



Case report

Markedly elevated procalcitonin due to anaphylactic shock, a case report

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ABSTRACT

Procalcitonin (PCT) is a well-known biomarker that is directly connected to bacterial infection especially when it reaches significantly high levels. It is extremely rare to be witnessed in non-bacterial infections such as viral or parasitic. It may be elevated in other conditions such as trauma and autoimmune diseases. We present a rare case of a young gentleman, who had an extremely high PCT level that appeared to be a result of anaphylaxis due to worm infestation.

1. Introduction

Procalcitonin (PCT) is one of the most important markers significantly linked to infections of a bacterial origin, which can be employed to determine the severity of the infectious process, and to guide the use of antibiotics [1]. Normal PCT level is less than 0.1 ng/mL in adults, and it points to the presence of infection when it exceeds 0.25 ng/mL [2]. PCT of mild elevated levels between 0.15 and 2 ng/mL usually indicates localized mild to moderate bacterial infection, noninfectious systemic inflammation, or untreated end-stage kidney disease [3]. It also can be found to be elevated in trauma and autoimmune disease patients [4, 5]. High levels of PCT of more than 2 ng/mL are associated with bacterial sepsis, severe localized bacterial infection, or medullary thyroid carcinoma [3]. PCT is now an essential laboratory test, especially in the in-patient hospital setting, not only because it predicts the severity of the bacterial infections, but also as an effective tool in reducing the unnecessary use of antibiotics which will decrease cost and antibiotics resistance [6].

Worm infections are still considered one of the important conditions especially in low to middle income countries [7]. Usually, these infections' laboratory panel includes eosinophilia of more than 600 μ L or >6% of the thin-layer chromatography, in addition to low hemoglobin and low ferritin concentration due to iron deficiency anemia. Parasitic infection is usually associated with an elevated risk of anaphylaxis, which may differ according to the host immune response and the pathogens [8]. We present a case of a young gentleman who had an extremely high level

of procalcitonin, which appeared to be a result of anaphylaxis due to worm infestation.

2. Case presentation

A Twenty-three-year-old gentleman, not known to have any medical conditions, presented to the emergency department after an episode of loss of consciousness that lasted for 30 min, and it was preceded by dizziness. He regained his consciousness fully after the episode with no neurological deficit. Physical examination was unremarkable apart from pallor, with normal vital signs. Initial laboratory tests revealed severe anemia with a hemoglobin level of 4.8 g/dl. Further laboratory tests showed microcytic hypochromic anemia with very low ferritin, and iron saturation levels. His B12, folate, and U&E panel were all normal, and hemolysis workup was negative. The patient was given two units of packed red blood cells (PRBCs) and was admitted to the medical ward for further investigations.

Three days later, an Esophagogastroduodenoscopy was performed to investigate the cause of his iron deficiency anemia and showed no clear pathology. Colonoscopy afterward was attempted, and the scope was passed up to the caecum, where multiple worms were noted. At that moment, the patient's blood pressure dropped, and he became tachycardiac (Table 1). However, no evidence of active or recent bleeding was noted. The procedure was aborted, and the patient was started on IV fluids and Dopamine infusion to support his blood pressure and was shifted to the high dependency unit. His blood pressure was 76/50

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Table 1. Vital parameters before colonoscopy, during shock and after Epinephrine administration.

Vitals parameter	Before colonoscopy	During Shock	After Epinephrine administration
Temperature (Celsius)	36.5	39.2	36.9
Blood pressure (mmHg)	109/65	76/50	108/54
Heart rate (beats per minute)	78	125	100
Respiratory rate (breath per minute)	18	20	20
Oxygen saturation on room air (percentage)	100	99	99

mmHg in the unit, and his heart rate was 125 beats per minute with a regular pulse. He had a fever of 39.2 (Celsius) and normal oxygen saturation on room air. The patient was conscious and was complaining of mild diffused colicky abdominal pain. Full septic workup was sent with blood cultures and the patient was started on empirical antibiotics and Ivermectin.

Despite the administration of 3.5 L of IV fluid and the continuous dopamine infusion, the patient's blood pressure remained low with mean arterial pressure of less than 65 mmHg. At that time, differential diagnosis was made as septic versus anaphylactic shock. Epinephrine 0.3 mg Intramuscular injection and 100 mg of hydrocortisone were given. Patient blood pressure immediately improved after the injection of epinephrine (Table 1). Dopamine infusion was tapered down gradually, then stopped altogether.

Laboratory results at that time showed elevated white cell count (with high eosinophils), high CRP, and very high PCT (Table 2). Chest X-ray was normal. Two sets of blood cultures came back negative and stool workup (including cultures, ova, and parasites) were also negative. Ivermectin was continued for 2 days (200 mcg/kg) based on colonoscopy findings to cover intestinal parasitic infection, which was predicted to be Ascaris or Strongyloidiasis based on the colonoscopy.

The patient remained stable, and his inflammatory markers were trending down (Table 2). He was discharged five days later and was followed a week after discharge in the clinic, where the laboratory tests

Table 2. Laboratory values before colonoscopy, during shock and after following up.

Labs	Before colonoscopy	During Shock (within 40 min)	Follow up labs 5 days later	Follow up labs after discharge
Hgb (gm/dl)	4.8	8	8.9	10.6
WBC (103/uL)	11.2	31.6	16	11.5
Neutrophils (103/uL)	7.3 (64.6%)	25.6 (81%)	11.4 (70.9%)	7.9 (68.9%)
Lymphocytes (103/uL)	2.1 (18.3%)	2.8 (8.7%)	2.3 (14.6%)	2.1 (18.6%)
Eosinophils (103/uL)	1 (8.6%)	1.3 (4%)	1.2 (7.4%)	0.7 (6.1%)
Basophils (103/uL)	0.12 (1.1%)	0.16 (0.5%)	0.11 (0.7%)	0.12 (1%)
Platelets (103/uL)	333	99	157	2047
CRP (mg/L)	NA	70	21	2.2
Procalcitonin (ng/ml)	NA	95.2	5.36	0.17
Haptoglobin (mg/dL)	131			
LDH (IU/L)	215			
Total Bilirubin (µmol/L)	5			
Reticulocytes (%)	1.7			

showed improving eosinophilia and normal CRP and procalcitonin. Repeated platelets and hemoglobin a month later were normal.

Written consent was obtained prior writing of the report.

3. Discussion

A high level of (PCT) is known to occur in the presence of bacterial infections; however, we might observe a rise in (PCT) level, where the evidence of infection is lacking, such as major surgery, severe trauma, severe burns, and prolonged cardiogenic shock [9].

Production of PCT in sepsis is assumed to be from the mononuclear cells in the peripheral blood and the liver, triggered by cytokines releases from bacterial lipopolysaccharides. Particularly, bacterial infection increases CALC 1 gene expression which leads to the release of PCT [10]. However, the mechanism of PCT elevation in anaphylaxis is unknown up to our knowledge. Generally, the rapid drop in PCT levels suggests the non-infectious causes [11].

In our case, the level of PCT was found to be extremely high, without any obvious well-defined cause. We think that the colonoscopy exposed and mobilized the worms, which triggered an anaphylactic shock that led to hypotension and elevation in the PCT level. Anaphylaxis may be a trigger that released cytokines, including interleukin-6 (IL-6), interleukin-10 (IL-10), tumor necrosis factor I, and histamine, which caused fever and raised white blood count as an acute inflammatory response, and eventually led to shock [12]. Initially, it was thought to be a septic shock, as the patient was febrile and had a notably very high PCT level. However, the rapid nature of the shock, absence of signs of infection before the colonoscopy, the lack of response to antibiotics, and the rapid response to epinephrin made the diagnosis of anaphylactic shock more likely. Moreover, our patient fits the diagnostic criteria of anaphylaxis, that were published by the Association of American Family Physicians [13].

Ideally, the tryptase test should be sent to confirm the diagnosis of anaphylaxis. We have not sent it as we believe the clinical picture was very suggestive of anaphylaxis as it fits the criteria and the patient significantly and instantly improved after administration of epinephrine. Moreover, negative tryptase test does not exclude anaphylaxis as it has poor sensitivity and negative predictive value [14].

Serum PCT level above 10 ng/mL was reported to not be exclusively associated with sepsis, also it was found that it can be a manifestation of anaphylactic shock [15]. Furthermore, drug-induced anaphylaxis has been reported to be a cause of high PCT levels, and it should be one of the differential diagnoses for elevated PCT, when bacterial infection is not present [16]. Although it was suggested that PCT can be used as a criterion to diagnose anaphylactic shock [17], we do not think that it is a necessary test in presence of clear clinical picture.

So, significantly high PCT is not considered to be specific to bacterial infection, and should rise the other and maybe more plausible causes [9]. However, the NPV of PCT level below 0.5 ng/mL is around 97 percent in ruling out bacteremia [18].

As described in our case, the markedly elevated PCT created a suspicion of bacterial infection or sepsis, and these cases may be misdiagnosed as septic shock instead of the more urgent to treat anaphylactic shock.

4. Conclusions

The life-threatening anaphylactic shock can be induced during colonoscopy in the presence of worm infestation, and it may cause marked PCT elevation, which may lead to a misdiagnosis of septic shock.

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Data will be made available on request.

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The authors declare no conflict of interest.

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