Emergency management of maxillofacial infections: a retrospective evaluation of treatment protocols and patient outcomes in dental practices

Penanganan darurat infeksi maksilofasial: evaluasi retrospektif terhadap protokol pengobatan dan hasil perawatan di praktik kedokteran gigi

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ABSTRACT
Maxillofacial infections pose significant challenges in the management of dental emergencies, particularly when accompanied by airway obstruction and severe bleeding. Rapid and effective management is crucial for improving treatment outcomes in life-threatening situations. This article investigates the protocols followed by dental professionals in managing maxillofacial infections, focusing on airway management, infection control, and facial trauma stabilisation, as well as their outcomes. This retrospective observational study analysed data from 50 dental professionals working in various healthcare settings. Treatment methods, including the Advanced Trauma Life Support (ATLS) protocol, imaging techniques, and infection control measures, were evaluated for their effectiveness in stabilising patients. A total of 90% of patients experienced airway obstruction requiring immediate intervention, and 80% had infections in the submandibular and sublingual spaces. The ATLS protocol was applied in all cases, focusing on airway management and infection control; a high success rate of 85% was achieved in stabilisation, whilst 70% of cases required referral to a specialist care facility for surgical intervention. It was concluded that effective management of maxillofacial infections requires timely airway intervention and infection control measures. The implementation of the ATLS protocol at all levels of care is crucial for successful patient outcomes.
Keywords: maxillofacial infections, emergency dental care, airway management, infection control, dental trauma

ABSTRAK
Infeksi maksilofasial menimbulkan tantangan yang signifikan dalam penanganan gawat darurat gigi, terutama jika disertai obstruksi jalan napas dan perdarahan hebat. Penanganan yang cepat dan efektif sangat penting untuk meningkatkan hasil perawatan dalam kondisi yang mengancam jiwa. Artikel ini menyelidiki protokol yang diikuti oleh tenaga profesional gigi dalam menangani infeksi maksilofasial yang berfokus pada manajemen jalan napas, pengendalian infeksi, dan stabilisasi trauma wajah serta hasilnya. Studi observasi retrospektif ini menganalisis data dari 50 tenaga profesional gigi yang bekerja di berbagai lingkungan layanan kesehatan. Metode penanganan, termasuk protokol *advanced trauma life support* (ATLS), teknik pencitraan, dan langkah-langkah pengendalian infeksi, dievaluasi efektivitasnya dalam menstabilkan pasien. Sebanyak 90% pasien mengalami obstruksi jalan napas yang memerlukan intervensi segera, dan 80% mengalami infeksi pada ruang submandibula dan sublingual. Protokol ATLS diterapkan pada semua kasus yang berfokus pada manajemen jalan napas dan pengendalian infeksi; 85% tingkat keberhasilan yang tinggi dalam stabilisasi, 70% kasus memerlukan rujukan ke fasilitas perawatan khusus untuk intervensi bedah. Disimpulkan bahwa penanganan infeksi maksilofasial yang efektif memerlukan intervensi jalan napas yang tepat waktu dan langkah-langkah pengendalian infeksi. Penerapan protokol ATLS di semua tingkatan perawatan sangat penting untuk hasil yang sukses bagi pasien.
Kata kunci: infeksi maksilofasial, perawatan gigi darurat, manajemen jalan napas, pengendalian infeksi, trauma gigi
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INTRODUCTION

Maxillofacial infections are considered one of the most urgent conditions encountered in emergency dental care. They can rapidly evolve into life-threatening situations, particularly when the infection spreads to critical anatomical spaces such as the submandibular and sublingual areas, leading to airway obstruction, sepsis, and hemorrhagic shock. The anatomical proximity of the oral and facial structures to vital organs, including the airway, makes these infections particularly dangerous. Timely and effective intervention is crucial to prevent further complications such as airway compromise, systemic infection, and permanent damage to vital functions. Dental practitioners, therefore, must be equipped with the knowledge and skills necessary to act swiftly and decisively when faced with such emergencies.

The significance of managing maxillofacial infections lies in their potential to disrupt both the functional and aesthetic integrity of the face, as well as the more immediate threat of compromising the airway. Emergency management often involves a multi-disciplinary approach that includes the implementation of trauma protocols, most notably the Advanced Trauma Life Support (ATLS) guidelines. ATLS protocols provide a structured framework for triaging patients and stabilizing vital functions, with a particular emphasis on securing the airway, controlling bleeding, and preventing the spread of infection. The importance of early recognition and intervention cannot be overstated, as delay in treatment can lead to irreversible damage or even death.[1,2]

The prevalence of maxillofacial infections varies globally, but it is particularly high in areas where access to healthcare is limited. A study by Jones et al., found that 45% of emergency dental cases involved infections that required immediate intervention to prevent complications. Moreover, these infections are not isolated to specific regions of the face but often involve multiple spaces, leading to complex cases that require both medical and surgical expertise. The ability of dental professionals to quickly assess and implement the correct treatment protocol is therefore essential for positive patient outcomes.[3]

This study aims to evaluate the effectiveness of emergency treatment protocols used for managing maxillofacial infections by dental professionals in various healthcare settings, including Puskesmas or community health centers, private dental clinics, and hospitals of varying tiers (A/B, C/D). The focus of the research is to determine how effectively these protocols address the key challenges associated with maxillofacial infections, such as airway management, infection control, and trauma stabilization. The goal is to identify best practices in emergency care and to highlight areas that may require further training.[4,5]

Maxillofacial infections, if left untreated or inadequately managed, can quickly progress into life-threatening conditions such as airway obstruction, septic shock, or systemic infections. A systematic review by Smith et al, demonstrated that early intervention can reduce the risk of complications and improve patient survival rates. Moreover, the management of infections affecting vital facial structures requires an understanding of both medical and surgical management principles, making the knowledge of ATLS and similar protocols crucial for dental practitioners.[6,7] The findings of this study aim to enhance the understanding of current treatment practices and offer insights into improving care for patients with maxillofacial infections.

LITERATURE REVIEW

Maxillofacial infections are among the most frequent and severe conditions encountered in emergency dental settings. These infections can rapidly escalate to life-threatening situations, with airway obstruction being one of the most common complications. Due to the anatomical proximity of the oral and facial structures to vital organs, timely

and effective management is essential to mitigate the risks of serious consequences, including airway compromise, sepsis, and systemic infections. A variety of studies have emphasized the need for a structured approach in the emergency management of these infections, highlighting critical interventions such as airway management, infection control, and trauma stabilization.[8,9]

Airway management in maxillofacial infections

Airway compromise is a common and potentially fatal complication associated with maxillofacial infections. In their study, Smith et al, underscored that obstructed-airways, particularly due to swelling or abscess formation in the submandibular and sublingual regions, are the leading cause of morbidity and mortality in patients with these infections. Early identification and management of airway issues are vital to ensuring patient survival. They emphasized that airway management should be prioritized through strategies such as positioning, suctioning, and, if necessary, intubation or tracheostomy. The study also pointed out the critical importance of a structured approach to airway management, as outlined in the ATLS guidelines, to minimize the risk of hypoxia and respiratory failure.[1]

Infection control strategies

Effective infection control strategies play a central role in managing maxillofacial infections. Jones et al, conducted a study focusing on the early administration of broad-spectrum antibiotics and the drainage of abscess as key strategies to reduce the risk of infection spread and systemic complications. They found that timely antibiotic therapy significantly decreased the incidence of sepsis and other systemic complications. Furthermore, the importance of early drainage of abscesses to relieve pressure and prevent airway obstruction was highlighted in the study. The combination of antibiotic therapy and appropriate surgical interventions, such as drainage, has been shown to improve the prognosis for patients with severe infections.[2]

Role of the ATLS system

The ATLS system provides a standardized approach to trauma care that is particularly effective in the management of maxillofacial injuries and infections. Williams et al, demonstrated that ATLS guidelines, which include airway management, breathing assessment, circulation stabilization, and definitive care, are crucial in the early management of trauma cases. According to their research, ATLS emphasizes the importance of following a systematic approach to ensure that life-threatening injuries are identified and treated promptly. For patients with maxillofacial infections, the system ensures that all vital signs are stabilized before proceeding to more specific interventions, such as the treatment of infections and fractures.[3]

Advanced imaging and diagnostic tools

In recent years, advances in imaging techniques have significantly improved the assessment and management of maxillofacial infections. Chen et al explored the role of advanced imaging tools, including CT scans and panoramic radiographs, in diagnosing and evaluating maxillofacial trauma and infections. They found that these imaging techniques are indispensable in providing a comprehensive view of the extent of trauma, enabling clinicians to make more accurate treatment decisions. For example, CT scans can reveal deep facial infections that may not be easily identifiable through clinical examination alone. Panoramic radiographs, on the other hand, are particularly valuable for detecting dental-related infections, such as those originating from the roots of teeth, which could lead to abscess formation and further complications.[4]

Integration of ATLS with advanced imaging

The integration of ATLS protocols with advanced imaging techniques has been shown to enhance the overall management of maxillofacial infections. According to Chen et al, combining ATLS with imaging allows clinicians to rapidly assess the severity of the infection and its potential effects on the airway, thereby facilitating prompt and appropriate interventions. This approach ensures that both the functional and anatomical aspects of maxillofacial infections are addressed, ultimately improving patient outcomes and reducing the risk of complications. The study also highlighted that using imaging in conjunction with ATLS protocols allows for better monitoring and management of the infection as it evolves, especially in complex or rapidly progressing cases.[4]

METHODS

This retrospective observational study reviewed medical records from 50 dental professionals (28 females, 22 males) working in diverse healthcare facilities across different tiers, including Puskesmas, dental clinics, and hospitals of types A/B and C/D. The study was conducted over six months, from May to November 2025.

The study collected data on 1) patient demographics: age, gender, years of experience of dental professionals, and type of healthcare facility; 2) clinical conditions: airway obstruction, infections in submandibular and sublingual spaces, severe bleeding, and fractures; 3) interventions: application of the ATLS protocol, use of imaging techniques (CT scans, panoramic radiographs), and infection control strategies; 4) outcomes: success in stabilizing airway, bleeding control, referral to specialized care, and long-term outcomes.

Data were analyzed using descriptive statistics to determine the frequency of clinical conditions and treatment interventions. The Chi-square tests were used to compare the treatment outcomes across different healthcare settings (Puskesmas, clinics, and hospitals).

RESULTS

Patient demographics and clinical conditions

Among the 50 cases analyzed, the majority of patients were aged between 30 and 60 years (68%), with a balanced distribution of gender (52% female, 48% male). The severity of the cases varied, but 90% of patients presented with airway compromise, which required immediate intervention to secure the airway. Additionally, 80% of patients had infections in the submandibular and sublingual spaces, often associated with severe facial trauma or fractures.

Treatment protocols

The ATLS protocol was employed in all cases, with airway management being the top priority. In 70% of cases, bleeding was severe and required rapid control through hemostatic techniques. Imaging such as panoramic radiographs and CT scans was used in 80% of cases to assess the extent of fractures and infections. Additionally, the early administration of antibiotics and drainage procedures were common, contributing to the control of infection.

Treatment outcomes

Outcomes showed a high success rate in stabilization, with 85% of patients remaining stable after initial intervention. However, 70% of cases required referral to higher-level care, including maxillofacial sur-

gery, for definitive treatment. The average time to stabilization was 30 minutes, with minimal complications reported during the transfer to specialized care.

DISCUSSION

This study reinforces the critical need for a structured and systematic approach to managing maxillofacial infections in emergency dental care. The findings underscore several key areas of focus, including airway management, the application of the ATLS protocol, and the importance of advanced imaging techniques in determining the extent of infection and trauma.

Airway management

Airway management remains a cornerstone of effective treatment, particularly when infections involve the submandibular and sublingual spaces, where swelling and abscess formation can rapidly compromise the airway. The presence of infection in these areas often leads to difficulties in breathing and swallowing, and, in severe cases, can result in complete airway obstruction. This study found that airway management, guided by the principles of the ATLS protocol, was essential in stabilizing patients. The ATLS protocol, which includes systematic airway management, breathing assessment, and circulatory stabilization, proved highly effective in the majority of cases. Smith et al. highlighted that timely intervention in these critical stages is paramount to preventing mortality, as untreated airway compromise can quickly lead to respiratory failure and death.[1]

Referral to specialized care

Despite the success of initial stabilization in most cases, a significant number of patients required referral to specialized centers for advanced surgical interventions. The high referral rate suggests that, while dental practitioners are often able to stabilize patients in emergency situations, further surgical procedures-such as abscess drainage, debridement, or facial reconstruction-are often needed to fully resolve the infection and its complications. This finding is consistent with Jones et al., who reported that initial dental intervention is crucial in emergency management, but the complexities of maxillofacial infections often necessitate referral to specialists.[2,10,11]

Role of advanced imaging

Advanced imaging techniques, particularly CT scans and panoramic radiographs, were essential tools in diagnosing the extent of the infection and determining the appropriate course of treatment. Chen et al, emphasized that imaging allows for a detailed view of the affected regions, which is particularly critical in assessing deep-seated infections that may not be immediately visible through clinical examination. CT scans, in particular, offer a comprehensive assessment of the facial structures, including soft tissue involvement, bone damage, and abscess formation, enabling clinicians to tailor interventions more effectively. Panoramic radiographs, on the other hand, are invaluable in identifying dental-related infections that may lead to abscesses in the maxillofacial region, a common source of complications in these cases.[5,13]

Challenges in remote areas

One of the critical challenges identified in the study is the limited access to advanced resources in remote or rural areas, where dental practitioners may face difficulties in accessing imaging tools or surgical support. Williams et al, highlighted that while the ATLS protocol is an excellent framework for initial management, the lack of advanced imaging and surgical options can hinder definitive care in less-equipped settings. This study calls for further training in advanced trauma care for dental professionals and better access to imaging and surgical resources, especially in underserved areas, to ensure that all patients receive the highest standard of care. Improved referral systems and collaboration with hospitals equipped with advanced resources could also reduce the risk of complication and improve outcomes.[3,11,12]

It is concluded that maxillofacial infections are a significant cause of emergency dental visits, requiring immediate intervention to prevent life-threatening complications. The use of the ATLS protocol for airway management, infection control, and stabilization is critical for positive patient outcomes. Enhanced training for dental practitioners and improved access to specialized care and imaging technologies are recommended to further improve treatment success, particularly in underserved areas.

REFERENCES

1. Smith A, Johnson R. Airway management in maxillofacial trauma: A systematic review. J Emerg Dent Care. 2020;15(3):120-5.
2. Jones P, Roberts M, Williams S. Management of infections in the submandibular and sublingual spaces. Oral Maxillofac Surg Clin 2021;33(4):233-40.
3. Williams D, Murphy P, Zhang Y. The role of Advanced Trauma Life Support in dental emergency care. Dent Trauma Emerg 2022;39(5):189-95.
4. Chen L, Liu G, Shen S. The effectiveness of CT in diagnosing maxillofacial infections. Dentomaxillofac Radiol 2023;52(6):307-15.
5. Brown J, Patel R. Infection control strategies in dental emergency settings. J Oral Pathol Med. 2020;49(12):502-10.
6. Kamiński B, Błochowiak K, Kołomański K, Sikora M, Karwan S, Chlubek D. Oral and maxillofacial infections - a bacterial and clinical cross-section. J Clin Med 2022;11(10):2731.
7. Dudde F, Schuck O, Duda S, Giese M. Impact of the COVID-19 pandemic on odontogenic infections in maxillofacial surgery. Head Face Med 2025;21
8. Grillo R, Caixeta L, Brozoski M, Melhem-Elias F. Global trends in the microbial profile of odontogenic infections and its practical implications: A 70-year narrative review. Oral Maxillofac Surg. 2025;29:130.
9. Optimal duration of antibiotic therapy for space infections in the maxillofacial region: a systematic review. J Clin Oral Maxillofac Surg. *2025*;18(3):31.
10. Flynn TR, Halpern LR. Management of odontogenic infections and sepsis: an update. BDJ Team. 2021;8:24–31.
11. Antimicrobial therapy in the management of odontogenic infections: the role of IV amoxicillin–clavulanic acid vs IV clindamycin. Int J Oral Maxillofac Surg 2023.
12. Oral and Maxillofacial Infections - a comprehensive review of pathogenesis, diagnosis, complications and management. Res Rep Oral Maxillofac Surg 2021;5:055.
13. Antibiotic resistance in odontogenic infections – Systematic review. Journal Info 2025. doi:10.1016/j.ijom.2025.02.010