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CASE REPORT

Cardiac tamponade caused by pericardial effusion in a patient with systemic capillary leak syndrome

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Abstract

We present a patient with systemic capillary leak syndrome (SCLS), complicated by obstructive shock due to cardiac tamponade.

Methods: SCLS is a rare disease characterised by hypotension, hypoalbuminaemia, haemoconcentration and generalised oedema. Several severe complications have been described, including acute kidney injury, rhabdomyolysis, compartment syndrome and death. We present a patient with SCLS, complicated by rapidly progressive pericardial effusion with cardiac tamponade, for which a lifesaving pericardiocentesis was performed. Because SCLS is often confused with septic shock and anaphylactic shock, an obstructive shock may be easily missed.

Although SCLS is a very rare disorder, it is important to be aware of its existence and the possible life-threatening complications, including cardiac tamponade, in order to improve the outcome for the patient.

Introduction

Systemic capillary leak syndrome (SCLS) is a rare disorder associated with a vascular permeability dysfunction leading to massive leakage of fluid into the soft tissue. Patients with SCLS usually present with clinical symptoms of hypovolaemic or distributive shock. We report a case of a patient suffering from SCLS resulting in obstructive shock due to acute cardiac tamponade after resuscitation.

Case report

A 38-year-old female patient of Ghanaian origin presented to the emergency department of our hospital with malaise, anorexia, arthralgia and diarrhoea for the past five days.

Four weeks earlier she had visited the outpatient clinic because of normocytic anaemia. Additional laboratory testing did not show any abnormalities, in particular no abnormal haemoglobin phenotyping. No treatment was initiated, follow-up of the anaemia was performed in the outpatient clinic.

Table 1. Laboratory values illustrating the course of SCLS

Laboratory test	Out-patient clinic	ER	ICU admission	ICU day 1	ICU day 2
Haemoglobin (g/dL, 13.7-16.9)	12.4	20.9	16.3	14.8	11.1
Haematocrit (L/L, 0.35-0.4)	0.38	0.62	-	-	0.32
Creatinine (µmol/L, 65-95)	52	118	172	175	169
Albumin (g/L, 35-50)	44	-	<10	27	28
Creatinine kinase (U/L)		264	149	44377	81622

At presentation, her blood pressure was 109/46 mmHg, pulse rate was 111 beats/min, respiratory rate was 24/min, oxygen saturation was 100% and temperature was 37.4 °C. Physical examination was otherwise unremarkable. Laboratory results showed a haemoglobin level of 20.9 g/dl (13 mmol/l), haematocrit 0.62 l/l and low inflammatory parameters (CRP 1.8 mg/l, leucocytes 5.5 x 109/l) *(table 1)*. Electrocardiography (ECG) showed sinus tachycardia with micro-voltage in the extremity leads. In order to exclude cardiac tamponade, a transthoracic echocardiography was performed, which revealed obliteration of the left ventricle without any other abnormalities. Based on the findings on physical examination, laboratory results, and the results from the echocardiography, a diagnosis of dehydration as a result of reduced intake and diarrhoea was made. She was admitted to the internal medicine department and initially improved following intravenous fluid resuscitation consisting mainly of normal saline solution. Twelve hours after

admission, she became restless and complained of pain in her legs. Despite fluid resuscitation with 4 litres of normal saline since admission, she was hypotensive (50/30 mmHg) with a pulse rate of 70 beats/min, respiratory rate of 35/min and a temperature of 34.6 °C. Physical examination showed tense calf muscles. The venous blood gas analysis showed severe metabolic acidosis (pH 6.89, HCO3 13.9 mmol/l, base excess -21.4, lactate 7.5 mmol/l). She was admitted to the intensive care unit (ICU) for a diagnostic workup. Because of the severe hypotension and hypothermia, we considered the diagnosis of septic shock. The patient received treatment including antibiotics, corticosteroids and fluid resuscitation with sterofundin.

In order to maintain an adequate blood pressure, the patient was treated with norepinephrine. Despite an adequate blood pressure, the lactate level increased up to 8.9 mmol/l. Laboratory findings showed signs of multi-organ failure with renal dysfunction (serum creatinine 172 µmol/l) and spontaneously deranged coagulation tests (prothrombin time 29.8 sec, activated partial thromboplastin time 61 sec) *(table 1)*. Her ECG showed new P-pulmonale in addition to the microvoltage already present at admission. The differential diagnosis in the absence of inflammatory parameters was pulmonary embolism or bowel ischaemia and a CT scan of the thorax and abdomen was performed. The scan showed no pulmonary embolism nor an obvious pericardial effusion, but it did reveal reduced contrast in the intestinal vasculature, suggesting ischaemia of the intestine. An emergency laparotomy was performed, showing no signs of bowel ischaemia. However, excessive amounts of ascites were evacuated, and the intestines were extremely oedematous and distended, necessitating a temporary surgical mesh and vacuum assisted closure system. Because the patient required high amounts of fluids without improvement of the blood pressure, a transoesophageal echocardiography (TEE) was performed during surgery to assess cardiac filling. Initially the TEE showed pericardial effusion without inflow reduction; however, within

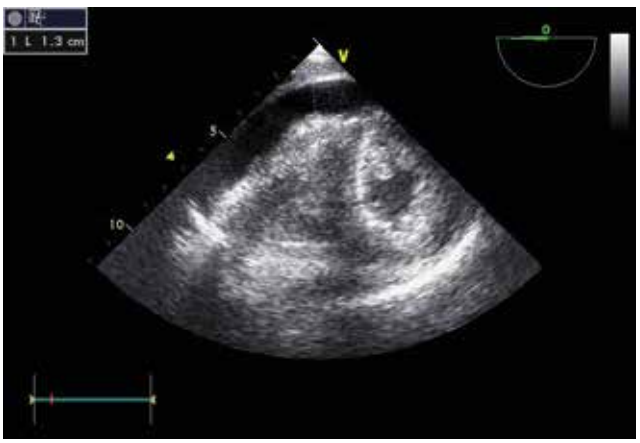

Figure 1. Transgastric mid short-axis view at the end-diastolic moment showing 1.3 cm of pericardial effusion at the posterior site

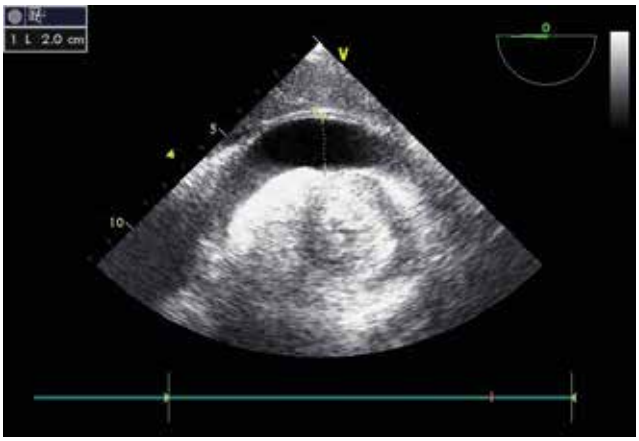

Figure 2. Transgastric mid short-axis view at the end-diastolic moment 20 minutes after figure 1 showing progression of the pericardial effusion to 2 cm

20 minutes the TEE revealed increased pericardial effusion with collapse of the left and right ventricle and right ventricle inflow obstruction *(figures 1 and 2)*. A pericardial drain was inserted and a large quantity of clear pericardial effusion was evacuated, resulting in improved haemodynamic parameters.

The clinical course was further complicated by rhabdomyolysis due to compartment syndrome of both lower legs and the right forearm. Fasciotomy was performed, which showed necrotic muscles for which extensive debridement was performed. Because of an acute kidney injury, continuous renal replacement therapy was started and continued during the entire ICU admission. Fluid extraction could also be started at a low intensity on day 3 and intensified in the following period.

All cultures collected at admission, including blood, urine, sputum and an intrauterine sample, came back negative. Malaria was ruled out by conventional thick film, buffy coat and antigen tests. The pericardial fluid was an exudate (high lactate dehydrogenase and protein levels) and showed no abnormalities upon microbial and pathological evaluation. Additional diagnostic tests did not reveal Lues, hepatitis B or HIV. The patient tested negative for antinuclear antibodies, IgM rheumatoid factor, anti-transglutaminase antibodies and microglobulin. Only the M-protein screening came back positive (1.2 g/l) with a free kappa of 23.4 mg/l (3.3-19.4 ml/l). Because all the other causes of hypovolaemic shock could be excluded and the M-protein screening was positive, we diagnosed the patient as having SCLS. After 16 days on the ICU, she was transferred to the medium care and another five days later to the surgical ward. Her renal function improved and renal replacement therapy was discontinued. After a hospital stay of 42 days she was discharged to a rehabilitation centre for further recovery and she will be evaluated regularly in the outpatient clinic.

Discussion

Epidemiology

This case describes the course of a patient suffering from SCLS resulting in hypovolaemic and obstructive shock due to rapidly developing cardiac tamponade. SCLS, also called Clarkson disease, is an extremely rare condition with an unknown pathogenesis.[1] It was first described in 1960 and there are less than 500 patients known worldwide.[2] Most knowledge of this syndrome is extracted from case reports and some small cohorts.[2-6] The condition is seen in all age categories, without a predominance in ethnicity or gender.[2,7]

Clinical presentation

SCLS is characterised by hypotension, hypoalbuminaemia, haemoconcentration and generalised oedema. The disease is characterised by episodic increases in vascular permeability resulting in an acute loss of protein-rich fluid from the intravascular to the interstitial space.[8] The majority (68-85%) of patients have monoclonal gammopathy of unknown significance, usually IgG kappa.[2] The course of the disease can be divided into three phases. First there is the prodromal phase with signs of generalised weakness, fatigue, myalgia, fever, vomiting, abdominal pain, flushing and diarrhoea. The 'leak' phase is characterised by hypotension and fluid leaking to the third space, usually lasting for one to three days. Hypovolaemic or distributive shock is a common finding during this phase, but the exact numbers of intensive care admissions are not known. The 'post-leak' phase covers the time when the capillary barrier function restores and fluid remobilisation occurs rapidly.[4,9]

Treatment

SCLS is a self-limiting disease, with vascular leakage usually recovering within two to five days.[4] To date, no specific therapy has been identified to treat the vascular leakage during the acute phase of SCLS, other than supportive care including treatment of complications. There is no supportive evidence for the use of a specific kind of fluid for the resuscitation of the patient, such as albumin.[8] Because of the small number of known cases, research for therapeutic options is limited. Most recent literature recommends aminophylline intravenously for severe flares. Aminophylline interacts with cyclic AMP, thereby blocking the signalling pathway for endothelial permeability.[2] Other therapeutic options are not supported by evidence, but include correction of adrenal and thyroid deficiency, high-dose intravenous immunoglobulin and methylene blue administration.[2]

Complications

Common complications of SCLS are ischaemia-induced organ failure due to severe hypotension, muscle compartment syndrome and rhabdomyolysis caused by excessive fluid resuscitation and venous thromboembolism due to venous stasis. In the post-leak phase, flash pulmonary oedema induced by rapid fluid remobilisation is common.[4]

Cardiac complications are a common finding in patients with an acute attack of SCLS. A cardiomyopathy is often seen due to an increase in myocardial extracellular volume.[1] Cardiogenic shock due to cardiac ischaemia is not common in this syndrome.[6] Although many articles on SCLS state that pericardial effusion is not a common finding, Druey and Parikh report an incidence of 9%.[2]

Prognosis

Many patients experience new attacks of SCLS within five years, with median frequencies of 0.6 to 1.23 attacks per year. Long-term treatment with methylxanthine (theophylline and aminophylline) possibly in combination with a B-agonist (terbutaline) can be considered, although many patients experience side effects and relapses. The use of intravenous immunoglobulin may reduce the frequency and severity of future episodes with few side effects.[3,5] The prognosis of patients developing SCLS is unclear with a five-year survival rate range from 20% to 85%, depending on the provided therapy and prophylaxis.[3-6,8,10] Recent literature suggests a mortality rate of 18.6% in patients with SCLS admitted to the ICU.[9]

Consideration

In retrospect, our patient developed all three phases of the illness. She presented to the emergency department with prodromal signs (malaise, arthralgia and frequent defecation) with haemoconcentration in the initial laboratory results. During admission she developed hypovolaemic shock and massive oedema due to the fluid leaking, complicated by cardiac tamponade and compartment syndrome. SCLS can only be diagnosed after exclusion of all other causes of distributive shock. By the time we considered the diagnosis of SCLS, the patient was already in the 'post-leak' phase. Therefore, specific treatment for the acute phase of SCLS was not considered, the patient was only treated with supportive care. Our report shows that patients with SCLS can rapidly develop pericardial effusion, leading to a cardiac tamponade within 20 minutes. We believe that physicians who treat patients with SCLS should be aware of this rare but life-threatening complication. Because SCLS mimics septic shock and anaphylaxis, cardiogenic shock due to tamponade may easily be missed with possible fatal outcome. This case illustrates that when a patient with SCLS does not respond to fluid therapy, cardiac ultrasound should be performed to rule out pericardial effusion.

Conclusion

SCLS is a rare disorder of vascular permeability dysfunction that can lead to a severe distributive shock. This disorder should be considered when there are signs of haemoconcentration and

hypoalbuminaemia and with no clear cause of shock. When a patient with SCLS is does not respond to fluid therapy, obstructive shock due to pericardial effusion should be considered.

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Disclosures

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