Case Report

Diagnosis and Management of Polycythemia Vera in a Persian Cat: A Clinical Case Report

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Abstract | A 3 year-9-months-old male Persian cat, piko presented at the Teaching and Training Pet Hospital and Research Center, Purbachal, Dhaka, who had a history of persistent anorexia and repeated vomiting from the previous 8-10 days. Vomiting was observed immediately after consumption of food. The cat is examined by the respective doctor and recorded severe dehydration, body temperature was 99.3° F and pink muc us membrane after a complete physical examination. It was gone through a diagnostic procedure including hematology and serum biochemistry, radiographic study and a quick screening of feline infectious peritonitis (FIP). Hematological results revealed an increased packed cell volume (62.5%) and red blood cell count (12.80 m/µl), while leukocyte and platelet parameters remained largely within the reference ranges. Serum biochemistry showed an increase of blood urea nitrogen level(46mg/dl), serum creatinine(3.8mg/dl) and calcium(11.8mg/dl), which indicated simultaneous met 21 abolic and renal involvement. There was no cardiopulmonary or abdominal pathology present in thoracic and abdominal radiographs and the result of FIP kit test was negative. The cat was treated by Hydroxyurea @ 20mg/kg, orally as a medication of polycythemia. Follow-up PCV tests were performed and those results indicated improvement after therapy. This case proves that proper diagnosis and timely treatment of polycythemia vera with hydroxyurea is capable of managing the condition in cat, resulting in a better hematological profile and recovery.

Keywords | Cat, Polycythemia Vera, Hematology, Serum biochemistry, Hydroxyurea

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INTRODUCTION

Pet ownership was not a common phenomenon in Bangladesh in the past and animals were usually treated like the street animals and not pets. However, in recent years, ownership of pets especially cats have grown in city centers as they have been associated with a series of positive influence on the physical, social, and psychological well-being of their owners. As humans grow closer to the city, more exposed to environment stressors, dietary imbalances, infectious agents, and lifestyle diseases, pet cats are susceptible to acute and chronic diseases (Billström-Saxon and Giger, 2024). Besides, Cats also experience hematological disorders including anemia, leukocyte abnormalities, and erythrocytosis which resemble similar disorders in humans (Boes *et al.*, 2022). Polycythemia, which is one such rare and significant condition, is important and has been reported in cat since in 1966 (Fennell, 2018a). PV is a characterized by an increased red blood cell and elevated packed cell volume (PCV), leading to increased blood viscosity and impaired tissue perfusion. It is broadly classified into two types

(Darcy *et al*., 2018a); relative polycythemia, resulting from reduced plasma volume (e.g., dehydration), and absolute polycythemia, which is further divided into primary (PV) and secondary polycythemia. Primary polycythemia is a rare myeloproliferative disorder marked by autonomous erythrocyte production independent of erythropoietin (EPO), whereas secondary polycythemia arises due to chronic hypoxia or inappropriate EPO secretion, commonly associated with cardiopulmonary disorders, renal disease or neoplasia (Passamonti *et al*., 2008; Barbui *et al*., 2018).

In feline medicine, PV is extremely rare, and its pathogenesis remains poorly understood. Unlike in humans, where JAK2 mutations play a central role, definitive molecular mechanisms have not been clearly established in cats. In human, JAK2 tyrosine kinase mutation has a major role to play pathogenesis which causes permanent activation of hematopoiesis (Zhao *et al*., 2005). Furthermore, differentiation between primary and secondary polycythemia presents a significant diagnostic challenge. Clinical signs are often nonspecific, and no single diagnostic test is confirmatory. Although evaluation typically includes hematological and biochemical profiling, imaging, arterial blood gas analysis and serum EPO measurement, EPO level may remain within normal ranges even in secondary polycythemia, limiting their diagnostic value. Consequently, diagnosis of PV is largely based on exclusion of underlying causes, which often leads to delayed or advanced-stage identification.

Despite its clinical importance, there is a scarcity of well documented reports of feline PV, particularly in developing countries such as Bangladesh. Existing literature rarely integrates comprehensive clinical findings with hematological, biochemical and imaging data alongside systematic exclusion of critical differential diagnosis such as feline infectious peritonitis (FIP). Additionally, limited information is available regarding breed-specific presentation, especially in Percian cats within local clinical settings.

Therefore, this case report describes a confirmed case of PV in a Percian cat, highlighting the diagnostic challenges through integrated clinical, laboratory and radiographic evaluation, along with exclusion of differential conditions. The aim is to contribute to the limited body of literature and provide practical insights to improve early recognition and diagnostic accuracy of the rare hematological disorder in veterinary practice.

CASE PRESENTATION

Case history and description

A 3-year-9 months old male Persian cat, Piko, came to the Teaching and Training Pet Hospital and Research Center, Purbachal, Dhaka, complaining of persistent anorexia and recurrent vomiting over a period of about 8-10 days (Figure 1). As reported by the owner, vomiting was experienced immediately after taking food. There was a significant loss of appetite by the cat during the same time. Defecation reported as normal, no abnormal fecal consistency was found. The anthelmintics had been administered to the animal at regular intervals of about six months before presentation. The cat is examined by the respective doctor. The cat was found severe dehydrated, body temperature was 99.3° F and mucus membrane were pink after a performed physical examination.

Figure 1: A clinically affected Persian male cat presented to TTPHRC, Dhaka (at the time of clinical examination).

Sample collection for laboratory examination

Hematological and biochemical tests involved the collection of blood samples through the jugular vein. The venipuncture site was aeptically prepared using a 70% alcohol swab. The blood collection was performed using a 3 mL sterile disposable syringe and a 22 gauge butter fly needle (Figure 2). Approximately 3 mL of blood was collected, of which 1.5 mL was transferred into an EDTA tube (K2 EDTA, BD Vacutainer®) for hematological analysis, and 1.5 mL was transferred into a plain red-top tube (BD Vacutainer®) for serum separation and subsequent biochemical evaluation. The plain tube blood sample was left to clot at room temperature, between 20 and 30 minutes and centrifuged at 3000 rpm. to extract the serum. Careful harvesting of the separated serum was done followed by the transfer of the sample to a clean microcentrifuge tube to do some biochemical analysis. Hematological parameters like Hemoglobin, Total WBC Count, RBC Count and PCV were evaluated with an automated hematology analyzer (OV-560 RET, Balio, France) and also biochemical parameters such as calcium, phosphorus, total protein, BUN and Serum Creatinine, a detailed estimation was performed using the biochemical analyzer (Humalyzer 3000, GmbH, Germany).

Hematological test of blood

Hematological test showed a higher hemoglobin level (15.7 g/dl) and red blood cell (RBC) count (12.80 m/µl). There was a significant increase (62.5%) in the packed

cell volume (PCV). Total leukocyte count (5,260 cells/µl) was in the normal range. Differential leukocytes count was neutrophils (54%), lymphocytes (37%), monocytes (6%), eosinophils (3%), and basophils (0%) with all the neutrophil, lymphocyte, monocyte, and eosinophil counts within their respective reference ranges. Erythrocyte indices such as mean corpuscular volume (MCV; 48.8 fl), mean corpuscular hemoglobin (MCH; 16.9 pg), and mean corpuscular hemoglobin concentration (MCHC; 34.7 g/dl) were normal also indicating normocytic, normochromic erythrocytes. Nevertheless, platelet count was slightly reduced (133×10³/µl) against the normal range (Table 1).

Table 1: Hematological findings of cat.

Parameter	Test results	Reference value*
Hemoglobin (g/dl)	15.7	9-15.5
WBC (count/µl)	5,260	5000-19000
Neutrophils (%)	54	40-70
Lymphocytes (%)	37	10-45
Monocytes (%)	06	2-8
Eosinophils (%)	03	1-4
Basophils (%)	00	0-1
RBC Count (m/µl)	12.80	4.6-10
PCV (%)	62.5	27-49
MCV (fl)	48.8	39-53
MCH (pg)	16.9	13-20
MCHC (g/dl)	34.7	30-36
Platelet count (×10³/µl)	133	150-500

Serum biochemical parameters

Serum biochemical findings demonstrated a slightly elevated calcium level (11.8 mg/dl) in comparison to the reference interval (8.2–10.8 mg/dl) (Table 2). Phosphorus concentration (6.9 mg/dl) and blood glucose level (78.6 mg/dl) were observed within normal limits. Total serum protein was recorded at 6.9 g/dl, which was within the normal range. Albumin (3.77 g/dl) and globulin (3.13 g/dl) values were also within reference limits, maintaining a normal albumin-globulin ratio of 1.20. Evaluation of liver enzymes showed ALT (SGPT) and AST (SGOT) activities of 96 µ/l and 56 µ/l, respectively, both lying within acceptable reference values. Renal biochemical parameters revealed elevated blood urea nitrogen (46 mg/dl) and serum creatinine (3.8 mg/dl) levels. Serum lipid profile parameters, including cholesterol (80.6 mg/dl) and triglycerides (127.3 mg/dl), remained the normal physiological ranges (Table 2).

Diagnostic test

A set of extensive diagnostic studies was conducted in order to arrive at the definite diagnosis, as well as to distinguish the disorder among other diseases that have similar clinical manifestations. These incorporated Feline Infectious Peritonitis (FIP) test to check whether there was a viral etiology or radiographic (X-ray) test to check the presence of any underlying abnormalities in the anatomy or system.

Table 2: Biochemical parameters results of cat.

Parameters	Test value	Reference value*
Calcium (mg/dl)	11.8	8.2-10.8
Phosphorus (mg/dl)	6.9	2.4-8.2
Glucose (mg/dl)	78.6	50-170
Total Protein (g/dl)	6.9	5.2-8.8
Albumin (g/dl)	3.77	2.5-3.9
Globulin (g/dl)	3.13	2.3-5.3
A/G Ration	1.20	0.6-2.0
ALT/SGPT (µ/l)	96	10-100
AST/SGOT (µ/l)	56	10-100
Blood Urea Nitrogen (mg/dl)	46	14-36
Serum Creatinine (mg/dl)	3.8	0.6-1.6
Cholesterol (mg/dl)	80.6	75-220
Triglycerides (mg/dl)	127.3	25-160

Figure 2: Collection of blood sample from the jugular vein, under aseptic conditions using a sterile syringe and needle.

FIP kit test

Feline Infectious Peritonitis (FIP) virus is a fast and easily diagnosed diagnosis. In this experiment we had the Rapid Test Kit manufactured by TESTSEALAB (Figure 3). There is a C (control) and T (test) zone that is not visible in the test cassette. The assay needed about 0.1– 0.2 ml of serum. Four drops of FIP assay buffer were added to the serum sample and the sample was applied on the sample well of the cassette. The reagent subsequently laterally diffused on the surface of the test strip. The appearance of both T and C bands indicates a positive result. A droplet of serum was taken with a disposable dropper and transferred to the sample well after which the buffer solution was added. The FIP test in this instance was negative in the cat (Figure 3).

X ray findings

The radiographic examination was done through usual methods (Figure 4). The cat was calmly held in conscious condition with a minimal level of stress. Radiographic

images of both lateral (right and left) sides and dorsoventral projections were taken. The X-ray images were considered carefully. These findings revealed that the heart and lung were of normal size and position, the lung fields were clear. Liver was in normal anatomic position, and normal size with no peritoneal abnormality. In general, the radiographic results were quite normal (Figure 4).

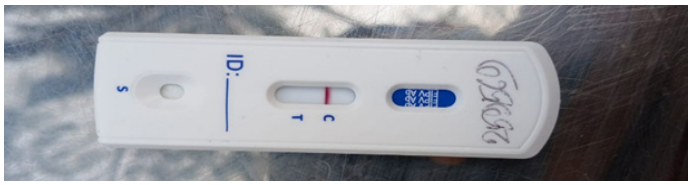

Figure 3: Rapid diagnostic kit test performed on the patient as part of the diagnostic work-up.

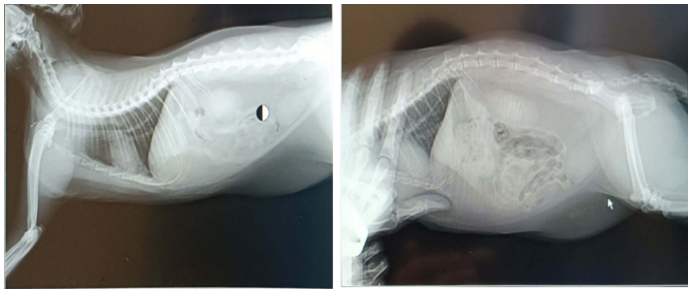

Figure 4: Radiographic examination of the patient showing normal thoracic and abdominal structures.

Confirmatory diagnosis

In accordance with the observed substantive growth of packed cell volume (PCV), hemoglobin levels, and total cell count of erythrocytes (Table 1), as well as the lack of any signs of cardiopulmonary or renal pathology (Figure 4), normal leukocyte and platelet counts, and the exclusion of infectious and secondary diseases (Figure 3), the current case best fits the diagnosis of Polycythemia Vera, which is a primary myeloproliferative disorder, the autonomous overproduction of red blood cells.

Treatment and follow up

After diagnosing the cat, it was initiated on a complex of therapeutic treatment to manage the situation. The Hydroxyurea was orally administered in the form of 20 mg/kg (cap. Hydronix 500mg) to assist in the regulation of abnormal cell production in the blood. The gastrointestinal tract was secured with the use of pantoprazole in the dose of 1mg/kg (Inj. Pantonix 40 mg), which decreased the secretion of gastric acid. The selected supportive therapy was the Vitamin B Complex 1 ml/10 kg (Inj. V-Plex Vet) to support hematopoiesis and poor metabolism, and Ondansetron 1 ml/4 kg (Inj. Emistat 4 ml) to prevent nausea and vomiting. Besides, intravenous fluid therapy was administered using 0.9% normal saline to ensure hydration and electrolyte balance. The 10 days course of treatment was continued and, after 15 days, the cat was followed up, its overall health significantly improved.

DISCUSSION

Polycythemia Vera is an uncommon hematological disorder in cats, characterized by a persistent increase in red blood cell mass, reflected by elevated packed cell volume (PCV), hemoglobin concentration, and total erythrocyte count. It is broadly classified into relative, secondary absolute, and primary absolute polycythemia (Fennell, 2018a).The patient has a history of unresolved anorexia and repeated vomiting during the last 8-10 days, and vomiting also occurred soon after consuming food. Clinical checkup showed severe dehydration, pink mucous membranes and decrease mildly body temperature (Figure 1).

Blood samples taken out of the suffering cat were used in complete blood count and biochemical analysis. The hematological analysis (Table 1) showed a significant rise in packed cell volume (PCV; 62.5%), red blood cell count (12.8 m/µl), and hemoglobin level (15.7 g/dl), with erythrocytes being normocytic and normochromic. These data show the apparent enhancement of red cell parameters but no sign of abnormal erythrocyte morphology. The total leukocyte count (5,260l/µl) and the differential leukocyte counts were found to be within normal reference ranges, which indicated that the patient did not have active inflammatory or infectious processes. The number of platelets was slightly low (133×10^3/µl), and it can be related to altered blood volume due to dehydration. The first diagnosis was polycythemia which was considered due to significantly increased PCV (62.5%) (Table 1) with a normal total protein level (6.9 g/dl) (Table 2) (Fennell, 2018b). Though dehydration was present in this case, it was not the exact cause of polycythemia. It was due to persistent anorexia and fluid loss with vomition.

Biochemical examination of the patient (Table 2) showed that there is an increase in blood urea nitrogen (46 mg/dl) and serum creatinine (3.8 mg/dl), which is a sign of azotemia. The simultaneous increase of both parameters indicates a lower glomerular filtration rate, which is most likely caused by the decrease in renal perfusion, due to hypovolemia (Galer *et al.*, 2023a). This is typical of pre-renal azotemia where the function of the kidney is impaired without the root cause of structural impairment. In case of the continuation of dehydration, continued renal hypo-perfusion can develop into intrinsic renal injury; hence, timely replacement of lost circulating blood volume by fluid therapy is critical to eliminate irreversible injury to the kidney (Kotb *et al.*, 2021). Serum calcium (11.8 mg/dl) was slightly elevated, and this can be explained by hemo-concentration and decreased renal excretion due to oliguria caused by dehydration (Galer *et al.*, 2023). A normal

serum phosphorus level (6.9 mg/dl) indicates maintained phosphorus homeostasis, which is an indication of early or reversible renal disease (Kotb *et al.*, 2021), and not a mature renal failure. Also, normal blood glucose (78.6 mg/dl), total protein (6.9 g/dl), liver enzyme levels (ALT: 96 µ/l; AST: 56 µ/l), and lipid levels (Table 2) demonstrate the preserved hepatic functioning and the absence of carbohydrate and lipid metabolism disorders (Fennell, 2018b).

Thoracic and abdominal radiographic examination (Figure 4), in the current scenario, did not provide any abnormal evidence, which indicates that there were no structural abnormalities, effusion, and mass lesions in the thoracic and abdominal cavities. The findings were useful in ruling out the possibility of cardiopulmonary disorders, abdominal organ displacement, or space-occupying lesions as possible causes of the clinical presentation. Moreover, the adverse outcome of the Feline Infectious Peritonitis (FIP) rapid test was a successful way of eliminating FIP as a possible diagnosis (Figure 3). This is also clinically important, with FIP commonly showing non-specific clinical features and a systemic response, such as biochemical and inflammatory alterations and can mimic renal or metabolic conditions. Thus, normal radiographic appearance and the absence of FIP test confirmed the ruling out of infectious and structural factors, and more attention could be paid to the renal involvement as the first underlying pathology. Finally, increased RBC mass, normal total protein level can differentiate this condition from relative polycythemia and term strongly this condition as absolute polycythemia or Polycythemia Vera.

Initially the cat was treated by phlebotomy (blood removal rate 10ml/kg) (Balakrishnan *et al.*, 2016; Carobbio *et al.*, 2010). Dehydration was managed by intravenous fluid therapy with 0.9% Normal saline. After that the cat was treated by Hydroxyurea @ 20mg/kg, PO is a medication of choice for polycythemia (Kotb *et al.*, 2021; Reiss *et al.*, 2007). The drug suppresses the process of ribonucleotide reductase, which converts ribonucleotides into deoxyribonucleotides, thus preventing the process of DNA synthesis. This inhibits cell division, especially in fast dividing cells, and causes arrest of the cell cycle, resulting in cell death (Carobbio *et al.*, 2010). Follow-up PCV tests performed seven days and fourteen days after treatment initiation have demonstrated a gradual decline in its values with 52 percent at day seven and 48 percent at day fourteen, which indicated a satisfactory improvement after therapy.

CONCLUSION

A confirmed case of Polycythemia Vera in a Persian cat was diagnosed based on persistently elevated packed cell volume and exclusion of secondary causes through hematological, biochemical, radiographic, and rapid FIP testing. Therapeutic management resulted in a gradual reduction of PCV to 52% and 48% on days 7 and 14, respectively, indicating a positive clinical response. This report contributes to the limited literature on feline Polycythemia Vera and underscores the importance of systematic diagnosis and timely intervention for successful case outcomes.

Limitations

This case report has certain limitations that should be acknowledged. Advanced diagnostic investigations such as serum erythropoietin concentration measurement, bone marrow examination, and molecular testing were not performed due to limited facility availability. Long-term follow-up beyond the 14-day post-treatment period was not possible, which restricts evaluation of disease recurrence and sustained therapeutic response. Additionally, as this is a single case report, the findings cannot be generalized to the wider feline population. Despite these limitations, the clinical, hematological, and therapeutic findings provide valuable insight into the diagnosis and management of Polycythemia Vera in cat.

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NOVELTY STATEMENT

A rare case of polycythemia vera in a persian cat was successfully diagnosed and managed with hydroxyurea therapy,resulting in significant clinical and hematological improvement.

AUTHOR'S CONTRIBUTION

All the authors contributed to research and manuscript writing.

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Generative AI and AI assisted technology statement

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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