**Invasive Dental Care in Anticoagulated Patients: An Integrative Review**

.

**ABSTRACT**

|  |
| --- |
| Dental care for anticoagulated patients is an increasingly important area, requiring precise protocols to ensure the safety and effectiveness of procedures. This study aims to analyze the safe use of anticoagulants in invasive dental procedures through an integrative review. Articles were searched in the Scielo and PubMed databases, published from January 2019 to June 2024, using the English descriptors "bleeding risk" AND "anticoagulant therapy" AND "dental extraction," resulting in 20 articles. After applying inclusion and exclusion criteria, 9 articles were selected. In summary, the reviewed articles provide essential information on the non-discontinuation of anticoagulant medication before invasive dental procedures, adjunctive hemostatic options for bleeding control, and differences between newer and older anticoagulants. This evidence supports the need for individualized approaches in the dental management of patients on anticoagulant therapy, aiming to ensure safe and effective outcomes. |

*Keywords: Bleeding risk; Anticoagulant therapy; Dental extraction*

**1. INTRODUCTION**

Anticoagulants play a crucial role in contemporary medicine, being essential for the prevention and treatment of thromboembolic events associated with various cardiovascular conditions, especially in patients with prosthetic heart valves and atrial fibrillation [1,2]. These medications act by modulating blood coagulation and platelet aggregation, reducing clot formation and preventing serious events such as myocardial infarction, stroke, and deep vein thrombosis [3].

Dental care for anticoagulated patients requires specific precautions, since anticoagulation used for the prevention of thromboembolic events increases the risk of bleeding during dental procedures [20]. Understanding hemostatic techniques, the pharmacology of the medications, and the essential laboratory tests to evaluate the patient's coagulation status becomes crucial for the dental surgeon. [20]

Patients undergoing anticoagulant therapy are frequently subjected to invasive dental procedures, such as tooth extractions and periodontal surgeries. Therefore, it is imperative that the professional carefully assess the risk and benefit of each procedure, take appropriate preoperative measures, and be prepared with a range of options to manage potential [4].

Hemorrhagic compromise or thromboembolic episodes are particularly relevant in patients under anticoagulant therapy, especially those using vitamin K antagonists such as warfarin [5]. Although it is the main anticoagulant drug, warfarin presents several disadvantages, including a narrow therapeutic index, delayed onset of action, and numerous drug and food interactions, requiring regular monitoring and dosage adjustments [6].

Therefore, it is crucial to evaluate these anticoagulants through tests such as the INR (International Normalized Ratio) for warfarin, which is used to monitor blood coagulation levels. For example, if the result is within the range of 2.5 to 3.5, surgical procedures can be considered. If the INR is above 3.5, the procedure may need to be performed in a hospital setting. However, if the INR is greater than 5, any procedure is contraindicated [3].

Heparin is an anticoagulant that has been used for over 90 years. It is considered one of the main anticoagulant drugs in the world due to its ability to prevent the formation of blood clots, also known as thrombi. Additionally, its pharmacokinetics include rapid absorption in the body, which contributes to its effectiveness. [20] However, despite its benefits, the literature highlights several disadvantages associated with its use. Among these adverse effects are hemorrhages, osteoporosis, eosinophilia, skin reactions, and alterations in liver function tests [7].

Furthermore, in heparin therapy, it is essential to monitor the Activated Partial Thromboplastin Time (aPTT). This test is used to assess the effectiveness of blood coagulation by measuring the time required for blood to clot in response to substances that activate the coagulation system. This evaluation is crucial for determining the coagulation status, providing vital information about its normality or abnormality [8].

Due to the limitations of vitamin K antagonists, new oral anticoagulants (NOACs) such as edoxaban, dabigatran, and rivaroxaban have been introduced. As evidenced in the study conducted by NOACs have demonstrated efficacy comparable to or even superior to warfarin. These therapies have proven capable of preventing approximately two-thirds of stroke or systemic embolism cases in patients diagnosed with atrial fibrillation (AF).[7]

However, there is a diversity of opinions within both the medical and dental communities regarding the appropriate approach to ensure patient safety. In dentistry, invasive procedures such as dental surgeries, implant surgeries, and periodontal surgeries are common. The literature provides evidence indicating that most dental surgical procedures can be safely performed without a significant risk of severe bleeding, as long as the International Normalized Ratio remains within therapeutic levels [9,10].

The careful management of anticoagulated patients during dental procedures is of utmost importance, as it aims to prevent bleeding and thromboembolic complications. In the context of oral health promotion, a thorough understanding of the risks and benefits associated with this therapy is essential to ensure safe and effective treatments. This study aims to analyze the safe use of anticoagulants in invasive dental procedures through an integrative review.

**2. material and methods**

**2.1 Study Design**

In this study, an integrative review was conducted based on scientific articles retrieved from the following databases: Scielo and PubMed.

**2.2 Research Question**

The guiding question used was: What are the recommended approaches regarding the safe use of anticoagulants in invasive dental procedures?

**2.3 Inclusion criteria**

Articles published from January 2019 to June 2024, in English and Portuguese, using the descriptors “Bleeding Risk”, “Anticoagulant Therapy”, “Dental Extraction” and their corresponding terms in Portuguese: “risco de sangramento”, “terapia anticoagulante”, and “cirurgia dentária”.

The Boolean operator used was AND with the following combinations: “bleeding risk AND anticoagulant therapy AND dental extraction”.

**2.4 Exclusion criteria**

Articles published outside the selected period, classic works on the study of anticoagulants in dentistry, other literature reviews, research not available in Portuguese or English, duplicate articles in the databases, and studies that do not directly address the guiding question.

**2.5 Collection procedures**

The data collection was conducted by a single researcher during the months of February and March 2024. Using English descriptors, articles published between January 2019 and June 2024 were examined.

A total of 20 articles were identified, with 15 from PubMed and 5 from Scielo. The process of identification, selection, eligibility, and inclusion is shown in Figure 1.



**Fig. 1. Flowchart of the inclusion of selected articles**

*Source: Authors (2024)*

**3. results and discussion**

A comparison was made between the articles included in the sample, selected based on specific inclusion criteria, to determine their relevance to the main question and to identify any elements not pertinent to the scope of the study. The results of this analysis are presented in Table 1.

**Table 1. Results obtained from the databases**

|  |  |  |  |
| --- | --- | --- | --- |
| **Title** | **Author / Year** | **Objective** | **Results** |
| Usefulness of platelet-rich fibrin as a hemostatic agent after dental extractions in patients receiving anticoagulant therapy with factor Xa inhibitors: a case series | Mourão *et al*. 2019 | To evaluate the clinical outcomes of applying platelet-rich fibrin (PRF) for hemostasis after tooth extraction in patients receiving anticoagulant therapy with factor Xa inhibitors. | The study involved 25 patients.The results showed that the application of PRF was effective in stopping bleeding after tooth extraction in all patients undergoing therapy with factor Xa inhibitors, with no reported complications.Furthermore, soft tissue healing was favorable during suture removal, 10 days after the procedure, with no signs of infection or delayed healing. |
| Should we fear direct oral anticoagulants more than vitamin K antagonists in simple single tooth extraction? A prospective comparative study | Berton *et al*. 2019 | To evaluate the effect of oral anticoagulants on perioperative and postoperative bleeding during simple single-tooth extractions, comparing patients treated with vitamin K antagonists (VKAs) and patients taking direct oral anticoagulants (DOACs). | The study included 65 patients in each group, totaling 130 tooth extractions. The groups were similar regarding preoperative, perioperative, and postoperative variables. Only one patient in the DOACs group and two in the VKAs group required medical evaluation due to post-extraction bleeding. There was no statistically significant difference in postoperative bleeding between the groups (*P* = .425), suggesting that interruption of DOAC therapy is not necessary for simple extraction of a single tooth. |
| Risk of postoperative bleeding following dental extractions in patients on antithrombotic treatment | Al Sheef *et al*. 2020 | To investigate the incidence of postoperative bleeding after tooth extractions in adult patients using antithrombotic medications in Saudi Arabia. | Out of a total of 539 patients, only 1.7% of extraction appointments were associated with postoperative bleeding.The highest risk of bleeding was observed in patients receiving warfarin (3.88%), while those using clopidogrel did not have a significant bleeding risk.Women showed the highest bleeding rate, with most of them using NOACs. |
| Postoperative bleeding after dental extraction among elderly patients under anticoagulant therapy | Inokoshi *et al*. 2021 | Analyze and compare the bleeding that occurs after tooth extraction in elderly patients with health problems who were using anticoagulant medications. | The study involved 232 patients.The incidence of postoperative bleeding varied with the type of anticoagulant: rivaroxaban (32.4%), apixaban (18.2%), warfarin (17.3%), edoxaban (5.7%).Dabigatran did not result in postoperative bleeding.Analyses indicated a higher risk with rivaroxaban compared to edoxaban or dabigatran. |
| Bleeding Complications in Anticoagulated and/or Antiplatelet-Treated Patients at the Dental Office: A Retrospective Study | MartinezMoreno *et al*. 2021 | Evaluate hemorrhagic complications in anticoagulated patients treated with antiplatelet agents after simple tooth extractions over a period of 4 years. | In 418 tooth extractions, five severe hemorrhagic complications occurred in three patients (2.11%). Of the five events, four occurred in patients treated with NOACs (1.68%) and one occurred in a patient anticoagulated with acenocoumarol (0.42%; *P* = .003). |
| Tranexamic acid and bleeding in patients treated with non-vitamin K oral anticoagulants undergoing dental extraction: The EXTRACT-NOAC randomized clinical trial | Ockerman *et al*. 2021 | Evaluate the postoperative outcomes of patients who underwent tooth extractions and used a 10% tranexamic acid (TXA) mouthwash or a placebo. | In the study, 106 patients received TXA (mean age 74.8 years; 81 men) and 112 received placebo (mean age 72.7 years; 64 men).In the TXA group, there were 46 cases of bleeding, while in the placebo group, 85 cases were recorded.It was concluded that TXA does not seem to reduce the rate of bleeding during or immediately after the procedure, but it may reduce bleeding at later stages and in cases of multiple teeth extractions. |
| Is L-PRF an effective hemostatic agent in single tooth extractions? A cohort study on VKA and DOAC patients | Berton *et al*. 2023 | Evaluate the efficacy of L-PRF as a hemostatic agent in patients undergoing treatment with vitamin K antagonists (VKAs) or direct oral anticoagulants (DOACs) who required a simple extraction of a single tooth. | A total of 112 patients (59 in the DOACs group and 53 in the VKAs group) were included.Postoperative bleeding occurred in nine patients (17%) in the VKAs group and nine patients (15.3%) in the DOACs group.None of the patients required medical support for bleeding management.Seven days after the surgery, no cases of post-extraction complications were reported. |
| Platelet-rich fibrin ensures hemostasis after single-tooth removal under factor Xa inhibitors - a clinical prospective randomized split-mouth study | Kyyak *et al*. 2023 | Compare the local hemostatic effect of platelet-rich fibrin (PRF) inserted into the extraction socket in patients using factor Xa inhibitors (FXa), also known as direct oral anticoagulants (DOACs), with a gelatin sponge (GS), compared to the therapeutic standard without interruption of oral anticoagulant therapy. | Twenty-one patients and 42 teeth were evaluated, and in 67% of cases, mild postoperative bleeding was controlled 30–90 minutes after extraction, with no subsequent bleeding. There was no difference between the PRF and GS groups in terms of bleeding events, nor among the medications rivaroxaban, apixaban, and edoxaban (all *P* > .15). |
| Risk of post-operative bleeding after dentoalveolar surgery in patients taking anticoagulants: a cohort study using the common data mod | Lee *et al*. 2024 | Evaluate the factors that increase the likelihood of bleeding after dentoalveolar surgery in patients who are using anticoagulant medications. | A total of 537 patients were studied, of whom 35 (6.5%) experienced postoperative bleeding. Among these, 21 (8.6%) continued anticoagulant therapy, while 14 (4.8%) discontinued treatment. The type of anticoagulant used (*P* = .037), tooth extraction with bone grafting (*P* = .016), and type of implant (*P* = .032) were associated with bleeding. In the group of patients who maintained anticoagulants, atrial fibrillation (OR = 6.051) and the use of vitamin K inhibitors (OR = 3.679) significantly increased the risk of bleeding. |

*Source: Authors (2024)*

Among healthcare professionals, there is often a discussion about whether or not to interrupt the use of oral anticoagulants before invasive dental procedures. Although it is a common belief that discontinuation may reduce the risk of hemorrhages or thromboembolic events, recent studies suggest that there is no advantage in suspending the medication before these procedures. On the contrary, this may increase the risk of thromboembolic and hemorrhagic events [7,8].

Research supports this conclusion, highlighting that discontinuing the medication before dental surgeries is not recommended [4,11]. Berton et al. examined simple tooth extractions in several patients, of whom a minority experienced postoperative bleeding, which was not severe, indicating that discontinuation of the medication is unnecessary [11]. Similarly, in the studies by Al Sheef et al., out of a total of 539 patients undergoing dental extractions, only a minority experienced postoperative bleeding, most of whom were using warfarin [4].

It is also observed that there are similar opinions regarding whether or not to suspend the medication [10]. However, five cases of severe hemorrhage occurred, which were related to the type of medication. In this study, these hemorrhages occurred in patients who were using new oral anticoagulants, unlike the case reported by Al Sheef et al. [4], where most hemorrhages occurred in patients using warfarin, one of the most classic vitamin K antagonists worldwide.

Therefore, the appropriate conduct is to maintain the use of the medication before invasive dental procedures. The mentioned studies support this recommendation, emphasizing that discontinuation is an inadequate measure that may pose risks to the patient [4,7,8,10,11].

Another commonly discussed topic is the choice between traditional oral anticoagulants, such as warfarin and heparin, and new oral anticoagulants, such as dabigatran, rivaroxaban, and edoxaban. According to the studies, warfarin, a vitamin K antagonist, was associated with higher rates of postoperative bleeding [4,8].

Traditional anticoagulants have been widely recognized and used for many years. However, with advancements in the medical field, there is a growing question about their suitability for contemporary practices. This is due to the development of new oral anticoagulants in recent years, aimed at offering more modern, safer, and more effective alternatives to these older medications.

However, contradicting these findings, another study demonstrated that rivaroxaban, a new oral anticoagulant, predominantly showed the highest bleeding rates, surpassing even vitamin K antagonists [7]. On the other hand, patients using edoxaban and dabigatran had satisfactory results, with only a minimal proportion experiencing bleeding with edoxaban and no patients experiencing bleeding with dabigatran.

Regarding the choice between traditional anticoagulants and new oral anticoagulants (NOACs), some studies suggest that NOACs may be a safer option, with lower postoperative bleeding rates compared to warfarin [8,10]. However, it is important to note that results may vary among different NOACs. While some, such as rivaroxaban, may present higher bleeding rates compared to others, it is notable that dabigatran showed excellent results, with zero reported cases of bleeding [6,7].

Berton et al. compared postoperative bleeding rates in patients using NOACs and vitamin K antagonists, and the results showed no significant differences, being quite similar [11]. Thus, it can be noted that NOACs perform better than conventional anticoagulants, as postoperative bleeding rates are lower; in some cases, they are similar, but overall, NOACs show better results.

After invasive procedures, especially in patients under treatment with anticoagulant medications, the risk of postoperative bleeding increases. To mitigate this concern, hemostatic options are available, such as platelet-rich fibrin (PRF), tranexamic acid, and hemostatic gelatin sponge. These solutions are used to control and reduce the risk of bleeding, providing a safer and smoother recovery for patients.

According to the findings of Mourão et al. and Berton et al., who investigated the effectiveness of PRF, favorable results were achieved [15,12]. Mourão observed that, in patients undergoing tooth extractions while under treatment with NOACs, the use of PRF resulted in no postoperative bleeding and favorable healing, with no signs of infection or late complications [15]. On the other hand, the results of Berton partially diverged from those of Mourão [12].

Despite the different results, Berton et al. recorded postoperative bleeding in a minority of patients, both in the NOAC group and in the vitamin K antagonist group. However, it is important to note that the incidence of bleeding was low relative to the total number of surgeries performed [12].

Other options for hemostatic control were also investigated. For example, one study analyzed the use of 10% tranexamic acid mouthwash [5], while another evaluated PRF or gelatin sponge [13]. Both studies were conducted on patients undergoing invasive procedures while under treatment with VKAs or NOACs.

Ockerman et al. conducted a study comparing tranexamic acid mouthwash with a placebo rinse. The results revealed that patients who used 10% tranexamic acid had significantly less bleeding than those who received the placebo, highlighting the favorable effectiveness of this mouthwash [5]. However, although tranexamic acid does not appear to reduce the bleeding rate during or immediately after the procedure, it proved effective in the postoperative period by reducing bleeding.

Kyyak et al. conducted a comparative study between PRF and gelatin sponge after surgical procedures. The results indicated that both have similar hemostatic effectiveness. For patients who experienced mild bleeding after surgery, the bleeding was controlled between 30 to 90 minutes after the extraction, with no subsequent recurrence [13]. Consequently, it was possible to note that both PRF and gelatin sponge presented comparable hemostatic effects, as there was no discernible difference in their performance.

Significant factors regarding oral anticoagulants and their effects in dentistry are highlighted. A crucial issue was the frequent doubt about whether to suspend the medication before invasive dental procedures, such as dental surgeries.

Additionally, VKAs and NOACs were analyzed. Although conventional anticoagulants have been used for decades, when compared to the new ones, it is observed that VKAs still have satisfactory performance and may be superior in some specific cases, as demonstrated in a study where rivaroxaban showed a higher risk of bleeding compared to warfarin [7]. However, in general, NOACs demonstrated superior performance, with a lower incidence of bleeding, especially in patients treated with dabigatran [6].

Furthermore, complementary strategies to reduce the risk of bleeding in patients using anticoagulants after invasive procedures were explored. PRF and tranexamic acid mouthwash stand out, having shown positive results in controlling postoperative hemorrhage [5,12,13,15].

The dental protocol for anticoagulated patients recommends not suspending the medication before invasive procedures. In more complex situations, the use of hemostatic agents is suggested as an adjunct for more effective hemorrhagic control, especially in multiple extractions. The choice between VKAs or NOACs varies depending on each case, and it is still difficult to determine the ideal option. Thus, it is essential to conduct further clinical studies to evaluate which anticoagulant medication is most appropriate in different scenarios.

**4. Conclusion**

 The analyzed studies provide a solid foundation of information regarding the use of oral

anticoagulants in dentistry, particularly in relation to invasive procedures. They emphasize the

importance of maintaining continuous medication use prior to dental procedures, rather than

discontinuing it, as the latter may lead to complications such as hemorrhages and thromboembolic events. Furthermore, they explore hemostatic options as adjuncts in the prevention of postoperative bleeding and compare the advantages and disadvantages of conventional anticoagulants with the newer anticoagulants. In this way, these evidence-based

practices offer greater safety and efficacy in the treatment of these patients, ensuringsatisfactory outcomes and minimizing risks.

**Consent (where ever applicable)**

All authors declare that ‘written informed consent was obtained from the patient (or other

approved parties) for publication of this case report and accompanying images. A copy of

the written consent is available for review by the Editorial office/Chief Editor/Editorial Board

members of this journal.

**References**

1. Statman BJ. Perioperative management of oral antithrombotics in dentistry and oral surgery: Part 1. **Anesth Prog**. 2022;69(3):40–47.

2. Minervini G, Romano A, Mariani P, Runci M, Cervino G, et al. The effectiveness of chitosan as a hemostatic in dentistry in patients with antiplatelet/anticoagulant therapy: systematic review with meta-analysis. **BMC Oral Health**. 2024;24(1):1–12.

3. Barbosa LM, Silva RB, Freitas AM, Gomes ER, Costa LF, et al. Protocolo de tratamento cirúrgico de pacientes em uso de anticoagulante e antiagregante plaquetário. **Res Soc Dev**. 2020;9(9):e670997726.

4. Al Sheef M, Gray J, Alshammari A. Risk of postoperative bleeding following dental extractions in patients on antithrombotic treatment. **Saudi Dent J.** 2020;33(7):511–517.

5. Ockerman A, Liesenborghs A, Verhamme P, Sas A, Vanhaverbeke M, et al. Tranexamic acid and bleeding in patients treated with non-vitamin K oral anticoagulants undergoing dental extraction: the EXTRACT-NOAC randomized clinical trial**. PLoS Med**. 2021;18(5):e1003601.

6. Andrade MVS, Nunes DN, Oliveira PA, Santos LC, Silva Júnior OC, et al. Evaluation of the bleeding intensity of patients anticoagulated with warfarin or dabigatran undergoing dental procedures. **Arq Bras Cardiol. 2018**;111(3):394–399.

7. Inokoshi M, Yoshida Y, Okamoto A, Tanaka Y, Ochi H, et al. Postoperative bleeding after dental extraction among elderly patients under anticoagulant therapy. **Clin Oral Investig**. 2020;25(4):2363–2371.

8. Lee JY, Kim YJ, Lee JS, Jang EJ, Park JH, et al. Risk of post-operative bleeding after dentoalveolar surgery in patients taking anticoagulants: a cohort study using the Common Data Model. **Sci Rep**. 2024;14(1):1–10.

9. De Stefano F, Balsano C, Corvo A, Filippi A, Franzoni F, et al. Current use of oral anticoagulation therapy in elderly patients with atrial fibrillation: results from an Italian multicenter prospective study—The ISNEP Study. **J Pers Med**. 2022;12(9):1419.

10. Martínez-Moreno E, García-Vera MC, González-Pacheco F, Domínguez-Sánchez JJ, Sanz M, et al. Bleeding complications in anticoagulated and/or antiplatelet-treated patients at the dental office: a retrospective study. **Int J Environ Res Public Health**. 2021;18(4):1609.

11. Berton F, Costantinides F, Polizzi E, Guida L, Di Lenarda R, et al. Should we fear direct oral anticoagulants more than vitamin K antagonists in simple single tooth extraction? A prospective comparative study. **Clin Oral Investig. 2**019;23(8):3183–3192.

12. Berton F, Costantinides F, Sivolella S, Di Lenarda R, Stacchi C, et al. Is L-PRF an effective hemostatic agent in single tooth extractions? A cohort study on VKA and DOAC patients. **Clin Oral Investig**. 2023;27(6):2865–2874.

13. Kyyak S, Mozul S, Chomok L, Semenova L, Kurhan D, et al. Platelet-rich fibrin ensures hemostasis after single-tooth removal under factor Xa inhibitors — a clinical prospective randomized split-mouth study. **Clin Oral Investig.** 2023 Oct 21.

14. Chahine J, Khoudary MN, Nasr S. Anticoagulation use prior to common dental procedures: a systematic review. **Cardiol Res Pract**. 2019;2019:1–13.

15. De Almeida Barros Mourão CF, Javid K, Borie E, Ghensi P, Scombatti de Souza SL, et al. Usefulness of platelet-rich fibrin as a hemostatic agent after dental extractions in patients receiving anticoagulant therapy with factor Xa inhibitors: a case series. **Oral Maxillofac Sur**g. 2019;23(3):381–386.

16. Lazăr A, Ilea A, Alb C, Călin M, Moldovan M, et al. State of the art regarding anticoagulant and thrombolytic therapy in dental procedures. Rom **J Morphol Embryol**. 2019;60(2):403–410.

17. Lupi SM, Rodriguez y Baena A. Patients taking direct oral anticoagulants (DOAC) undergoing oral surgery: a review of the literature and a proposal of a peri-operative management protocol. Healthcare (Basel). 2020;8(3):281.

18. Manfredini M, Gualerzi A, Zanghì G, Nicolò M, Bartolucci R, et al. Comparative risk of bleeding of anticoagulant therapy with vitamin K antagonists (VKAs) and with non-vitamin K antagonists in patients undergoing dental surgery. **J Clin Med.** 2021;10(23):5526.

19. Martins JR, Nhuch J. Simplificando o tratamento de paciente em uso de rivaroxabana através da cirurgia guiada – relato de caso. **Full Dent** **Sci**. 2019;10(40):24–29.

20. Mendes ES, Albuquerque DS, Silva AR, Fernandes P, Araujo BL, et al. Cuidados que o cirurgião-dentista deve tomar no momento de tratar cirurgicamente um paciente em uso de anticoagulantes ou antiagregantes plaquetários. **Rev Flum Odontol**. 2021;2(58):81–90.

21. Osasu YM, Cooper R, Mitchell C. Patients’ and clinicians’ perceptions of oral anticoagulants in atrial fibrillation: a systematic narrative review and meta-analysis. **BMC Fam Pract**. 2021;22(1):1–15.

22. Samulak-Zielińska R, Dembowska E, Lizakowski P. Dental and medical problems. **Dent Med Probl**. 2019;56(3):291–298.