

Cardiac Tamponade-Related Hyponatremia: A Case Series

Abdurrahman Hadi¹, Putu Lokita Pradnyana Putra¹, Rendy Agustian¹, Andreas Andri Lensoen², Wijoyo Hadi Mursito², Arief Widya Taufiq²

¹Thoracic, Cardiac and Vascular Surgery Division, Department of Surgery, Faculty of Medicine University of Indonesia/Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia 10440

²Thoracic, Cardiac and Vascular Surgery Division, Gatot Subroto Army Central Hospital, Jakarta, Indonesia 10410



Introduction

Hyponatremia is one of the most common electrolyte imbalance in the Emergency Department. Rather than a disease, hyponatremia usually poses as a manifestation of another disease rather than an entity itself.^{1,2}

The etiology of hyponatremia is plentiful, ranging from malignancies, SIADH, exercise-induced hyponatremia, low sodium diet, to the side effect of several drugs such as carbamazepine, cisplatin, haloperidol, and amiodarone.¹⁻³

One of the rarest cause of hyponatremia is pericardial effusion, which has been reported several times before. Several hypothesis states that low sodium concentration in pericardial effusion is caused by Antidiuretic Hormone (ADH) release in addition to the free water excretion.⁴

Objective / Aim

In this posters, we present a serial case report consist of cardiac tamponade – associated hyponatremia

Method and Result

Case 1

A 48-year-old male presented with history of worsening dyspnea for 3 days. The patient had a history of intraabdominal mass and was planned to have a pancreatic biopsy.

He presented with blood pressure 112/78, heart rate 123 beats per minute, and respiratory rate 24 times per minute.

From physical examination, heart sound was distant with elevated jugular venous pressure, bilateral lung crackles, decreased lung sound, and bilateral leg oedema.

From the laboratory test done in Aug 15th, the patient had a hyponatremia and was treated with NaCl 3% 500 cc/24 hours for several days but no improvement shown,

From the echocardiography examination done in Aug, 16th, the patient had a pericardial effusion with signs of cardiac tamponade with a swinging heart as shown in figure 1. Then, we did pericardiocentesis, followed with serial electrolyte laboratory test, which showed a gradual rise to mild hyponatremia as shown in table 1.

Table 1 Summary of electrolyte results of the Case 1

Laboratory Test	Date				
	August 15 th 2022	August 17 th 2022	August 18 th 2022	August 20 th 2022	August 22 nd 2022
Sodium / Na (mEq/L)	120	124	124	126	132
Potassium / K (mEq/L)	3.6	3.6	3.7	4.0	4.4
Clorida / Cl (mEq/L)	89	94	96	98	104
Urea (mg/dL)	-	-	32	-	-
Creatinine (mg/dL)	-	-	0.65	-	-



Figure 1 Echocardiography images before pericardiocentesis (left) shows pericardial effusion with signs of cardiac tamponade and echocardiography images after pericardiocentesis (right) shows reduction of fluid accumulation in pericardial space

Case 2

A 60-year-old male presented with shortness of breath that worsened one night before, cough, and fever. The patient had a history of lung cancer with multiple metastatic lesion in the neck. He had a right lung pigtail drain inserted since March 2022.

His blood pressure is 141/103, heart rate 123 BPM, and respiratory rate 20 times per minute. From the physical examination, we found diminished right lung sound, lumps on the right side of the neck. Echocardiography examination showed massive pericardial effusion with pleural effusion. Laboratory study results showed hyponatremia, as shown in Table 2.

Table 1 Summary of electrolyte results of the Case 2

Laboratory Test	Date	
	August 19 th 2022	August 22 nd 2022
Sodium / Na (mEq/L)	123	125
Potassium / K (mEq/L)	5.5	5.6
Clorida / Cl (mEq/L)	97	98
Urea (mg/dL)	98	-
Creatinine (mg/dL)	2.68	-

The patient has treated with NaCl 3% 500 cc/24 hours during hospitalization, but no improvement shows. We did pericardiocentesis, but unfortunately the patient died on post-operative day two before the serial electrolyte test has been obtained.

Hyponatremia in cardiac tamponade may be related to the reduction of effective circulating volume because of tamponade that leads to a decrease of glomerulus filtration rate that cause stimulation of atrial and carotid baroreceptors and will release Renin-Angiotensin-Aldosterone System. The activation of these baroreceptors also stimulate the release of arginine vasopressin (AVP) which leads to water retention and hyponatremia. Another theory stated that main cause of this, is free water retention because of elevated ADH serum stimulated by increased cardiac pressure and impairment of kidney free water excretion because of low cardiac output.⁴⁻⁷

In addition to that, almost all the patients that presented in previous case reports will be recovered rapidly after pericardiocentesis. We suggest that underlying mechanism is the decrease of atrial pressure after relief of tamponade that will inhibit ADH secretion. Relief of cardiac tamponade also will increase the transmural pressure that allowing distension of atrial, therefore ANF will be released. Lastly, as the effective circulating blood volume increase, the effect of RAAS and activation of the sympathetic nervous system will be decrease, and this will lead to increase in glomerular filtration rate. This three main mechanism will result in diuresis and will correct serum sodium level.⁷⁻¹⁰

Conclusion

Although the main mechanism of cardiac tamponade-associated hyponatremia remains unclear, there are several reports that state the etiologies of it which are uremia, malignancy, medication, and idiopathic cause.⁴ Not to forget cardiac tamponade as a differential diagnosis of hyponatremia as we report our case series, especially when there is active malignant disease.

To rule in cardiac tamponade as a differential diagnosis will help a physician to do prompt treatment of cardiac tamponade that may lead to recovery of the sodium concentration level of the patient. But the main mechanism on how cardiac tamponade itself lead to hyponatremia is remain unclear and needs more study to clarify it.

Citation

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