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Chronic Renal Failure and Vestibular Syndrome as a manifestation of nephrotoxic drug: a case report

Necrosis tubular Aguda y Síndrome Vestibular cómo causa de Insuficiencia Renal Crónica por fármaco nefrotóxico: a propósito de un caso

Mariliam Martínez Igarza [1], **Danilo Taño Tamayo** [1], **Dianet Saray Peña Ramírez** [1], **Félix Mario Pérez Batista** [1]

1 Universidad de Ciencias Médicas de Holguín. Facultad de Ciencias Médicas "Mariana Grajales Coello" Holguín, Cuba.

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ABSTRACT

Chronic Kidney Failure (CKD) or Chronic Kidney Disease (CKD), as it is currently known, has increased significantly in recent times. It is defined as an entity that is produced by various etiological factors, including underlying diseases and those induced by medications. The clinical case of a patient who evolved Acute Tubular Necrosis and Vestibular Syndrome leading to Chronic Renal Failure after the administration of Gentamicin was presented. The findings in the complementary examinations demonstrate the changes produced, however, no renal alterations were found in the ultrasounds performed and the patient is currently progressing favorably. To prepare the report, a total of 32 bibliographic references were reviewed to select 15, coming from Scielo, Google Academic and Infomed sources. Knowledge of the adverse reactions produced by drugs such as aminoglycosides is necessary to avoid complications that may affect the health of patients.

RESUMEN

La Insuficiencia Renal Crónica (IRC) o Enfermedad Renal Crónica (ERC), como se conoce actualmente, ha aumentado notablemente en los últimos tiempos. Se define como una entidad que se produce por diversos factores etiológicos, incluido enfermedades de base y los inducidos por medicamentos. Se presentó el caso clínico de un paciente que evolucionó a Necrosis Tubular Aguda y un Síndrome vestibular dando lugar a una Insuficiencia Renal Crónica luego de la administración de Gentamicina. Los hallazgos en los exámenes complementarios demuestran los cambios producidos, sin embargo, no se encontraron alteraciones a nivel renal en los ultrasonidos realizados y actualmente lleva una evolución

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favorable. Para la realización del informe se revisaron un total de 32 referencias bibliográficas para la selección de 16, provenientes de las fuentes de Scielo, Google Académico e Infomed. El conocimiento de las reacciones adversas producidas por fármacos como los aminoglucósidos son necesarias para evitar complicaciones que pueden afectar la salud de los pacientes.

INTRODUCTION

Chronic Kidney Failure (CKD) or Chronic Kidney Disease (CKD), as it is currently known, has been increasing significantly in recent times. It should be noted that this disease produces various changes, whether local or towards other systems of the body. It is defined as an entity that is produced by various etiological factors, including underlying diseases and those induced by medications. [1]

This disease is due to the deterioration and loss of kidney function that progresses months or years, at the beginning it can be asymptomatic, where the symptoms can vary, until reaching the final phase in a state of uremia. [2]

The disease is detected when there are functional or structural abnormalities of the organ. The calculation of the glomerular filtration rate is very important for its diagnosis. [3]

Currently, kidney diseases are the 8th cause of death in the Region of the Americas. It is evident that one in ten adults in the world suffers from it without treatment, which is fatal. It is also estimated that it will be the 5th cause of death in the year 2040. [4]

According to the Health Statistical Yearbook, in Cuba during 2021, 1,576 deaths caused by glomerular and kidney diseases were reported, occupying a rate of 14.1 per 100,000 inhabitants in both sexes, where the male sex obtained a greater number, with a rate of 15.7. 5 In 2021, a study was carried out in the province of Holguín, specifically at the Vladimir Ilich Lenin Hospital, where a universe of 163 patients was studied, where older male

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adults with high blood pressure, advanced stages and respiratory complications turned out to be the most affected. [6]

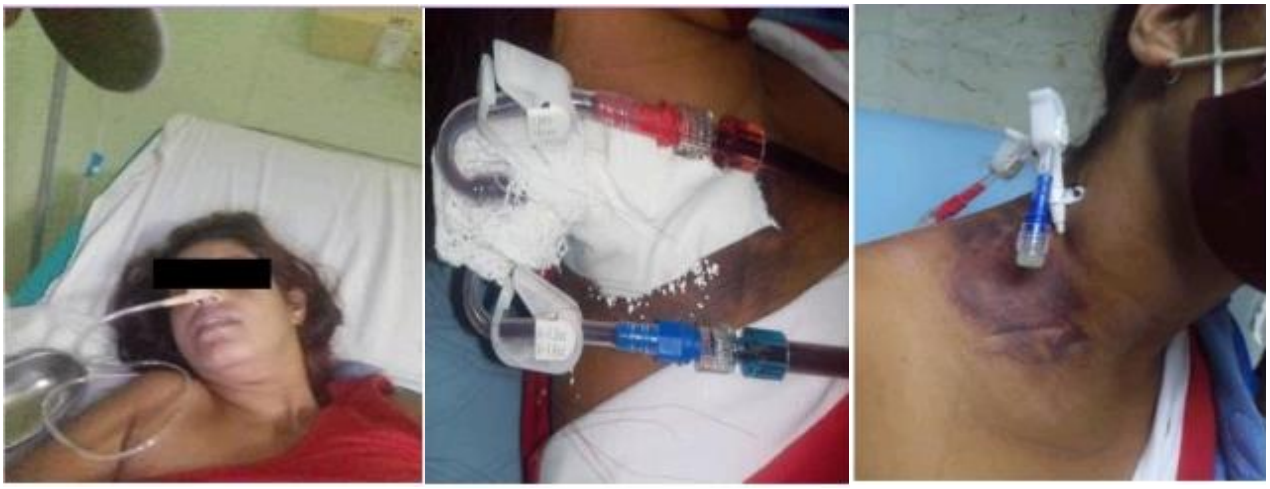
The ingestion of drugs can produce reactions that alter the body's function and promote the appearance of conditions that deteriorate the patient's health. Over the years it has been determined that aminoglycosides are medications that must be used with caution since they cause kidney and vestibular damage. [7]

On rare occasions both adverse reactions have been determined in the individual. The kidney damage caused by Gentamicin is fatal, evident in imaging studies, laboratory studies, and physical examination. [8]

Taking into consideration the above elements, a case presentation was made with the objective of describing the evolution of a patient treated with aminoglycosides who presented Acute Tubular Necrosis and Vestibular Syndrome as adverse reactions and evolution with Chronic Kidney Disease.

CASE PRESENTATION

Reason for admission: Burning when urinating and lower back pain. History of the current illness (HEA): 38-year-old female patient, white from rural origin, with a history of vesicoureteral reflux since childhood, which was no longer followed up at 12 years of age, and repeated urinary tract infection. Diagnosed with Chronic Kidney Failure in stage 5 secondary to vesicoureteral reflux and administration of Gentamicin about a year ago (January 2022) (Figure 1).



A **B** **C**

Fig. 1: Images of the patient at the beginning of the disease. A- application of nasogastric tube; B and C- catheterization for hemodialysis. He was admitted to the hospital in his health area due to burning when urinating and lower back pain, which is constant, which is exacerbated by physical effort that radiates to the

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lower limbs and is relieved with rest. He expressed general malaise and a fever of 38.5°C that subsided with the administration of medication (Paracetamol 500 mg 1 tablet). In the hospital she was treated with Gentamicin 3 vials 80mg/2mL per day for 7 days at a dose of 5 mg/kg of body weight per day. He reports that when the medication was administered, after 10 minutes, he had cramps in his nose and lips, and in the latter, an increase in volume. He complied with the treatment, after a week he began to experience loss of consciousness where on one occasion he lost consciousness, accompanied days later by nausea and vomiting, preceded by these, weakness, dizziness and loss of balance. He also reported constant pain in the lower back that increased with physical exertion and did not improve. She was treated at the Lucía Iñiguez Clinical Surgical Hospital where she was diagnosed with vestibular position syndrome as an adverse reaction to the administration of Gentamicin. The patient continued with the same condition; He reported that he lost his balance and staggered sideways, which prevented him from carrying out daily tasks. Subsequently, after a few weeks, he was admitted again due to edema, decreased urinary volume with uremic symptoms. She underwent a group of complementary tests where she was diagnosed with Chronic Renal Failure in Grade III (GFR: 58 ml/min). The patient also presented with decline, general malaise, anemia (Hb: 6 mmol/L and high blood pressure levels. She received Pre-Dialysis treatment (3 months), then Hemodialysis (2 months) where she progressed unfavorably. She currently has Peritoneal Dialysis treatment (8 months) and has a favorable clinical evolution with a reserved prognosis until now.

Personal Pathological History: Vesicoureteral reflux

Family Pathological History: Mother (living): High Blood Pressure (HBP) Father (living): Parkinson's Disease

Operations: not reported Transfusions: 1 (6 years)

Trauma: not reported Toxic habits: not reported

Allergic Reaction Medication: "Gentamicin" Positive data on the Physical Examination Note: During the first admission, the patient presented positive data on the physical examination at the level of the genitourinary system, during palpation the Fist-Percussion maneuver was painful as well as positive pyelonorureteral points at the level of the midpoint in the anterior plane, and the costomuscular points in the posterior plane.

Vital signs: Blood pressure - 160/100 mmHg.

Skin and mucous membranes: pale skin and hypocolored mucous membranes.

Subcutaneous Cellular Tissue (SCT): infiltrated by edema in the face and lower limbs (soft, white, non-painful and easy to swallow). Urinary system: painful Fist-Percussion maneuver, positive pyeloureteral points at the level of the midpoint in the anterior plane, and costomuscular points in the posterior plane.

Nervous System: Positive Simple and Sensitized Romberg Maneuvers, Barany Index, Positive Babinski Star.

Complementary Exams

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Parameters	March 2021	January 2022	August 2022	November 2022	January 2023
Glycemia	3.5	3.4	4.0	4.3	3.6
Creatinine	123	816	648	606	561
Hematocrit	0.33	0,49	0.45	0.35	0.36
Uric Acid	-	456	-	371	331
PGT	5	-	6	13	9
Albumin	53	48	41	39	44
Total Proteins	83	80	-	68	75
GAT	1.12	1.09	2.65	0.58	1.10
Cholesterol	-	4.5	-	-	4.6
Fe	-	9.1	-	-	22.1
HbsAg	Negative	Negative	Negative	Negative	Negative
Evolution of the GF	**54,6 mm/min**	**8,0 mm/min**	**10,0 mm/min**	**11,08 mm/min**	**11,97 mm/min**

After the symptoms presented, the patient underwent multiple complementary treatments; however, in March 2021, follow-up began to determine the evolution. In the complements explained above, alterations in values are observed in some parameters, among them are the high BP figures found in the physical examination during the patient's first admission. There was also a decrease in body weight and alterations in creatinine values were evident from the beginning. These factors affect the glomerular filtration rate, as well as the increase in uric acid, evidencing the deterioration of kidney function. Regarding urea, it also presented high figures, although its value subsequently decreased. The Glomerular Filtration Rate was calculated to evaluate kidney function, resulting in a GFR filtration volume: 58 ml/min Taking the above into account, the Glomerular Filtration Rate was evaluated to determine its evolution: (See the Table of Complementary Examinations). Note: Imaging, renal and abdominal ultrasound and evolution studies have been performed, where there are no relevant results and no visible kidney damage. Topographically normal abdominal structures and kidneys, no fluid in the abdominal cavity. Diagnosis According to the clinical manifestations and the complementary examinations carried out in addition to the positive data found during the physical examination, Chronic Kidney Failure due to Acute Tubular Necrosis and Bilateral Acute Vestibular Syndrome is proposed. Treatment After being evaluated by Nephrology specialists, the treatment is decided. by Hemodialysis where he evolved unfavorably. He has had two failed Internal Arteriovenous Fistulas (AVF) due to complicated vascular access, in the short time that treatment took, several catheters have been placed and all with associated bacteremia and he is currently receiving Peritoneal Dialysis treatment (8 months) (Figure 2)

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. Four exchanges are made a day. Take medication to treat HTN with Enalapril 20 mg 1 tablet per day, Furosemide 40 mg 1 tablet when there is edema. Nutritional therapy and diet. The patient has gained weight in recent months and has not had any repercussions on the body. He leads a completely normal life.

A B

Fig. 2:

Peritoneal Dialysis Treatment. A- Image of the removed catheter (Hemodialysis) B- Image of the catheter used in Peritoneal Dialysis.

DISCUSSION

According to the Cuban Statistical Yearbook 2022, kidney and glomerular diseases predominate in males, in contrast to our case suffered by a female patient. 5 Kidney Disease represents a serious problem today, each year the numbers are increasing, lifestyles are inadequate, chronic underlying diseases impact the body and we give less importance to the side effects produced by the administration of drugs.

According to the study carried out by Calderón-Ospina et al [9], aminoglycosides produce direct nephrotoxicity; there are several mechanisms that cause it and some that have not been determined. These drugs adhere to the edges of the brush cells that line the convoluted tubules and are stored as vacuoles there. According to research [10], the alterations found in evolutionary ultrasounds of patients with kidney damage are markedly evident. Generally, in chronic kidney diseases, kidney enlargement or decrease in size, poor differentiation of the medullary cortex, presence of masses, cysts or alterations in the urinary tract may appear. However, in this case, the patient during her evolution did not present any of these characteristics in the imaging studies. There are also other risk factors related to the deterioration of kidney function, such as advanced age, female sex, and duration of antibiotic therapy for more than 10 days. In this case, the patient presented repercussions of the disease in an early stage and the administration of Gentamicin occurred only for 7 days. [8]

Mercado M, Burgos S and Muñoz V state that: "SAAs are exclusively eliminated by glomerular filtration; therefore, kidney failure would determine an increase in plasma concentrations, increasing the risk of

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ototoxicity." [11] However, in the previous case, at the end of the drug cycle, the first manifestations were vestibular without apparent kidney damage. [11]

Experimental studies have been carried out in animals where it is stated that most aminoglycosides accumulate in high quantities in the kidney and to a lesser extent in other tissues. [12] According to González-Sánchez et al. [13] Peripheral vestibular dysfunction involves the involvement of the vestibular organ or nerves. Recurrent and chronic vestibulopathy entails greater disability and disability, which means, from a limitation of the basic activities of daily life, which coincides with the present case where the patient reports having occasional attacks of said disease, which prevent her from carrying out daily tasks. For their part, Martín-Bailón et al. [14] states that the various symptoms that constitute vestibular syndrome progressively decrease over time, which generally leads to a rapid and complete disappearance of static deficits and a slower and incomplete regression of dynamic deficits.

Although most patients have a satisfactory recovery after unilateral acute vestibular syndrome, there are patients who do not recover as well. This implies an important subjective component. This deficient compensation generates a syndrome of chronic vestibular insufficiency that consists of imbalance, ataxia and oscillopsia. [14]

As presented in this clinical case where the patient reports that she lost her balance and staggered to the sides. Ataxia manifests itself in situations where vision is impaired or proprioception is challenging. Oscillopsia is evident when making sudden active or passive head movements (looking from side to side). [15]

In this sense Marambio G et al. 15 states that persistent perceptual postural dizziness (PPPM) is a chronic functional vestibular disorder of the nervous system, characterized by persistent non-rotational vertigo and instability triggered by different types of stimuli. Knowledge of the adverse reactions produced by drugs such as aminoglycosides is necessary to avoid complications that may affect the health of patients. CONCLUSIONS Chronic Kidney Failure is a complex medical condition that can be triggered by various factors, including underlying diseases and medications. The clinical case presented highlights the importance of surveillance and careful monitoring of patients receiving potentially nephrotoxic treatments, such as Gentamicin. The results of complementary examinations are essential to understand the evolution of the disease and guide appropriate treatment. Despite the challenges that CKD represents, a multidisciplinary approach and comprehensive medical care can contribute to a favorable outcome and improve the quality of life of affected patients.

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STATEMENT OF AUTHORSHIP

Conceptualization: Mariliam Martínez Igarza, Danilo Taño Tamayo, Dianet Saray Peña Ramirez.

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Data curation: Danilo Taño Tamayo.

Financing acquisition: Danilo Taño Tamayo, Mariliam Martínez Igarza.

Formal analysis: Dianet Saray Peña Ramirez. Research: Félix Mario Pérez Batista.

Methodology: Danilo Taño Tamayo, Mariliam Martínez Igarza

Project Administration: Félix Mario Pérez Batista Resources: Mariliam Martínez Igarza.

Software: Danilo Taño Tamayo. Supervision: Dianet Saray Peña Ramirez.

Validation: Danilo Taño Tamayo, Félix Mario Pérez Batista.

Visualization: Mariliam Martínez Igarza.

Editorial - original draft: Mariliam Martínez Igarza, Danilo Taño Tamayo.

Writing - review and editing: Mariliam Martínez Igarza, Félix Mario Pérez Batista.

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