Asian Journal of Periodontics and Orthodontics
2025, Volume 5, Page No: 96-103
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Available online at: www.tsdp.net

ISSN: 3062-3499

Case Report

Unexpected Hemostatic Complications During Dental Implant and Mini-Screw Therapy in Von Willebrand Disease: Case Report

Cristina Mennitti[1]*, Silvia Paolucci[2], Angelo Russo[3], Edoardo Stellini[1]

[1]Unit of Oral Pathology, Department of Neurosciences, Section of Clinical Dentistry, University of Padova Teaching Hospital, 35128 Padova, Italy.
[2]Hemophilia Center, University of Padova Teaching Hospital, 35128 Padova, Italy.
[3]Unit of Implantology, Department of Neurosciences, Section of Clinical Dentistry, University of Padova Teaching Hospital, 35128 Padova, Italy.

***E-mail** ✉ cristinamenniti@gmail.com

Received: 27 April 2025; **Revised:** 17 September 2025; **Accepted:** 21 September 2025

ABSTRACT

Dental implants are routinely used to replace missing teeth, and orthodontic mini-screws are commonly applied to provide temporary anchorage for precise tooth movement. These procedures are frequently combined in comprehensive dental care. Although medical histories are generally reviewed before any intervention, undiagnosed bleeding disorders, such as Von Willebrand Disease (VWD), can create significant risks during invasive procedures like implant placement or mini-screw insertion. This report details a patient who underwent placement of dental implants and orthodontic mini-screws while having an unrecognized VWD. The case emphasizes the potential for intraoperative and postoperative bleeding, highlights the necessity of detecting hidden coagulopathies, and provides recommendations for managing such patients during and after surgical procedures. Careful preoperative evaluation, including focused inquiry into personal and family bleeding history, is crucial to reduce the likelihood of excessive bleeding in patients undergoing dental implant or mini-screw procedures.

Keywords: Orthodontic mini-screw, Dental implant, Prosthodontics, Von Willebrand Disease

How to Cite This Article: Mennitti C, Paolucci S, Russo A, Stellini E. Unexpected Hemostatic Complications During Dental Implant and Mini-Screw Therapy in Von Willebrand Disease: Case Report. Asian J Periodont Orthodont. 2025;5:96-103. https://doi.org/10.51847/BSQvnauZim

Introduction

Von Willebrand Disease (VWD) encompasses a range of bleeding disorders resulting from either a quantitative deficiency or functional impairment of the Von Willebrand factor (VWF) [1]. The overall prevalence of VWD in the population is estimated between 0.6% and 1.3% [2, 3]. Clinically relevant cases that require intervention, however, are much rarer, occurring in about 1 per 10,000 individuals. Type 1 VWD represents the majority of diagnosed cases, roughly 70–80%, making it the most common subtype, whereas Type 3 is exceedingly uncommon, affecting approximately 1 in 1,000,000 people. Due to often subtle manifestations, many affected individuals remain undiagnosed, which may lead to unnoticed bleeding complications during medical or dental procedures [4, 5].

Inheritance of VWD is most often autosomal dominant, though autosomal recessive patterns are observed in rare variants [6]. Depending on disease severity and type, patients may experience prolonged bleeding, reduced factor VIII activity, and defective platelet adhesion [6]. Type 1 usually presents with mild symptoms, yet severe hemorrhage can occasionally occur [7]. Blood group also influences VWF levels, with type O individuals typically having lower baseline concentrations than other blood types [7]. A definitive diagnosis requires multiple laboratory evaluations, as no single test can comprehensively assess VWF

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function [8, 9]. Standard testing involves measuring VWF antigen and activity, assessing platelet adhesion, and evaluating VWF-factor VIII interactions [9].

In dental practice, particularly for procedures like extractions or implant placement, managing patients with undiagnosed bleeding disorders such as VWD is challenging [10]. While acquired coagulopathies are usually detected through thorough medical histories, congenital disorders often remain asymptomatic until a bleeding event occurs. Although severe hemorrhagic events in dentistry are reported less frequently than in other surgical fields, they can still pose significant risks. Dental implants are widely used to restore missing teeth, yet their placement is complicated in patients with coagulation abnormalities [11]. In VWD, impaired clotting increases the risk of excessive intraoperative and postoperative bleeding. Despite the extensive use of dental implants, literature documenting cases of previously undiagnosed VWD remains limited [11–14].

This case report highlights the importance of identifying hidden bleeding disorders such as VWD in dental patients and emphasizes the necessity for clinicians to be prepared for unexpected hemorrhagic complications to ensure safe treatment outcomes.

Case report

In December 2021, a 25-year-old woman visited our private dental practice seeking comprehensive oral rehabilitation, primarily for the replacement of her missing lower right first molar (tooth 4.6) **(Figure 1)**. This tooth had been extracted five years earlier due to extensive decay. Her dental history also included multiple restorations and the removal of her lower right third molar (tooth 4.8).



a)



b)

Figure 1. Area of tooth loss following extraction of 4.6.

The patient reported no prior episodes of unusual mucocutaneous bleeding, joint hemorrhages, or excessive menstrual bleeding. She also stated that she had not experienced abnormal bleeding after previous dental extractions or minor occupational injuries. Her overall health was good, she maintained a healthy lifestyle, and she was a non-smoker. She did mention, however, that in 2018 she had developed significant bruising and bleeding after a dental scaling session, which required medical attention. At that time, coagulation studies including PT and PTT were normal, and no additional testing was performed.

During the dental examination, multiple carious lesions and existing restorations were noted, alongside gingival inflammation due to plaque and calculus buildup. The intraoral assessment revealed a plaque index (PI) of 60% and bleeding on probing (BOP) of 50%. Teeth 1.6 and 1.8 showed extrusion, likely as a result of missing teeth 4.6 and 4.8 **(Figures 2 and 3)**.

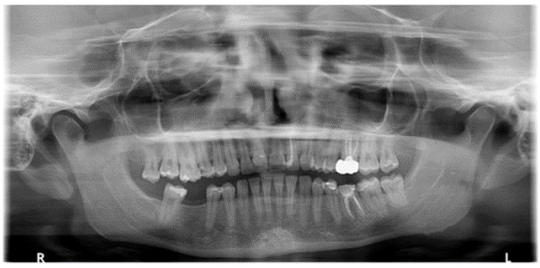


Figure 2. Pre-treatment panoramic radiograph.



a)



b)



c)



d)



e)

Figure 3. Intraoral images of the patient.

The initial treatment protocol involved professional dental cleaning and scaling, with maintenance visits scheduled every four months during the course of prosthetic and orthodontic therapy, to reduce PI and BOP. Restorative treatments were completed without notable bleeding complications. Subsequent assessments revealed PI and BOP had decreased to below 20%, indicating the patient was suitable for implant-supported rehabilitation at the edentulous site.

For the prosthetic plan, considering the overeruption of tooth 1.6 and the extrusion of tooth 1.8, the treatment team decided, in consultation with the orthodontist, to extract tooth 1.8 first. Following this, controlled intrusion of tooth 1.6 was planned to improve occlusal alignment prior to prosthetic restoration **(Figures 2 and 4)**.



a)



b)

Figure 4. Edentulous region illustrating overeruption of tooth 1.6.

In December 2021, a 25-year-old female sought treatment at our private clinic for restoration of a missing first lower right molar (tooth 4.6) **(Figure 1)**. The patient had previously undergone extraction of this tooth five years earlier due to decay and had received additional dental care, including restorations and the removal of tooth 4.8.

At the initial evaluation, no history of abnormal mucocutaneous bleeding, hemarthrosis, menorrhagia, or excessive hemorrhage following prior dental procedures or minor injuries was reported. The patient was otherwise healthy, followed a non-smoking lifestyle, and had no significant trauma history. She did, however, recall experiencing hematomas and substantial bleeding following a scaling procedure in 2018, which required medical attention. Hematologic tests at that time, including PT and PTT, were within normal limits, and no further investigation was performed.

Clinical examination revealed multiple caries, existing restorations, and gingivitis related to plaque and tartar buildup. The intraoral assessment showed gingival inflammation with a plaque index (PI) of 60% and bleeding on probing (BOP) of 50%. Additionally, teeth 1.8 and 1.6 appeared extruded, likely secondary to the absence of teeth 4.8 and 4.6, respectively **(Figures 2 and 3)**.

The treatment plan included repeated professional oral hygiene and scaling sessions every four months to reduce PI and BOP before initiating prosthetic and orthodontic interventions. After a dental cleaning and necessary restorations, no abnormal bleeding occurred, and follow-up indices dropped below 20%, confirming readiness for implant placement.

Due to overeruption of tooth 1.6 and extrusion of 1.8, the orthodontist recommended extraction of 1.8 followed by the intrusion of 1.6 to achieve proper occlusion **(Figures 2 and 4)**. Following the extraction in December 2021, initial healing was uneventful. However, ten days later, the patient noticed extensive bruising on her right arm. Laboratory tests were performed, yielding the following results:

- Platelet count: 238,000/µL
- PT INR: 1.07 (normal range: 0.80–1.20)
- APTT: 35.3 s
- APTT ratio: 1.12 (normal range: 0.80–1.18)
- Fibrinogen: 394 mg/dL

A CBCT scan of the 4.6 site was conducted to evaluate the alveolar ridge before implant placement. This imaging enabled precise assessment of bone density and quality, as well as the vertical distance from the ridge crest to the mandibular canal, ensuring safe implant positioning without compromising the inferior alveolar nerve [15].

The ridge in the 4.6 region was classified as Class 3 per Cawood and Howell [16], reflecting moderate resorption but maintaining a rounded, favorable shape. Despite partial bone loss, the ridge dimensions and bone quality were adequate for implant placement without requiring immediate augmentation **(Figure 5)**.

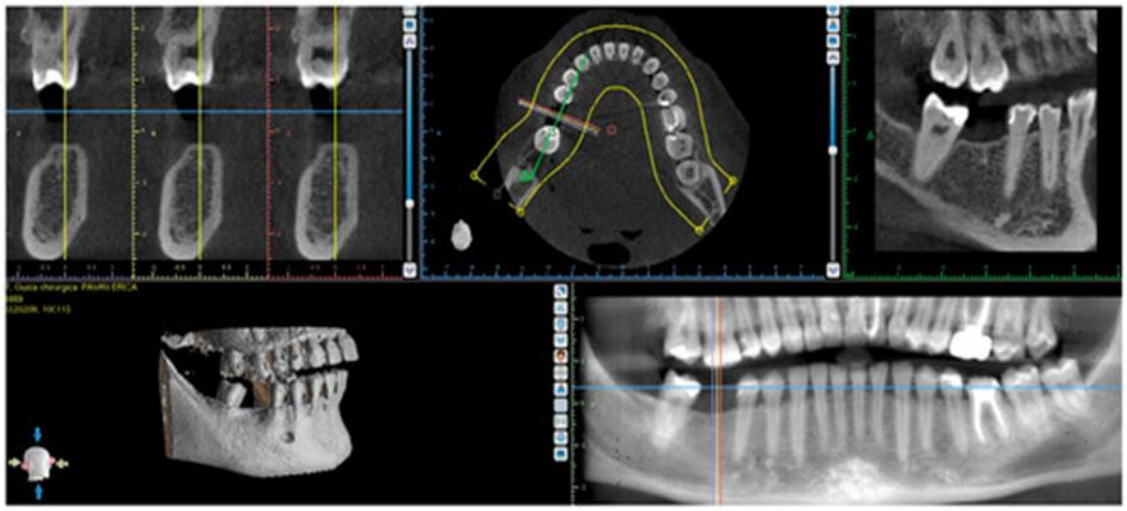


Figure 5. Preoperative CBCT of the patient before implant placement.

Significant buccal alveolar bone loss was detected, indicating that a connective tissue graft would be necessary alongside implant placement to restore the defect.

The treatment plan consisted of two stages. In the first stage, the implant screw was inserted. The second stage, scheduled four months later, involved uncovering the implant and augmenting the connective tissue using a roll flap approach **(Figure 6)**.

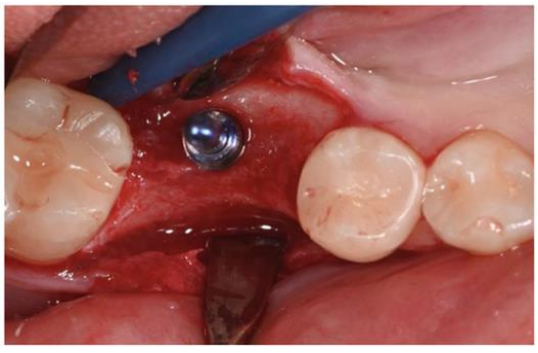


Figure 6. Preparation of the implant site with full-thickness flap elevation.

Prior to the procedure, the patient provided written and verbal consent. To prevent postoperative infection, 1 g of amoxicillin clavulanate was administered prophylactically [17]. Local anesthesia was performed using mepivacaine with adrenaline (1:100,000) via infiltration. A crestal incision allowed reflection of a full-thickness mucoperiosteal flap. After preparing the site with appropriate burs, a 4 × 10 mm bone-level implant (BIOMAX, Planegg, Germany) was placed. The flap was sutured with resorbable Vycril 5.0, and intraoral radiographs were taken to confirm correct positioning **(Figures 7 and 8)**.

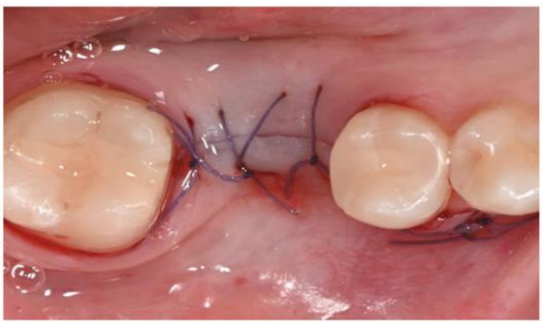


Figure 7. Suturing of the flap using resorbable material.

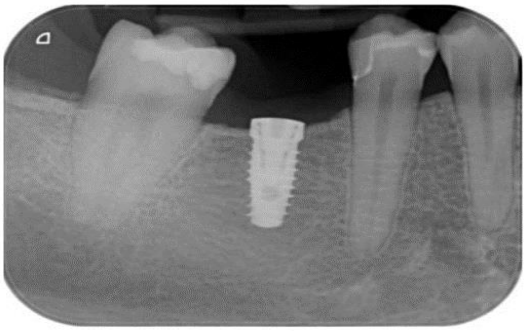


Figure 8. Intraoral radiograph for placement verification.

Next, two interradicular mini-screws for orthodontic purposes (8 mm × 1.5 mm, HDC, Vicenza, Italy) were positioned—one vestibularly between teeth 1.5 and 1.6 and one palatally between teeth 1.6 and 1.7—after infiltration of 1/5 cartridge (1.70 mL) of 2% mepivacaine with 1:100,000 adrenaline. An elastic power-chain was applied over the heads of both mini-screws, spanning the occlusal surface of tooth 1.6 **(Figure 9)**.



Figure 9. TAD-based intrusion mechanics.

Postoperative instructions included a cold-liquid diet, ice application for the first few hours, and avoidance of hot beverages. The patient was prescribed amoxicillin clavulanate (1 g) and ibuprofen (600 mg), and advised to rinse twice daily with 0.12% chlorhexidine digluconate.

After 24 hours, the patient experienced excessive bleeding at the implant site. Attempts to control it using direct pressure with non-resorbable gauze and local tranexamic acid were unsuccessful **(Figure 10)**. Immediate referral to a hematologist resulted in an oral tranexamic acid prescription of two 5 mL ampoules every 8 hours.

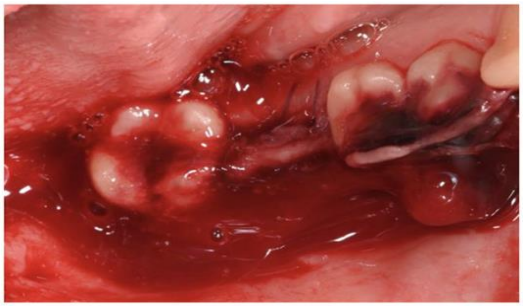


Figure 10. Postoperative bleeding at 24 hours.

Following the episode of heavy bleeding, coagulation testing was carried out to determine the patient's hemostatic status. The test outcomes were:

- Factor VIII (FVIII): 43% (normal: 50–200)
- von Willebrand factor (VWF) antigen, quantitative: 35% (normal: Group O: 48–160; Groups A, B, AB: 50–210)
- VWF Ristocetin cofactor (R:CoF), qualitative: 32.5% (normal: Group O: 44–165; Groups A, B, AB: 54–210)
- PFA-100 platelet function: CT/EPI > 300 (normal: 74–191), CT/ADP > 300 (normal: 57–152)

The measured FVIII, VWF antigen, and VWF R:CoF levels were below the reference ranges for an O-positive individual. The hematologist confirmed a diagnosis of Type 1 von Willebrand Disease (vWD). Retrospective bleeding assessment using the ISTH-BAT tool (https://practical-haemostasis.com/Clinical%20Prediction%20Scores/Formulae%20code%20and%20formulae/Formulae/Bleeding-Risk-Assessment-Score/ISTH_BAT_score.html, accessed 1 October 2024) resulted in a score of 6.

Other hematologic parameters, including complete blood count, platelet numbers, and aggregation studies, were within normal limits. Based on the findings, the following preventive measures were recommended:

- Avoid NSAIDs and acetylsalicylic acid; paracetamol or corticosteroids may be used if needed.
- For surgeries with high hemorrhage risk, administer an intravenous plasma-derived FVIII/vWF concentrate (e.g., Hemate P® or equivalent) at 20–100 U/kg every 24 hours.
- In the case of minor bleeding, oral tranexamic acid, two 500 mg tablets, three times daily for 3–6 days, is advised.

It was also recommended that family members potentially at risk undergo similar testing.

Six months later, the second stage of implant surgery was performed. The roll flap technique was applied to enhance keratinized tissue and manage the alveolar defect, supporting soft tissue stability and gingival contour around the implant. A healing abutment was placed, and the site was closed using 5-0 Vicryl sutures **(Figure 11)**.

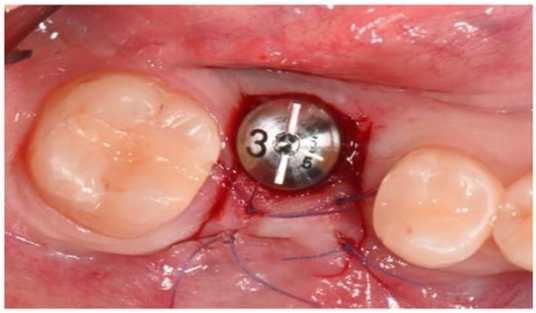


Figure 11. Second-stage procedure utilizing the roll flap technique.

Following the surgical intervention, the patient's care was guided by the hematologist's instructions for minor procedures. No bleeding complications were noted. After seven days, the sutures were removed, and a silicone impression was captured to create a provisional restoration.

A two-month tissue adaptation phase (Figure 12) preceded the placement of a porcelain-fused-to-metal crown over the implant (Figure 13). The implant located in the 4.6 region functioned as rigid anchorage to reposition tooth 4.7. For this purpose, two molar tubes and a 17 × 25 TMA sectional wire were employed, which allowed proper alignment, enhanced the space beneath the contact point, and facilitated effective hygiene maintenance around the site **(Figure 13)**.



Figure 12. Tissue adaptation period.



Figure 13. Definitive PFM crown positioned over the implant.

Von Willebrand disease (vWD) is the most commonly inherited bleeding disorder, yet it frequently remains undetected because symptoms are often mild and irregular. Individuals with type 1 vWD may show only occasional bleeding episodes, and routine coagulation testing can appear normal. The present case highlights a female patient whose bleeding disorder went unnoticed until she underwent implant surgery, resulting in severe postoperative hemorrhage that led to a formal diagnosis of vWD.

For many patients with previously unrecognized vWD, the first significant bleeding episode may occur during dental procedures, even when the procedures are considered minor, such as root canal therapy [18]. Remarkably, there are no reports in the literature describing the incidental detection of vWD following implant placement or the use of orthodontic mini-screws.

The manifestation of type 1 vWD is often intermittent, and standard coagulation tests frequently fail to detect abnormalities [19]. While global tests like bleeding time can sometimes be prolonged, their poor reproducibility limits their usefulness in routine preoperative screening [20]. In this case, the patient's isolated bleeding episode did not repeat in other surgical contexts, and her previous medical history included no surgical procedures, which explains why a bleeding disorder was not initially suspected.

The patient's O-positive blood group may have contributed to her reduced von Willebrand factor (vWF) levels [21]. ABO blood type affects baseline VWF, with individuals having type O blood generally exhibiting lower levels than those with A, B, or AB types. Genetic factors influence VWF clearance, and type O individuals have a shorter half-life of circulating VWF, which can worsen bleeding tendencies in those with vWD. In this patient, her blood type may have intensified the severity of postoperative bleeding [21, 22].

It is not clear whether medications administered perioperatively influenced the hemorrhage. NSAIDs, particularly acetylsalicylic acid (ASA), are known to impair platelet function, whereas the role of ibuprofen in this context is less clearly defined [22].

In dental practice, clinicians should carefully assess bleeding risk. Routine coagulation testing in unselected patients is generally discouraged [22]. A thorough review of prior bleeding episodes and medication history is often a more reliable predictor of postoperative hemorrhage than indiscriminate laboratory screening.

Gingival bleeding can be caused by systemic coagulation disorders, such as hemophilia, platelet abnormalities, or vWD, but it may also result from local factors like plaque-induced gingivitis or untreated periodontal disease. In patients with vWD, gingival inflammation can trigger bleeding without necessarily reflecting a systemic bleeding disorder [23].

Although unstructured bleeding histories are not reliably predictive of postoperative hemorrhage, structured assessments can be useful. The ISTH Bleeding Assessment Tool (ISTH-BAT) retrospectively evaluates 14 bleeding domains, with higher scores correlating with inherited bleeding disorders [24]. However, some studies indicate that the tool may not consistently identify patients at risk of future hemorrhagic events [23].

In this case, ISTH-BAT was administered after the bleeding episode and resulted in a score of 6, suggesting a considerable risk for recurrent bleeding. The patient also exhibited cutaneous bruising. Importantly, while ISTH-BAT provides an estimate of bleeding risk, it is not specific to vWD, and further specialized testing was required to confirm the diagnosis.

Conclusion

Prior to any surgical procedure, it is crucial to carefully evaluate patients for potential bleeding tendencies through detailed and targeted questioning about their bleeding history. The ISTH-BAT can serve as a valuable screening tool to identify those who might be susceptible to hemorrhagic complications. In cases where the tool indicates abnormal findings, additional specialized hematology tests should be carried out to confirm or rule out an underlying bleeding disorder.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

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