal chronique in tratatul Anesthesie reanimation chirurgicale 1995 ed Flamarion Paris; F. Purcaru, Insuficienta renala acuta 1995, Ed.Universitara Craiova

[8] Daniela Filipescu, Diselectrolitemii, Cursuri de ATI, 2011, Ed Mirton, Timisoara, pg. 153-168

oedema, with diagnosis: ACPO (acute cardiogenic pulmonary oedema), HF (heart failure) class IV NYHA, low ejection fraction, primary HBP (high blood pressure), grade 3, very high cumulative risk, old myocardium infarction, moderate mitral insufficiency, paroxysmal AFib in the background, pericardial effusion, stage 5 CKD, type 2 diabetes, anaemic syndrome, left small quantity pleurisy, metabolic acidosis.

Detailed history describes a relatively complex background medication: beta-blocker, anticoagulant, platelet antiaggregant, loop diuretic, angiotensin II receptor antagonist, antiguts, nitrates in pain, highlights a series of personal pathological antecedents, with etiological importance for the present status, namely that the patient also had accelerated intestinal transit, with multiple diarrhoea stools, and to detect a contagious disease that may have adverse repercussions on the patient, but also on other patients, it was decided to perform the rapid test for Clostridium difficile, the result being negative, but also a history of diabetes.

The day after admission, dyspnoea and orthopnea, BP, AV maintained in constant limits, SpO2 (oxygen saturation) = 88%, with additional endonazal O_2, bulky limb oedema, urine emission = 200 ml/8 hours. At the clinical examination scrotal oedema is detected, and the urologist prescribes anti-inflammatory medication and local ice bag.

In order to monitor the basic cardiac pathology, a cardiac ultrasound was performed, the echocardiographic bulletin reporting the following values:

Table 1: Echocardiography result
TAP (lung acceleration time) = 100; FE = 35%; Abdominal = 20mm; Pericard: circumferential pericardial fluid blade.
Diastolic function V.S.

Sizes	(mm)	Normal (min)	Sizes	(mm)	Normal (min)
Aortic ring	33	18-23	L.V (D)		
Ascending aorta			L.V (S)		
Aortic arch			R.V	40	30
Descending aorta	20	30	RA	40	30-42
A.S.			PA ring		
S.I.V.	16	6-12	IVC	27	14-16

Table 2: Echocardiography result:

Wave E(m/s)	107
Wave A(m/s)	0,58
TDE(m/s)	140

Ao = aorta; S.I.V = seven interventricular; LV = left ventricle; PA = pulmonary artery;

RA = right atrium; IVC= inferior vena cava; TDE = time of detection of wave E.

The treatment, used in the Cardiology Clinic, consisted of anticoagulant, platelet antiaggregant, antiarrhythmic, nitrate, beta-blocker, thiazide diuretic, antibiotic, angiotensin converting enzyme inhibitor, loop diuretic and 5% and 10% glucose buffered infusion solutions.

During the hospitalization in the Cardiology Clinic the usual analyses presented normal values, except for INR, which had a value of 7.33.

On day 11, the patient has oligoanuria (800ml/24 hours), hypoalbuminemia (2.3 g/dl), and impaired renal function (creatinine = 6.4 mg/dl, urea = 172 mg/dl, eRFG = 8ml/min/1.73m2).

It is decided to discontinue the treatment with thiazide diuretic and angiotensin converting enzyme inhibitor, to correct hypoalbuminemia with human albumin, to mount a CVC (central venous catheter) for emergency initiation of renal function replacement therapy by hemodialysis, taking into account nitrogen retention. Importantly, severe hyperkalemia refractory to the patient's drug delivery and oligoanuria. The clinical evolution is progressively degraded, it shows signs of decompensated congestive heart failure, mixed massive limb oedema (hypoprotein and cardiac), initially pulmonary stetacoustics without subsequently diminished basal left, which is why the patient is transferred to IC.

At the time of admission in IC the patient is admitted with the same diagnosis, to which we added Sepsis, Sacral sore, Acute enterolitis, Severe leukocytosis, Severe hypoalbuminemia with very serious general condition, conscious, cooperative, with SpO_2 = 91% with additional O_2, SpO_2 = 88% without additional O_2, tendency to hypotension: BP = 92/51 mmHg, AV = 65b/min, with mixed oedema, multiple bruises on upper limbs bilaterally, major scrotal oedema, MV greatly diminished basal bilaterally, with bronchial rales disseminated in both lung areas.

The determination of the biological parameters when admitted to the Intensive Care Clinic showed: Na (sodium) = 134mEq (milliequivalents)/l, K = 3.64mEq/l; Albumin G = 1.7 g/dl, direct bilirubin = 1.38mg/dl, creatinine = 8.25mg/dl, urea = 263mg/dl, total protein = 4.3g/dl; CBC: leukocytes = 23,000mm^3, neutrophils = 94.66%, haemoglobin = 8.3 g/dl; Coagulation tests: INR = 3.16, APTT (partially activated thromboplastin time) = does not coagulate; Crib = 2970pg/mL.

The presence of important nitrogen retention requires a chest, abdomen and pelvis CT (CT scan), which does not show abdominal and pelvic lesions, only at the level of the chest describes fluid with bilateral loculated pleural effusions with a maximum thickness of 6.5 cm right and 4.3 cm left, with the collaboration of the adjacent pulmonary parenchyma, loculated fluid at the level of the right oblique excisions, pericardial thickening, maximum thickness of 1.6 cm and parietal atheromatous calcifications at the level of the aortic arch and intrathoracic descending aorta.

The presence of fluid in the thorax required the pleural puncture, which was negative for liquids, leading to the diagnosis of left pachypleuritis. Considering the presence of the anaemic syndrome and the coagulation disorders 2 units isoRh isogroup, erythrocyte mass and fresh frozen plasma, vitamin K were administered, for the correction of the coagulation disorders that allow the setting of dialysis CVC, a procedure that was performed on the day of admission in Intensive Care, after the informed consent of the patient and the family’s, by a single puncture, strict aseptic conditions, without incidents and scheduling for haemodialysis, at the nephrologist’s orders. The patient was transported to the dialysis centre, continuously monitored and supervised by the IC resident physician. The first session of the kidney function substitutions proceeded without major incidents.

Drug treatment initiated on the first day in IC included: double-generation antibiotic therapy with a third-generation Cephalosporin (Ceftriaxone 2 grams at 12 hours), and Fluaroquinolone (Moxifloxacin 400 mg/day), loop diuretic (Furosemid 1 vial after administration of human Albumin), proton pump inhibitor (Pantoprazol 40mg/day), expectorant (Fluimucil 1 vial at 12 hours), uric acid inhibitors (Allopurinol 100mg/day), beta

blockers Metoprolol 100mg/day, Gluconic calcium 1 vial/day, Dobutamine 5 micrograms/kg/hour, Salbutamol 2ml + 3ml nebulization saline at 6 hours, anti-inflammatory steroidine Dexamethasone 8mg + 4 ml nebulization saline at 12 hours.

Endovenous infusion contained: diabetes doctor's scheme, human albumin 1 vial at 6 hours, Amino acid solution for renal pathology and oral feeding, low-sodium and renal diet.

After 5 days of IC treatment and 2 haemodialysis sessions, the clinical condition of the patient was much improved, from the cardiocirculatory point of view it was kept within normal limits, without the need for positive inotropic support, with the resumption of diuresis, limb and scrotal oedema much in remission, and from a paraclinical point of view a favourable evolution, some parameters reaching the normal limits. The evolution of the results of the laboratory analyses, in dynamics, from the admission in IC, is the following: albumin G: 1.7 -2.3 -3 g/dl; total protein = 4.3 -5.7g/dl; nitrogen retention in remission (creatinine: 8.25 - 7.3 - 5.2 - 3.4 -2,7mg/dl; urea = 263 -196 -142 -123 -119mg/dl); presepsin = 2970 - 2722 - 1642 - 1022 pq/mL; CBC: (leukocytes = 23,000mm^3 -normal, neutrophil = 94.66% -90.11%, haemoglobin = 8.3 g/dl -11.3 g/dl) INR = 3.16 -2.45 -2.11, APTT = does not coagulate -42.8 -33.7 seconds; acid-basic metabolism (PH = 7,211 -7,199 -7,234 -7,399), hydroelectricity (K = 6.2 -5,9 -4,25 -3,9 -3,4).

Subsequently, the patient was transferred to the Nephrology Clinic, with stable vital functions, and, at the nephrologist's order, CVC dialysis is extracted, without incident (bleeding or hematoma at the extraction site).

DISCUSSIONS:

The peculiarity of the case is that the patient presents with multiple cardiac pathology, MD and CKD, which became acute, acute enterocolitis and sacral sore, aspects which supported the diagnosis of sepsis, highlighting the causal relationship between chronic kidney disease, cardiac pathology, MD and sepsis.

Diabetes is a common pathology associated with renal dysfunction and sepsis, and pre-existing kidney disease, such as diabetic nephropathy, increases the risk of CKD during sepsis[9].

A systemic inflammation can cause severe sepsis, responsible for multiple complications, which can affect each organ and system, with a mortality of about 50%. Besides the proper treatment of the cardiovascular pathology, the correct initiation of the antibiotic also plays an extremely important place. According to studies, it has been shown that the administration of crystalloids, erythrocyte mass, inotropic support and rigorous monitoring, can lead to decreased mortality[10].

And in our case, the associated cardio-vascular pathology led to the appearance of sepsis, the presence of the staircase also constituting an outbreak of infection.

In addition to measures to combat hypotension and anaemia (inotropic support and erythrocyte mass), dialysis is one of the treatment methods used to help eliminate residues and excess fluid, while also maintaining a balance in the body when renal function is below 10%.

Among the indications of dialysis we can list: acute, chronic renal failure, hyper K, disorders of acid-basic balance, especially refractory metabolic acidosis, etc.

[9] Marion Venot, Lise Weis, Christophe Clec'h, et all. Acute Kidney Injury in Severe Sepsis and Septic Shock in Patients with and without Diabetes Mellitus: A Multicenter Study, Published 2015; 10 (5), e0127411 online 2015 May 28

[10] Marin H. Kollef and Scott T. Micek, Severe Sepsis and Septic Shock, The Washington Manual of Critical Care, second Edition, 2012 by Lippincott Williams and Wilkins, pg. 8-9

Anaemia is often associated with increased mortality and morbidity leading to worsening renal function, according to the literature. Various reports have been observed as an anaemic syndrome with haemoglobin level ≤12 g/dl in 53.6% of patients with CKD and an estimated GFR of 15-30 ml/min/1.73 m^2 in about 50% of patients. Serum iron deficiency is common in chronic disease patients, including CKD. In a haemodialysis population, iron deficiency is associated with a poor prognosis. Recent studies have suggested that, with the correction of iron deficiency and anaemia in patients with renal dysfunction, it may prevent the progression of both conditions (Heart failure and renal dysfunction)[11].

In critically ill patients, the risk of developing acid-base disorders is increased, of which metabolic acidosis is most commonly encountered, occurring after exhaustion of compensatory mechanisms. These mechanisms consist of: renal elimination of hydrogen ion, with the restoration of bicarbonate reserves and the elimination of carbon dioxide, by hyperventilation[12].

Another indication of initiation of extrarenal clearance is refractory metabolic acidosis, because the kidneys, losing their excretion function, develop the progression of acidosis. In CKD patients it is impossible to excrete nitrogen residues and glycosylated products, serum urea being an indirect marker of the accumulation of uremic toxins, which is an indication of haemodialysis[13].

Hyperkalemia is another criterion for initiation of haemodialysis and is based on 3 main mechanisms: transmembrane changes, decreased glomerular filtration and aldosterone deficiency, with symptoms that vary depending on the severity of hyperkalemia. The kidneys are able to compensate for the elimination of K, up to a certain threshold, when oliguria appears, which is why it is sometimes necessary to initiate extrarenal treatment methods. Until this method is used (haemodialysis), calcium administration can be used to stabilize the cardiac cell membrane, insulin administration, with the role of facilitating K cell entry, diuretics to promote the elimination of excess K[14].

The failure of the conservative measures (administration of Calcium, insulin, diuretics), did not lead to the decrease of K-emission, the metabolic acidosis remained refractory and the persistence of the oliguria forced, in the present case, the initiation of haemodialysis, a decision that was beneficial, with the improvement of the condition. patient and biological parameters.

CONCLUSIONS:

Chronic kidney disease and heart disease may be important risk factors for sepsis. Sepsis can aggravate the chronic kidney disease, exacerbating it, between these two pathologies there is a causal relationship. The appropriate treatment, in this case, especially the initiation of hemodialysis, prevents the occurrence of catastrophic phenomena, significantly reducing the risk of death.

[11] Maria-Magdalena Craciun , Cornelia Ancuta Zara, The diagnostic approach of a mixed cardiorenal syndrome case, Romanian Journal of Cardiology | Vol. 27, No. 2, 2017

[12] Peter Juran and Steven Cheng, Metabolic acid-Base Disorder, The Washington Manual of Critical Care, second Edition, 2012 by Lippincott Williams and Wilkins, pg. 209-210

[13] Tingting Li and Anitha Vijayan, Renal Replacement Therapy, The Washington Manual of Critical Care, second Edition, 2012 by Lippincott Williams and Wilkins, pg. 367-368

[14] Ahsan Usman and Seth Goldberg, Electrolyte Abnormalities, The Washington Manual of Critical Care, second Edition, 2012 by Lippincott Williams and Wilkins, pg. 179, 190-192

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Abbreviations: Chronic kidney disease = CKD
ER (emergency room)
performing replacement therapy for renal function by haemodialysis (HD)
MI (myocardial infarction)
LV (left ventricle)
RV (right ventricle)
K (potassium)
ACPO (acute cardiogenic pulmonary oedema)
HF (heart failure)
DM (diabetes mellitus)
SpO_2 (oxygen saturation)
CVC (catheter venous central)

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