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CASE STUDY

Endodontic Care for Patients with Polycythemia: Clinical Considerations and Case Analysis

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ABSTRACT

Polycythemia is a myeloproliferative neoplasm characterized by uncontrolled proliferation of red blood cells due to mutations in early hematopoietic cells, often linked to Janus kinase 2 (JAK2) gene mutations. Polycythemia vera (PV), the primary form of the disease, leads to increased blood viscosity and stasis, raising the risk of thrombotic events such as stroke and myocardial infarction. Secondary polycythemia results from hypoxic conditions, stimulating erythropoietin production. Diagnosis is confirmed through hemoglobin and hematocrit levels, with treatment aimed at reducing thrombosis and hemorrhage risks. Low-risk patients are treated with aspirin and phlebotomy, while high-risk cases may require cytoreductive therapies like hydroxyurea. In our case, a patient presented with necrosis and horizontal bone loss in tooth 36, complicated by polycythemia. Due to the increased risk of bleeding and inflammation, the decision was made to prioritize endodontic treatment, avoiding periodontal surgery. The patient, considered low-risk for PV complications due to the absence of thrombosis history, was managed conservatively. Preoperative coordination with hematologists was essential to optimize hematologic parameters and minimize potential risks. The goal of endodontic treatment was to disinfect and seal the root canal, reducing inflammation in the surrounding periodontal tissues and preventing reinfection. This approach allowed for effective management of the patient’s oral condition while minimizing systemic risks. This case highlights the importance of a multidisciplinary approach in managing dental treatment for patients with polycythemia, ensuring both local and systemic complications are effectively addressed.

Keywords: polycythemia; root canal therapy; dental complication

INTRODUCTION

Polycythemia refers to an elevated red blood cell (RBC) count, indicating an increase in the circulation of RBC mass, which can result in blood hyperviscosity. Patients with polycythemia exhibit high level of hematocrit. Polycythemia exists in three distinct forms: polycythemia vera (primary polycythemia), secondary polycythemia, and relative polycythemia.[1–3]

Polycythemia presents with distinct clinical features and oral manifestations. The oral mucosa may appear deep red to purple, and the gingiva often appears edematous.[4] Mucosal erythema may resemble erythematous candidiasis. Patients commonly experience easy gingival bleeding, along with submucosal petechiae, ecchymoses, and hematoma formation. Additionally, there is an increased risk of excessive bleeding following oral surgical procedures. This can also affect blood flow and increase the risk of blood clots, which may complicate dental procedures, including root canal treatment.[5]

In endodontics, where accessing and cleaning the root canals is required, increased blood viscosity can complicate bleeding control, particularly if surgery or tissue manipulation is needed. Patients with polycythemia may also be on blood-thinning medications such as anticoagulant and cytoreductive therapies to prevent clotting, which can increase the risk of bleeding during treatment.[6] Therefore, adjusting treatment plans and coordinating with the patient’s doctor to manage anticoagulant therapy is often necessary for more effective planning and safer dental care,

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minimizing risks associated with bleeding, clotting, and overall treatment success. The existing literature on dental management of patients with polycythemia is limited. This case report aims to contribute to the body of knowledge by presenting the endodontic management of a patient with polycythemia.

METHODS

A 45-year-old male patient presented to the Dental Conservation Clinic at RSUP Sardjito, seeking treatment for discomfort in his lower left molar. Initially, he discussed his dental issues with his Internal Medicine physician during a routine examination for his systemic health condition. The physician then referred him to the Dental Department for further assessment. The patient reported that his dental issues began due to a lack of routine tartar removal, which led to significant tooth mobility across his dentition. As a result, some teeth were extracted, while others were retained through curettage and splinting which were performed by a Periodontist. Severe mobility caused pulp necrosis in several teeth, leading to a referral to the Conservation Department for root canal treatment.

At the time of his visit, the patient still experienced discomfort while chewing and remained hopeful that the treatment would restore the normal function of the affected tooth. He had a medical history of polycythemia and had been on Hydroxyurea medac for its management since 2019. He brushed his teeth twice daily but occasionally experienced gum bleeding. The complexity of this case involved addressing the endodontic needs of a medically compromised patient with polycythemia, highlighting the need for careful treatment planning and consideration of systemic factors.

The patient was in a good overall condition, alert, and oriented. Mild facial asymmetry was observed, though no lymph node enlargement was observed. Vital signs were stable: blood pressure of 120/60 mmHg, a pulse of 80 bpm, a respiratory rate of 18 bpm, and a body temperature of 36 °C. His height and weight were 165 cm and 62 kg, respectively.

Upon intraoral examination, a temporary restoration was observed on the occlusal surface of the lower left molar, with the cavity extending to the pulp chamber (Figure 1A). Significant gingival recession was noted, reaching the level of the bifurcation (Figure 1B). Percussion testing elicited a positive response, indicating sensitivity upon tapping, while palpation over the surrounding area was negative, showing no tenderness to touch. Vitality testing with cold and electric pulp tests confirmed a negative response, suggesting pulpal necrosis. According to the Miller index, the patient's tooth mobility was classified into degree 2, indicating moderate horizontal mobility of 1-2 mm without vertical displacement.

The pre-operative radiograph of tooth 36 showed an irregular, poorly defined radiolucent area at the furcation, extending around both the mesial and distal roots. The radiolucency in the furcation

(A) (B)

Figure 1. (A) Clinical appearance of tooth 36 with a temporary filling seen from occlusal (B) Clinical appearance of tooth 36 showing significant gingival recession

Figure 2. Preoperative radiographs of teeth 36 reveal resorption and destruction of the periodontal ligament and surrounding alveolar bone

area suggested potential furcal involvement, while the radiolucent areas surrounding the roots indicated likely resorption and destruction of the periodontal ligament and surrounding alveolar bone (Figure 2). This pattern of bone loss and ligament damage suggests advanced periodontal breakdown, with possible involvement of both endodontic and periodontal structures.

Based on subjective and objective assessments, as well as preoperative radiography, the diagnosis for tooth 36 was pulp necrosis, a disease of periradicular tissue of nonendodontic origin. The treatment plan for this case involved root canal treatment for tooth 36. The final restoration was performed using direct resin composite. The prognosis for this case was doubtful to favorable with specific consideration of the patient's controlled systemic condition (polycythemia), which may influence healing and overall treatment response. This factor may collectively support a cautious yet optimistic outlook for restorative success.

During the initial visit, a comprehensive evaluation was conducted, including subjective and objective assessments, intraoral photography, radiography, diagnosis determination, and treatment planning. The patient was provided with detailed explanations of the treatment procedures, including costs and anticipated treatment duration. Informed consent was obtained from the patient.

Subsequently, root canal negotiation was performed using a #15 K-file, followed by crown-down preparation using ProTaper Next (Dentsply). This involved coronal flaring to achieve a straight-line access, and the root canal was prepared up to X4. Root canals were irrigated with 2.5% NaOCl solution (2.5 ml) followed by 17% EDTA solution for 1 minute, and then dried with sterile paper points. Root canal dressing was performed using calcium hydroxide (Calcipex II), and temporary cavity sealing was done with Caviton.

The working area was isolated with a cotton roll and saliva ejector to maintain a dry field. Temporary restoration on the occlusal surface was removed using an ultrasonic scaler, followed by access cavity preparation to the pulp chamber with an endo access bur and diamendo bur. The pulp chamber was then irrigated with 2.5% NaOCl and saline. Upon inspection and exploration of the canal orifices with an endodontic probe, three root canals were identified: mesiobuccal, mesiolingual, and distal (Figure 3). Initial exploration and debridement were performed using a #10 K-file. Root canal preparation was carried out using the crown-down technique with ProTaper Universal rotary files (Dentsply). Coronal flaring was done first using an SX file to create straight-line access, with 2.5% NaOCl irrigation between each file change. Final working length was determined by inserting a #10 K-file to the estimated working length, confirmed with an electronic apex locator and a periapical radiograph, showing working lengths of 18.5 mm for both the mesiobuccal and mesiolingual canals and 19 mm for the distal canal.

Figure 3 Tooth 36 showing three distinct root canals

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Further canal preparation continued with the crown-down technique using ProTaperr Universal files (S1, S2, F1, F2) for each canal. Irrigation with 17% EDTA, saline, and 2.5% NaOCl was conducted with each file change. Apical gauging with a #15 K-file confirmed adequate apical preparation, and final file preparation reached F2 for all canals. Final irrigation was performed using 17% EDTA followed by 2% chlorhexidine digluconate, with agitation using an endoactivator and saline as an intermediate irrigant. The canals were then dried with paper points and medicated with calcium hydroxide (Calcigel, Prevest DenPro). A temporary filling (Caviton, GC) was placed, and the patient was instructed to return for a follow-up.

During the second visit, seven days after the initial treatment, the patient reported no significant complaints. The temporary restoration remained intact with no signs of leakage. The root canals were dry and odorless. Gutta-percha cones were selected according to the final file size used for each root canal preparation. Obturation was carried out using single cone technique with bioceramic sealer (Ceraseal, MetaBiomed). Master cone was coated with sealer at the apical tip and inserted into the root canal to the working length of each mesiobuccal, mesiolingual, and distal canal. The gutta-percha was cut 2 mm below the orifice using a heated Heat Carrier Plugger and gently condensed. The cavity was cleaned of residual sealer, and glass ionomer (Fuji II LC, GC) was applied as a base material.

The restoration procedure involved several steps to ensure both functional and aesthetic outcomes. Unsupported dentin was removed from the cavity and a bevel was created at the cavosurface to improve the bonding area. The cavity was then etched with 37% phosphoric acid

(A) (B)

Figure 4. (A) Clinical condition of tooth 36 after root canal filling and composite resin restoration; (B) Radiograph of tooth 36 after root canal filling and composite resin restoration

(A) (B)

Figure 5. (A) Clinical condition of tooth 36 seen from occlusal (B) The clinical examination of tooth 36 from the buccal aspect revealed no signs of inflammation in the periodontal tissues

for 15 seconds, rinsed thoroughly, and air-dried. A bonding agent (Single Bond Universal, 3M ESPE) was applied and air-thinned with a syringe before being light-cured for 10 seconds. Following this, a bulk-fill flowable composite resin (SDR, Dentsply) was placed in the cavity and polymerized for 20 seconds. To achieve proper anatomical form, a packable composite resin (Palfique LX5, Tokuyama) was applied incrementally, with each layer light-cured for 20 seconds. The restoration was then shaped to match the tooth's anatomy, and occlusion was checked using articulating paper. Any traumatic occlusion was corrected. After the restoration was completed, the patient was instructed to return for a follow-up appointment one week later. The clinical and radiographic images of tooth 36, post-root canal filling and composite restoration, demonstrated successful integration and restoration of the tooth structure (Figure 4).

During the follow-up examination after 1 week of treatment, the patient reported no pain or discomfort and had no sensitivity to percussion. The patient also expressed no concerns regarding the composite resin restoration. The objective examination revealed that the restoration showed excellent marginal adaptation and proper anatomical contour. There were no signs of traumatic occlusion, and the restoration maintained its original color without any discoloration. The supporting periodontal tissues appeared healthy, with no signs of inflammation or other abnormalities. Overall, the restoration was well-integrated, and the treatment outcome was satisfactory, with no complications observed.

DISCUSSION

Polycythemia is classified as one of several myeloproliferative neoplasms (MPNs), a group of blood cancers arising from the uncontrolled clonal proliferation of blood cells, primarily red blood cells, due to mutations acquired in early hematopoietic cells. Primary polycythemia, often linked to mutations in the JAK2 gene, affects approximately 1 to 2 individuals per 100,000, with a prevalence rate of 22 per 100,000. Risk factors for polycythemia vera (PCV) include age, particularly over 60 years, and male gender, as men are more frequently affected than women.[7]

Polycythemia vera is characterized by neoplastic proliferation of bone marrow stem cells, producing an excessive number of circulating red blood cells. Although its exact etiology remains unclear, this overproduction leads to reduced blood flow, vascular stasis, and compromised circulation. The excessive red blood cell production in polycythemia vera increases the risk of thrombus formation, which can obstruct blood flow to critical organs such as the brain, heart, or peripheral vessels, leading to potential complications such as stroke, myocardial infarction, or peripheral ischemia.[3]

Secondary polycythemia is characterized by an increased red blood cell count as a physiological response to reduced oxygen levels, which stimulates the kidneys to produce more erythropoietin. This, in turn, promotes greater red blood cell production. Elevated carbon monoxide levels, often associated with tobacco smoking, can also contribute to this condition.[8]

The diagnosis of polycythemia is confirmed through laboratory tests that measure hemoglobin and hematocrit levels. Treatment typically involves addressing underlying causes, chemotherapy, and phlebotomy to reduce red blood cell levels. Oral lesions generally do not require local treatment; however, careful bleeding management is necessary following any oral surgical procedures.[9,10]

The primary treatment goals for managing polycythemia vera are to reduce the risks of thrombosis and hemorrhage while controlling blood counts. Treatment is determined by the patient's risk level. For low-risk patients (under 60 years old with no history of thrombosis), treatment typically includes low-dose aspirin and therapeutic phlebotomy to keep hematocrit levels below 45%. For high-risk patients, cytoreductive therapy is recommended. Options for this therapy include hydroxyurea, pegylated interferon alfa-2a, and ropeginterferon alfa-2b. Hydroxyurea (HU) is the most commonly used first-line cytoreductive medication for patients with high-risk polycythemia.[11,12]

In this case, the patient's tooth 36 presented with necrosis and horizontal bone loss. The presence of polycythemia added complexity to treatment due to the increased risk of bleeding and inflammation. However, the patient was considered at a low risk for polycythemia-related complications, as there was no history of thrombosis. The endodontic procedure proceeded as normal without the use of a rubber dam. In this case, the rubber dam was avoided to prevent potential gum ulcers caused by clamp placement.

The primary objective of endodontic therapy is to establish a clean root canal system through thorough disinfection, thereby enabling the achievement of a hermetically sealed three-dimensional filling. By achieving effective disinfection and sealing, endodontic treatment can minimize the risk of reinfection and promote healing of periapical and periodontal tissues. Proper irrigation techniques, combined with meticulous cleaning and shaping of the canal system, are essential to reduce inflammation in the surrounding periodontal area, thereby enhancing overall treatment outcomes and preserving the integrity of the tooth's supporting structures.[13]

In this case, periodontal surgery was not planned, with endodontic treatment prioritized as the initial therapeutic approach to reduce potential surgical complications. Should periodontal surgery be required, close coordination between hematologists and periodontists will be crucial, particularly for invasive procedures. Optimal preoperative parameters include maintaining a platelet count below 600,000, hemoglobin levels below 16 g/dl, hematocrit values between 42% and 52%, and normal blood volume. Effective management of polycythemia prior to invasive procedures is essential, as evidence indicates that 75% of patients with poorly controlled polycythemia vera experience bleeding or thrombotic complications.[14,15]

Unlike hemophilia or other bleeding disorders, nerve block anesthesia is preferred over multiple periodontal injections because it reduces the risk of hematomas or joint bleeding and fewer punctures are needed. Some studies, however, suggest using local anesthesia with a vasoconstrictor and an aspirating syringe when a nerve block is necessary. Atraumatic dental procedures can usually be done safely in patients with controlled polycythemia. For cases like pulpectomy, which may also result in bleeding, caution should be taken to minimize risks. In some cases, taking tranexamic acid 500 mg (four times a day for one day before the procedure) can prevent excessive bleeding. It is also important to monitor for delayed bleeding, which can occur 5 to 10 days after surgery, and follow up at least 10 days afterward.[14,16,17]

CONCLUSION

Polycythemia adds complexity to dental treatment due to heightened risks of bleeding, thrombus formation, and inflammation. As a myeloproliferative disorder, polycythemia vera results in elevated red blood cell production, which can lead to vascular complications. In the case presented, the patient's endodontic treatment focused on minimizing risks of bleeding or ulceration in the periodontal tissues. The patient's low-risk polycythemia status, with no thrombosis history, allowed for standard treatment with careful attention to maintaining periodontal health and preventing excessive bleeding. Should periodontal surgery become necessary, interdisciplinary collaboration with hematologists will be essential for optimizing preoperative blood parameters, reducing the likelihood of bleeding or thrombotic events. The endodontic approach, emphasizing thorough canal disinfection and sealing, aims to support periodontal healing and preserve the integrity of surrounding tissues, thus enhancing the overall prognosis for the affected tooth.

CONFLICT OF INTEREST

The authors declare no competing interests.

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