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Balantidium Coli Colitis Revealing a Common Variable Immunodeficiency: A Case Report

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Balantidium Coli is a large protozoan parasite, measuring up to 150 micrometers, initially identified in 1857 and later renamed in 1861-1862. It is an animal parasite, with its primary reservoir being pigs (domestic pigs/wild boars), but it can also be found in other animal species such as dogs, cats, hyenas, buffaloes, camels, monkeys, and others. Humans are an accidental host, as they represent a dead-end in the parasitic life cycle. Infection by this parasite is typically asymptomatic or presents with mild symptoms. It becomes pathogenic only in cases of primary or secondary immunodeficiency, where it typically manifests as colitis; however, urinary tract involvement is also

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possible. In our case, *Balantidium Coli* infection presented multiple challenges. It is not a well-known parasite in our region, particularly since pig farming is not practiced in Morocco. The parasite was found in both the urine and stool of the patient, who exhibited clear signs of infection which is not usual with this parasite. This led to the "late" discovery of Common Variable Immunodeficiency (CVID) in the patient, a primary immunodeficiency typically diagnosed before the age of 4 and characterized by a deficiency in immunoglobulin production, particularly affecting the IgA and IgG fractions.

Keywords: Balantidium coli; common variable immunodeficiency; protozoan parasite; hypogammaglobulinemia.

1. INTRODUCTION

Balantidium Coli is a protozoan parasite measuring about 150 micrometers, with pigs as its primary reservoir. Humans are accidental hosts, and contamination can occur through direct contact by ingesting the parasite's cyst via dirty hands or indirectly by consuming contaminated food or water, the population that is mostly affected by this protozoan are farmers raising pigs and their family members. It is the largest pathogenic protozoan in humans and is responsible for a zoonosis [1]. It typically causes colitis, first described and identified by Malmsten in 1857 in two patients presenting with dysentery. It was initially named *Paramoecium* and was later renamed *Balantidium* by Leuckart in 1861 and Stein in 1862 [2].

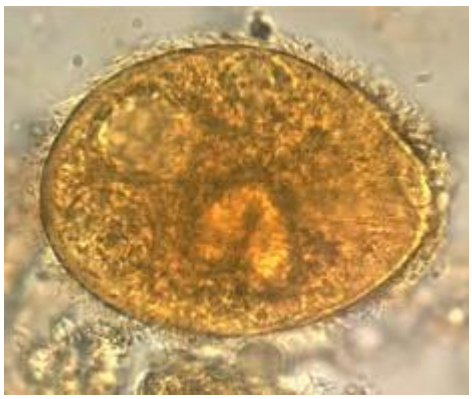


Fig. 1. Photo of the Balantidium Coli [3]

Common Variable Immunodeficiency (CVID) is a primary immunodeficiency characterized by a deficiency in the production of immunoglobulin G and immunoglobulin A, leading to hypogammaglobulinemia. It is usually diagnosed before the age of 4, following recurrent infections, particularly of the respiratory tract [4]. We report the case of a patient in whom *Balantidium Coli* colitis revealed a Common Variable Immunodeficiency.

2. CASE PRESENTRATION

The patient was a 23-year-old woman, born from a first-degree consanguineous marriage. She had a history of recurrent respiratory and digestive infections (more than three episodes per year) that responded to probabilistic antibiotic therapy (amoxicillin + clavulanic acid) since early childhood. She also had chronic iron deficiency anemia since the age of 14, treated with iron supplementation (80 mg/day) without improvement in ferritin levels. Additionally, she had a history of *Helicobacter pylori* gastritis diagnosed at age 19, treated with amoxicillin 1 g twice daily, clarithromycin 500 mg twice daily, in combination with omeprazole 20 mg twice daily for 15 days. She had an appendectomy at age 12 and primary amenorrhea. The patient received three doses of the Sinopharm COVID-19 vaccine.

The illness began six months before her hospitalization, with the onset of diffuse abdominal pain in the colonic region, associated with mucus-bloody diarrhea, occurring 6 to 8 times per day, all evolving in a febrile context with weight loss of 18 kg over six months. The condition progressed with the appearance of vomiting, lumbar pain, hematuria, and frequent urination, prompting the patient to seek emergency care at the Ibn Sina University Hospital Center in Rabat.

On clinical examination, the patient was found to be cachectic with growth retardation, measuring 1.42 meters tall and weighing 27 kg, with a body mass index of 13.4. She was dehydrated, with a skin fold persisting for more than two seconds. The patient was somnolent and confused, with a Glasgow Coma Score of 13/15, hypotensive at 91/62 mmHg, tachycardic at 100 beats per minute, and tachypneic at 27 breaths per minute, with pale conjunctiva and a temperature of 38.7°C. Pulmonary examination revealed rhonchi, and abdominal examination revealed a

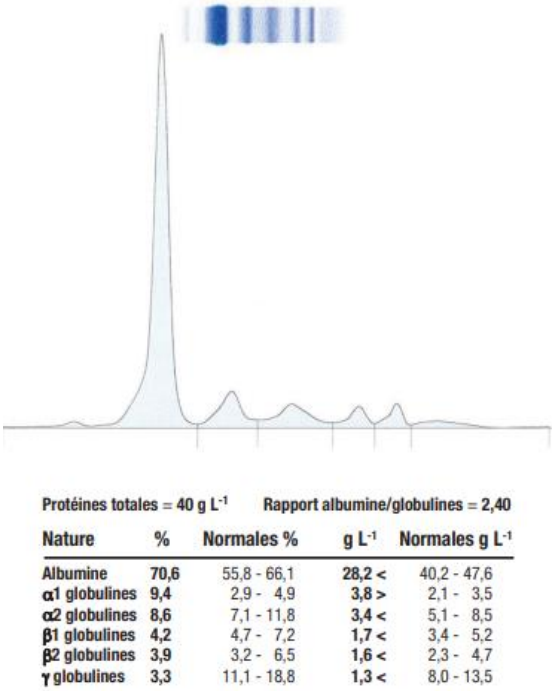
palpable spleen tip with minimal splenomegaly (15 cm liver span) and tenderness in the colonic region without clear guarding or rigidity, with an appendectomy scar in the right iliac fossa. On rectal examination, the glove was covered with mucus streaked with blood.

The patient was urgently hospitalized for an etiological workup and appropriate management. The patient's laboratory workup revealed hypochromic microcytic anemia with a hemoglobin level of 6 g/dL, moderate leukocytosis at 11,000/mm³, predominantly neutrophils at 8,500/mm³, with moderate eosinophilia at 620/mm³, and normal lymphocytes at 1,580/mm³ with mild thrombocytosis at 480,000/mm³. Coagulation tests were normal. The inflammatory workup showed an elevated C-reactive protein (CRP) at 98 mg/L, with fibrinogen at 5.6 g/L. Procalcitonin was negative at 0.11 ng/L. The electrolyte panel showed hyponatremia at 124 mmol/L and hypokalemia at 2.8 mmol/L. Ferritin was severely depleted at 3 µg/L, total protein was decreased at 57 g/L, and hypoalbuminemia was noted at 23 g/L, with fasting blood glucose at 0.58 g/L and triglycerides at 0.28 g/L.

The patient thus presented with three major problems:

- Severe dehydration and malnutrition with probable malabsorption.
- A probable digestive and/or urinary infection, given the fever, digestive, and urinary symptoms, potentially due to an intracellular bacterium, virus, or parasite (given the eosinophilia); a combination of the three is also possible.
- An immunosuppressive condition that could explain the recurrent infections as well as the profound deterioration in the general state, such as an acquired or primary immunodeficiency, a chronic inflammatory or autoimmune disease, an underlying neoplastic condition, or a metabolic disorder like cystic fibrosis.

Our priority was to rehydrate the patient and correct the electrolyte disturbances, alongside antibiotic therapy with intravenous metronidazole 500 mg three times a day. The patient underwent a QuantiFERON test, which came back negative, and a urine cytobacteriological examination revealed leukocyturia at 130,000/mL and hematuria at 24,000/mL without acanthocytes, with cystic protozoa present in the culture. Fecal calprotectin was strongly positive at 180 µg/g of stool, and the stool culture was sterile, while three parasitological stool examinations isolated ciliated protozoa measuring between 80 and 120 µm, suggesting *Balantidium coli*. Given this unusual finding in our context, PCR confirmation was performed on urine and stool, which came back positive.



Protéines totales = 40 g L^{-1} Rapport albumine/globulines = 2,40

Nature	%	Normales %	g L^{-1}	Normales g L^{-1}
Albumine	70,6	55,8 - 66,1	28,2 <	40,2 - 47,6
α1 globulines	9,4	2,9 - 4,9	3,8 >	2,1 - 3,5
α2 globulines	8,6	7,1 - 11,8	3,4 <	5,1 - 8,5
β1 globulines	4,2	4,7 - 7,2	1,7 <	3,4 - 5,2
β2 globulines	3,9	3,2 - 6,5	1,6 <	2,3 - 4,7
γ globulines	3,3	11,1 - 18,8	1,3 <	8,0 - 13,5

Fig. 2. Serum protein electrophoresis of the patient

Since *Balantidium coli* is rarely pathogenic in humans and is thus considered an opportunistic pathogen, an underlying immunosuppressive condition was investigated. HIV 1 and 2 serology was performed and was negative, which was expected since an opportunistic infection would occur at stages B or C (AIDS), and the patient did not present with lymphopenia. Cystic fibrosis was investigated due to the early onset of recurrent respiratory and digestive infections, with sweat chloride testing coming back normal at 32 mmol/L, and the search for the CFTR gene mutation was negative. Inflammatory Bowel Disease (IBD) was considered, although the patient had no erythema nodosum, oral or nasal mucosal ulcerations, anal fissures, or arthralgias; ANCA and ASCA testing was negative, the enteroscanner showed no abnormalities, upper gastrointestinal endoscopy revealed non-specific antrum-fundus gastritis with *Helicobacter pylori* positive without ulcerations or signs of

malignancy, while rectosigmoidoscopy was unremarkable, and total ileocolonoscopy was normal. The histopathological study of biopsies revealed chronic interstitial ileitis in acute vasculo-exudative flare without specificity or malignancy signs, and non-specific interstitial colitis without malignancy signs. The uroscan was also unremarkable.

The possibility of primary immunodeficiency was then considered. Serum protein electrophoresis revealed hypoalbuminemia at 23 g/L and profound hypogammaglobulinemia at 1.3 g/L.

Lymphocyte immunophenotyping showed no abnormalities, and 24-hour proteinuria was negative at 0.11 g/24h. Quantitative measurements of immunoglobulins revealed severely reduced IgG at 1.86 g/L and IgA at 0.34 g/L, while IgM levels were normal. The diagnosis of Common Variable Immunodeficiency (CVID) was therefore established according to revised international (PAGID) criteria in 2016 [5]. The patient was placed on therapeutic human immunoglobulin infusion at 0.8 g/kg during the first course, followed by 0.4/kg/month. For her *Balantidium coli* infection, she was treated with doxycycline 400 mg/day on the first day, then 200 mg/day for 21 days, with good clinical and biological improvement.

3. DISCUSSION

Our clinical case presents several atypical features that are worth highlighting. *Balantidium coli* is a large protozoan parasite, approximately 150 µm in size, commonly found in tropical regions, with higher prevalence in Asia.

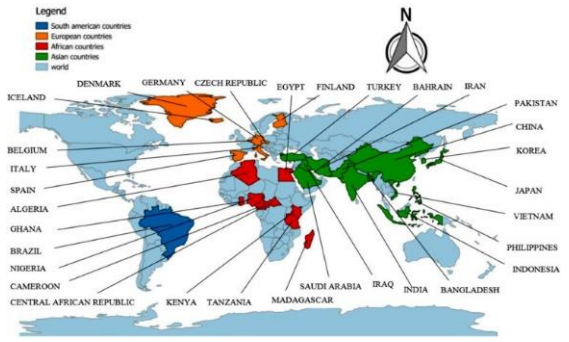


Fig. 3. Regions affected with the Balantidium Coli [6]

The typical reservoir is pigs, but it can also be found in other species such as dogs, cats, rats, hyenas, and monkeys [1,2,4,7]. Humans are an accidental host, with transmission occurring either directly through ingestion of the parasite cyst or indirectly through consumption of contaminated food or water [1].

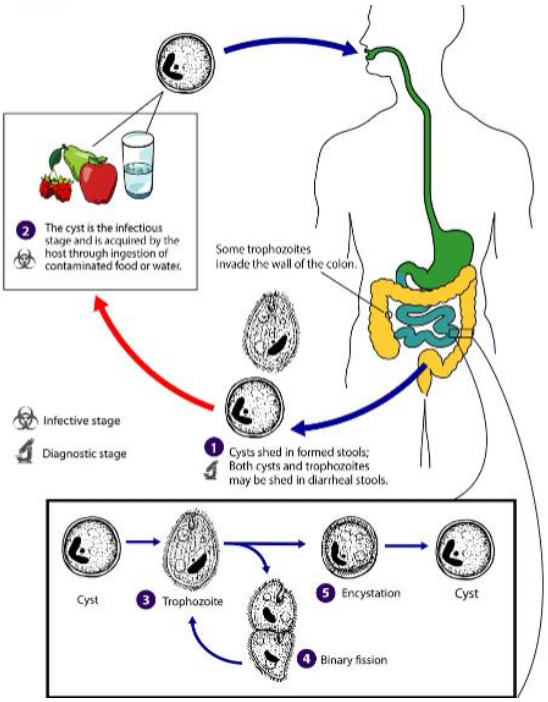


Fig. 4. Cycle of the Balantidium Coli in the human body [3]

The individuals most frequently affected are pig farmers and those in close contact with them, as demonstrated in a study conducted in Ghana [8].

This brings us to the first atypical aspect in the Moroccan context: this parasite is not known to be present here, and we do not have pig farming where the parasite is commonly found [9,10]. Upon further investigation, we discovered that the patient came from the Sekhirate region, residing in a small village without running water, which is known for the presence of wild boars that could potentially carry the parasite. A review of the literature also revealed that cattle can be affected, as shown in a study on a species of buffalo in Thailand [11], as well as ostriches [7] and camels [12]. This suggests the need for an epidemiological investigation to conduct large-scale screening in various cattle and camel farms, screening of wild boar populations, and exploration of the groundwater for possible contamination.

It is important to note that different direct examination techniques can be used to detect

Balantidium coli, with the best being Lugol's iodine staining [13]. However, direct examination has limitations, which is why PCR has demonstrated greater accuracy [1,14].

The second atypical aspect is the presence of the protozoan in the patient's urine. *Balantidium coli* is generally asymptomatic or even harmless to humans, but it can become pathogenic in immunocompromised patients, where it typically causes digestive symptoms, primarily colitis [1,2,4,7-15,5]. However, in our patient, the parasite was not only found in the urine but also showed significant clinical and biological impact. This prompted us to search for similar cases in the literature, where we found two reports: the first involving a pregnant woman in Ethiopia [16], and the second in an Iranian patient with bladder cancer [17]. Notably, all three cases involved women, even though the carriage of *Balantidium coli* shows a slight male predominance according to the Ghana study [8]. It appears that urinary localization is more common in females.

The third atypical aspect is the late diagnosis of Common Variable Immunodeficiency (CVID), which is the most common primary immunodeficiency disorder. This condition is more familiar to pediatricians since it is generally diagnosed before the age of four [4]. This delay in diagnosis can be attributed to the limited access to healthcare, due in part to the significant shortage of doctors in Morocco, as well as the lack of awareness about CVID among general practitioners, highlighting the need for specialized training.

4. CONCLUSION

Balantidium coli is a protozoan parasite, primarily hosted by pigs. Humans serve as an accidental host. This parasite is rarely pathogenic in humans, requiring an immunosuppressive condition to become harmful, which classifies it as an opportunistic pathogen. When pathogenic, *Balantidium coli* typically causes colitis but can also have urological manifestations. The key takeaway is always to consider an underlying immunosuppressive condition, whether primary or acquired, as this parasitosis may be indicative of such a state.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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17. DOI: 10.1002/ccr3.7494 CASE REPORT Uninvited guest, Balantidium coli in urine in a patient with bladder cancer: A case report and review of the literature Farnaz Farmani, Neda Soleimani, Mohammad Razeghi, Amir Zamani, Sahand Mohammadzadeh, Davoud Soleimani.

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