Dental Implant Placement in a Patient With Polycythemia Vera: A Case Report

Xiaona Wang, MDS[1]*
Xing Meng, MDS[2]

Polycythemia vera is a malignant myeloproliferative neoplasm. It is characterized by the proliferation of all 3 major hematopoietic cells, including erythrocytes, leucocytes, and platelets. The resultant hypervolemia and hyperviscosity cause patients with polycythemia vera to be at risk of bleeding and thrombotic complications. This article reports a rare case in which a patient with preexisting polycythemia vera at a dental clinic underwent dental implant placement and provides the possibility of dental implant placement with an excellent outcome for patients with polycythemia vera.

Key Words: polycythemia vera, myeloproliferative disease, dental implant, case report

Introduction

Polycythemia vera (PV) is a myeloproliferative disease classified as a chronic myeloproliferative disorder. PV is characterized by the proliferation of 3 major hematopoietic groups: erythrocytes, leucocytes, and platelets.[1–3] PV is a chronic Philadelphia chromosome (Ph)-negative myeloproliferative neoplasm (MPN), which also includes essential thrombocythemia (ET) and myelofibrosis (MF). The same gene mutation, Janus kinase 2 (JAK2), drives PV, ET, and MF, but the main characteristic of PV is an increase in red blood cell count.[4–6] An increased blood cell mass results in an increase in blood volume and hyperviscosity of the circulatory system in polycythemia vera patients; therefore, patients usually have thrombotic or hemorrhagic complications.[5,7,8]

Frequent physical symptoms include aquagenic pruritus, weight loss, diaphoresis, tinnitus, epistaxis, vertigo, fatigue, headache, dizziness, visual disturbances, plethora splenomegaly, and erythromelalgia.[6,9–11] The frequent presenting oral signs include spontaneous bleeding gums, glossitis and cheilosis.[9,12,13] Current treatment for PV is focused on preventing thromboembolic complications, decreasing thrombotic risk, and relieving symptoms.[6,10,14] Patients with PV were stratified into 2 thrombotic classes: low-risk patients ($<$ 60 years old without a history of thrombosis) and high-risk patients ($\geq$ 60 years old or with a history of thrombosis). Without contraindications, all patients are managed with phlebotomy and low-dose aspirin. High-risk or symptomatic low-risk disease should be treated with cytoreductive therapy.[4,15]

This article presents a case report of a patient with PV who underwent dental implant surgery and was restored with a fixed dental prosthesis on the implants.

Case Report

A 63-year-old Chinese woman with a complaint of tooth loss in the left mandibular posterior teeth region and decreased mastication beginning 5 years after dental extraction presented at our dental outpatient department. The patient was diagnosed with low-risk polycythemia vera based on her abnormally high erythrocyte count and her age in 2008, when she was 48 years old. The PV was stably controlled by a cytoreductive drug (hydroxyurea, 500 mg twice daily) and aspirin (100 mg once daily). According to her complete blood analysis, the patient also underwent regular therapeutic control of phlebotomy. The patient had regular follow-up appointments with her hematologist, and her hematological values were reasonably stable. Her medical history included cholecystectomy in 2013 and dental extractions in 2018 without prolonged postoperative hemorrhage. Intraoral examination revealed that the patient had missed teeth #35, #36, and #37. A 5-unit maxillary fixed bridge between teeth #13 and #17 normally functioned. A 2-unit combined crown on teeth #26 and #27 was fractured, and caries were noted on teeth #26 and #27. All of her teeth had normal mobility. Generally, the gingiva mildly receded and appeared mildly friable, bleeding on probing. The deep periodontal pocket was not noted. From the panoramic radiograph, generalized bone loss was not presented around the teeth. The patient underwent cone beam computerized tomography (CBCT) to evaluate residual bone width and height at the dentition defect site. A diagnostic evaluation through preoperative radiography revealed that this patient had enough bone mass for dental implant therapy to achieve the desired effect (Figures 1 and 2).

After consultation with a hematologist, the patient took a cytoreductive drug (hydroxyurea, 500 mg twice a day) and aspirin (100 mg once a day) as usual and underwent phlebotomy 2 weeks before dental implant surgery. The patient's hemoglobin was 129.0 g/L; red blood cell count was 5.92×10^{12}/L; hematocrit was 47.7%; and platelet count was 454×10^{9}/L. The thrombin time and activated partial thromboplastin time were within normal limits at 12.0 seconds and 31.1 seconds, respectively. She was administered cefixime dispersible tablets (5 grams) and tinidazole

[1] Department of General Dentistry, Ningbo Stomatology Hospital, Zhejiang, China.
[2] Department of Stomatology, The 82nd Group Military Hospital of the Chinese People's Liberation Army, Baoding, Hebei, China.
* *Corresponding author*, e-mail: Tina90520@163.com
https://doi.org/10.1563/aaid-joi-D-24-00046

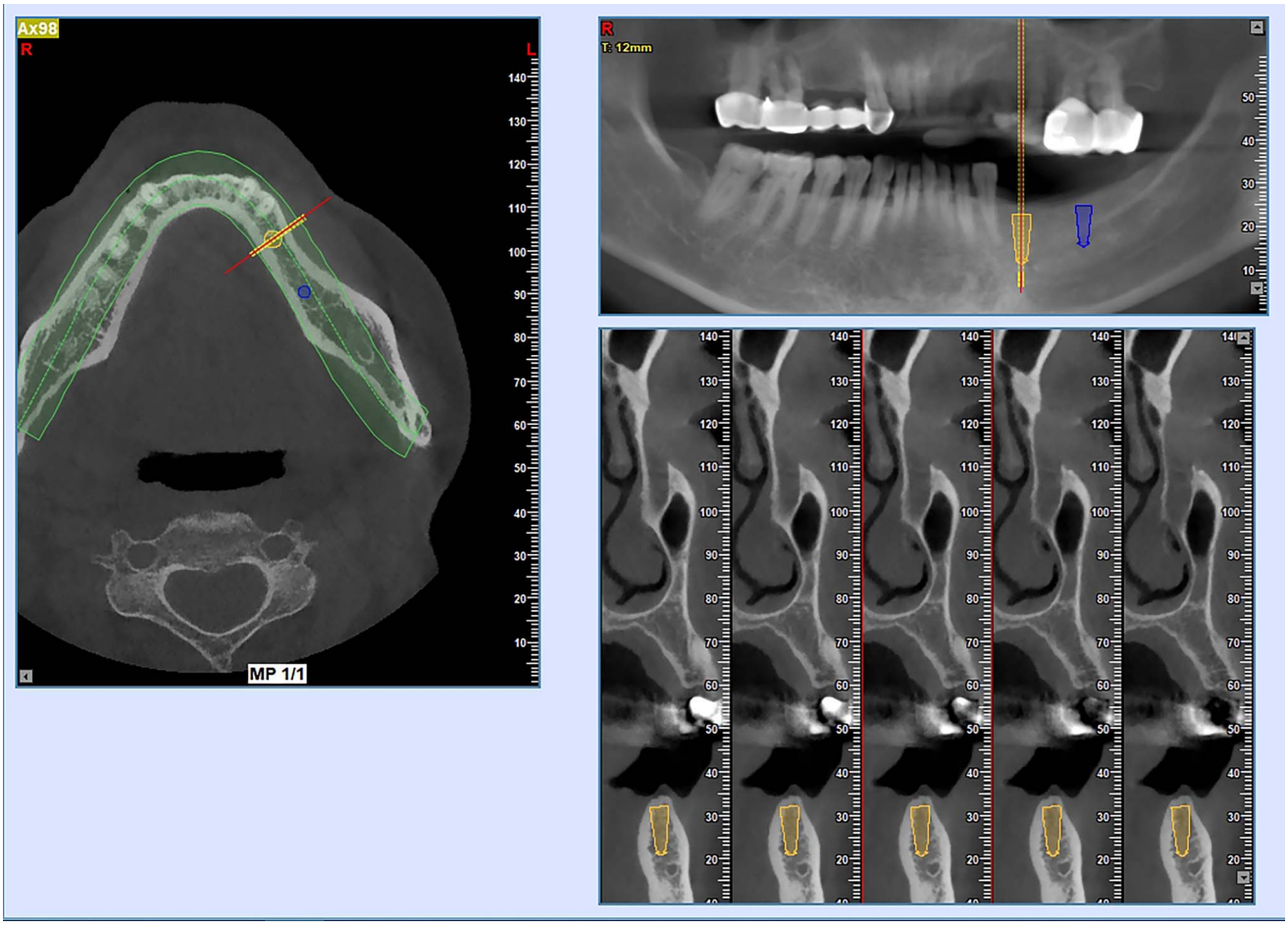

Figure 1. Preoperative CBCT coronal sections show preoperative virtual implant planning for position #35.

capsules (100 mg) as antibiotic drugs and diclofenac sodium dual enteric-coated capsule (75 mg) as an analgesic drug by mouth and gargled compound gargle solution chlorhexidine (5 mL) twice half an hour before dental implant surgery. Local anesthesia (atocaine epinephrine, 3.4 mL) was applied by single tooth anesthesia system (Dynamic Pressure Sensing Technology, Milestone Scientific Inc., Beijing, China). Gingival flap surgery was performed on the patient. Two implants (TSIII SA implant system, Osstem Implant Co., Ltd. -Gu, Seoul, Republic of Korea) were placed on positions #35 and #37 of the mandibular area. After the surgery, the interrupted sutures were well implemented with 4-0 synthetic absorbable sutures (Ethicon, Inc., USA) to prevent postoperative bleeding.

Postoperative panoramic radiography revealed that two implants were implanted at the appropriate sites (Figure 3). The patient's blood loss was less than 20 mL. The patient was treated under medical instructions with cefixime dispersible tablets (5 grams once a day) for 3 days, tinidazole capsules (100 mg twice a day) for 3days, and compound gargle solution chlorhexidine (5 mL three times a day) for 7 days after surgery. No intraoperative or postoperative complications occurred during the operation or at postoperative follow-ups after 1 day, 3 days, or 7 days. The stitches were removed 2 weeks later, and the wound in the mandibular area healed well. The panoramic film was taken 4 months after the operation. The results revealed that the osseointegration of 2 implants was well (Figure 4). Then, the implant impression was taken. After 3 weeks, dental implants were restored with a fixed dental prosthesis (Figure 5). After more than 4 months of follow-up, the implants and prosthesis remained stable without complications. The gingiva was in good condition, the occlusion was stable, and the patient complained of no discomfort. The panoramic film showed favorable osseointegration of the implants. Routine blood tests and coagulation function examinations were performed 4 months after the operation. The test showed that the patient's blood test results were similar to the preoperative conditions, and her coagulation function was normal.

Discussion

Polycythemia vera is a chronic myeloproliferative disease that usually progresses slowly with a favorable prognosis. At present, there are limited reports on oral treatment for patients with polycythemia vera, and few treatment-related severe complications have been reported. Before oral treatment, a stomatologist needs to consult a hemato-oncologist, classify the risk of the patient's disease according to the hematological test results, administer specialized treatment according to the patient's symptoms, and carry out oral treatment after effective control.[9–12]

The 2016 revised World Health Organization (WHO) diagnostic criteria for PV is composed of major criteria and minor criteria.

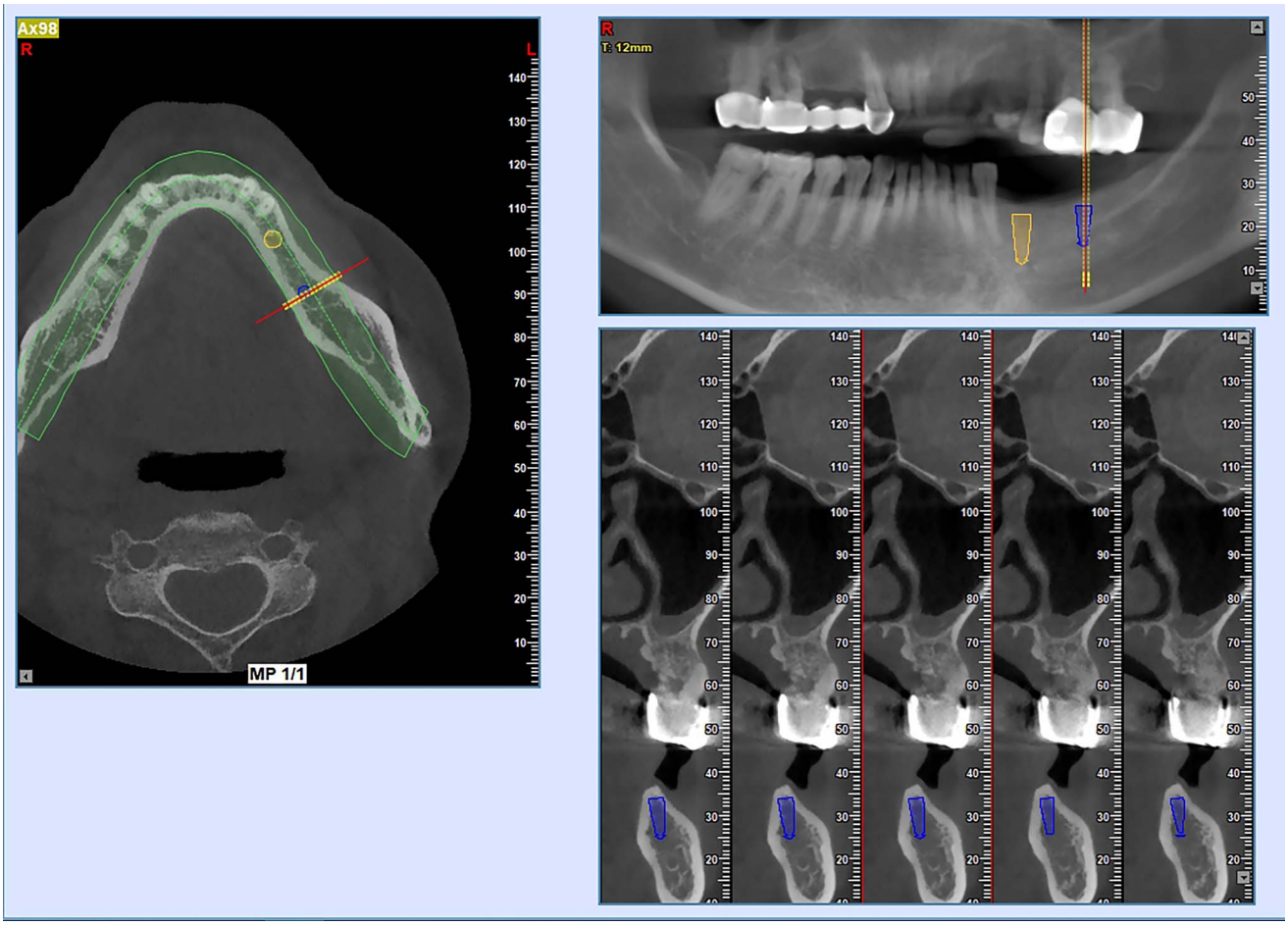

Figure 2. Preoperative CBCT coronal sections show preoperative virtual implant planning for position #37.

Patients would be diagnosed with PV when the first two major criteria and the minor criterion are present or all three major criteria are present. The major criteria included the following: (1) hemoglobin > 165 g/L (16.5 g/dL) in men or > 160 g/L (16.0 g/dL) in women or hematocrit > 49% in men or > 48% in women or an increased red blood cell mass (> 25% above normal); (2) bone marrow with trilineage proliferation with pleomorphic mature megakaryocytes; and (3) the presence of JAK2 mutation. The minor criterion is subnormal erythropoietin level.[4] Some scholars argue that the main diagnostic criteria for PV are increased red cell mass (RCM), decreased oxygen saturation, and splenomegaly.[7] The currently recommended treatments include low-dose aspirin, phlebotomy, and cytoreduction therapy. Low-dose aspirin alleviates microvascular symptoms and prevents the formation of primary thrombosis. Phlebotomy mitigates hyperviscosity of the circulatory system by keeping the hematocrit level below 45%. Cytoreduction therapy normalizes platelet and white blood cell count and decreases thrombotic complications. Hydroxyurea (HU) is included in the first-line cytoreductive treatment for patients with PV, and it is a bone marrow suppressive agent that impairs DNA synthesis.[13,16–19]

It is crucial to consider the surgical timing of patients with PV in case of thrombosis or hemorrhage during or after surgery, as well as the need for perioperative and postoperative management. In a paper by Tefferi, it is noted that it is necessary to maintain a hematocrit level below 45% and platelet count below 450×10^9/L before and after surgery; platelet count control might be performed with HU in low-risk patients, and low-molecular-weight heparin is advised to be used carefully in high-risk patients in addition to cytoreductive therapy.[20] The recommended laboratory values before surgery include a hemoglobin below 160 g/L, a hematocrit between 45% and 52%, and a platelet count of under $600 \times 10^3/mm^3$.[9] In this case, the patient's preoperative routine blood investigations met the requirements of the surgical recommended values mentioned above, and her preoperative coagulation function test was within the normal range. A previous study advocated that patients who continued the intake of aspirin during and after dental implant surgery did not increase the risk of postoperative bleeding.[21] Several studies have demonstrated that there is no increase in the occurrence of postoperative bleeding complications in patients taking anticoagulants before dental extractions. Therefore, antiplatelet therapy should not be interrupted before tooth extractions because the withdrawal of antiplatelet drugs and antiplatelet treatment exposes patients to the risk of thromboembolism.[22–25] In this case, the patient continued to take aspirin before and after dental implant surgery. In addition to the essential preoperative requirements above, phlebotomy and therapeutic control are recommended

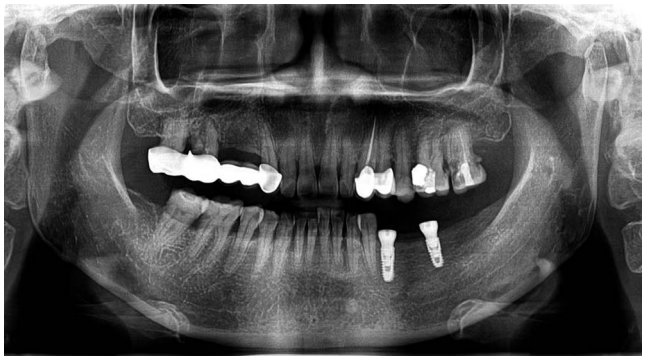

Figure 3. Postoperative panoramic tomography reveals 2 implants placed appropriately in positions #35 and #37.

for patients with PV for at least 2 months before routine alveolar surgery, and therapeutic and myelosuppressive control before major oral and maxillofacial surgery should be longer than 4 months.[12,26,27]

There are few academic papers about the dental management of patients with PV. Those published cases reported dental treatments in PV patients, which included periodontal therapy, tooth extraction, and removable prosthesis, and those dental treatments were noted without any severe perioperative or postoperative complications.[9–12] In this report, 2 implants were implanted in a PV patient with dentition defects at the dental clinic; after 4 months, 2 implants achieved favorable osseointegration, and the patient was given an implant-supported fixed partial denture without any thromboembolic complications. Intensive cooperation between the dentist and the hematologist is paramount for successful surgery. Several factors also play essential roles in the success of this case, such as strictly controlling surgical indications, performing minimally traumatic surgery for soft tissue and bone tissue, and working with well-experienced dentists. Furthermore, it is equally important to provide regular follow-up and appropriate anticoagulant administration to prevent postoperative bleeding. To avoid missing a diagnosis of PV, dental practitioners

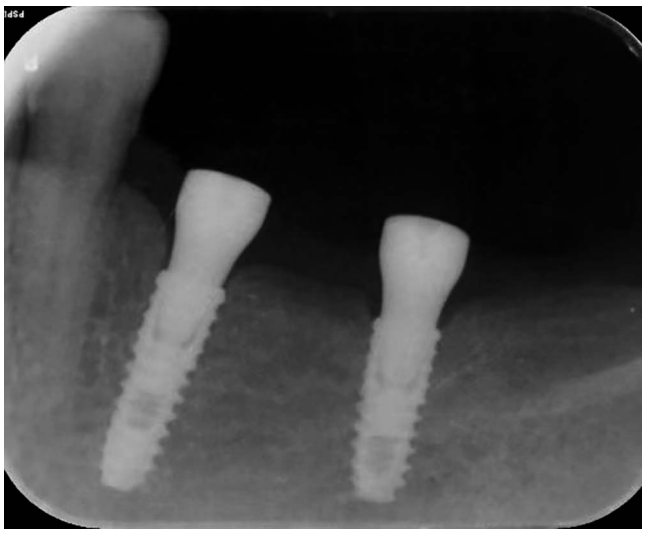

Figure 4. Intraoral X ray shows favorable osseointegration of 2 implants 4 months after the operation.

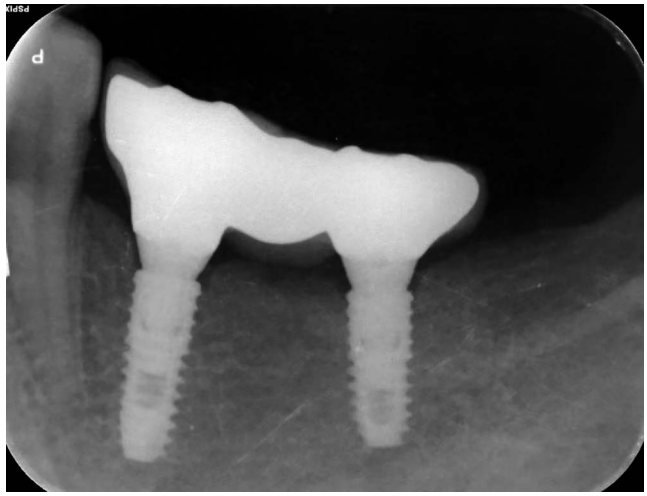

Figure 5. Intraoral X ray reveals the fixed all-ceramic bridge fit into the implants.

should especially enquire about the following aspects when recording medical history: (1) whether patients have ever had a history of hemorrhage or clots, (2) ask patients about their history of present illness and medication history, (3) make sure patients provide their recent blood tests and coagulation function reports.

Conclusion

In conclusion, patients with PV reach the appropriate hematological standard after phlebotomy and drug therapy; surgeons minimize intraoperative trauma as much as possible and adopt effective hemostatic methods for preventing intraoperative and postoperative complications; therefore, patients with PV can tolerate various dental treatments. In recent years, dental treatments for polycythemia vera patients include periodontal therapy, surgical tooth extraction, and removable partial denture restoration. This case report revealed that a patient with PV successfully underwent dental implant surgery, and it provides a treatment chance to perform dental implant therapy for patients with PV.

Acknowledgments

Xiaona Wang is in charge of concept and drafting article. Xing Meng is in charge of critical revision of article. The authors appreciate Mengjie Lin for patient management and Chengcheng Yin for reviewing the early drafts of this paper.

Notes

There is no conflict of interest related to this case report. There is no financial support for this case report. The author declares no conflicts of interest related to this case report.

The authors certify that all the management strategies, treatment plans, and treatment risk considerations have been explained to the patient, and they have obtained a consent form from her. In the form, the patient has given her consent for her clinical information to be reported in the journal. The authors assure the patient that her name will not be published.

References

1. Fox S, Griffin L, Robinson Harris D. Polycythemia vera: rapid evidence review. *Am Fam Phys*. 2021;103:680–687.
2. Tefferi A, Barbui T. Polycythemia vera and essential thrombocythemia: 2019 update on diagnosis, risk-stratification and management. *Am J Hematol*. 2019;94:133–143.
3. Putter JS, Seghatchian J. Polycythaemia vera: molecular genetics, diagnostics and therapeutics. *Vox Sang*. 2021;116:617–627.
4. Arber DA, Orazi A, Hasserjian R, et al. The 2016 revision to the World Health Organization classification of myeloid neoplasms and acute leukemia. *Blood*. 2016;127:2391–2405.
5. Iurlo A, Cattaneo D, Bucelli C, Baldini L. New perspectives on polycythemia vera: from diagnosis to therapy. *Int J Mol Sci*. 2020;21:5805.
6. Büyükaşik Y, Alİ R, Ar C, Turgut M, Yavuz S, Saydam G. Polycythemia vera: diagnosis, clinical course, and current management. *Turk J Med Sci*. 2018;48:698–710.
7. Stuart BJ, Viera AJ. Polycythemia vera. *Am Fam Phys*. 2004;69:2139–2144.
8. Tefferi A. Polycythemia vera: a comprehensive review and clinical recommendations. *Mayo Clin Proc*. 2003;78:174–194.
9. Badner VM, Lawrence C, Mehler S. Polycythemia vera: dental management considerations. *Spec Care Dentist*. 1991;11:227–230.
10. Hassan FW, Mohd N. Periodontal management in a primary polycythemia rubra vera patient: a case report. *Spec Care Dentist*. 2021;41:92–97.
11. Ruparelia PB, Ruparelia KP, Shirolkar R, Tripathi A. Chronic myeloproliferative disorders: a rarest case with oral manifestations and dental management. *J Indian Acad Oral Med Radiol*. 2012;24:155–157.
12. Carlson ER, Chewning LC. Polycythemia vera in an oral surgical patient. A case report. *Oral Surg Oral Med Oral Pathol*. 1989;67:673–675.
13. Spivak JL. How I treat polycythemia vera. *Blood*. 2019;134:341–352.
14. Stein BL, Verstovsek S. Prognostication and initiation of therapy in polycythemia vera: do we have it right? *Curr Hematol Malig Rep*. 2017;12:507–509.
15. Griesshammer M, Kiladjian JJ, Besses C. Thromboembolic events in polycythemia vera. *Ann Hematol*. 2019;98:1071–1082.
16. Marchioli R, Finazzi G, Specchia G, et al. Cardiovascular events and intensity of treatment in polycythemia vera. *N Engl J Med*. 2013;368:22–33.
17. Alvarez-Larrán A, Pereira A, Cervantes F, et al. Assessment and prognostic value of the European LeukemiaNet criteria for clinicohematologic response, resistance, and intolerance to hydroxyurea in polycythemia vera. *Blood*. 2012;119:1363–1369.
18. Evers D, Kerkhoffs JL, Van Egmond L, Schipperus MR, Wijermans PW. The efficiency of therapeutic erythrocytapheresis compared to phlebotomy: a mathematical tool for predicting response in hereditary hemochromatosis, polycythemia vera, and secondary erythrocytosis. *J Clin Apher*. 2014;29:133–138.
19. Barbui T, Passamonti F, Accorsi P, et al. Evidence- and consensus-based recommendations for phlebotomy in polycythemia vera. *Leukemia*. 2018;32:2077–2081.
20. Tefferi A, Vannucchi AM, Barbui T. Polycythemia vera: historical oversights, diagnostic details, and therapeutic views. *Leukemia*. 2021;35:3339–3351.
21. Tabrizi R, Khaheshi I, Hoseinzadeh A, Rezvanpour B, Shafie S. Do antiplatelet drugs increase the risk of bleeding after dental implant surgery? A case-and-crossover study. *J Oral Maxillofac Surg*. 2018;76:2092–2096.
22. Akhlaghi F, Khaheshi I, Amirhassani S, Tabrizi R. Do antiplatelet drugs increase the risk of bleeding after tooth extraction? A case-crossover study. *Int J Oral Maxillofac Surg*. 2017;46:1475–1478.
23. Broekema FI, van Minnen B, Jansma J, Bos RR. Risk of bleeding after dentoalveolar surgery in patients taking anticoagulants. *Br J Oral Maxillofac Surg*. 2014;52:e15–e19.
24. Napeñas JJ, Oost FC, DeGroot A, et al. Review of postoperative bleeding risk in dental patients on antiplatelet therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013;115:491–499.
25. Lu SY, Lin LH, Hsue SS. Management of dental extractions in patients on warfarin and antiplatelet therapy. *J Formos Med Assoc*. 2018;117:979–986.
26. Wasserman LR, Gilbert HS. Surgical bleeding in polycythemia vera. *Ann N Y Acad Sci*. 1964;115:122–138.
27. Wasserman LR, Gilbert HS. Surgery in polycythemia vera. *N Engl J Med*. 1963;269:1226–1230.