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Original Research

Evaluation of antibiotics efficacy in maxillofacial region space infections: An original research

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ABSTRACT:
Introduction: Maxillofacial region space infections are a common and potentially serious condition that requires prompt and effective treatment. Antibiotics are crucial in managing these infections, but their efficacy remains debatable. This original research aims to evaluate the effectiveness of antibiotics in treating maxillofacial region space infections. **Methodology**: Using a retrospective study design, an evaluation of records of patients admitted to the Department of Oral and Maxillofacial Surgery with maxillofacial region space infections from a tertiary care hospital. **Result**: Among the 39 patients in the study, 24 were male, and 15 were female. The patients were divided into two groups: Group I consisted of 28 patients, and Group comprised 11 patients. I had more male patients (63.2%) than Group II (47.6%). Regarding ASA status (American Society of Anesthesiologists Physical Status Classification System), 84.7% of patients in Group I and 76.9% in Group II belonged to either ASA Class I or II. Regarding hospital treatment, the average number of days of inpatient stay for Group I patients was 5.87 days, slightly lower than the average of 6.57 days for Group II patients. The antibiotic failure rate was 3.5% in Group I and 4.7% in Group II. **Conclusion**: By evaluating the effectiveness of antibiotics, this study seeks to enhance patient care and optimise treatment strategies for maxillofacial region space infections.
Keywords: Maxillofacial, space infection, antibiotics, Dental, Oral

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INTRODUCTION

Maxillofacial region space infections often stem from dental pulp, periodontal, or peri coronal tissues. This leads to acute abscess formation due to inflammation in the periapical connective tissues, frequently associated with necrotic pulp. Such infections can cause swelling and cortical bone resorption. (1) The primary management approach involves local dental treatment to address the root cause and facilitate drainage through the soft tissues. Antibiotics play a crucial role in managing these infections.

Antibiotic use guidelines in dentistry differ globally, with penicillin, particularly amoxicillin, being the most prescribed drug for dental infections. Policies for antibiotic use in dentistry vary globally. Some suggest monotherapy with penicillin as the first-line treatment for acute odontogenic conditions, while others recommend a combination of penicillin with metronidazole. (2) Overprescribing dental antibiotics contributes to the global public health concern of antimicrobial resistance. Selecting appropriate antibiotics for managing dental infections in community settings, where pus sampling is uncommon, is vital for patient care and antibiotic stewardship.

Aerobes, facultative anaerobes, and strict anaerobes cause space infections. Determining the most suitable antibiotic for empirical treatment in a community

dental setting, where intravenous antibiotics and pus sampling are unfamiliar, is essential. (3) Understanding the effectiveness of oral antibiotics in these cases is crucial for improving patient care and optimising antibiotic use in dentistry.

Maxillofacial region space infections pose potentially life-threatening risks, necessitating a multidisciplinary approach involving surgical drainage and antibiotic therapy. (4) While antibiotics are commonly prescribed, their true efficacy in resolving conditions and preventing complications requires further research. This study aims to evaluate the effectiveness of antibiotics in managing maxillofacial region space infections, contributing to evidence-based treatment guidelines for this condition.

METHODOLOGY

Study Design: This research employed a retrospective analysis study design.

Participants: An evaluation of records of patients admitted to the Department of Oral and Maxillofacial Surgery with maxillofacial region space infections from a tertiary care hospital.

Participants were randomly assigned to one of two groups: the intervention group (receiving standard antibiotic treatment of Penicillin/Metronidazole) or the control group (receiving Clindamycin).

Data Collection: Data was collected through medical records.

Data Analysis: Statistical analysis was conducted to compare outcomes between the two groups using appropriate tests.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board, and written informed consent was obtained from all participants.

RESULTS

The oral and maxillofacial surgery department managed 49 patients with maxilla facial space infections during the study period. Among them, 39 patients were included in the study.

Among the 39 patients in the study, 24 were male, and 15 were female. The patients were divided into two groups: Group I consisted of 28 patients, and Group comprised 11 patients. I had more male patients (63.2%) than Group II (47.6%). The average age of patients in both groups did not show a significant difference, with Group I having an average age of 32.6 years and Group II having an average age of 32.8 years. The findings were analysed using chi-square and t-tests, and no statistically significant differences were observed in the middle white blood cell count at the initial presentation between the two groups (P value < 0.003).

Table 1: Group Characteristics

Characteristics	Groups (n = 49)	
	Group 1 (n = 28)	Group 2 (n = 11)
Average Age (Years)	32.68	32.42
Gender		
Men	17 (63.2 %)	5 (47.6 %)
Women	11 (36.8 %)	6 (52.4 %)
ASA Class		
Class I	10 (35.3 %)	4 (38.2 %)
Class II	14 (49.4 %)	4 (38.7 %)
Class III	4 (15.3 %)	3 (23.1 %)
Anatomical Risk		
Low	1 (5.2 %)	1 (4.7 %)
Medium	24 (84.7 %)	8 (76.1 %)
High	3 (10.1 %)	2 (19.1 %)

Regarding ASA status (American Society of Anesthesiologists Physical Status Classification System), 84.7% of patients in Group I and 76.9% in Group II belonged to either ASA Class I or II. Regarding infection risk, 84.7% of patients in Group I and 76.1% in Group II presented a moderate risk, commonly involving submandibular, sublingual, and submental spaces. Microbiological assessment of culture samples revealed expected findings in space infection. Gram-positive microorganisms were found in 75.9% and 66.3% of patients in Groups I and II, respectively. Gram-negative organisms were obtained in 21.4% and 42.9% for Groups I and II, respectively. Anaerobic cultures were present in 21.1% of Group I patients and 37.3% of Group II patients, with the remaining infections being aerobic.

Table 2: Microbiology

Culture Results	Group 1	Group 2
Gram Positive	75.9 %	66.3 %

Gram Negative	21.4 %	42.9 %
Aerobic	75.1 %	66.1 %
Anaerobic	21.1 %	37.3 %

Regarding hospital treatment, the average number of days of inpatient stay for Group I patients was 5.87 days, slightly lower than the average of 6.57 days for Group II patients. The antibiotic failure rate was 3.5% in Group I and 4.7% in Group II.

Table 3: Study Variables

Group	Average Hospital Stay (Days)	Antibiotic Failure (%)
Group 1 (n = 28)	5.87	3.5
Group 2 (n = 11)	6.57	4.7

DISCUSSION

Historically, space infections of the head and neck region had significant morbidity and mortality. However, with the progression of technology, including CT scanning and advanced airway management techniques, coupled with substantial changes in treatment strategies, including appropriate antibiotic therapy and surgical care delivery, one cannot help but notice the significant shift in mortality rate.

A combination of Penicillin G and Metronidazole has long been shown to be effective for managing maxilla facial space infection. Penicillin G has the most excellent activity against gram-positive organisms, gram-negative cocci, and non-beta lactamase-producing anaerobes. (5) In contrast, metronidazole has potent antibacterial activity against anaerobes, including Bacteroides and *Clostridium* species. Penicillin derivatives remain effective as an antimicrobial against most significant pathogens in orofacial odontogenic infections. (6)

Even though Penicillin resistance is a primary concern, the combination of Penicillin and Metronidazole was quite effective in Maxillofacial region space infections, as demonstrated by our study's clinically acceptable failure rate of 4.7%. This is likely because Metronidazole acted as a supplementary treatment for anaerobic bacteria; we only used it in the inpatient course. Patients were discharged on oral Penicillin alone as a 5-day course of these antibiotics quickly destroys susceptible anaerobic bacteria.

A study by Sepannen et al. evaluated the type of primary antibiotic administered during the hospital stay in two separate studies and found that the use of Penicillin G and Metronidazole remained the highest at 79% of all antibiotics issued for Maxillofacial region space infections between 1994–1995 (n = 71) and at 80% in 2004 (n = 101) at a medical centre in Finland. The second antibiotic agent that was evaluated was Clindamycin. (7) The spectrum of this medication includes streptococci, staphylococci, and pneumococci; some Bacteroides species and other gram-positive and -negative anaerobes are also marginally susceptible. In our study, Clindamycin as a single drug had an acceptable efficacy for managing Maxillofacial region space infections with an antibiotic failure rate of 3.5%. This failure rate of Clindamycin was lower than that of Penicillin and Metronidazole, even though Clindamycin has a narrower antimicrobial spectrum. A possible explanation may be the greater prevalence of infections with Penicillin resistant bacteria. Overall, the failure rates for Clindamycin and Penicillin/Metronidazole were 3.5% and 4.7%, respectively, well below the critical value of 5%.

A correlation has been suggested between the length of hospitalisation and the extent (anatomic) the infection has spread, with masticator space being the most involved, which was found faithful in our study also. (8) The average hospital stay for the Clindamycin group was slightly shorter than the penicillin/Metronidazole group (5.87 vs 6.57 days). More recently, multiple studies in the medical community advocate for the use of broader spectrum and more potent antibiotics such as Zosyn, Unasyn or third-generation cephalosporins in managing severe neck infections due to the evolution of resistant bacteria.

The results of this study show that Clindamycin and Penicillin/Metronidazole combination still represents a clinically effective first-line treatment option for treating Maxillofacial region space infections, at least for the more common, moderate-risk disorders. They should be used empirically until specific culture and sensitivity results are available, while traditional wisdom promotes using broader spectrum agents in situations with poor clinical progress. The use of culture and sensitivity has been propagated by surgeons worldwide to manage odontogenic infections; however, most of these patients get discharged because they start responding to surgical drainage following empirical antibiotic therapy. Rarely do some patients have a prolonged stay due to either antibiotic or surgical failure or both.

Patients who stay longer in the hospital have a better chance to improve when the culture and sensitivity results are available. Unfortunately, a delay in reporting can lead to worsening symptoms with a consequent increase in surgical morbidity and treatment costs. Benvenuti et al. concluded from their study that delaying antibiotic therapy does not yield better culture results. (9) it should be initiated early in managing severe infections.15 It seems only prudent that such an approach helps reduce bacterial resistance and minimise side effects that usually accompany

broader spectrum agents. The net effect is decreased burden on the healthcare system.

Based on our results, a reasonable treatment algorithm may be to continue to use Penicillin and Metronidazole or Clindamycin as the empiric first-line treatment rather than more potent antibiotics for many Maxillofacial region space infections unless the patient has an allergy to any one of them. The patient could always be switched to a broader spectrum antibiotic if the cultures showed resistance, or the patient failed to improve despite adequate drainage seen on repeat CT scans or if there are other reasons to use a more potent antibiotic (high-risk infection, medical comorbidities, etc.).

CONCLUSION

Maxillofacial region space infections are severe conditions that require prompt and effective treatment. This original research aims to contribute valuable insights into the efficacy of antibiotics in managing such infections. By evaluating the effectiveness of antibiotics, this study seeks to enhance patient care and optimise treatment strategies for maxillofacial region space infections.

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