



## CASE REPORT

# Hyponatremia Related To Pericardial Tamponade Caused By Renal Cell Carcinoma: A Rare Cause of Cardiac Tamponade

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## Learning Objectives

1: To be able to make a differential diagnosis of hyponatremia and understand the pathophysiological mechanisms of hyponatremia associated pericardial tamponade.

2. To understand the role of the appropriate management of patients with hyponatremia associated pericardial tamponade especially in patients with active malignant disease.

## Introduction

Hyponatremia is defined as serum concentration of sodium below 135 mEq/L. It is the most common electrolyte disturbance in daily clinical practice and is associated with high morbidity and mortality [1]. It is most commonly asymptomatic but can be associated with symptoms such as headaches, nausea, vomiting, muscle cramps, seizures, convulsions, lethargy, disorientation, depressed reflexes and death due to cerebral edema [2]. Symptoms depend on the severity and the abruptness of occurrence of hyponatremia. Pericardial effusion has been reported as a rare cause of hyponatremia but it is common in the context of advanced malignancy. Lung cancer is the most common malignancy, followed by lymphoma, leukemia and sarcoma [3]. The mechanism underlying pericardial effusion related hyponatremia remains to be established. In this article we report a rare case of renal cell carcinoma presenting with hyponatremia-related pericardial tamponade that experienced normalization

of serum sodium following pericardiocentesis.

## Case presentation

A 78-year-old female patient was admitted at the Internal Medicine Department of our hospital due to symptoms of generalized weakness, fatigue, confusion and dyspnea. On her clinical examination the patient was disoriented in time and space, with bilateral peripheral edema, diminished lung sounds at the basal fields of the lungs and muffled heart sounds. Her medical history included uterine cancer eight years ago treated with hysterectomy and radiotherapy, bilateral hip replacement, hypertension and two episodes of bowel obstruction.

During laboratory examination, she was found to suffer severe hyponatremia with sodium levels at 107 (normal range: 135-145 mmol/L) along with increased liver enzymes: ALP 235 U/L (normal range: 30-120), AST 116 U/L (normal range: 3-32 U/L),  $\gamma$ GT 113 U/L (normal range: 9-38). An abdominal ultrasound was performed that revealed ascites, liver hyperemia and normal kidney dimensions. Her chest x-ray was remarkable for increased cardiothoracic index and bilateral pleural effusions. Performed ECG revealed sinus rhythm. The patient was receiving hydrochlorothiazide, which was at first thought could be the reason for her hyponatremia.

Urine osmolality and urine sodium were 453 mOsm/kg (normal range: 300-900) and 95 mmol/L (normal range: 27-147) respectively. During her hospitalisation, the patient experienced an episode of Acute Pulmonary

Edema with further disorientation. A subsequent ECG revealed low voltages and ventricular bigeminy. A brain CT scan was performed which revealed atrophy and ischemic leukoencephalopathy, while CT scan of her chest showed bilateral pleural effusions with atelectasis and pericardial effusion.

The patient had a transthoracic echocardiogram that showed pericardial effusion causing cardiac tamponade that needed immediate pericardiocentesis (Figure 1).

She was immediately transferred to the Cardiothoracic Department of a tertiary Hospital where she underwent pericardial window through a left anterior mini thoracotomy and drainage of the pleural effusions. Her postoperative recovery was slow but stable.

Cultures of the pleural fluid didn't reveal any microorganism growth while cytology report showed chronic inflammation without any malignancy findings. Cytology report of the pericardial fluid was positive for malignancy, while histology confirmed the presence of a papillary tumor, possibly metastatic from the kidney.

A control echocardiogram was performed which revealed normal cardiac function, without presence of pericardial effusion. The patient was reviewed by the oncology team and accepted for further treatment and investigation.

## Discussion

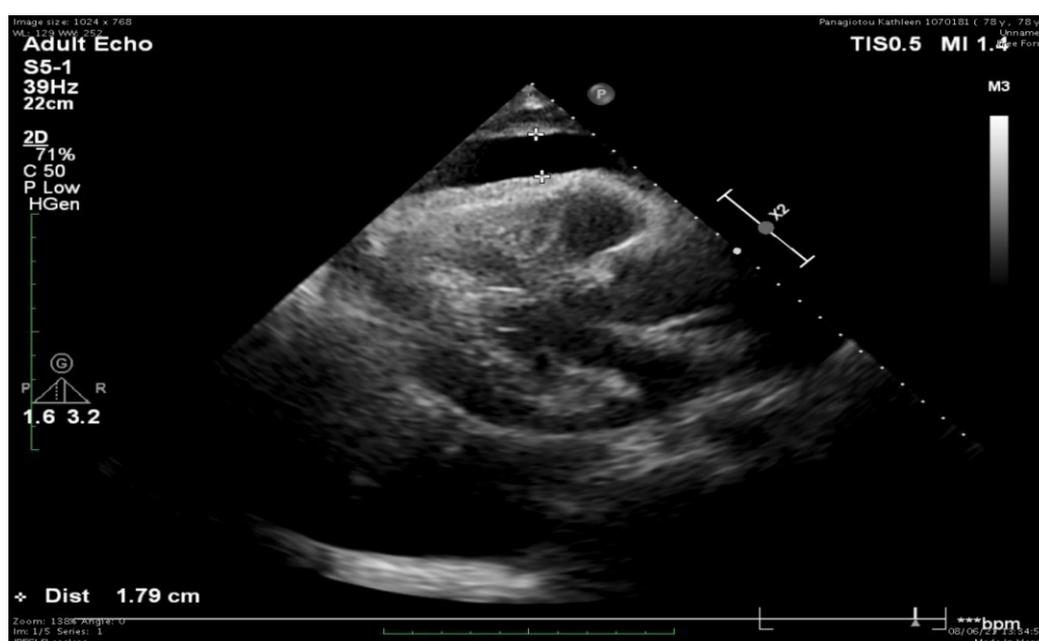
Hyponatremia that develops in the settings of pericardial tamponade has been reported in rare situations. It is also a negative prognostic factor in patients with cancer and it is most commonly associated with SIADH [4]. SIADH may be the result of ectopic

antidiuretic hormone (ADH) by malignant cells, atrial natriuretic peptide (ANP) production, or the result of stimulation of ADH secretion or potentiation of ADH effects by anticancer drugs and other medications that can cause vomiting, diarrhea and renal toxicity as side effects [5].

On the other hand, pericardial effusion is a rare cause of reversible hyponatremia. A possible explanation may be the following: The compressed cardiac chambers cause an increase of the atrial pressure which results in the release of ADH. As a consequence, there is a decrease of serum sodium due to increased water retention. Moreover, the decrease of the cardiac output impairs renal free water excretion which can also stimulate the release of ADH.

In most cases, hyponatremia resolves after drainage of pericardial effusion through pericardiocentesis [6]. Patients with cardiac tamponade related hyponatremia had a significant increase in serum sodium levels within 48 hours of pericardiocentesis [7]. According to Mancini, et al. there is increase of atrial stretch due to the relief of the pressure on the cardiac chambers which leads to increase in ANP production. ADH production decreases and this causes further diuresis [7]. Furthermore, the improvement of effective circulating volume results in increase of glomerulus filtration rate. All the above lead to the excretion of large amount of dilute urine and rapid correction of hyponatremia [8].

Malignant tumors represent 32% of the causes of cardiac tamponade [9]. Carcinomatous pericarditis is observed in 10-20% of patients with malignancies. According to Oliver, et al. the main primary malignant tumors with pericardial metastasis are lung cancer (36.5%), breast cancer (22.3%), leukemia and malignant



**Figure 1:** Echocardiography demonstrated a large pericardial effusion causing marked tamponade that needed immediate pericardiocentesis.

lymphoma (17.2%) and renal cancer (1.9%) [9]. A study by Berge and Sievers showed that malignant tumor metastasis that involves the pericardium was observed in 50% of autopsies of patients with metastatic malignant tumors [10].

Cardiac tamponade presenting as a first sign of malignancy is not so common and it can be considered an indicator of a poor prognosis. The median overall survival of patients with malignant pericardial effusion is less than 6 months [9].

In this report, we summarize the case of a patient with renal cell carcinoma presenting with hyponatremia-associated cardiac tamponade. The case emphasizes the importance of a thorough history review and physical examination in the work-up of patients with hyponatremia. The first step in differential diagnosis of hyponatremia is the evaluation of extracellular fluid status and the effective circulating volume. Cardiac tamponade should be considered in the differential diagnosis of hyponatremia especially in active malignant disease. Inappropriate secretion of ADH is the leading cause of hyponatremia in cancer patients and the treatment is water restriction. Nevertheless, for patients with pericardial tamponade related hyponatremia, the treatment is pericardiocentesis and not water restriction which can actually worsen sodium levels and have negative effects on the hemodynamic status of the patient. The management of cardiac tamponade is sufficient to result in rapid recovery of hyponatremia, although pericardial tamponade is not the sole contributing factor to hyponatremia in these patients. As mentioned above, prognosis for these patients is poor.

### Author's Contribution

Dr. Vasiliki Vanesa Stylianou and Dr. Avgoustina Kyriakou were involved with writing and literature search.

Dr. Lorentzos Kapetis was involved with the editing the paper and proving guidance.

### Ethical Disclosure

This manuscript has not been published and is not

under consideration for publication of elsewhere. We have no conflicts of interest to disclose. All authors have reviewed and agreed to the content present in this Article.

### Consent

Published with written consent of the patient.

### Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### References

1. Chang FK, Lee YC, Chiu CH (2012) Hyponatremia in patients with symptomatic pericardial effusion. *J Chin Med Assoc* 75: 509-512.
2. Hanfy AA, Manasewitsch NT, Beutler BD, Antwi-Amoabeng D, Elnaggar M, et al. (2020) Pericardial effusion-associated hyponatremia. *Case Rep Cardiol*.
3. Islam N, Ahmedani MY (1998) Renal carcinoma presenting as cardiac tamponade: A case report and review of literature. *Int J Cardiol* 64: 207-211.
4. Mouallem M, Wolf I, Mindlin G, Farfel Z (2003) Pericardial tamponade-associated hyponatremia. *Am J Med Sci* 325: 51-52.
5. Castillo JJ, Vincent M, Justice E (2012) Diagnosis and management of hyponatremia in cancer patients. *Oncologist* 17: 756-765.
6. Jong BH, Wei CC, Shyu KG (2016) Improved hyponatremia after pericardial drainage in patients suffering from cardiac tamponade. *BMC Cardiovasc Disord* 16: 135.
7. Dalia T, Masoomi R, Sahu KK, Gupta K (2018) Cardiac tamponade causing severe reversible hyponatraemia. *BMJ Case Rep* 2018.
8. Shafique R, Sarwar S, Wall BM, Cooke CR (2007) Reversible hyponatremia related to pericardial tamponade. *Am J Kidney Dis* 50: 336-341.
9. Erlon De Avila Carvalho, Marina Varela Braga De Oliveira, Rafael Reis, Isabela Oliveira Campos, Rafael Brito Fontella, et al. (2020) Pericardial Effusion caused by renal carcinoma of clear metastatic cells: A rare cause of cardiac tamponade. *GJMR* 8.
10. Berge T, Sievers J (1968) Myocardial metastases. A pathological and electrocardiographic study. *Br Heart J* 30: 383-390.