

Current Concepts in the Management of Postoperative Complications Following Oral Surgery

Luay Hatem Jalil

(College of Dentistry, Al-Farahidi University, Baghdad, Iraq)

Abstract:

Oral surgery postoperative events can be expected and self-limited or include postoperative hemorrhage, surgical-site infection, alveolar osteitis, neurosensory injury, and impaired healing. Prevention and Management is dependent on the assessment of procedure complexity, medications and systemic disease, and anatomic risk, all on a patient-specific basis. A narrative review of the 10 publications related to tooth extraction and dentoalveolar surgery. It covers the most common complications of recognition and management and reviews interventions such as local hemostasis, selective antimicrobial prophylaxis, chlorhexidine, platelet-rich fibrin and coronectomy. Literature indicates that many uncomplicated cases should be treated with a local rather than systemic approach, and that there is a need to escalate treatment rapidly to the systemic level when there is bleeding, spreading infection or an ongoing sensory disturbance. There is highest level of evidence for extraction and third-molar surgery for the mandible, and transfer of evidence to other oral procedures should be done with caution.

Keywords: oral surgery, postoperative complications, hemorrhage, infection of the surgical site, alveolar osteitis, nerve injury, wound healing.

Introduction

The wound in the oral cavity is surrounded by a microbiologically active environment and this surgery can disturb the blood vessels, nerves, and bones. There should be some pain, swelling and difficulty opening the mouth after a tough extraction, but, if things get worse or late, it may be a complication. A wide literature review of tooth extraction revealed that alveolar osteitis was a common complication, and that there was significant variation in the way that complications were defined and reported. This variation prevents easy comparisons of incidence among procedures and patient groups [1].

The management is started before the surgery. These factors include the indication and complexity of extraction, the location of the roots of the third molars in relation to the inferior alveolar nerve, smoking habits, oral hygiene, diabetes, immunosuppression, antithrombotic medication and antiresorptive therapy. A systematic review of patients at higher risk for medication-related events emphasizes that hemorrhage, infection, and medication-related jaw osteonecrosis are distinct pathways, with different

medications, and should be treated separately in order not to miss the diagnosis of a possible medication-related complication in a routine protocol [2]. The present review is based upon the ten publications provided, and prevention strategies and the evidentiary limits of their effectiveness are discussed.

Preoperative assessment and the early recognition of problems.

The surgical plan and follow up will be based on a detailed medical and medication history. The clinician needs to differentiate an expected course (peak pain and swelling followed by improvement) from recurrent bleeding, progressive swelling, fever, purulent drainage, and new changes in lip and tongue sensation, and worsening pain after initial improvement. Patient, tooth and procedural characteristics have been shown to materially alter estimates of complications [1] and the definition of the complication is inconsistent across studies, resulting in a lower ability to interpret pooled results of the narrative extraction review.

When multiple medications are prescribed, the purpose and timing of anticoagulants, antiplatelets, antiresorptives or immunosuppressive therapy should be recorded. The medication review suggests personalised planning, non-traumatic approach, local bleeding control and postoperative monitoring. Although the evidence is mixed, it should be used for guiding the assessment rather than be used for indiscriminate use of multiple antibiotics for all patients with it [2]. There should be explicit thresholds for contacting the surgical team, particularly if bleeding is persistent, swelling is getting worse rapidly or sensory loss has occurred, in written instructions.

Risk communication needs to differentiate between likelihood and seriousness. A mild, but common symptom may cause a lot of distress, while a rare symptom like a chronic sensory deficit can be far more significant. The extraction review, which breaks down patients, tooth, and clinician factors, warns that published studies may combine different endpoints [1]. Thus, consent and follow-up should be based on the specific adverse outcomes that are pertinent to the specific operation being considered. For patients with an anticoagulant prescription, for instance, it is important to explicitly discuss their bleeding and medication plans, and for a mandibular third molar with close canal relationship, discuss nerve injury [1,2].

Postoperative hemorrhage

Bleeding assessment begins with the onset of bleeding, the amount of bleeding, the effects of bleeding on the airways, the location of the operative site, how a patient's medications may affect bleeding, and the effectiveness of direct pressure. A blood stained saliva loss is not a repeated active bleeding. Typical first-line care includes continued pressure on the gauze packing, identification of the bleeding site, removal of unstable clot if clinically indicated and local treatment (e.g. suturing, hemostatic agent). If such bleeding has been ongoing or is severe, or if there is a hemodynamic alteration or airway involvement, there is an urgent need for evaluation. Do not automatically interrupt antithrombotic therapy; it should be based on the procedure and the risk of thrombosis [3].

Bleeding days in systemic reviews and network meta-analyses of randomized dental-procedure studies were mostly mild, and local hemostatics were generally effective and occurred on the first postoperative day. The procedures and drug protocols reviewed were, however, varied, so the results do not necessarily apply to complex surgery or high-risk patients [3]. Of the 537 patients with coagulation disorders who had extractions, periodontal flap surgery, or implant placement, 35 (6.5%) bled during the postoperative

period. Anticoagulants and more complex procedures such as extraction with grafting were included in the associations. It is important to note that the results of observational associations should not be interpreted as evidence that stopping treatment leads to clinically meaningful events [4].

A practical approach is then to assess the bleeding risk of the procedure, to determine if an antithrombotic indication needs to be communicated to the prescriber prior to the procedure, and to have hemostatic materials available locally prior to incision. If oozing continues after being discharged, re-check the socket – do not change a systemic drug by telephone. At the time of postoperative review, it should be noted if bleeding has been controlled, if a haematoma is enlarging and if referral is required [3,4].

The apparent treatment effect for the bleeding rates of the cohort (8.6% in the medication-maintenance group versus 4.8% in the discontinuation group) cannot be considered a causal treatment effect. Patients were not randomly allocated to continuation; there may have been differences in systemic risk and procedure type. In addition, this observational comparison did not correct for thromboembolic events, which are another safety-related concern [4].

The randomized-study synthesis identified no thromboembolic events in the trials included in the synthesis, however the number and type of studies limit confidence for rare adverse events [3].

The restrictions reinforce the decisions that are made in coordination and on an individual basis, and ensure that local measures are carried out with great care, instead of a blanket medication rule for all extractions.

Surgical-site infection and antibiotic stewardship

Symptoms include pain that worsens rather than resolves, new or worsening swelling, purulent discharge, fever, and/or deterioration in function. A clinical review should differentiate localized inflammation, alveolar osteitis from spreading odontogenic infection, as the latter may require urgent hospital review, debridement, antibiotics and drainage. Treatment of a collection and an existing source of infection is not with antibiotics but identification and control of an infected focus are key [1,2].

De Angelis and colleagues performed a systematic review that consolidated 16 studies on antibiotic prescribing before third molar surgery in healthy patients. It detected fewer infections and fewer cases of alveolitis with antibiotic prophylaxis and clearly expressed adverse effects and resistance when evaluating the necessity of antibiotic prescribing [5]. The finding is not intended to suggest that universal prophylaxis is indicated. The baseline infection risk, the difficulty of surgery, patient factors, and the absolute benefit should all be part of the decision making process; the results of third molar surgery cannot be directly applied to uncomplicated extraction, implants or any oral surgery [5].

Coronectomy infection profile is different. Meta-analysis of 22 observational studies with 2173 coronectomies resulted in an estimated pooled surgical-site infection prevalence of 2.4% (CI 1.0%–4.3%). The studies were considered to be of moderate methodological quality [6] and heterogeneity was high ($I^2=81\%$). This rate is helpful for counseling purposes, but is not a one-on-one comparison to extraction and is not intended to dictate the need for any particular antibiotic regimen. The clinical reaction to suspected infection remains largely dependent on severity, examination and the need for local therapy [6].

Prophylaxis needs to be differentiated from treatment especially. The antibiotic review focuses primarily on preventative use in otherwise healthy patients with third molar extraction, and is not intended to provide a regimen when a patient already has spreading postoperative infection [5].

A post-operative evaluation should include onset, progression, local findings, systemic findings, and drainage or specialist referral. However, if it is just a mild ache that is not getting worse and is not causing inflammation, it should not be considered infection.

The medication-related systematic review brings up individual issues for patients who are immunocompromised, but the diversity of sources does not warrant the adoption of a standard antibiotic regimen for all of these patients [2].

Alveolar osteitis, Delayed socket healing

Usually, dry socket or alveolar osteitis results in severe pain during the first few days after a tooth extraction. This usually results in significant pain, also during the first few days after the extraction of a tooth, when the clot in the empty socket is either dislodged or dissolves. During examination, the doctor might find bone exposed, an empty appearing socket, and pain that is not proportionate to the normal healing process. It is a condition that should be differentiated from a purulent infection and other causes of chronic pain. The extraction review indicates that alveolar osteitis is a common complication identified but cautions that there are multiple definitions and patient populations making it difficult to arrive at a universal frequency [1].

Local management includes a thorough evaluation of the socket, gentle irrigation if necessary, symptom management and reevaluation if the course is atypical or long. There is more evidence supporting the use of chlorhexidine as a preventive adjunct than a single agent in the treatment of a well-established severe socket. The risk ratio for the incidence of alveolar-osteitis was 0.46 (95% CI 0.39-0.53) when chlorhexidine was compared to other measures to improve the wound healing after extraction in a meta analysis of 33 studies and 4766 cases. Each formulation had different effects, so it is not recommended to apply a numerical estimation to all concentrations and clinical uses [7].

Platelet-rich fibrin (PRF) is being studied as an adjunct to regeneration. Thirteen studies were selected for a systematic review and qualitative analysis and some clinical comparisons showed that this method resulted in fewer pains and quicker healing. Nevertheless, the authors recommended further larger and better standardized randomized trials before becoming routine as the definitive treatment of dry socket [8]. In the present practice, PRF may be used as an adjunct in a suitable environment, but for all else, clear diagnosis, local care and follow-up are still the basis of the practice. The distinction between the primary (during extraction) and secondary (after extraction) treatment of an alveolar osteitis should be clear [7,8].

The chlorhexidine and PRF results also should be segregated for review of management. Chlorhexidine was assessed in various aspects of wound healing and alveolar osteitis prevention following surgery, while the PRF review focused on the clinical comparisons that aligned with an already symptomatic alveolar socket [7,8].

The latter reported promising results, but was unable to pool a limited number of studies with varying methods and endpoints. A better argument would be to suggest that PRF is better than all of the established methods of dressing and irrigation, which would go beyond the evidence provided. When a patient wants to alleviate their pain quickly, counseling should outline the probable reason for using each adjunct along with the level of uncertainty, in relation to the adjunct.

Neurosensory injury and risk reduction.

Interruption of the inferior alveolar or lingual nerves can lead to alteration of sensation, dysesthesia or neuropathic pain in the gingiva, lip or tongue and to numbness of the tongue or lip. Any new symptom should not be termed “postoperative discomfort”, but plotted on a baseline and recorded at the time and followed longitudinally. There is some variation in the evidence for physical therapy and/or photobiomodulation (PBM) rehabilitation therapies [9] and neurological effects are transient when studying surgeries for lower molars. Where a deficit is identified or one that is substantial and ongoing, then there is a need for appropriate specialist evaluation [9].

Risk reduction, at least in part, is a pre-operative decision that needs to be taken in cases of third molars that are associated with the inferior alveolar canal. A systematic review revealed that IAN injury was found in 0.56% and 6.53% of cases in the coronectomy and complete extraction groups, respectively, and in 0.13% and 1.18% of cases in the two groups, respectively, which caused permanent injury. Other factors of coronectomy are failure, root migration and the need for later intervention, and it is not only the relative-risk number that decides on the suitability of the tooth and patient [10]. It is also important to note that one of the infection meta-analysis is found in the separate publication [6] which explains one of the safety results, but is not an excuse for not conducting clinical follow-up of retained roots.

A critical postoperative sensory examination will involve the area affected by the symptom (numbness or distorted sensation), the time it first occurred and changes since surgery. This would enable an evolving deficit to be differentiated from the residual anaesthetic effect and would give a baseline for referral [9].

Patients were deemed to have a higher risk of damage to the anatomical nerve during conventional extraction and hence were included in the systematic review of the coronectomy procedure. Comparisons should not be made with the indication for an uncomplicated, low risk third molar [10] as to the need for coronectomy. Similarly, if the coronectomy is successful, a follow-up surgery might not be necessary, but should be based on symptoms and clinical findings [10].

Inability to heal for medically complex patients

If the wound does not heal or if the wound breaks down, infection should be suspected, as should further trauma, retained pathology, and any other factor that may exist for the patient such as smoking, diabetes, immunosuppression, and any previous drug exposure. The medication focused systematic review [2] addresses antiresorptive drugs and risks of infection for patients who have been made immuno compromised. These are problems that need to be diagnosed and surgery/specialist treatment prescribed; they don't just have to be called a dry socket due to pain. The use of chlorhexidine will not replace systemic risk assessment or a long-term local cause [7].

There are also several types of evidence from the source literature: a narrative synthesis, a systematic review of a range of designs, a randomized-study review, and an observational bleeding cohort. They answer some questions with answers of 'risk reduction', 'prevalence', and 'treatment responses'. Specifically, the number of events following an intervention isn't the only one that determines the intervention for every patient. Follow-up should be commensurate with the type of complication and the consequences of failure to diagnose [1–10].

It is not likely that one follow-up schedule will be suitable for all 10 topics. Bleeding is typically an early complication and should be reassessed immediately if the bleeding is not caused by local pressure, a dry-

socket pain may occur over the following days, and infection may occur with increasing signs, and recovery of nerves may require serial sensory documentation [1,3,8,9]. The discharge plan should then parallel the potential for recovery, with warning signs, and describe the pathway for immediate contact. It can also be helpful for medically complex patients, if a review has been planned, it will show whether any healing is delayed or if the underlying cause is not apparent at the patient's return visit [2]. In this time-based approach, the clinical pattern described in the reviews provided are followed but no particular day is a 'diagnostic day' for any particular symptom.

Conclusion

Post-surgical care of oral surgery complications can be done most effectively if simple recovery is contrasted with active bleeding or bleeding, infection, alveolar osteitis, neurosensory injury or impaired healing. Some of the unifying principles are those of local hemostasis, careful evaluation of the socket, selection of antibiotics in the correct manner, and early referral. Some of the extraction results for chlorhexidine have been proven to be preventive; PRF is an emerging aid in managing postsurgical dry sockets; coronectomy is a possible treatment for high-risk third molars in the mandible to avoid inferior alveolar nerve damage.

For all of these 10 sources, the highest level of evidence is for the procedures of extraction and third molar; for all other cases, the decision should be based on the procedure and on the extent of patient acceptance and the level of certainty of the underlying evidence [1-10].

References

1. Dignam P, Elshafey M, Jeganathan A, Foo M, Park JS, Ratnaweera M. Prevalence and factors influencing post-operative complications following tooth extraction: a narrative review. *Int J Dent.* 2024;2024:7712829. doi:10.1155/2024/7712829.
2. Morgado-Sevillano D, Rodríguez-Molinero J, García-Bravo C, Peña-Cardelles JF, Ruiz-Roca JA, García-Guerrero I, et al. Oral surgery considerations in patients at high-risk of complications related to drug intake: a systematic review. *Saudi Dent J.* 2024;36:1503–1508. doi:10.1016/j.sdentj.2024.12.004.
3. Bocatonda A, Frisone A, Lorusso F, Bugea C, Di Carmine M, Schiavone C, et al. Perioperative management of antithrombotic therapy in patients who undergo dental procedures: a systematic review of the literature and network meta-analysis. *Int J Environ Res Public Health.* 2023;20(7):5293. doi:10.3390/ijerph20075293.
4. Lee JY, Park SH, Kim DM, Ko KA, Park JY, Lee JS, 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;14:7787. doi:10.1038/s41598-024-57881-7.
5. De Angelis N, Denegri L, Miron IC, Yumang C, Pesce P, Baldi D, et al. Antibiotic prescription for the prevention of postoperative complications after third-molar extractions: a systematic review. *Dent J (Basel).* 2025;13(3):107. doi:10.3390/dj13030107.
6. Kostares E, Kostare G, Kostares M, Tsakris A, Kantzanou M. Prevalence of surgical site infections following coronectomy: a systematic review and meta-analysis. *Dent J (Basel).* 2024;12(12):379. doi:10.3390/dj12120379.
7. Romero-Olid MN, Bucataru E, Ramos-García P, González-Moles MA. Efficacy of chlorhexidine after oral surgery procedures on wound healing: systematic review and meta-analysis. *Antibiotics (Basel).* 2023;12(10):1552. doi:10.3390/antibiotics12101552.
8. Laforgia A, Inchingolo AD, Riccaldo L, Avantario P, Buongiorno S, Malcangi G, et al. The use of platelet-rich fibrin (PRF) in the management of dry socket: a systematic review. *Int J Mol Sci.* 2024;25(18):10069. doi:10.3390/ijms251810069.
9. Mancini A, Inchingolo AM, Di Blasio M, de Ruvo E, Di Noia A, Ferrante L, et al. Neurological complications following surgical treatments of the lower molars. *Int J Dent.* 2024;2024:5415597. doi:10.1155/2024/5415597.
10. Rico-Barroso L, Barroso-Medel ME, Gutiérrez-Pérez JL, Serrera-Figallo MA, Torres-Lagares D. Coronectomy as an alternative technique to complete extraction of mandibular third molars with risk of nerve injury. *Med Oral Patol Oral Cir Bucal.* 2026;31(1):e19–e30. doi:10.4317/medoral.27459.