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Local Hemostatic Management of Simple and Surgical Dental Extractions in Patients Receiving Antiplatelet and Anticoagulant Therapy: A Narrative Review

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Abstract:

- ***Background:***
Antithrombotic therapy is increasingly common in dental patients and creates a practical need to balance postoperative bleeding against potentially severe thromboembolic events associated with inappropriate medication interruption.

- ***Objective:***
To critically review perioperative assessment, antithrombotic drug classes, conventional local hemostasis, tranexamic acid, chitosan-based dressings and platelet-rich fibrin (PRF) for simple and surgical extractions.

- ***Review Approach:***
This expanded narrative review integrates major dental guidance and selected clinical trials and systematic reviews. It is not a systematic review; no exhaustive search, formal risk-of-bias grading or meta-analysis was conducted.

- ***Synthesis:***
Most low-risk dental extractions can be performed without routine antithrombotic interruption when meticulous local hemostasis is available. Higher-bleeding-risk procedures require drug-specific planning. Tranexamic acid may reduce selected delayed bleeding outcomes; chitosan is promising for rapid local control; PRF offers a biological scaffold with possible healing benefits, although heterogeneous methods limit comparative conclusions.

- ***Conclusion:***
Risk-stratified treatment, atraumatic surgery, pressure, socket packing, sutures and appropriate follow-up remain the foundation of safe care. Newer agents should be viewed as adjuncts rather than substitutes for clinical judgment.

Keywords: *Dental Extraction; Oral Surgery; Anticoagulants; Antiplatelet Drugs; Tranexamic Acid; Chitosan; Platelet-Rich Fibrin; Postoperative Bleeding.*

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I. INTRODUCTION

Dental extraction is a frequent intervention in patients receiving chronic antiplatelet or anticoagulant medication for atrial fibrillation, venous thromboembolism, mechanical heart valves, coronary artery disease or cerebrovascular prevention. The clinical dilemma is not merely whether a socket will bleed: it is whether changing an effective systemic therapy might expose the patient to stroke, stent thrombosis or another serious vascular event. Bleeding after an extraction is generally visible and amenable to local treatment, whereas thromboembolic complications can be unpredictable and potentially catastrophic [1,2].

Current practice has moved away from blanket medication discontinuation toward individualized assessment of procedural bleeding risk, medication characteristics and thrombotic vulnerability. Guidance emphasizes the value of pressure, local packing and suturing, with attention to the distinction between a single uncomplicated extraction and procedures involving flap elevation, osteotomy or multiple adjacent sockets [1,2].

This review focuses on the clinical interface between systemic antithrombotic therapy and local surgical hemostasis. Particular attention is given to the differing mechanisms and evidence bases for tranexamic acid (TXA), chitosan and PRF. The intention is to support practical decisions, not to rank these agents using comparisons that the published literature cannot reliably sustain.

➢ *Scope and Narrative Review Approach*

The manuscript is a narrative synthesis of clinical guidance and selected peer-reviewed research relevant to dental extraction under antithrombotic treatment. Sources include the American Dental Association clinical resource, the 2022 Scottish Dental Clinical Effectiveness Programme (SDCEP) guidance, randomized studies and systematic reviews of hemostatic measures, and recent clinical investigations of chitosan and PRF [1–11].

Publications were selected for their direct relevance to perioperative dental decision-making, representation of major antithrombotic classes, and coverage of conventional and emerging hemostatic materials. The search was not designed to be exhaustive, no prespecified eligibility criteria were registered, and neither formal study-quality scoring nor pooled statistical analysis was performed. Consequently, this article must not be described as a systematic review or used to claim a quantified comparative ranking of products.

The evidence is discussed by clinical domain, with distinctions between guideline recommendations, randomized comparisons, observational findings and mechanistic hypotheses. When study populations, endpoints or product protocols differ, comparisons are explicitly qualified.

➢ *Physiology of Extraction-Site Hemostasis*

The extraction socket contains a complex vascular and tissue environment. Immediate vessel constriction is followed by platelet adhesion and aggregation, generation of thrombin, conversion of fibrinogen to fibrin and subsequent clot stabilization. The resulting clot provides a temporary barrier against further bleeding and a scaffold for inflammatory cell migration, granulation tissue formation and subsequent bone and soft-tissue repair.

Antiplatelet agents primarily modify platelet activation or aggregation, whereas anticoagulants reduce the activity of coagulation factors or thrombin generation. Both can influence the early socket clot, but neither automatically implies uncontrollable bleeding. Local pressure helps approximate wound surfaces, and mechanical packing or sutures can protect the clot while endogenous hemostasis proceeds [1,2].

Fibrinolysis is also relevant. Salivary exposure, mechanical disruption and local fibrinolytic activity may contribute to delayed oozing. Antifibrinolytic therapy addresses this process rather than reversing systemic anticoagulation. The distinction helps explain why a topical product may improve selected bleeding endpoints without eliminating all postoperative bleeding events [4].

➢ *Antithrombotic Medication Classes*

Antiplatelet drugs include aspirin and P2Y12 inhibitors such as clopidogrel, prasugrel and ticagrelor. Aspirin inhibits thromboxane-dependent platelet activation; P2Y12 inhibitors interfere with ADP-mediated signaling. Dual antiplatelet therapy may be prescribed after coronary intervention and should not be altered without assessment of the cardiovascular indication and timing of stent placement [1,2].

Vitamin K antagonists such as warfarin inhibit the synthesis of vitamin K-dependent coagulation factors. Their effect is assessed with the international normalized ratio (INR). A recent INR within the acceptable range specified by applicable guidance is essential to treatment planning; clinicians should not generalize thresholds across all procedures or ignore a history of unstable anticoagulation [2,7,8].

Direct oral anticoagulants (DOACs) include factor Xa inhibitors apixaban, rivaroxaban and edoxaban and the direct thrombin inhibitor dabigatran. Unlike warfarin, routine INR testing does not measure their anticoagulant effect. Renal function, dosing schedule, time since the last dose and procedural bleeding risk are important variables, especially when considering any drug-specific dose timing adjustment [2].

Patients may also receive low-molecular-weight heparin or combined antiplatelet and anticoagulant therapy. Such regimens warrant careful medication reconciliation. The reason for treatment should always be documented before any discussion of alteration, because the thrombotic risk is driven by the underlying disease as well as the medication.

➢ *Patient-Specific Preoperative Assessment*

A structured history should identify the precise medication, dose, frequency, last administration and indication; previous thrombosis or postoperative bleeding;

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recent cardiovascular events; renal or hepatic dysfunction; anemia or thrombocytopenia; and all additional prescription or nonprescription agents. Particular attention should be given to nonsteroidal anti-inflammatory drugs and combination antithrombotic regimens [1,2].

The physical examination and dental assessment should determine the number and location of teeth, periodontal inflammation, anticipated socket size, need for flap elevation or bone removal, and the feasibility of direct compression. A single mobile tooth with uncomplicated access differs materially from several impacted teeth requiring extensive surgical exposure.

Laboratory testing should be targeted. For warfarin, a suitable INR result is used according to current guidance; for DOACs, routine INR is not a reliable surrogate for drug exposure. Platelet count or additional medical testing may be relevant when a coexisting disorder is suspected, but indiscriminate laboratory testing cannot replace a detailed history [2].

Coordination with the prescribing physician is especially important when treatment modification is being considered, when a patient has a recent coronary stent or thromboembolic event, or when advanced organ dysfunction and combination therapy complicate decision-making. The objective of consultation is to resolve a specific management question, not simply to transfer routine dental decisions to another clinician.

- *Procedural Bleeding Risk and Extraction Complexity*

Bleeding risk is shaped by the amount of tissue injury, size and number of sockets, extent of flap elevation, osteotomy, surgical duration and access for compression. Procedures should be classified using the relevant guidance rather than assuming that every extraction carries the same risk [2].

Low-risk care may be feasible with uninterrupted DOAC therapy. For procedures with a higher risk of bleeding complications, SDCEP recommends medication-specific consideration of missing the morning dose of apixaban or dabigatran or delaying the morning dose of rivaroxaban or edoxaban, within the conditions specified in its guidance. This is a conditional recommendation based on very low-certainty evidence, and it is not a blanket instruction for every patient or every extraction [2].

When clinically reasonable, staging treatment into smaller appointments can reduce the number of simultaneously exposed sockets and simplify postoperative observation. Early-day scheduling allows time to verify stable hemostasis and address problems before the clinic closes. Operative technique should remain atraumatic even when an advanced dressing is available.

- *Conventional Local Hemostatic Measures*

Firm direct pressure with sterile gauze is the most accessible first-line intervention. Pressure must be sustained rather than repeatedly interrupted to inspect the socket. Clinicians should identify a focal bleeding source, evaluate the clot and assess whether the patient can maintain compression after discharge.

Suturing can approximate gingival margins, retain an absorbable dressing and reduce exposure of the clot to mechanical trauma. The choice of suture pattern depends on tissue mobility and socket geometry; excessive tension can compromise perfusion and wound healing. Packing materials such as absorbable gelatin sponge, oxidized regenerated cellulose or collagen provide mechanical support and can be used with sutures when appropriate [1,2,6].

Conventional measures are often combined, which creates a challenge for comparative research: an observed reduction in bleeding may reflect pressure duration, suture placement, socket packing or their interaction. Investigators should document co-interventions and avoid attributing an entire clinical outcome to a single material.

- *Tranexamic Acid: Mechanism and Clinical Evidence*

Tranexamic acid is a synthetic lysine analogue that inhibits plasminogen activation and fibrin breakdown. Its local use aims to stabilize the existing clot without necessarily changing the patient's systemic antithrombotic regimen. Published dental protocols vary in concentration, application method, frequency and duration; a specific formulation should be used only according to available products and institutional practice [4,6].

The multicenter randomized EXTRACT-NOAC trial evaluated a 10% TXA mouthwash against placebo in patients taking non-vitamin K oral anticoagulants. Among 218 participants in the full analysis set, any post-extraction bleeding occurred in 26.4% in the TXA group and 28.6% in the placebo group (relative risk 0.92; 95% confidence interval 0.60–1.42; P = 0.72). The primary endpoint was not significantly reduced. However, delayed bleeding and bleeding after multiple extractions were lower in the TXA group, suggesting that effects may differ by bleeding timing and procedural context [4].

A systematic review of local measures reported favorable findings for TXA mouthwash compared with placebo in vitamin K antagonist-treated patients, but evidence was insufficient to establish superiority over all other local agents [6,12]. These observations should not be conflated with universal efficacy across DOACs, antiplatelet drugs, single-tooth procedures and extensive surgery.

Clinically, TXA may be considered as one component of a multimodal local strategy, especially when delayed oozing is a concern. The clinician should distinguish mild blood-stained saliva from persistent bleeding requiring reassessment, and should not use TXA as a substitute for adequate mechanical control.

- *Chitosan-Based Hemostatic Dressings*

Chitosan is a cationic polysaccharide-derived biomaterial. Its positively charged surface can interact with blood components and support local hemostatic plug

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formation. Product architecture, composition and application pressure vary substantially, so results from one commercial dressing cannot automatically be transferred to all chitosan formulations.

A 2025 clinical study involving 102 patients and 204 extraction sites with altered coagulation profiles compared chitosan dressing plus pressure with gauze pressure alone. Hemostasis within 10 minutes was reported at 83.1% of test sites and 18.8% of control sites; mean hemostasis times were 15.10 ± 12.88 and 45.20 ± 20.62 minutes, respectively. The cohort included patients on anticoagulants as well as patients with other coagulation-related conditions, limiting direct extrapolation to a single drug class [10].

Another prospective randomized investigation in antiplatelet-treated patients reported shorter median time to hemostasis with chitosan than with cotton gauze. Although these findings support interest in rapid local control, variation in baseline bleeding risk, comparator treatment and measurement protocols complicates indirect comparisons with TXA or PRF [11].

Chitosan is best regarded as a potentially useful adjunct for prompt local hemostasis. Future research should specify dressing type, amount applied, duration of compression, need for reapplication, late bleeding and adverse events.

- *Platelet-Rich Fibrin: Biological Rationale And Evidence*

Platelet-rich fibrin is an autologous fibrin matrix obtained from centrifuged blood without the routine addition of anticoagulant in common preparation protocols. It contains a fibrin network with platelets and leukocytes and may serve as a biologically active scaffold. Preparation systems differ in rotor geometry, relative centrifugal force, time and tube properties; reporting only revolutions per minute does not ensure reproducibility.

PRF has been investigated both as a local hemostatic aid and as a material potentially supporting postoperative soft-tissue healing. These are distinct outcomes. A material that improves patient comfort or socket epithelialization does not necessarily provide the shortest time to immediate hemostasis.

Katz and colleagues reviewed 11 studies examining PRF for dental extraction in patients receiving antiplatelet or anticoagulant medication. The studies reported adequate hemostasis but were too heterogeneous for quantitative synthesis. The authors discussed potential advantages over sutures alone and possible healing benefits, while emphasizing that variation in methods prevented definitive superiority claims [3].

Autologous PRF also requires venipuncture, equipment, a trained team and a suitable clinical workflow. Patient acceptance, anemia, urgent procedural timing and practical infection-control requirements should be considered. PRF should not be presented as an alternative to careful medication assessment or conventional surgical control.

- *Comparative Interpretation: TXA, Chitosan and PRF*

The three materials act through different biological or physical pathways. TXA primarily reduces fibrinolysis; chitosan supports local blood–material interaction and plug formation; PRF supplies a fibrin scaffold with potential regenerative properties. These differences create opportunities for individualized selection, but do not prove that any agent is universally superior.

The 2023 systematic review and meta-analysis by Mahardawi and colleagues found fewer postoperative bleeding events when local hemostatic agents were used compared with conventional measures (risk ratio 0.62; 95% confidence interval 0.44–0.88). Subgroup findings were limited by small study numbers and heterogeneous products [5,9].

An important methodological caution is that “time to hemostasis,” “bleeding within 24 hours,” “delayed bleeding,” “reintervention,” and “wound healing” are not interchangeable outcomes. Trials should report each separately. Indirectly comparing a rapid-hemostasis study of chitosan with a healing-focused PRF study risks producing a misleading product hierarchy.

When selecting an adjunct, clinicians should consider the dominant clinical goal: immediate bleeding control, prevention of delayed bleeding, support for tissue recovery, material availability, cost, and compatibility with the planned operation.

- *Postoperative Instructions and Recurrent Bleeding*

Before discharge, the clinician should document satisfactory hemostasis, explain expected mild oozing and provide written instructions. Patients should be advised to protect the socket, avoid vigorous rinsing or manipulation immediately after surgery, and know whom to contact if bleeding persists. Instructions must be understandable and realistic for the patient’s home circumstances.

If bleeding recurs, the first step is sustained direct pressure. Continued bleeding warrants clinical reassessment to identify a focal vessel, unstable clot, loose packing or wound disruption. Local re-packing, suturing or another adjunct may be appropriate. Severe or persistent bleeding, hemodynamic symptoms or inability to maintain oral intake requires urgent medical evaluation [1,2].

Analgesic prescribing deserves particular attention. Nonsteroidal anti-inflammatory drugs may increase bleeding risk or interact with antithrombotic therapy; choices should reflect comorbidity, concomitant medication and appropriate dosing. Patients should not independently stop prescribed antithrombotic therapy in response to minor postoperative oozing.

- *Special Populations and Clinical Complexities*

Chronic kidney disease may alter the pharmacokinetics of some DOACs and may independently impair platelet function. Advanced liver disease can affect synthesis of multiple hemostatic proteins and may complicate

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interpretation of routine laboratory tests. Both conditions require a broader assessment than medication name alone.

Diabetes mellitus, smoking, poor plaque control and untreated odontogenic infection can influence postoperative wound recovery. Older adults frequently have polypharmacy and reduced physiologic reserve. In these groups, it is particularly important to separate bleeding endpoints from healing outcomes and to plan appropriate follow-up.

Patients receiving dual antiplatelet therapy, or combined anticoagulant and antiplatelet treatment, may have elevated bleeding risk but also substantial thrombotic risk if treatment is altered. Recent stent placement, recent stroke or venous thromboembolism, and mechanical valves are examples in which liaison with the prescribing specialist is essential before contemplated medication changes [1,2].

- *Clinical Decision Pathway*

First, verify the drug regimen and indication, including the timing of the last dose and any relevant recent cardiovascular event. Second, assess patient-related bleeding factors and classify the planned extraction as lower or higher bleeding risk using established guidance. Third, determine whether routine care is appropriate or whether medical liaison, staging or a different treatment setting is needed.

Fourth, prepare local measures before beginning surgery: gauze, an appropriate socket dressing, sutures and a plan for re-evaluation. Fifth, use atraumatic technique, confirm adequate hemostasis before discharge and provide clear written advice. Sixth, ensure that recurrent bleeding can be assessed promptly and that the patient knows when urgent care is necessary.

This sequence is not a substitute for the full SDCEP algorithm or local policy. It is a conceptual framework to reduce omission of critical safety steps [2].

- *Evidence Gaps and Priorities for Future Research*

Existing research is limited by small samples, mixed antithrombotic populations, variable surgical complexity and inconsistent definitions of clinically important bleeding. Trials often permit multiple concurrent hemostatic measures, making it difficult to isolate a product effect. Timing of bleeding assessment also differs markedly across studies.

Future controlled investigations should prespecify a primary bleeding endpoint, distinguish immediate and delayed events, document need for professional reintervention, and record thromboembolic outcomes. Stratification by medication class, renal function, extraction complexity and number of sockets would improve generalizability.

For chitosan, studies should report dressing characteristics and compression protocol. For PRF, centrifugation should be described using relative centrifugal force and other reproducible parameters. Head-to-head studies should include conventional best-practice local hemostasis in all groups, so that new materials are assessed as genuine adjuncts rather than compared against inadequate baseline care.

II. CRITICAL DISCUSSION

The central message across major guidance and much of the clinical literature is that dental teams should not reflexively discontinue antithrombotic treatment. A modest increase in controllable socket bleeding may be preferable to exposing a high-risk patient to avoidable systemic thrombosis. Nevertheless, this principle does not imply that every medication schedule is identical or that complex surgical extraction requires no adjustment [1,2].

TXA provides a particularly instructive example of the need to interpret endpoints carefully: EXTRACT-NOAC did not demonstrate a significant difference in the proportion of patients with any bleeding, yet certain delayed and multiple-extraction outcomes favored TXA [4]. Selective reporting of favorable secondary outcomes without acknowledging the negative primary result would exaggerate certainty.

Chitosan trials report promising rapid hemostasis, but populations and comparators differ, and the reproducibility of effect across products remains uncertain [10,11]. PRF is attractive for its autologous scaffold and potential healing benefits, but available extraction studies are not sufficiently uniform to establish a robust head-to-head ranking [3].

Clinical selection should therefore remain anchored in patient safety, operator experience, availability and outcome-specific evidence. Comparative efficacy claims must be proportionate to the strength and applicability of the underlying studies.

III. CONCLUSIONS

Most uncomplicated dental extractions in patients taking antiplatelet or anticoagulant therapy can be managed without routine interruption when a careful individualized assessment and dependable local hemostatic measures are available. Higher-risk procedures and complex medical conditions require medication-specific planning and, where appropriate, interdisciplinary discussion.

Direct pressure, socket packing, suturing, atraumatic technique and clear postoperative instructions remain the foundation of care. TXA, chitosan and PRF offer distinct adjunctive strategies, but their evidence bases differ and no single material can be recommended as universally superior for all bleeding and healing outcomes.

Further rigorously designed comparative trials are needed to clarify clinically meaningful benefits, standardize bleeding endpoints and evaluate safety, patient comfort, wound healing and cost-effectiveness.

DECLARATIONS

- Ethics approval: Not applicable; no new human-participant data were collected for this narrative review.

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